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## Preface

This user manual is applicable to Wecon VD5L series bus servo drives.

In order to use this series of servo drives correctly, please read this manual carefully in advance and save it for later use.

During use, if you have any doubt about the function and performance of this equipment, please contact our technicians for relevant assistance to use this equipment smoothly.

The company's products are constantly being improved and upgraded, and the contents of this manual are subject to change without notice.

This manual is suitable for introductory and use reference books for elementary and intermediate readers. At the same time, all interpretation rights of this manual belong to our company.



### Dangerous

The danger caused by failure to operate as required may result in serious injuries or even death.



### Notice

The danger caused by failure to operate as required may result in moderate or minor injuries, and equipment damage.

## User Manual Change Record

| Date    | Version | Changed content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Applicable models                               |
|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 2024.12 | V1.0    | First edition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ★ VD5L-0□□SA1P                                  |
| 2025.05 | V2.0    | <ul style="list-style-type: none"> <li>▪ Added VD5E model related content (VD5E 6-channel DI).</li> <li>▪ Deleted section 7.8.3 "Related function settings" in Chapter 7;<br/>Deleted [60E6] position calculation method object dictionary.</li> <li>▪ Added [P01-20], [P06-34], [P05-20], [P05-21] function codes in Chapter 8;<br/>Added [60FE] object dictionary;<br/>Added monitoring quantity [U0-07] encoder communication error count;<br/>Added [U0-58] dynamic brake relay switching times;<br/>Added [U2-12] EtherCAT version number;<br/>Modified [P04-4] lower limit value, [P10-06] range, [U0-49] unit;<br/>Supplemented [605A] and [605D] descriptions.</li> </ul> | ★VD5L-0□□SA1P<br>★VD5E-0□□SA1G<br>★VD5E-0□□TA1G |

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# Chapter 1 Safety Reminder

## 1.1 Safety Precautions

This section describes the important items that users must observe, such as product confirmation, storage, transportation, installation, wiring, operation, inspection, and disposal. Please follow the steps required by this manual for trial operation.



### Dangerous

- ◆ After the power is turned off for more than 5 minutes and the power indicator is off, use a multi-meter to confirm that the voltage across the high-voltage capacitor has dropped to a safe voltage, and then proceed with the disassembly and assembly of the drive, otherwise the residual voltage may cause electric shock.
- ◆ Please never touch the inside of the servo drive, otherwise it may cause electric shock.
- ◆ Please insulate the connection part of the power terminal, otherwise it may cause electric shock.
- ◆ The grounding terminal of the servo drive must be grounded, otherwise it may cause electric shock.
- ◆ Please install the servo drive, servo motor, and external braking resistor on non-combustible materials, otherwise it may cause a fire.
- ◆ Be sure to connect an electromagnetic contactor and a non-fuse circuit breaker between the power supply and the main circuit power supply of the servo drive. Otherwise, when the equipment fails, it may cause fire because it cannot cut off the large current.
- ◆ In the servo drive and servo motor, please do not mix with oil, grease and other flammable foreign objects and screws, metal pieces and other conductive foreign objects, otherwise it may cause a fire.
- ◆ When the servo motor is connected to the machine, in case of any error in operation, it will not only cause damage to the machine, but also sometimes cause personal safety accidents.
- ◆ Do not damage or pull the cable forcefully, do not impose excessive force on the cable, or place heavy objects underneath, otherwise electric shock may occur, causing the product to stop operating or burn out.
- ◆ Do not use the brake of the brake motor for normal braking, otherwise it may cause a malfunction.
- ◆ Except for the designated operator, please do not set up, disassemble and repair the equipment, otherwise it may cause electric shock or injury.
- ◆ Do not remove the cover, cables, connectors and optional accessories while the power is on, otherwise it may cause electric shock.

- ◆ Please install a stop device on the machine side to ensure safety.
- ◆ Please take measures to ensure that your personal safety will not be endangered when restarting, otherwise it may cause injury.
- ◆ Do not modify this product, otherwise it may cause personal injury or mechanical damage.

## 1.2 Precautions for Storage and Transportation



### Notice

Please store and install the product in the following environment:

- ◆ Places without direct sunlight;
- ◆ Places where the ambient temperature does not exceed product specifications;
- ◆ Places where the relative humidity does not exceed product specifications;
- ◆ Places where condensation will not occur due to rapid changes in temperature;
- ◆ Places free of corrosive gas and flammable gas;
- ◆ Places without combustible materials nearby;
- ◆ Places with less dust, salt and metal powder;
- ◆ Places where there is no splash of water, oil, medicine, etc.;
- ◆ Places where vibration or shock will not affect the product (places that exceed product specifications);
- ◆ Places that will not be exposed to radiation;

Storage or installation in environments other than the above may cause product failure or damage:

- ◆ Please use the correct method for handling according to the weight of the product;
- ◆ Do not hold the motor cable or motor shaft for transportation;
- ◆ When operating the servo unit and servo motor, please pay attention to sharp parts such as the corners of the device.

## 1.3 Precautions During Installation



### Notice

- ◆ Do not install this product in a place free from water splashed or in an environment prone to corrosion;
- ◆ Please be sure to comply with the device installation direction, otherwise it may cause device failure;
- ◆ When installing, please make sure to keep the specified distance between the servo drive and the inner surface of the electric cabinet and other machines, otherwise it may cause fire or device failure;
- ◆ Do not apply excessive impact, otherwise it may cause equipment failure;
- ◆ Do not sit on the product or place heavy objects on it, otherwise it may cause personal injury;
- ◆ Do not use this product near flammable gases and combustibles, otherwise there may be a risk of electric shock or fire;
- ◆ Do not block the suction and exhaust ports, and do not allow foreign objects to enter the product, otherwise it may cause device failure or fire due to the aging of internal components.

## 1.4 Precautions During Wiring



### Notice

- ◆ Do not connect the three-phase power supply to the output terminals U, V, W of the servo drive, otherwise it may damage the device or cause a fire;
- ◆ Please connect the output U, V, W of the servo drive and the U, V, W of the servo motor directly. Do not use the electromagnetic contactor during the connection, otherwise it may cause abnormal operation or malfunction of the device;
- ◆ When the DO output terminals are connected to the relay, please pay attention to the polarity of the freewheeling diode, otherwise the drive may be damaged and the signal can not be output normally;
- ◆ Please fix the power terminal and the motor terminal firmly, otherwise it may cause a fire hazard;
- ◆ Do not connect the 220V servo unit directly to the 380V power supply;
- ◆ Do not pass the power cable and signal cable through the same pipe or bundle them together. When wiring, the power cable and signal cable should be placed at an interval of more than 30cm;
- ◆ Use twisted-pair shielded cables for signal cables and encoder cables, and the shielding layer should be grounded at both ends;
- ◆ The wiring length of the signal input cable is recommended to be within 3M, and the wiring length of the encoder is recommended to be within 15M;
- ◆ When using in the following places, please take adequate shielding measures.
  - When interference occurs due to static electricity.
  - Places where strong electric or magnetic fields are generated;
  - Places where there may be radiation;
- ◆ When checking the status, please make sure that the CHARGE indicator is off.

## 1.5 Precautions During Operation



### Notice

- ◆ During trial operation, in order to prevent accidents, please run the servo motor without load (not connected to the drive axis), otherwise it may cause injury.
- ◆ When the servo motor is running, do not touch its rotating parts, otherwise it may cause injury.
- ◆ Be sure to set the correct rotational inertia ratio, otherwise it may cause vibration.
- ◆ When it is installed on the supporting machine and starts to run, please set the user parameters in accordance with the machine in advance. If the operation is started without parameter setting, the machine may lose control or fail.
- ◆ When installing on the supporting machinery and starting to run, please put the servo motor in a state where it can be stopped in an emergency at any time, otherwise you may get injured.
- ◆ When using a servo motor on a vertical axis, please install a safety device to prevent the workpiece from falling under states such as alarm and overrun. In addition, please perform servo lock stop setting when

overrun occurs, otherwise the workpiece may fall in overrun state.

- ◆ Since extreme user parameter adjustments and setting changes will cause the servo system to become unstable, please never make settings, otherwise it may cause injury.
- ◆ When an alarm occurs, reset the alarm after removing the cause and ensuring safety, and restart the operation, otherwise it may cause injury.
- ◆ Except for special purposes, do not change the maximum speed threshold (P01-10). If user change it carelessly, it may damage the machine or cause injury.
- ◆ When the power is turned on and within a period of time after the power is cut off, the cooling fin of the servo drive, the external braking resistor, the servo motor, etc. may be exposed to high temperature. Please do not touch it, otherwise it may cause burns.
- ◆ If the power supply is restored after an instantaneous power failure occurs during operation, the machine may restart suddenly, so please do not stay close to the machine, and press the stop button when the power is off, and operate after the power supply is stable.

## 1.6 Precautions During Maintenance and Inspection



### Notice

- ◆ The power on and off operations should be carried out by professional operators.
- ◆ When testing the insulation resistance of the drive, please cut off all the connections with the drive first, otherwise it may cause the drive to malfunction.
- ◆ Do not use gasocable, alcohol, acid and alkacable detergents to avoid discoloration or damage to the casing.
- ◆ When replacing the servo drive, please transfer the user parameters of the servo drive to be replaced to the new servo drive before restarting operation, otherwise the machine may be damaged.
- ◆ Do not change the wiring when the power is on, otherwise it may cause electric shock or injury.
- ◆ Do not disassemble the servo motor, otherwise it may cause electric shock or injury.

## 1.7 Leakage protection and circuit breaker

| Servo drive          |              |                            | Recommended circuit breaker |             |             |
|----------------------|--------------|----------------------------|-----------------------------|-------------|-------------|
| Voltage level        | Drive model  | Rated input current IN (A) | Manufacture                 | Current (A) | Model       |
| VD5L-0xxSA1P         |              |                            |                             |             |             |
| Single phase<br>220V | VD5L-003SA1P | 0.9                        | Schneider                   | 2           | OSMC32N2D2  |
|                      | VD5L-010SA1P | 3.61                       |                             | 6           | OSMC32N2D6  |
|                      | VD5L-014SA1P | 6.76                       |                             | 16          | OSMC32N2D16 |
|                      | VD5L-015SA1P | 6.76                       |                             | 16          | OSMC32N2D16 |
| VD5E-0xxSA1G         |              |                            |                             |             |             |
| Single phase<br>220V | VD5L-003SA1G | 0.9                        | Schneider                   | 2           | OSMC32N2D2  |
|                      | VD5L-010SA1G | 3.61                       |                             | 6           | OSMC32N2D6  |
|                      | VD5L-014SA1G | 6.76                       |                             | 16          | OSMC32N2D16 |
|                      | VD5L-015SA1G | 6.76                       |                             | 16          | OSMC32N2D16 |
| VD5E-0xxTA1G         |              |                            |                             |             |             |
| Three phase<br>380V  | VD5L-016SA1G | 4.52                       | Schneider                   | 10          | OSMC32N3D10 |
|                      | VD5L-050SA1G | 22.61                      |                             | 32          | OSMC32N2D32 |



### Notice

If the device is to use a residual current device (RCD), please select it according to the following conditions:

- ◆ The drive device can generate DC leakage current in the protective conductor, so please be sure to use a type B residual current device (RCD);
- ◆ When the drive is running, a certain high-frequency leakage current will be generated. In order to avoid RCD misoperation, please select an RCD with an operating current of no less than 100mA for each drive;
- ◆ When multiple drives are connected in parallel to share one RCD, an RCD with an operating current of no less than 300mA should be selected;
- ◆ Do not change the wiring when the power is on, otherwise it may cause electric shock or injury;
- ◆ It is recommended to use RCDs from brands such as Chint and Schneider.

## Chapter 2 Product Information

### 2.1 Servo Drive

#### 2.1.1 Servo Drive Model Naming

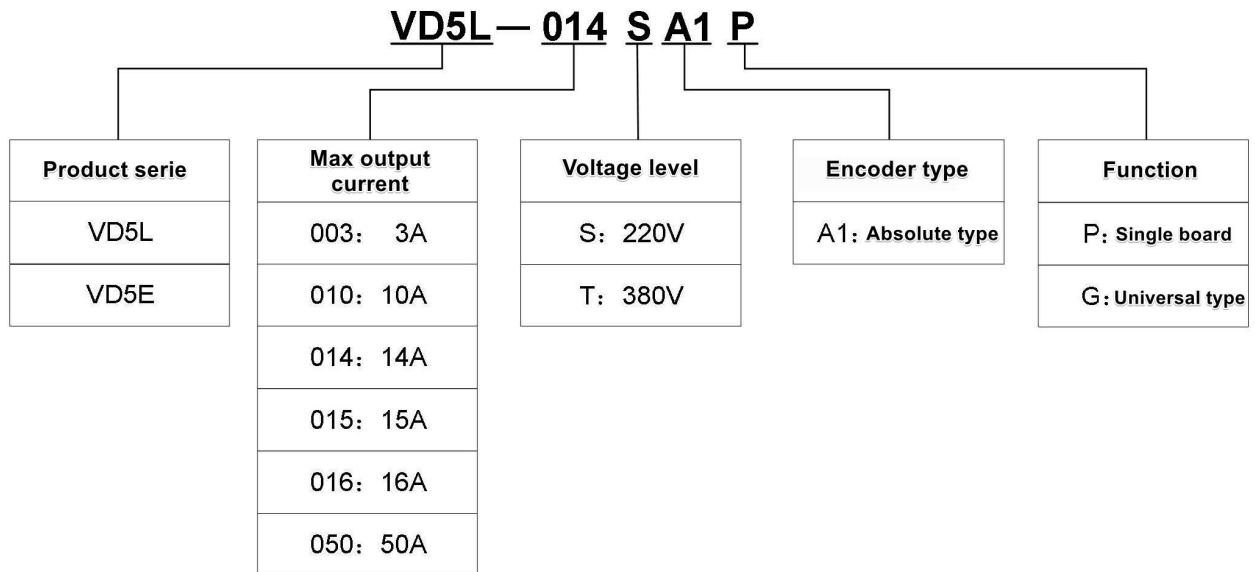


Figure 2-1 Servo drive model

Wecon VD5L, VD5E series bus servo drive nameplate and appearance are shown in Figure 2-2 and Figure 2-3

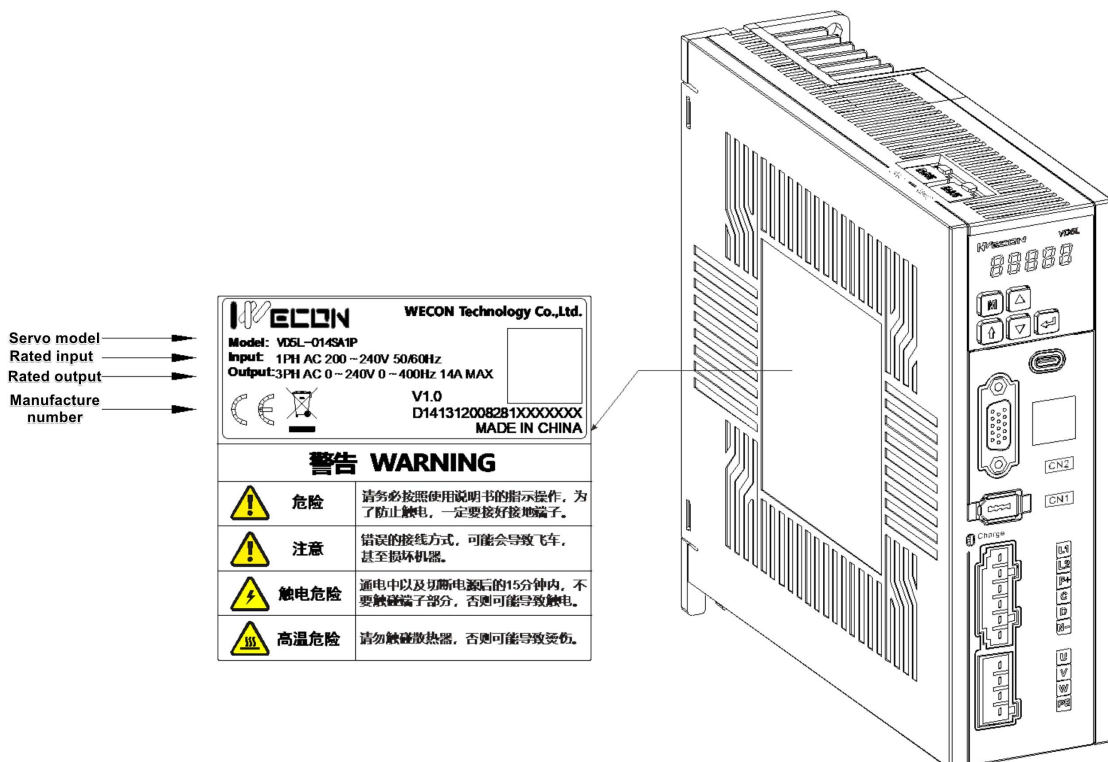


Figure 2-2 VD5L servo drive nameplate and appearance

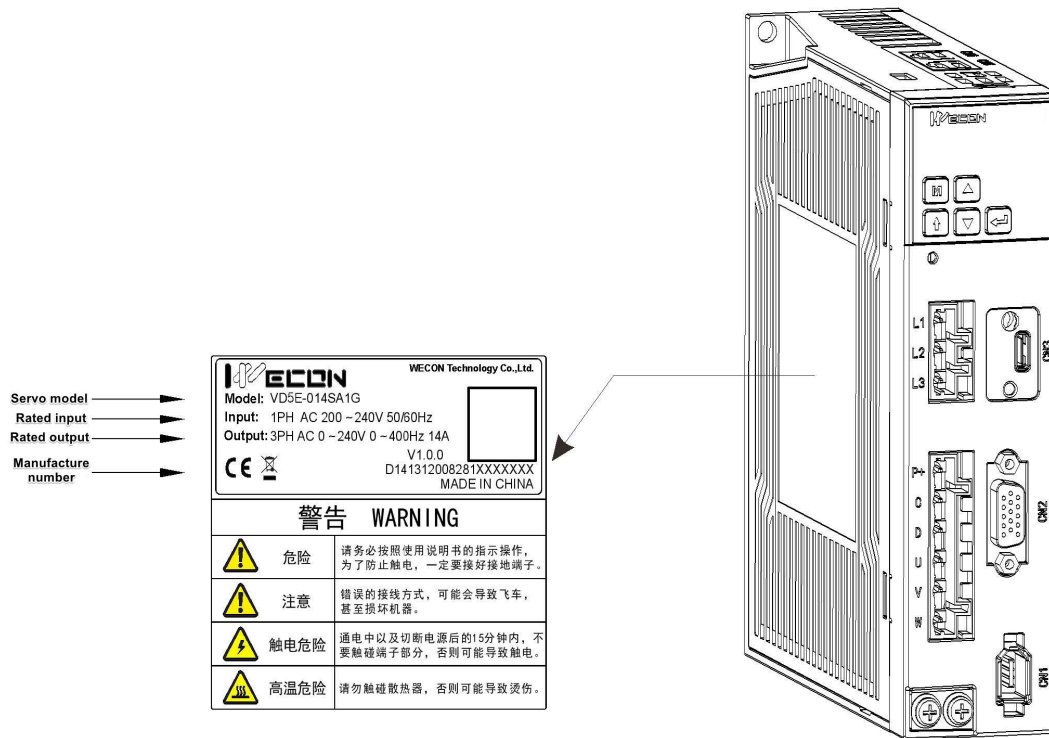


Figure 2-2 VD5L servo drive nameplate and appearance

### 2.1.2 The Composition of Servo Drive

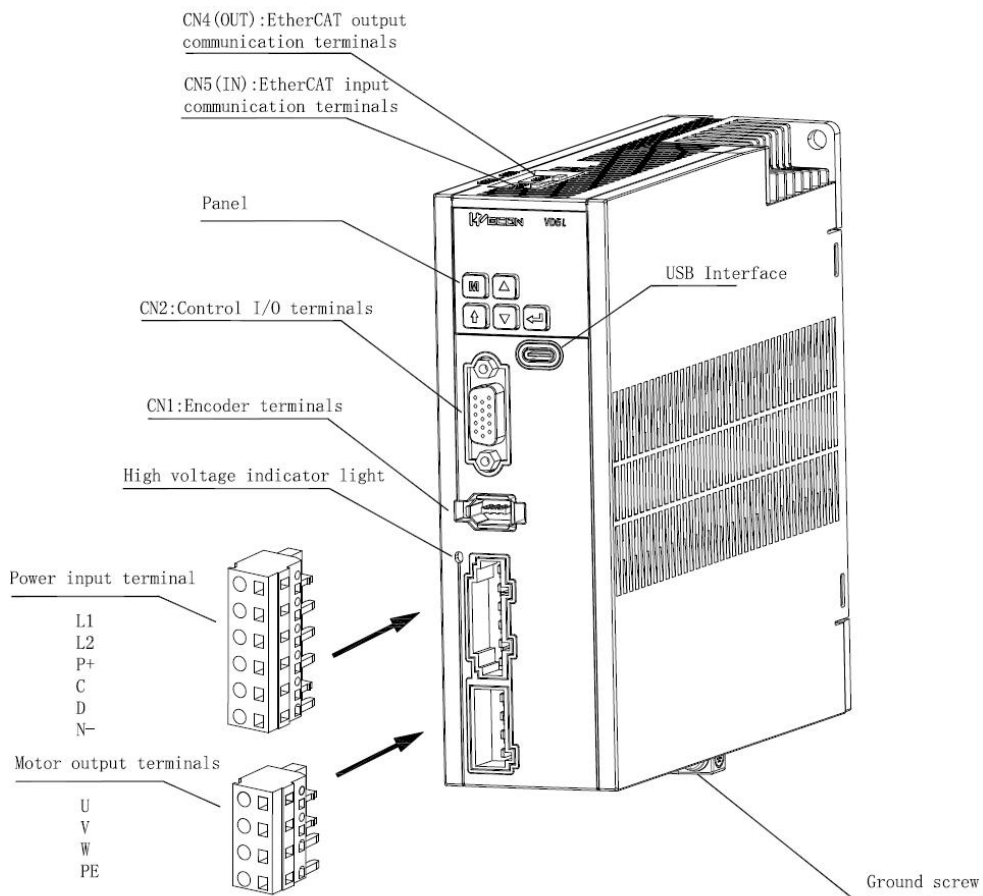


Figure 2-3 Composition of VD5L servo drive



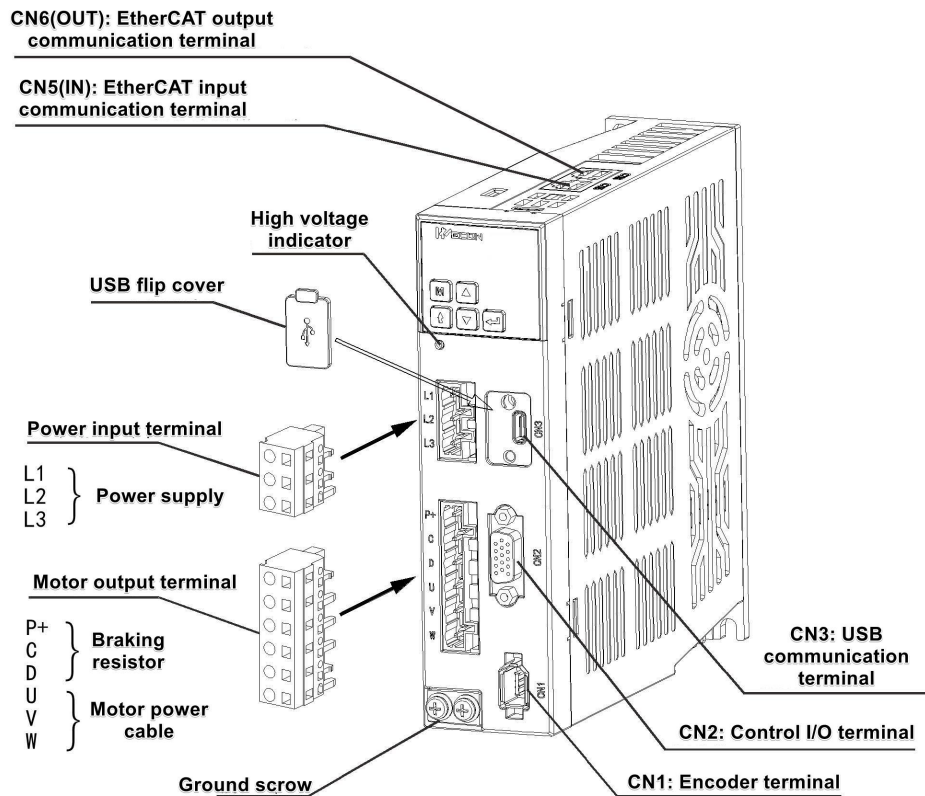


Figure 2-3 Composition of VD5E servo drive

Note: When using external braking resistor or internal braking resistor, special short-circuit treatment is required, which is shown in Figure 2-4.

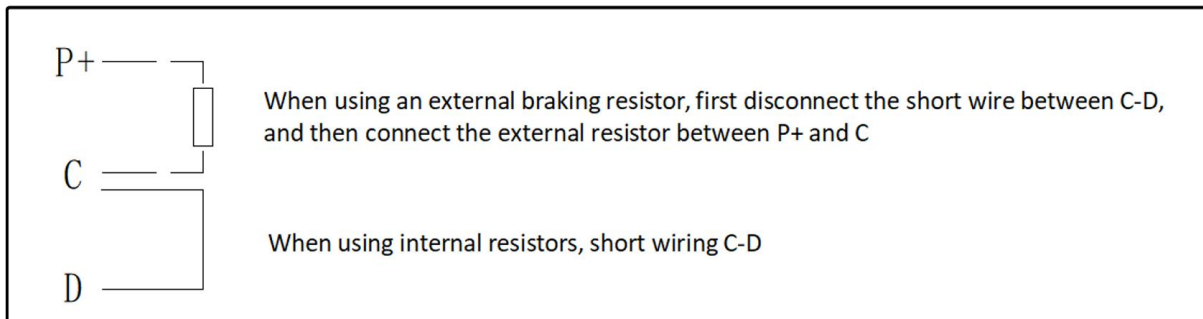


Figure 2-4 Short circuit schematic diagram of braking resistance

### 2.1.3 Servo Drive Specifications

#### (1) Electrical specification

Table 2-1 Electrical specification for single-phase 220V VD5L

| Project                | VD5L                                  |              |                                          |              |
|------------------------|---------------------------------------|--------------|------------------------------------------|--------------|
| Model                  | VD5L-003SA1P                          | VD5L-010SA1P | VD5L-014SA1P                             | VD5L-015SA1P |
| Maximum output current | 3A                                    | 10A          | 14A                                      | 15A          |
| Control supply         | -                                     |              |                                          |              |
| Power supply           | Single-phase AC 198V to 242V 50/60 Hz |              |                                          |              |
| Braking resistor       | Support external connection           |              | Support built-in and external connection |              |

Table 2-2 Electrical specification for single-phase 220V VD5E

| Project                | VD5E                                  |              |                                          |
|------------------------|---------------------------------------|--------------|------------------------------------------|
| Model                  | VD5E-003SA1G                          | VD5E-010SA1G | VD5E-014SA1G                             |
| Maximum output current | 3A                                    | 10A          | 14A                                      |
| Control supply         | -                                     |              |                                          |
| Power supply           | Single-phase AC 198V to 242V 50/60 Hz |              |                                          |
| Braking resistor       | Support external connection           |              | Support built-in and external connection |

Table 2-3 Electrical specification for three-phase 380V VD5E

| Project                | VD5E                                  |              |
|------------------------|---------------------------------------|--------------|
| Model                  | VD5E-003SA1P                          | VD5E-050SA1P |
| Maximum output current | 16A                                   | 50A          |
| Control supply         | Single-phase AC 342V to 440V 50/60 Hz |              |
| Power supply           | Three-phase AC 342V to 440V 50/60 Hz  |              |
| Braking resistor       | Support external connection           |              |

## (2) Basic specifications

| Item                    |                   | Description                                                  |
|-------------------------|-------------------|--------------------------------------------------------------|
| Environment information | Use               | Temperature                                                  |
|                         |                   | 0 to 40℃                                                     |
|                         |                   | Related humidity                                             |
|                         |                   | 20% to 90%, no condensation                                  |
|                         | Storage           | Shock                                                        |
|                         |                   | 3M4, 3mm[2-9HZ], 1 category                                  |
|                         |                   | Vibration                                                    |
|                         |                   | 3M4, 1G[9-200HZ], 1 category                                 |
|                         | Altitude          | Temperature                                                  |
|                         |                   | -20℃ to 65℃                                                  |
|                         |                   | Related humidity                                             |
| Basic Information       | Protection level  | 20% to 90%, no condensation                                  |
|                         |                   | 2M2, 3.5mm[2-9Hz]                                            |
|                         |                   | Vibration                                                    |
|                         | Polluted level    | IP20                                                         |
|                         |                   | II                                                           |
|                         |                   | III                                                          |
|                         | Usage temperature | The maximum altitude is 2000m.                               |
|                         |                   | • No derating is required for use at 1000m and below;        |
|                         |                   | • Derating is 1% for every 100m increase above 1000m;        |
|                         |                   | • Please contact the manufacturer for altitudes above 2000m. |
|                         | Usage humidity    | Control method                                               |
|                         |                   | IGBT PWM control, sine wave current drive mode               |
|                         |                   | Drive model                                                  |
|                         |                   | VD5L-0□□SA1P<br>VD5E-0□□SA1G<br>VD5E-0□□TA1G                 |
|                         | Encoder feedback  | 17bit absolute value encoder<br>23bit absolute value encoder |
|                         |                   | Usage temperature                                            |
|                         | Usage humidity    | 0 to 45℃                                                     |
|                         |                   | Below 90%RH (No condensation)                                |

|                                             |                                 |                                                 |
|---------------------------------------------|---------------------------------|-------------------------------------------------|
| Basic Performance of EtherCAT Slave Station | Communication protocol          | EtherCAT protocol                               |
|                                             | Support services                | CoE                                             |
|                                             | Synchronization mode            | DC                                              |
|                                             | Physical layer                  | 100BASE-TX                                      |
|                                             | Baud rate                       | 100Mbit/s                                       |
|                                             | Duplex mode                     | Full duplex                                     |
|                                             | Topological structure           | Ring, cablear                                   |
|                                             | Slave station number            | Less than 128 sets suggested for actual working |
|                                             | Synchronous jitter              | 1 $\mu$ s                                       |
| EtherCAT Configuration Unit                 | FMMU unit                       | 8                                               |
|                                             | Storage synchronization snap-in | 8                                               |
|                                             | Process data RAM                | 8KB                                             |
|                                             | Distributed clock               | 64-bit                                          |
|                                             | EEPROM capacity                 | 32Kbit                                          |
| Input and output                            | Digital input (DI) signal       | 4-channel DI (VD5L)<br>6-channel DI (VD5E)      |
|                                             | Digital output (DO) signal      | 3-channel DO                                    |

## (3) Support function

| Item              |                            | Description                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input and output  | Digital input (DI) signal  | Servo Enable (S-ON), Fault and Warning Clear (A-CLR), Forward Drive Disable (POT), Reverse Drive Disable (NOT), Error Counter Clear (CL), Emergency Stop (E-STOP), Homing Signal (HOMEORG)                                                                                                                                                                                                                     |
|                   | Digital output (DO) signal | Servo Ready (RDY), Fault Signal (ALM), Speed Limited (V-LIMIT) Brake output (BRK-OFF), warning signal (WARM signal), servo running state output (SRV-ST), rotation detection (TGON), communication VDO1 output (COM_VDO1), communication VDO2 output (COM_VDO2), communication VDO3 output (COM_VDO3) ZSP (Zero Speed Signal), Positioning Complete (P-COIN), Speed Approach (V-NEAR), Torque Arrival (T-COIN) |
| Built-in function | Electronic gear ratio      | The range is " $0.001 \times \text{Encoder Resolution}/10000$ , $4000 \times \text{Encoder Resolution}/10000$ "                                                                                                                                                                                                                                                                                                |
|                   | Protective function        | Overcurrent protection, overvoltage protection, undervoltage protection, overload protection, main circuit lack of phase protection, Overtemperature protection, abnormal parameter protection, encoder protection, others                                                                                                                                                                                     |

|  |                      |                                                               |
|--|----------------------|---------------------------------------------------------------|
|  | LED display function | Panel 5-bit LED                                               |
|  | Others               | Gain adjustment, fault and alarm recording, inching operation |

## 2.2 Servo Motors

### 2.2.1 Servo Motor Model Naming

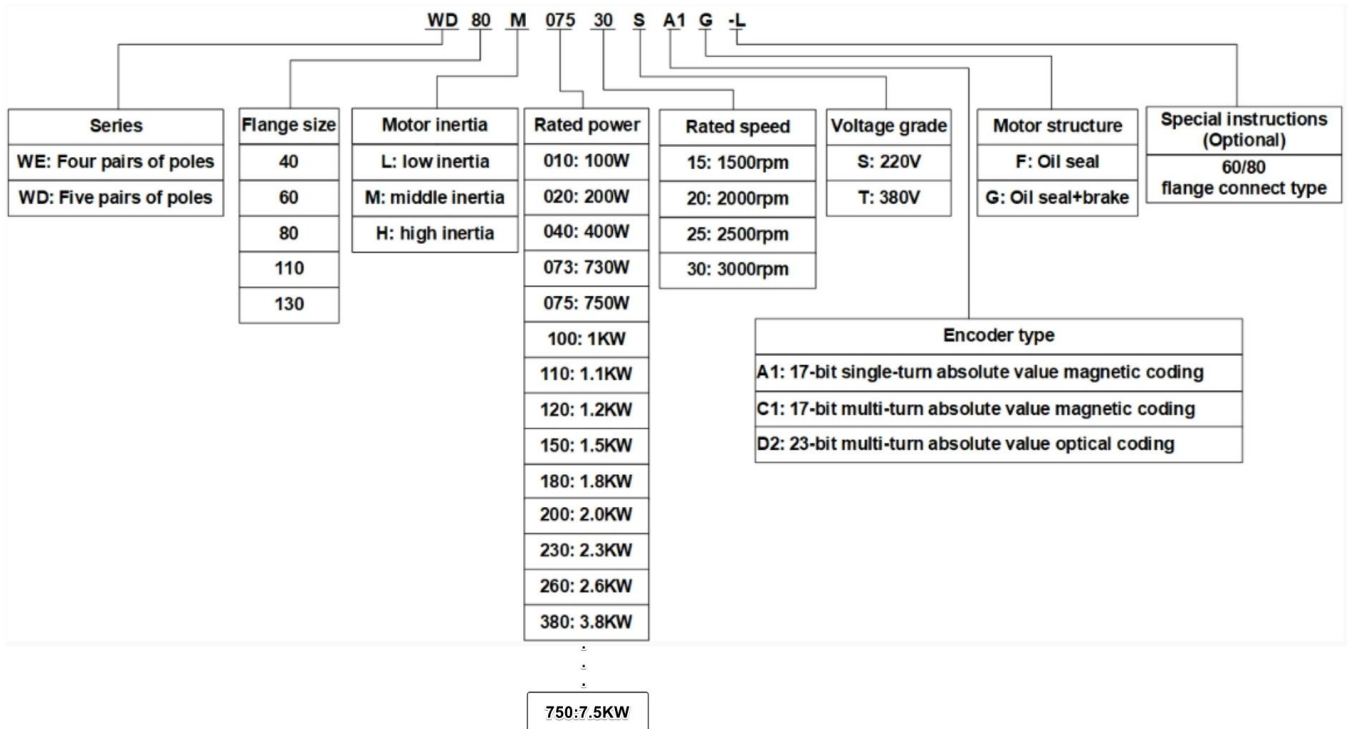


Figure 2-5 Naming of servo motor

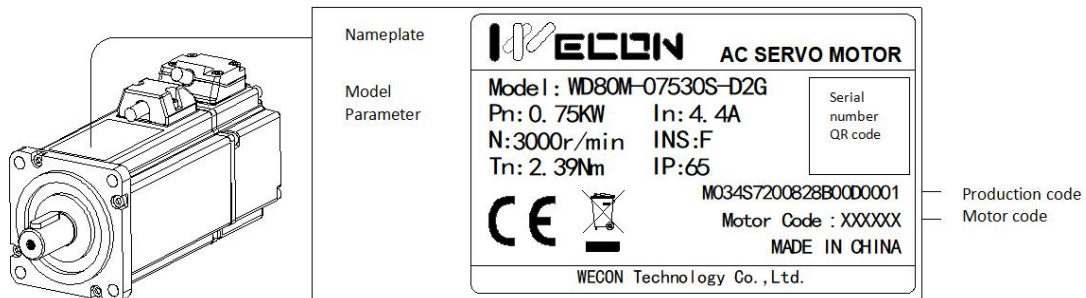


Figure 2-6 Servo motor nameplate

### 2.2.2 Composition of Servo Motor

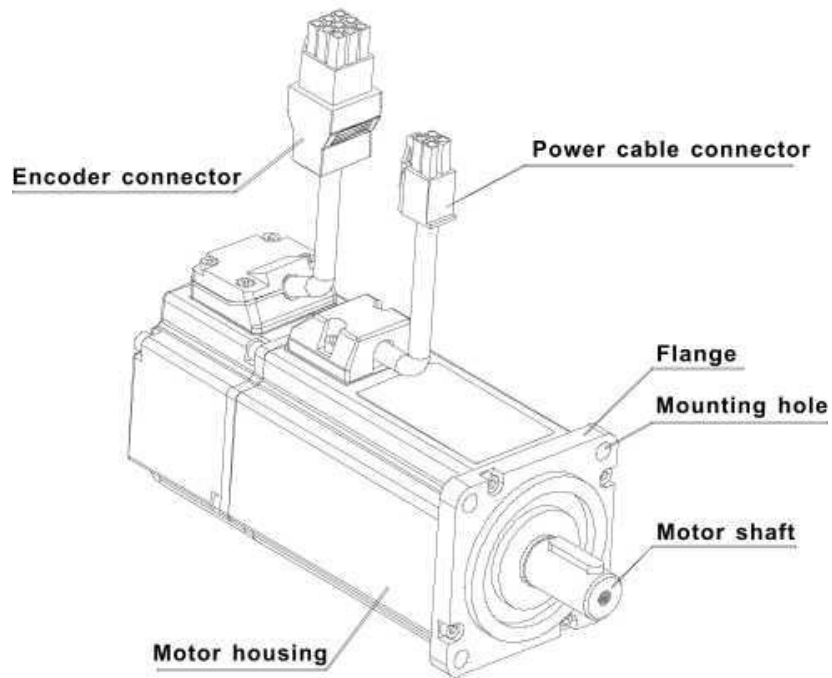


Figure 2-7 Composition of 40/60/80 flange of cable motor

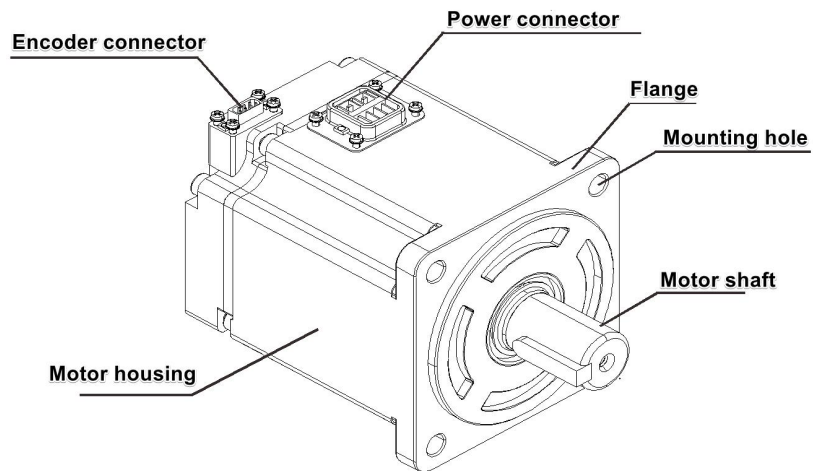


Figure 2-8 Composition of 40/60/80 flang of connector motor

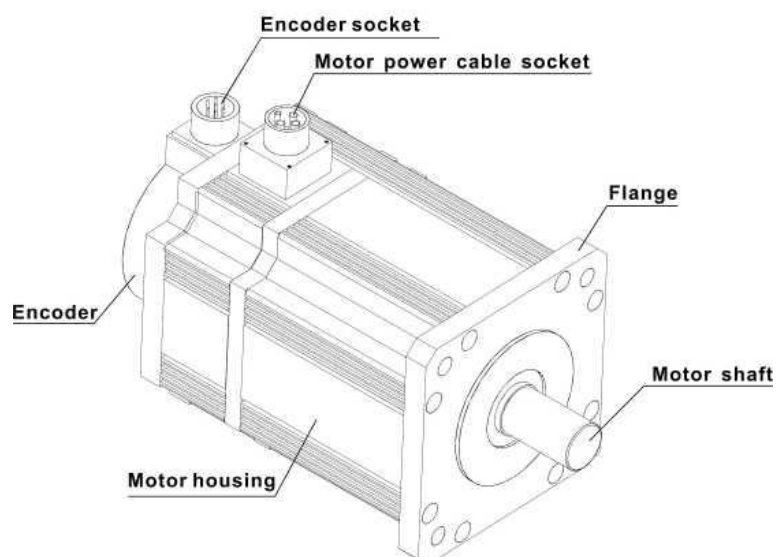


Figure 2-9 Composition of 110/130 flange motor

### 2.2.3 Specification of Servo Motor

Table 2-4 Wecon motor specifications

| Wecon motor model | Motor Code | Flange size | Rated power (KW) | Rated torque (N*m) | Voltage (V) | Rated speed (rpm) | Encoder type                         | Brake function |
|-------------------|------------|-------------|------------------|--------------------|-------------|-------------------|--------------------------------------|----------------|
| WE130M-10025S-A1F | A091       | 130         | 1.0              | 4.0                | 220         | 2500              | 17-bit single turn absolute magnetic | Not supported  |
| WE130M-15025S-A1G | A111       | 130         | 1.5              | 6.0                | 220         | 2500              | 17-bit single turn absolute magnetic | Supported      |
| WE130M-26025S-C1F | C191       | 130         | 2.6              | 10                 | 220         | 2500              | 17-bit multi turn absolute magnetic  | Not supported  |
| WE80M-12030S-C1G  | C231       | 80          | 1.2              | 4.0                | 220         | 3000              | 17-bit multi turn absolute magnetic  | Supported      |
| WE110M-18030S-D2G | D131       | 110         | 1.8              | 6.0                | 220         | 3000              | 23-bit multi turn absolute optical   | Supported      |
| WE130M-23015S-D2F | D161       | 130         | 2.3              | 15.0               | 220         | 1500              | 23-bit multi turn absolute optical   | Not supported  |

**Note:** Only part of the motor models are displayed, please refer to the [Model Selection Manual] for details.

## 2.3 Servo System Wiring Diagram

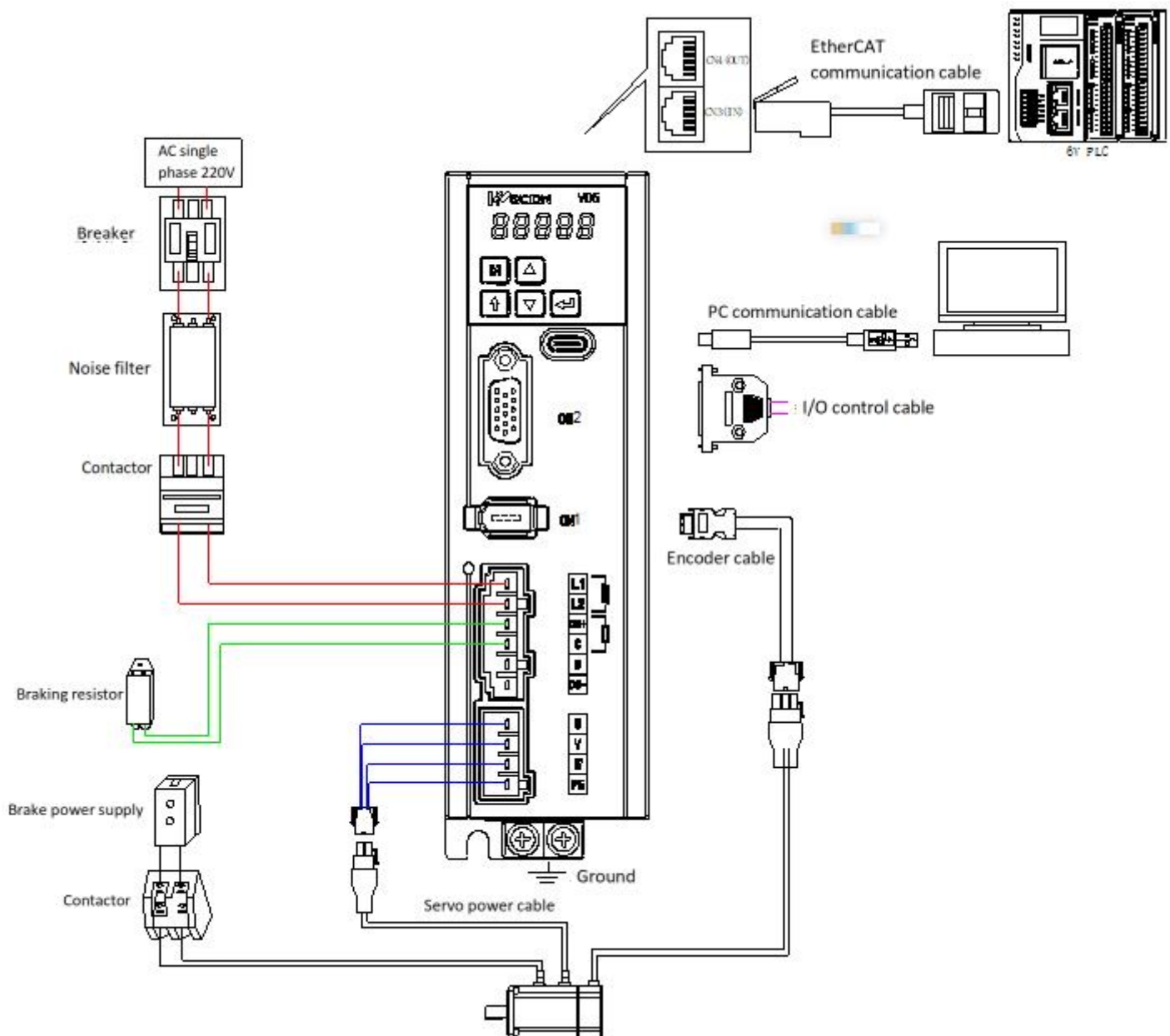


Figure 2-10 Wiring diagram of single-phase 220V servo drive system



### Notice

- ① When using external brake, need to remove the shorting cap or short wiring between terminal C and D of servo drive before operating!
- ② Pay attention to the power capacity of the brake power supply. When powering multiple brake devices at the same time, if the power supply capacity is insufficient, the brake will fail!



- ③ It is strictly forbidden to use electromagnetic brake for motor operation and stop operation! Otherwise, the instantaneous high voltage generated by the motor may break down the contactor!
- ④ In order to prevent cross-shock accidents in the servo system, please use a fuse or a circuit breaker for wiring on the input power supply!
- ⑤ This series of products must strictly comply with the EMC-related electrical installation requirements in the manual to meet the EMC certification standards;
- ⑥ When the CE mark is affixed to equipment or devices equipped with this series of products, please confirm whether the final equipment complies with the European unified standards. The relevant responsibilities shall be borne by the customer who finally assembles the product;
- ⑦ For more product certification information, please consult our company's agent or sales manager.

## Chapter 3 Installation of Servo Drive and Motor

### 3.1 Installation of Servo Drive

#### 3.1.1 Dimensions (Unit: mm)

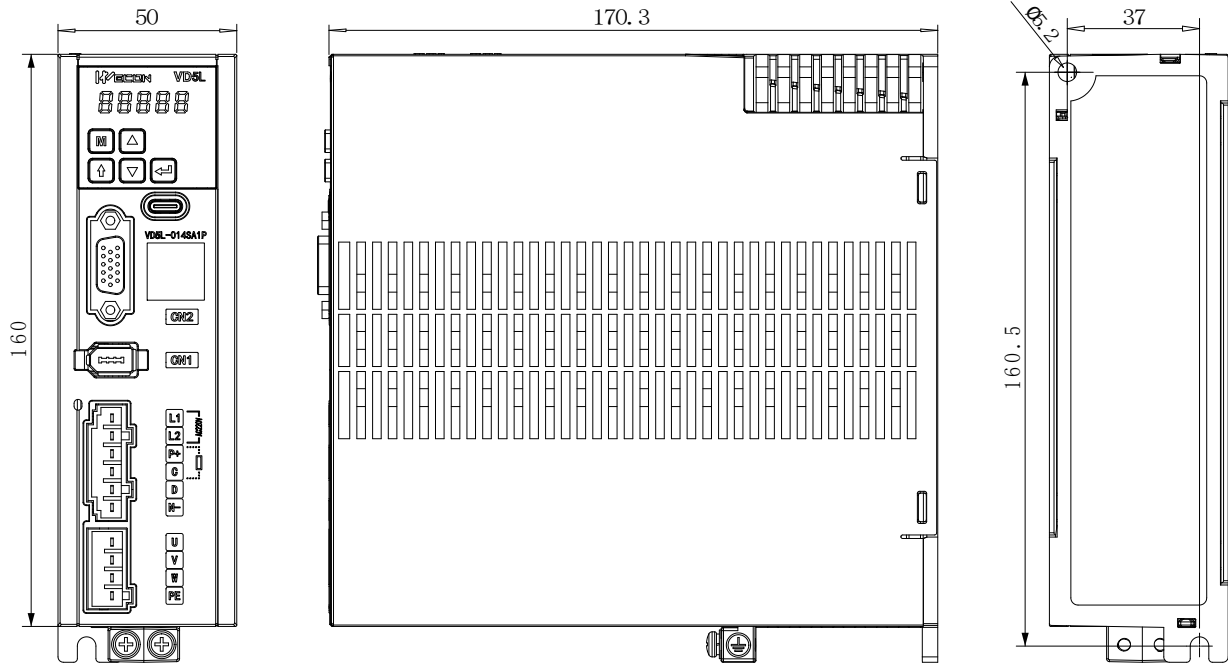


Figure 3-1 Installation Dimensions of VD5L Servo Drive

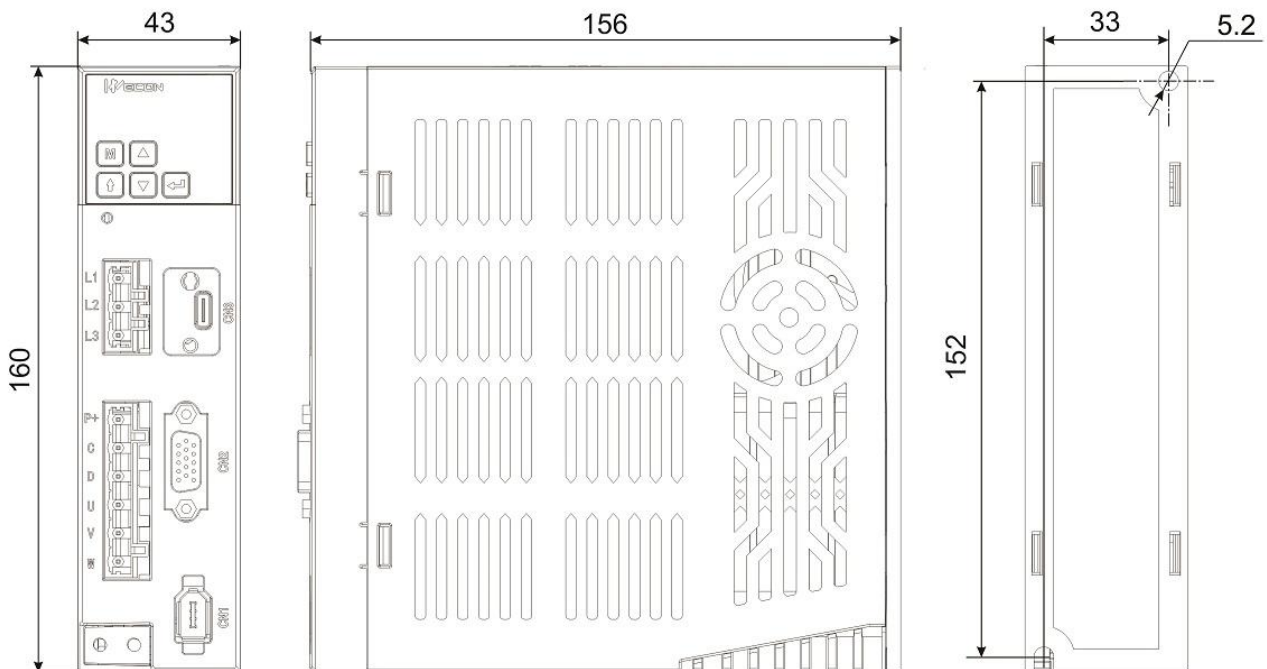


Figure 3-1 Installation Dimensions of VD5E Servo Drive

### 3.1.2 Installation Site

- ① Please install the device in an installation cabinet free from sunlight and rain;
- ② Place without vibration;
- ③ Please do not install in the environment exposed to high temperature, humidity, dust and metal dust;
- ④ Do not use this product near corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt or combustible materials.

### 3.1.3 Installation Environment

The installation environment of the servo drive has a direct impact on the normal function of it and its service life.

Therefore, the installation environment of servo drive must meet the following conditions:

| Item                | Specification                                                                                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient temperature | 0°C to 40°C (No freezing)                                                                                                                                                                                                      |
| Ambient humidity    | 20% to 90%RH (No condensation)                                                                                                                                                                                                 |
| Storage temperature | -20°C to 65°C                                                                                                                                                                                                                  |
| Storage humidity    | 20%~90%RH (No condensation)                                                                                                                                                                                                    |
| Protection level    | IP20                                                                                                                                                                                                                           |
| Pollution level     | II                                                                                                                                                                                                                             |
| Overvoltage level   | III                                                                                                                                                                                                                            |
| Altitude            | The maximum altitude is 2000m.<br>Don't need to derate if the altitudes is below 1000m;<br>Derate by 1% for every 100m increase if the altitudes is above 1000m;<br>Please contact the manufacturer for altitudes above 2000m. |
| Vibration           | Less than 0.5G (4.9 m/s <sup>2</sup> ), 10 to 60Hz (discontinuous operation)                                                                                                                                                   |
| Power Systems       | TN system*                                                                                                                                                                                                                     |

**Note:** TN system means that the neutral point of the power system is directly connected to the ground, and the exposed metal components are connected to the ground through a protective grounding conductor.

### 3.1.4 Installation Precautions

#### (1) Installation specifications

In order to achieve a good cooling cycle effect, ensure that there is enough ventilation space around it when installing the servo drive, and be sure to comply with the installation standards in the control cabinet shown in the figure below, otherwise it may cause the drive to malfunction. Please refer to Figure 3-3 for the typical minimum installation size.

#### (2) Parallel installation

When multiple units are installed in parallel, the minimum distance between each other should be 20mm, and the distance between each other in vertical dimension should be at least 100mm. Please refer to Figure 3-4 and Figure for details (VD5E is the same as VD5L). To prevent temperature rise, a cooling fan can be placed on the upper part. For smaller spacing installation, please consult our company.

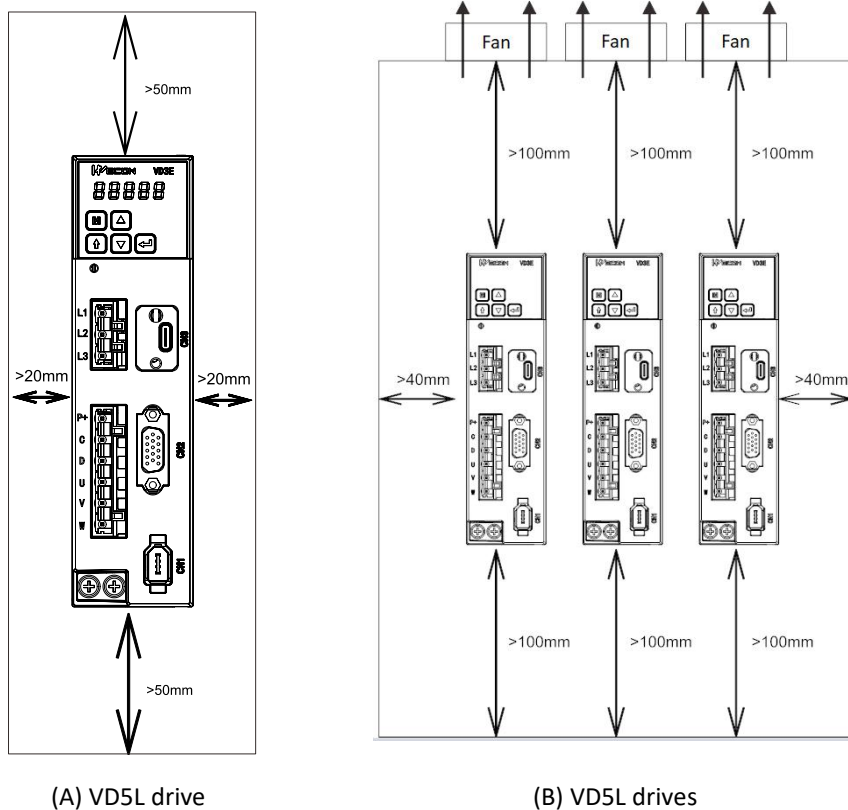


Figure 3-3 Minimum mounting size

#### (3) Installation direction

When installing the servo drive, face the front (panel interface) of the servo drive to the operator so that the servo drive is perpendicular to the wall.

## 3.2 Installation of Servo Motor

### 3.2.1 Dimensions (unit: mm)

#### (1) Installation dimensions of WD series 40 flange servo motor

| Specification         | WD series 40 flange motor |
|-----------------------|---------------------------|
| Rated torque (N*m)    | 0.318                     |
| LA without brake (mm) | 74.8                      |
| LA with brake (mm)    | 108                       |

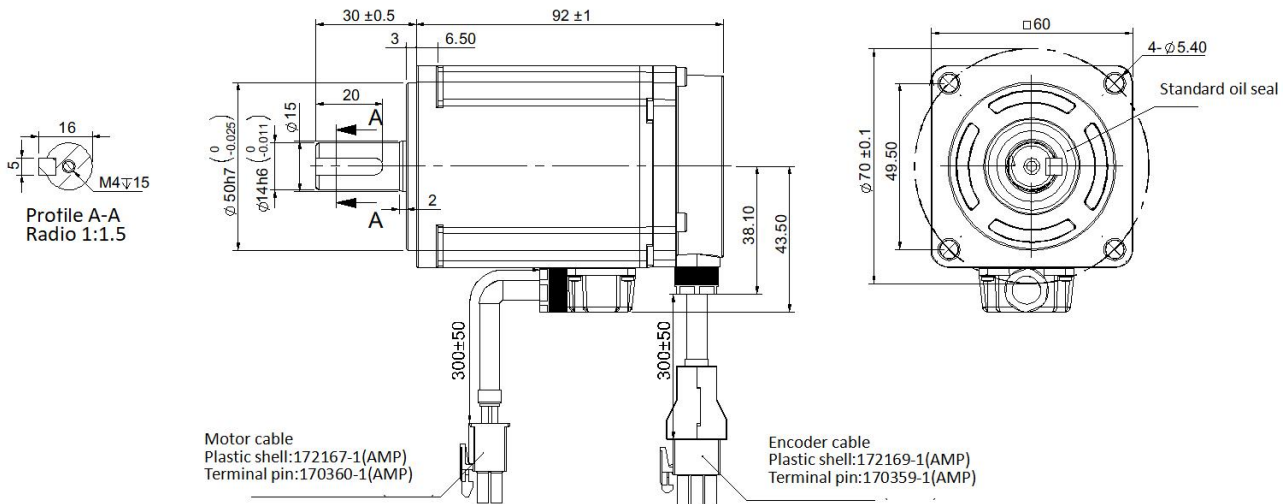


Figure 3-4 WD series 40 flange servo motor installation dimension drawing

#### (2) Installation dimensions of WD series 60 flange servo motor

| Specification         | WD series 60 flange motor |       |
|-----------------------|---------------------------|-------|
| Rated torque (N*m)    | 0.64                      | 1.27  |
| LA without brake (mm) | 75                        | 92    |
| LA with brake (mm)    | 104.5                     | 121.5 |

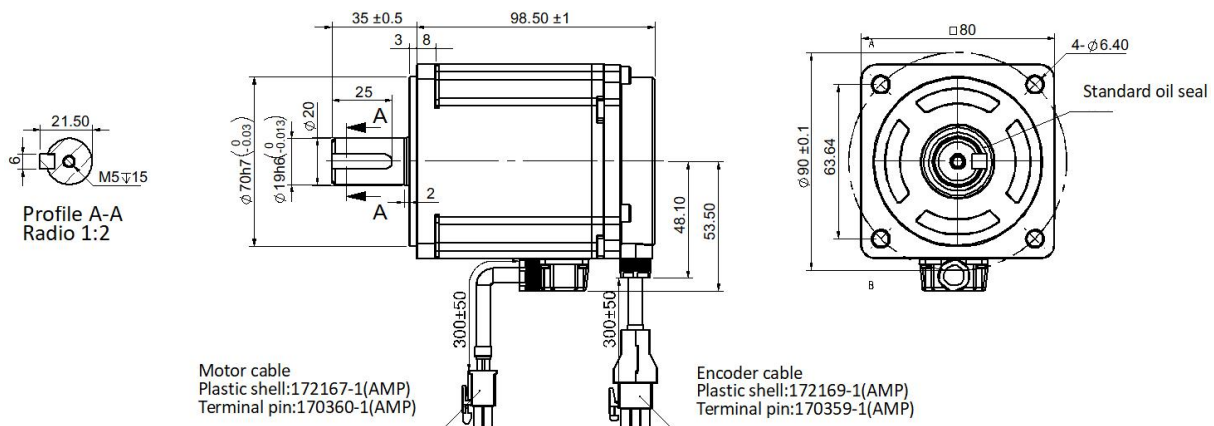


Figure 3-5 Installation dimension drawing of WD series 60 flange servo motor

(3) Installation dimensions of 80 flange servo motor

① WD series motor

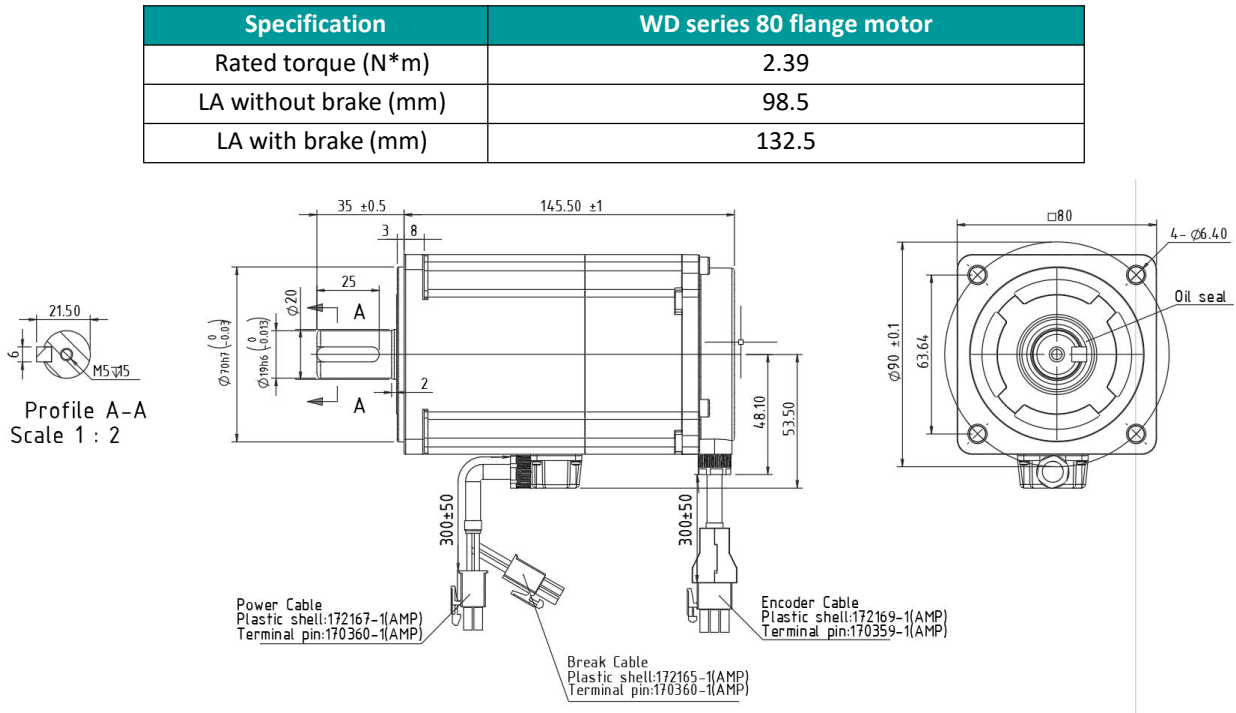


Figure 3-5 Installation dimension drawing of WD series 80 flange servo motor

② WE series motor

| Specification         | WE series 80 flange motor |     |
|-----------------------|---------------------------|-----|
| Rated torque (N*m)    | 3.5                       | 4.0 |
| LA without brake (mm) | 179                       | 189 |
| LA with brake (mm)    | 221                       | 233 |

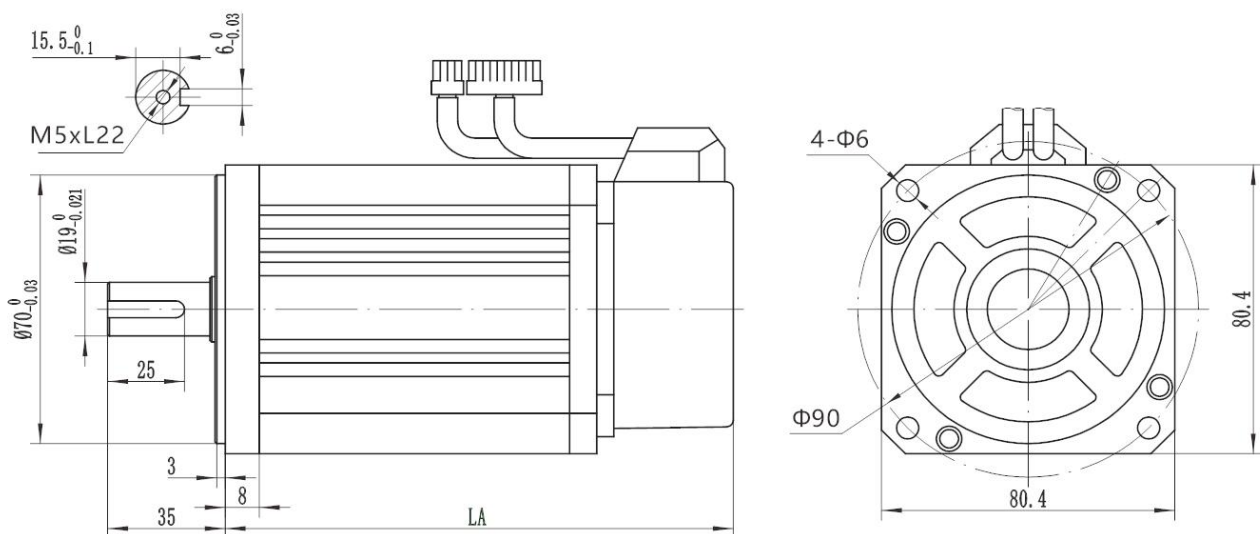


Figure 3-7 Installation dimension drawing of WE series 80 flange servo motor

(4) Installation dimensions of WE series 110 flange servo motor

| Specification         | WE series 110 flange motor |     |     |
|-----------------------|----------------------------|-----|-----|
| Rated torque (N*m)    | 4                          | 5   | 6   |
| LA without brake (mm) | 189                        | 204 | 219 |
| LA with brake (mm)    | 254                        | 269 | 284 |

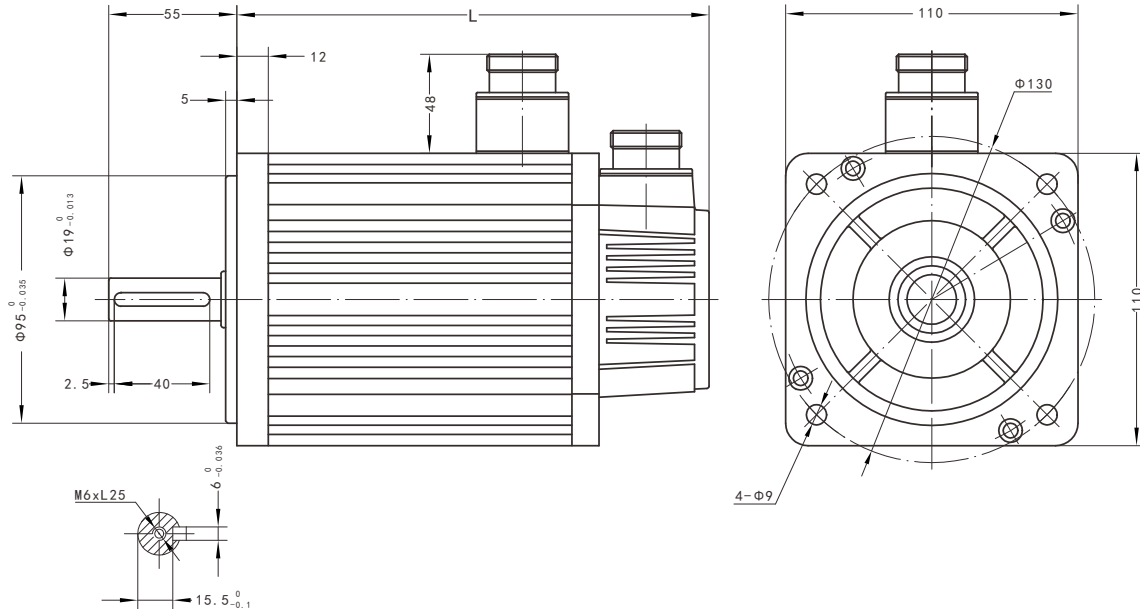


Figure 3-8 Installation dimensions of WE series 110 flange servo motor

## (4) Installation dimensions of WE series 130 flange servo motor

| Specification         | WE series 130 flange motor |     |     |     |         |         |         |         |
|-----------------------|----------------------------|-----|-----|-----|---------|---------|---------|---------|
| Rated torque (N*m)    | 4                          | 5   | 6   | 7.7 | 10      |         | 15      |         |
|                       |                            |     |     |     | 1500rpm | 2500rpm | 1500rpm | 2500rpm |
| LA without brake (mm) | 166                        | 171 | 179 | 192 | 213     | 209     | 241     | 231     |
| LA with brake (mm)    | 226                        | 231 | 239 | 252 | 276     | 276     | 304     | 294     |

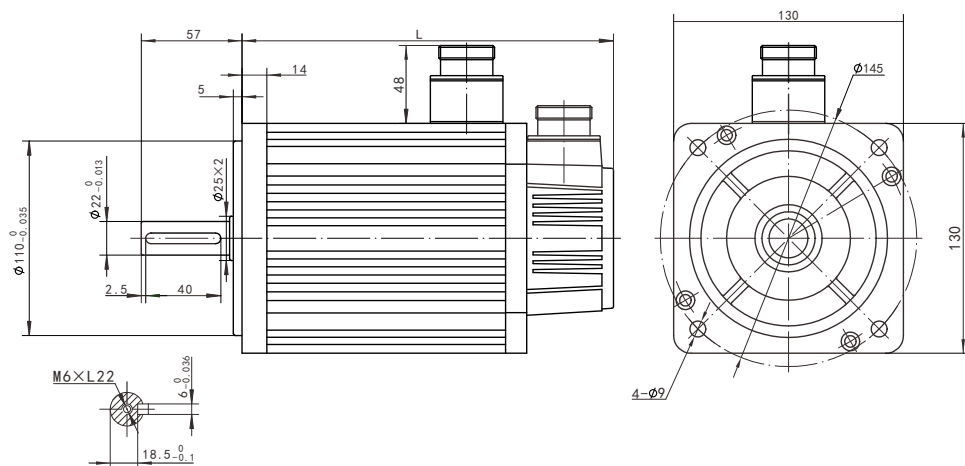


Figure 3-9 Installation dimension drawing of WE series 130 flange servo motor

## 3.2.2 Installation Site



1. Do not use the motor near corrosive, flammable gas environment, combustible materials such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt, etc.
2. Do not remove the oil seal in places where there is grinding fluid, oil mist, iron powder, cutting, etc.
3. Do not use the motor in a closed environment. Closed environment will cause high temperature of the motor and shorten the service life.
4. A place far away from heat sources such as stoves.

### 3.2.3 Installation Environment

The installation environment of the servo motor has a direct impact on the normal function of it and its service life. Therefore, the installation environment of the servo motor must meet the following conditions:

| Project             | Specification                                                                |
|---------------------|------------------------------------------------------------------------------|
| Ambient temperature | -10℃ to 40℃ (no freezing)                                                    |
| Ambient humidity    | -20%~90%RH (no condensation)                                                 |
| Storage temperature | -20℃ to 60℃                                                                  |
| Storage humidity    | -20% to 90%RH (no condensation)                                              |
| Vibration           | Less than 0.5G (4.9m/s <sup>2</sup> ), 10 to 60Hz (non-continuous operation) |

### 3.2.4 Installation Precautions

| Project                | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rust inhibitor         | Before installation, please wipe clean the "anti-rust agent" on the shaft extension end of the servo motor, and then do the relevant anti-rust treatment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Encoder notice         | <ul style="list-style-type: none"> <li>When installing a pulley on a servo motor shaft with a keyway, use a screw hole at the shaft end. In order to install the pulley, first insert the double-headed nail into the screw hole of the shaft, use a washer on the surface of the coupling end, and gradually lock the pulley into the pulley with a nut;</li> <li>For the servo motor shaft with keyway, use the screw hole on the shaft end to install;</li> <li>For axis without keyway, adopt friction coupling or similar methods</li> <li>When removing the pulley, use a pulley remover to prevent the bearing from being strongly impacted by the load;</li> <li>To ensure safety, install a protective cover or similar device in the rotating area, such as a pulley installed on the shaft.</li> </ul> |
| Centering              | When linking with the machine, please use the coupling, and keep the axis of the servo motor and the axis of the machine in a straight cable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Installation direction | The servo motor can be installed horizontally or vertically.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oil and water countermeasures    | <p>When using in a place with dripping water, please use it after confirming the protection level of the servo motor. When using it in a place where oil drips on the shaft penetration part, do not remove the oil seal of the servo motor.</p> <p>The use conditions of the servo motor with oil seal:</p> <ul style="list-style-type: none"> <li>☞ When using, please make sure the oil level is lower than the lip of the oil seal;</li> <li>☞ The oil seal can be used in a state with a good degree of splashing of oil foam;</li> <li>☞ When the servo motor is installed vertically upwards, please be careful not to accumulate oil on the oil seal lip.</li> </ul>                                                                                                                                                                                                                                                                                                                 |
| Stress condition of the cable    | <p>Do not "bend" the wire or apply "tension" to it, especially the signal wire whose core diameter is 0.2mm or 0.3mm. During the wiring process, please do not make it too tight.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Processing of the connector part | <p>Regarding the connector part, please note the following matters:</p> <ul style="list-style-type: none"> <li>☞ When connecting the connector, please make sure that there is no foreign matter such as garbage or metal pieces in the connector;</li> <li>☞ When connecting the connector to the servo motor, be sure to connect it from the side of the main circuit cable of the servo motor first, and the grounding of the main cable cable must be reliably connected. If you connect one side of the encoder cable first, the encoder may malfunction due to the potential difference between PEs;</li> <li>☞ When connecting, please make sure that the pin arrangement is correct;</li> <li>☞ The connector is made of resin, please do not apply impact to avoid damage to the connector;</li> <li>☞ Do not apply stress to the connector part during handling while the cable is connected. If stress is applied to the connector part, the connector may be damaged.</li> </ul> |

## Chapter 4 Wiring

### 4.1 Main Circuit Wiring

#### 4.1.1 Main Circuit Terminals

(1) Main circuit terminal distribution of VD5L

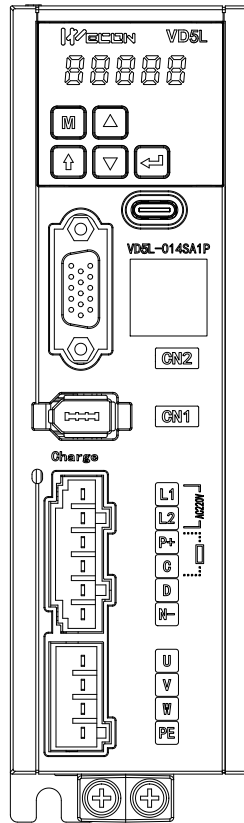


Figure 4-1 VD5L Servo Drive Main Circuit Terminal Schematic

Table 4-1 Name and function of main circuit terminal of VD5L type A servo drive

| Terminal number | Terminal name              | Terminal function                                                                                                                                |
|-----------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| L1              | Power input terminal       | Single-phase 220V AC input is connected to L1 and L3.                                                                                            |
| L2              |                            |                                                                                                                                                  |
| P+              | Braking resistor terminal  | Use internal braking resistor: short connected C-D.                                                                                              |
| C               |                            | Use an external braking resistor: please disconnect the short wire between C-D, and then connect the external braking resistor between P+ and C; |
| D               |                            |                                                                                                                                                  |
| P+              | Common DC bus terminal     | Common DC bus terminal of servo drive                                                                                                            |
| N-              |                            |                                                                                                                                                  |
| U               | Motor power cable terminal | Connect with the U, V, W of the motor to supply power to the motor.                                                                              |
| V               |                            |                                                                                                                                                  |
| W               |                            |                                                                                                                                                  |
| PE              | Ground terminal            | Grounding of the servo drive.                                                                                                                    |

## (2) Main circuit terminal distribution of VD5E

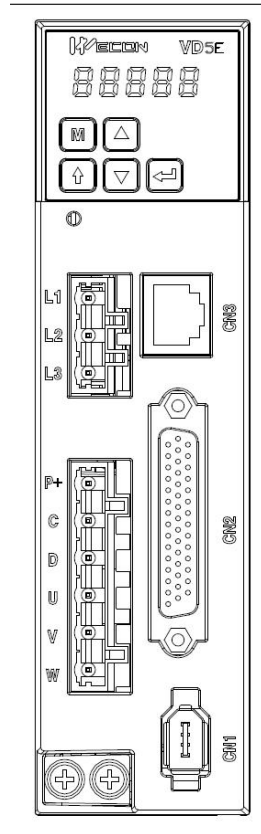


Figure 4-1 VD5E Servo Drive Main Circuit Terminal Schematic

Table 4-1 Name and function of main circuit terminal of VD5E servo drive

| Terminal number | Terminal name              | Terminal function                                                                                                                                |
|-----------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| L1              | Power input terminal       | Single-phase 220V AC input is connected to L1 and L3.                                                                                            |
| L2              |                            |                                                                                                                                                  |
| L3              |                            |                                                                                                                                                  |
| P+              | Braking resistor terminal  | Use internal braking resistor: short connected C-D.                                                                                              |
| C               |                            | Use an external braking resistor: please disconnect the short wire between C-D, and then connect the external braking resistor between P+ and C; |
| D               |                            |                                                                                                                                                  |
| U               | Motor power cable terminal | Connect with the U, V, W of the motor to supply power to the motor.                                                                              |
| V               |                            |                                                                                                                                                  |
| W               |                            |                                                                                                                                                  |
| PE              | Ground terminal            | Grounding of the servo drive.                                                                                                                    |

## 4.1.2 Power Wiring Example

## (1) VD5L Type A Drive Single-phase 220V Main Circuit Wiring

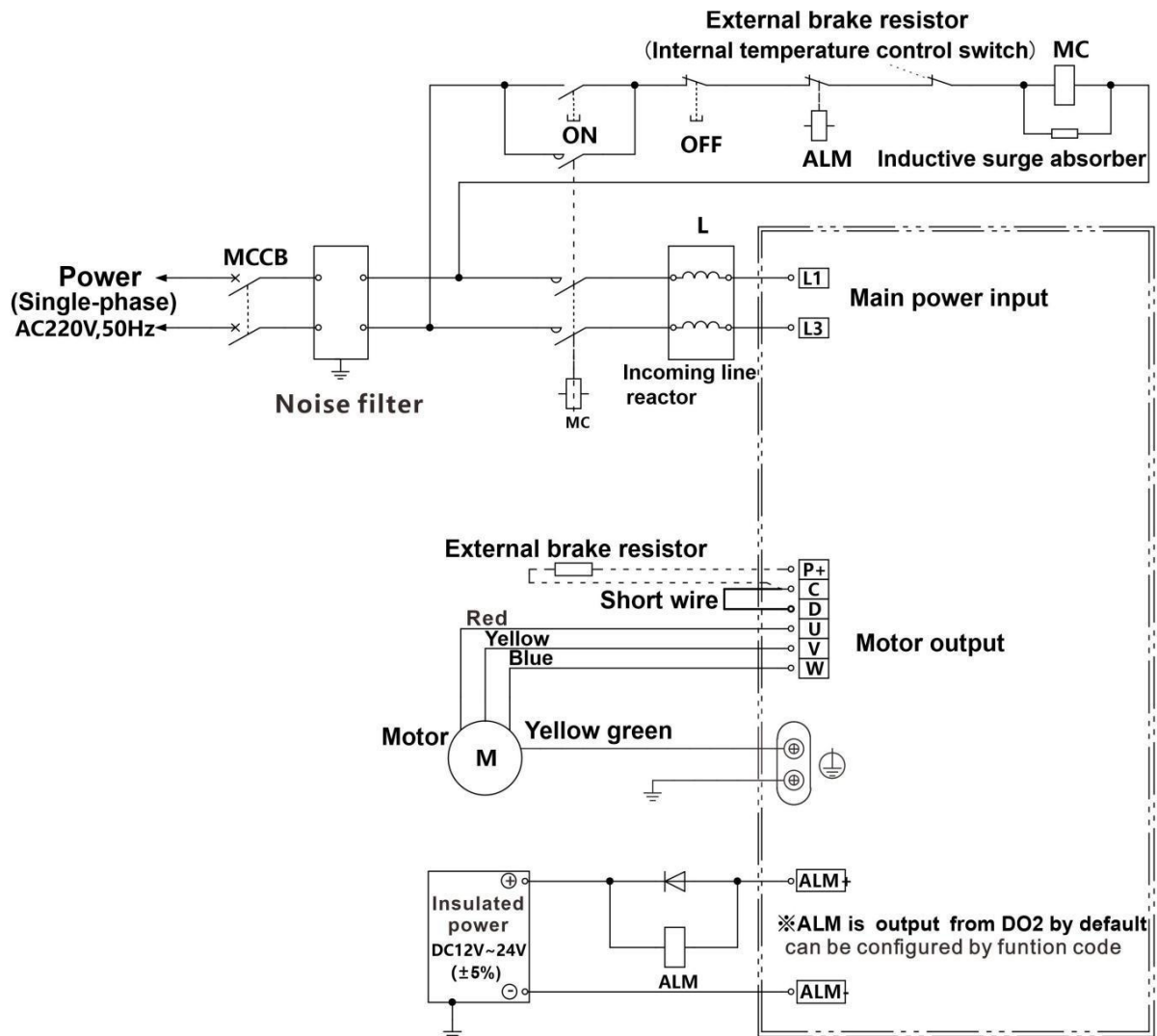


Figure 4-2 Main Circuit Wiring for Sing-phase 220V VD5L, VD5E

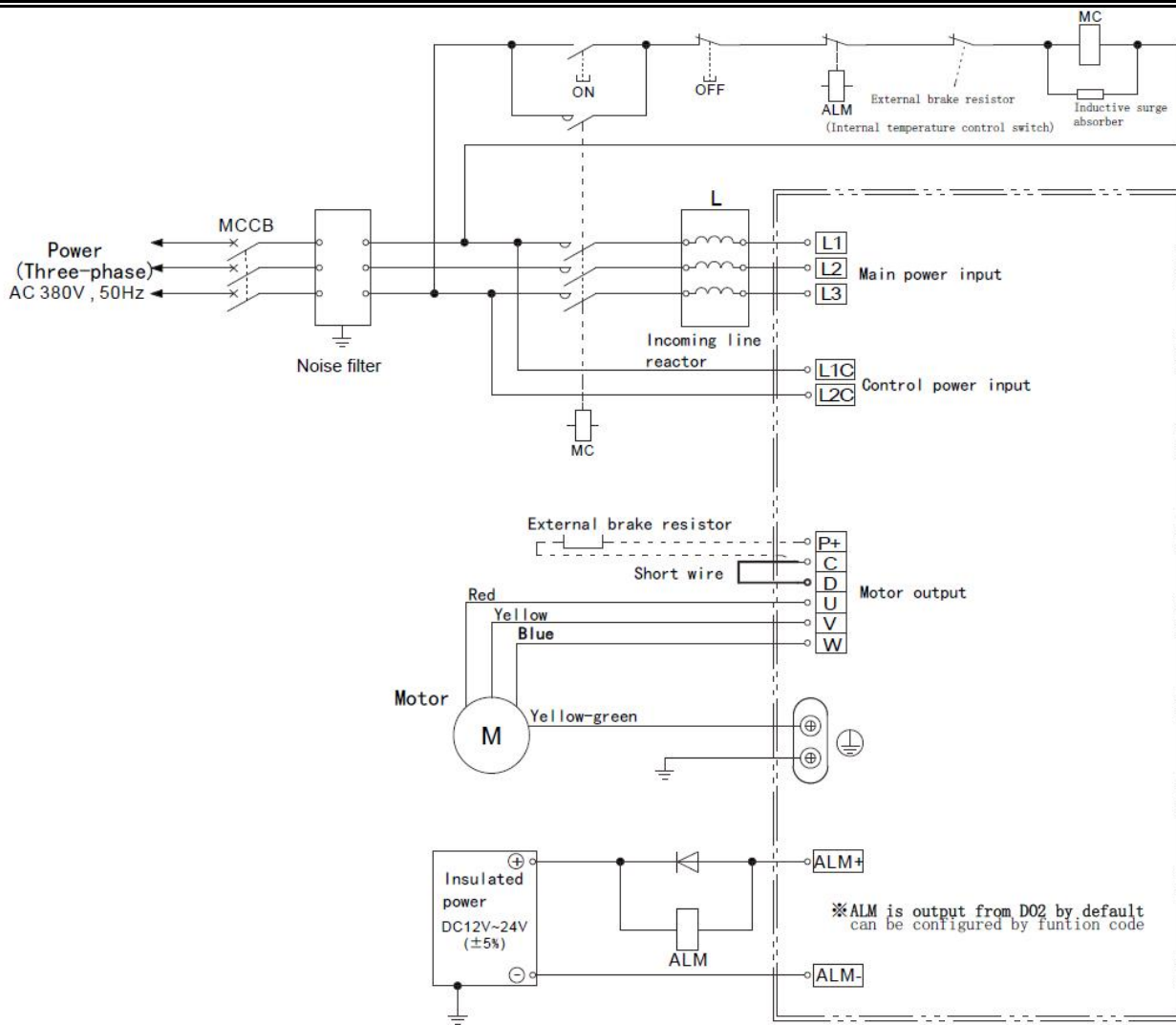


Figure 4-3 Main Circuit Wiring for Three-phase 380V VD5E

#### 4.1.3 Precautions for Main Circuit Wiring

- ① The input power cable cannot be connected to the output terminals U, V and W, otherwise the servo drive will be damaged. When using the built-in braking resistor, C and D must be connected (factory default connection).
- ② When the cables are bundled and used in pipes, etc., due to the deterioration of heat dissipation conditions, please consider the allowable current reduction rate.
- ③ When the temperature in the cabinet is higher than the cable temperature limit, please choose a cable with a larger cable temperature limit, and it is recommended that the cable wire use Teflon wire. Please pay attention to the warmth of the cable in the low temperature environment. Generally, the surface of the cable is prone to hardening and breakage under the low temperature environment.
- ④ The bending radius of the cable should be more than 10 times the outer diameter of the cable itself to prevent the core of the cable from breaking due to long-term bending.

## 4.2 Power Cable Connection of Servo Drive and Servo Motor

### 4.2.1 Power Cable

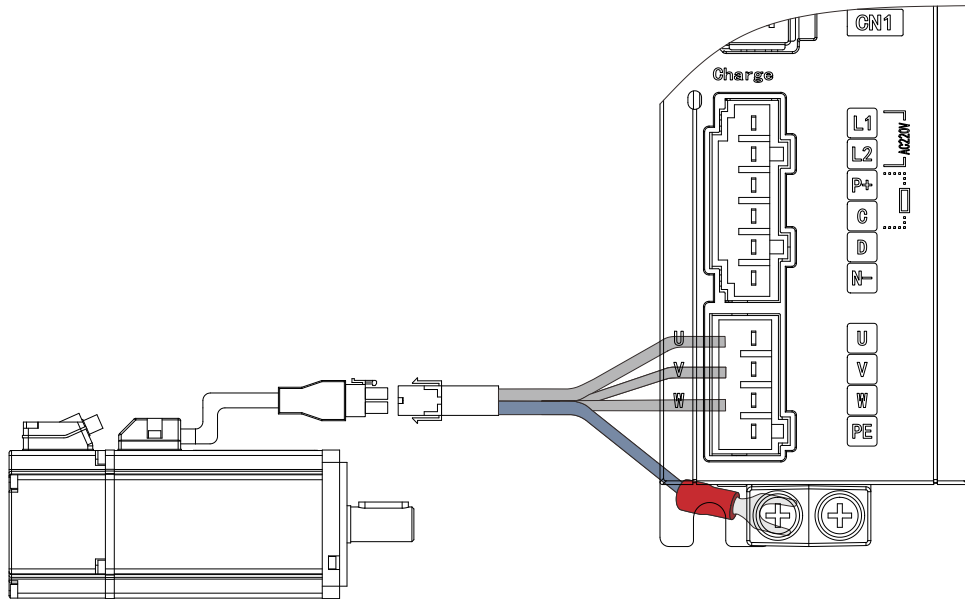
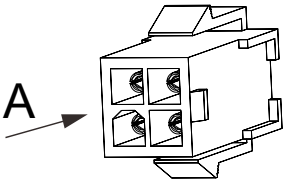
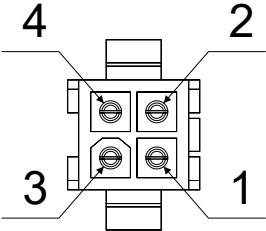
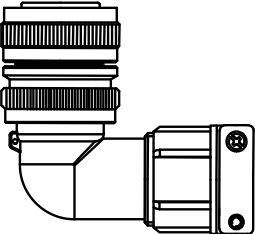
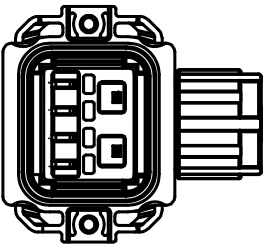
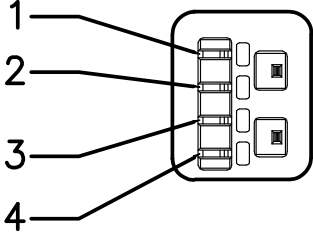


Figure 4-4 Connection schematic diagram of servo drive and servo motor

Wecon VD5L series servo drives have 3 kinds of interface power cables: rectangular plug, aviation plug and in-cable type.

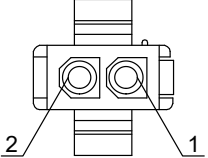
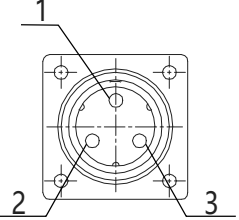
Table 4-2 Power cable servo motor side connector

| Connector exterior                                                                  | Terminal pin distribution                                                           | Pin description  | Adaptation<br>Motor flange |                |                   |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------|----------------------------|----------------|-------------------|
|  |  | Rectangular plug |                            | 40<br>60<br>80 |                   |
|                                                                                     |                                                                                     | Pin number       | Signal name                |                | Color             |
|                                                                                     |                                                                                     | 1                | U                          |                | Red               |
|                                                                                     |                                                                                     | 2                | V                          |                | White             |
|                                                                                     |                                                                                     | 3                | W                          |                | Black             |
| 4                                                                                   | PE                                                                                  | Yellow-green     |                            |                |                   |
|  |                                                                                     | Aviation plug    |                            | 110<br>130     |                   |
|                                                                                     |                                                                                     | Pin number       | Signal name                |                | Color             |
|                                                                                     |                                                                                     | 2                | U                          |                | Red               |
|                                                                                     |                                                                                     | 4                | V                          |                | Yellow            |
|                                                                                     |                                                                                     | 3                | W                          |                | Blue              |
|                                                                                     |                                                                                     | 1                | PE                         |                | Yellow-green<br>n |

|                                                                                   |                                                                                   |                    |             |              |          |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------|-------------|--------------|----------|
|  |  | In-cable type plug |             |              | 60<br>80 |
|                                                                                   |                                                                                   | Pin number         | Signal name | Color        |          |
|                                                                                   |                                                                                   | 3                  | U           | Red          |          |
|                                                                                   |                                                                                   | 1                  | V           | White        |          |
|                                                                                   |                                                                                   | 2                  | W           | Black        |          |
|                                                                                   |                                                                                   | 4                  | PE          | Yellow-green |          |

**Note:** The color of the cables is subject to the actual product. The cables described in this manual are all cables of Wecon.

#### 4.2.2 Brake Device Cable

| Connector |                                                                                    | Pin description |             | Flange    |
|-----------|------------------------------------------------------------------------------------|-----------------|-------------|-----------|
| WD Series |   | Pin number      | Signal name | 60<br>80  |
|           |                                                                                    | 1               | BR+         |           |
|           |                                                                                    | 2               | BR-         |           |
| WE Series |  | Pin number      | Signal name | 80<br>110 |
|           |                                                                                    | 1               | DC 24V      |           |
|           |                                                                                    | 2               | GND         |           |
|           |                                                                                    | 3               | -           |           |



4.3 Encoder Cable Connection of Servo Drive and Servo Motor

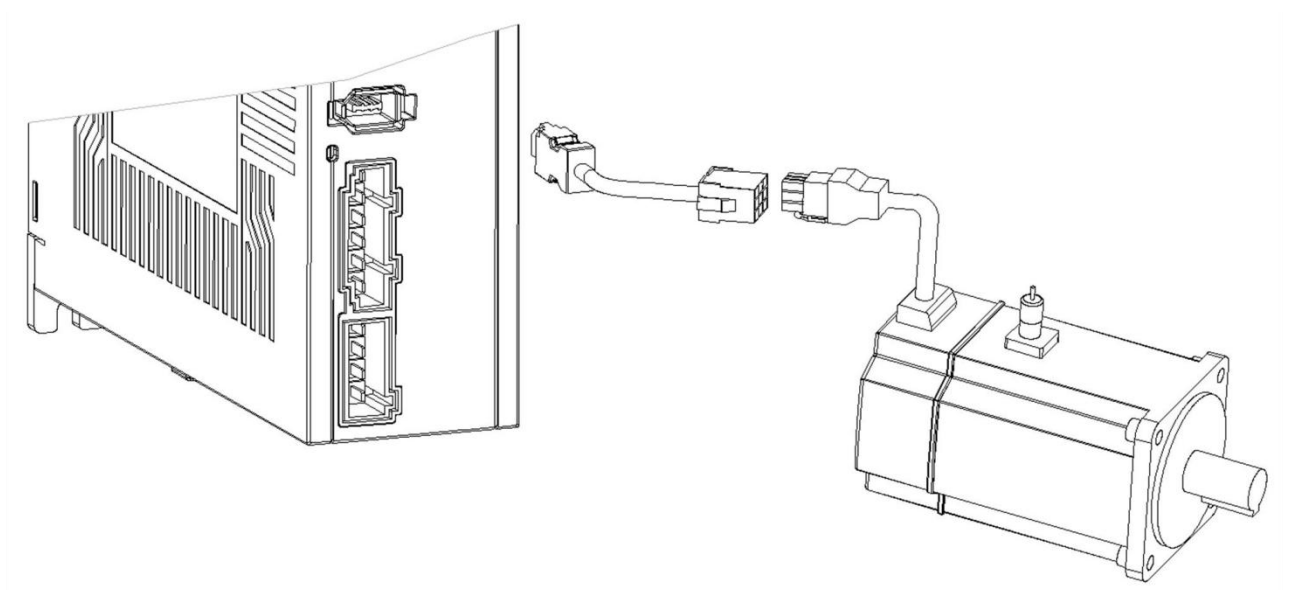


Figure 4-5 Encoder cable connection schema

Table 4-3 Encoder cable servo drive side connector

| Connector exterior | Terminal pin distribution | Pin description |             |
|--------------------|---------------------------|-----------------|-------------|
|                    |                           | Pin number      | Signal name |
|                    |                           | 1               | 5V          |
|                    |                           | 2               | GND         |
|                    |                           | 3               | -           |
|                    |                           | 4               | -           |
|                    |                           | 5               | SD+         |
|                    |                           | 6               | SD-         |

Table 4-4 Absolute encoder cable connector (rectangular plug)

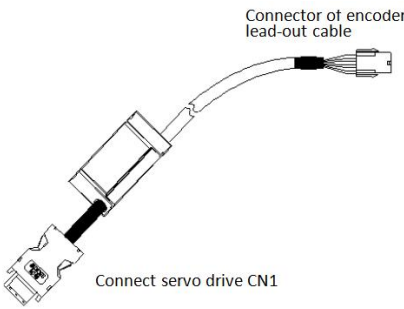
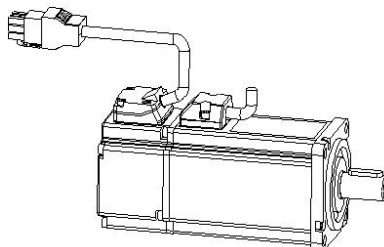
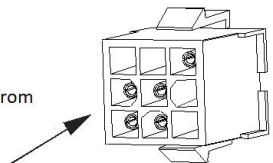
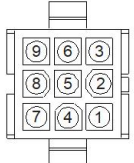
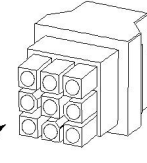
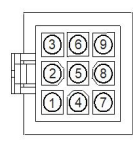
| Connector shape and terminal pin distribution                                                                                                                                                                                                                                                        |                                                                                                                                                                                              | Adapted motor<br>Flange |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------|-------------|---|----|---|-----|---|-----|---|-----|---|--------|---|----------|---|
|  <p>Connector of encoder lead-out cable</p> <p>Connect servo drive CN1</p>                                                                                                                                          |  <p>Encoder lead-out cable</p>                                                                             | 60<br>80                |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
|  <p>View from here</p>                                                                                                             |  <p>View from here</p>  |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| <table><tr><th>Pin number</th><th>Signal name</th></tr><tr><td>7</td><td>5V</td></tr><tr><td>8</td><td>GND</td></tr><tr><td>4</td><td>SD+</td></tr><tr><td>5</td><td>SD-</td></tr><tr><td>3</td><td>Shield</td></tr><tr><td>1</td><td>Battery+</td></tr><tr><td>2</td><td>Battery-</td></tr></table> |                                                                                                                                                                                              |                         | Pin number | Signal name | 7 | 5V | 8 | GND | 4 | SD+ | 5 | SD- | 3 | Shield | 1 | Battery+ | 2 |
| Pin number                                                                                                                                                                                                                                                                                           | Signal name                                                                                                                                                                                  |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 7                                                                                                                                                                                                                                                                                                    | 5V                                                                                                                                                                                           |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 8                                                                                                                                                                                                                                                                                                    | GND                                                                                                                                                                                          |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 4                                                                                                                                                                                                                                                                                                    | SD+                                                                                                                                                                                          |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 5                                                                                                                                                                                                                                                                                                    | SD-                                                                                                                                                                                          |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 3                                                                                                                                                                                                                                                                                                    | Shield                                                                                                                                                                                       |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 1                                                                                                                                                                                                                                                                                                    | Battery+                                                                                                                                                                                     |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 2                                                                                                                                                                                                                                                                                                    | Battery-                                                                                                                                                                                     |                         |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |

Table 4-5 Encoder cable pin connection relationship

| Drive side J1394 |             | Description                   | Motor side                  |             |
|------------------|-------------|-------------------------------|-----------------------------|-------------|
| Pin number       | Signal name |                               | Rectangular plug pin number | Cable color |
| 1                | 5V          | Encoder +5V power             | 7                           | Blue        |
| 2                | GND         | Encoder power ground          | 8                           | Orange      |
| 5                | SD+         | Serial communication signal + | 4                           | Green       |
| 6                | SD-         | Serial communication signal - | 5                           | Brown       |
| Shell            | Shield      | Shield                        | 3                           | -           |
| -                | -           | Battery+                      | 1*                          | Pink        |
| -                | -           | Battery-                      | 2*                          | Pink-Black  |

The pin with “\*” indicates the signal cable of encoder battery. If the multi-turn battery memory function is not used, you don’t need to connect the signal cables. It is only used as single turn encoder cable at this time.

**Note: The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!**

Table 4-6 Absolute value encoder cable connector (aviation plug)

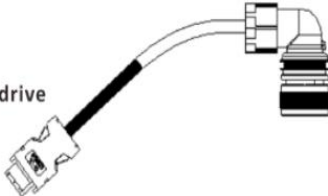
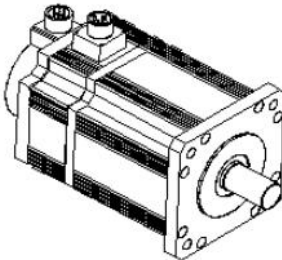
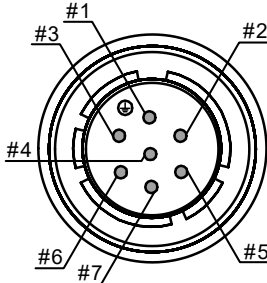
| Connector shape and terminal pin distribution                                                                                                                                                                                                                                                        |                                                                                                                             | Adapted motor flange |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------|------------|-------------|---|----|---|-----|---|-----|---|-----|---|--------|---|----------|---|
| <div>Connector of encoder pinout</div> <div>Connect servo drive CN1</div>                                                                                                                                           | <div>Encoder connected to a socket</div>  | 110<br>130           |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
|                                                                                                                                                                                                                                                                                                      |                                          |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| <table><tr><th>Pin number</th><th>Signal name</th></tr><tr><td>7</td><td>5V</td></tr><tr><td>5</td><td>GND</td></tr><tr><td>6</td><td>SD+</td></tr><tr><td>4</td><td>SD-</td></tr><tr><td>1</td><td>Shield</td></tr><tr><td>3</td><td>Battery+</td></tr><tr><td>2</td><td>Battery-</td></tr></table> |                                                                                                                             |                      | Pin number | Signal name | 7 | 5V | 5 | GND | 6 | SD+ | 4 | SD- | 1 | Shield | 3 | Battery+ | 2 |
| Pin number                                                                                                                                                                                                                                                                                           | Signal name                                                                                                                 |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 7                                                                                                                                                                                                                                                                                                    | 5V                                                                                                                          |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 5                                                                                                                                                                                                                                                                                                    | GND                                                                                                                         |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 6                                                                                                                                                                                                                                                                                                    | SD+                                                                                                                         |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 4                                                                                                                                                                                                                                                                                                    | SD-                                                                                                                         |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 1                                                                                                                                                                                                                                                                                                    | Shield                                                                                                                      |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 3                                                                                                                                                                                                                                                                                                    | Battery+                                                                                                                    |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |
| 2                                                                                                                                                                                                                                                                                                    | Battery-                                                                                                                    |                      |            |             |   |    |   |     |   |     |   |     |   |        |   |          |   |

Table 4-7 Encoder cable pin connection relationship

| Drive side J1394 |             | Description                   | Motor side               |             |
|------------------|-------------|-------------------------------|--------------------------|-------------|
| Pin number       | Signal name |                               | Aviation plug pin number | Cable color |
| 1                | 5V          | Encoder +5v power             | 7                        | Blue        |
| 2                | GND         | Encoder power ground          | 5                        | Orange      |
| 5                | SD+         | Serial communication signal + | 6                        | Green       |
| 6                | SD-         | Serial communication signal - | 4                        | Brown       |
| Shell            | Shield      | Shield                        | 1                        | -           |

|   |   |          |    |            |
|---|---|----------|----|------------|
| - | - | Battery+ | 3* | Pink       |
| - | - | Battery- | 2* | Pink-Black |

need to connect the signal cables. It is only used as single turn encoder cable at this time.

**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

Table 4-8 Absolute value encoder cable connector L type (in-cable type)

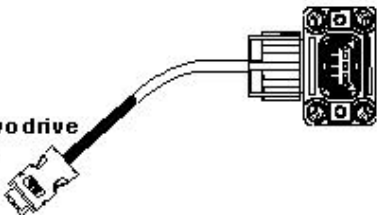
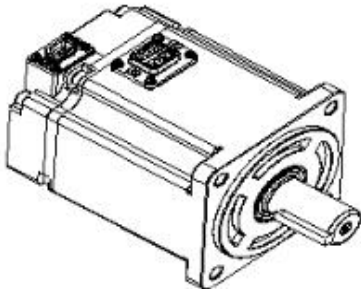
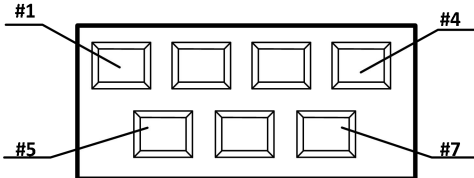
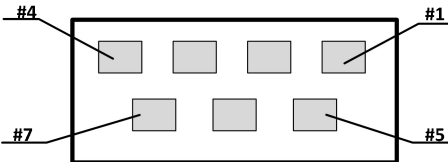
| Connector shape and terminal pin distribution                                                                                                                                                                                                                                                        |                                                                                                          |          | Adapted motor<br>Flange |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------|-------------------------|-------------|---|----|---|-----|---|-----|---|-----|---|--------|---|----------|---|----------|
| <p>Connector of encoder pinout</p> <p>Connect servo drive<br/>CN1</p>                                                                                                                                               | <p>Encoder socket</p>  | 60<br>80 |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
|                                                                                                                                                                                                                    |                       |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| <table><tr><th>Pin number</th><th>Signal name</th></tr><tr><td>7</td><td>5V</td></tr><tr><td>5</td><td>GND</td></tr><tr><td>6</td><td>SD+</td></tr><tr><td>4</td><td>SD-</td></tr><tr><td>1</td><td>Shield</td></tr><tr><td>3</td><td>Battery+</td></tr><tr><td>2</td><td>Battery-</td></tr></table> |                                                                                                          |          | Pin number              | Signal name | 7 | 5V | 5 | GND | 6 | SD+ | 4 | SD- | 1 | Shield | 3 | Battery+ | 2 | Battery- |
| Pin number                                                                                                                                                                                                                                                                                           | Signal name                                                                                              |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 7                                                                                                                                                                                                                                                                                                    | 5V                                                                                                       |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 5                                                                                                                                                                                                                                                                                                    | GND                                                                                                      |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 6                                                                                                                                                                                                                                                                                                    | SD+                                                                                                      |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 4                                                                                                                                                                                                                                                                                                    | SD-                                                                                                      |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 1                                                                                                                                                                                                                                                                                                    | Shield                                                                                                   |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 3                                                                                                                                                                                                                                                                                                    | Battery+                                                                                                 |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |
| 2                                                                                                                                                                                                                                                                                                    | Battery-                                                                                                 |          |                         |             |   |    |   |     |   |     |   |     |   |        |   |          |   |          |

Table 4-9 Encoder cable pin connection relationship

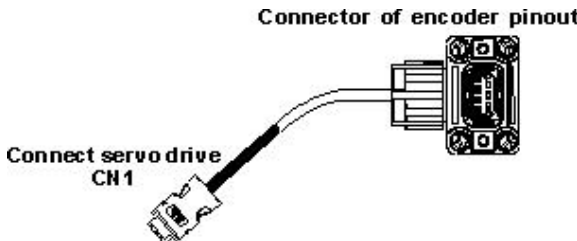
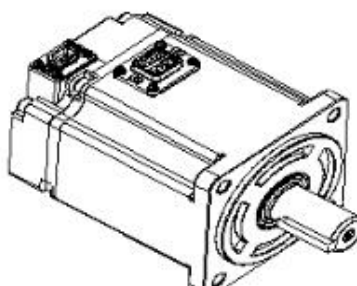
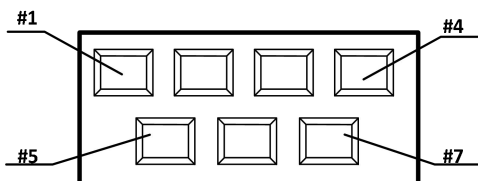
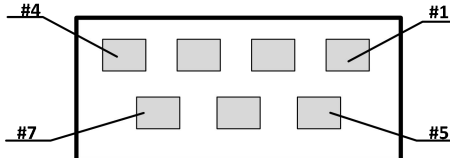
| Drive side J1394 |             | Description                   | Motor side               |             |
|------------------|-------------|-------------------------------|--------------------------|-------------|
| Pin number       | Signal name |                               | Aviation plug pin number | Cable color |
| 1                | 5V          | Encoder +5v power             | 7                        | Blue        |
| 2                | GND         | Encoder power ground          | 5                        | Orange      |
| 5                | SD+         | Serial communication signal + | 6                        | Green       |

|       |        |                               |    |       |
|-------|--------|-------------------------------|----|-------|
| 6     | SD-    | Serial communication signal - | 4  | Brown |
| Shell | Shield | Shield                        | 1  | -     |
| --    | --     | Battery+                      | 3* | Brown |
| --    | --     | Battery-                      | 2* | Black |

The pins with \* indicate the signal lines of the encoder battery. If the user does not use the multi-turn memory function, these two signal lines can be disconnected and they are only used as single-turn encoder lines.

**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

Table 4-10 Absolute value encoder cable connector L2 type (in-cable type)

| Connector shape and terminal pin distribution                                                                                                                                                                                                              |                                                                                                            | Adapted motor<br>Flange |            |             |   |    |   |     |   |     |   |     |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------|------------|-------------|---|----|---|-----|---|-----|---|-----|---|
| <p>Connector of encoder pinout</p>  <p>Connect servo drive<br/>CN1</p>                                                                                                  | <p>Encoder socket</p>  | 60<br>80                |            |             |   |    |   |     |   |     |   |     |   |
|                                                                                                                                                                         |                        |                         |            |             |   |    |   |     |   |     |   |     |   |
| <table><thead><tr><th>Pin number</th><th>Signal name</th></tr></thead><tbody><tr><td>1</td><td>5V</td></tr><tr><td>2</td><td>GND</td></tr><tr><td>3</td><td>SD+</td></tr><tr><td>4</td><td>SD-</td></tr><tr><td>5</td><td>Shield</td></tr></tbody></table> |                                                                                                            |                         | Pin number | Signal name | 1 | 5V | 2 | GND | 3 | SD+ | 4 | SD- | 5 |
| Pin number                                                                                                                                                                                                                                                 | Signal name                                                                                                |                         |            |             |   |    |   |     |   |     |   |     |   |
| 1                                                                                                                                                                                                                                                          | 5V                                                                                                         |                         |            |             |   |    |   |     |   |     |   |     |   |
| 2                                                                                                                                                                                                                                                          | GND                                                                                                        |                         |            |             |   |    |   |     |   |     |   |     |   |
| 3                                                                                                                                                                                                                                                          | SD+                                                                                                        |                         |            |             |   |    |   |     |   |     |   |     |   |
| 4                                                                                                                                                                                                                                                          | SD-                                                                                                        |                         |            |             |   |    |   |     |   |     |   |     |   |
| 5                                                                                                                                                                                                                                                          | Shield                                                                                                     |                         |            |             |   |    |   |     |   |     |   |     |   |

|  |   |              |  |  |
|--|---|--------------|--|--|
|  | 6 | Batter<br>y+ |  |  |
|  | 7 | Batter<br>y- |  |  |

Table 4-11 Encoder cable pin connection relationship

| Drive side J1394 |             | Description                   | Motor side               |             |
|------------------|-------------|-------------------------------|--------------------------|-------------|
| Pin number       | Signal name |                               | Aviation plug pin number | Cable color |
| 1                | 5V          | Encoder +5v power             | 1                        | Blue        |
| 2                | GND         | Encoder power ground          | 2                        | Orange      |
| 5                | SD+         | Serial communication signal + | 3                        | Green       |
| 6                | SD-         | Serial communication signal - | 4                        | Brown       |
| Shell            | Shield      | Shield                        | 5                        | -           |
| --               | --          | Battery+                      | 6*                       | Pink        |
| --               | --          | Battery-                      | 7*                       | Black       |

The pins with \* indicate the signal lines of the encoder battery. If the user does not use the multi-turn memory function, these two signal lines can be disconnected and they are only used as single-turn encoder lines.

**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

## 4.4 Servo Drive Control Input and Output Terminal Wiring

### 4.4.1 CN2 Pin Distribution

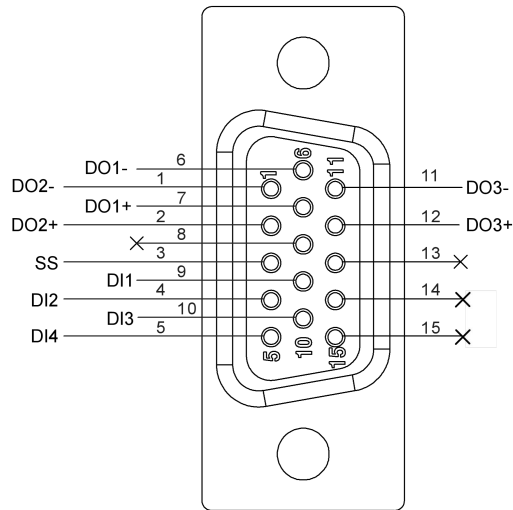


Figure 4-6 Shape and pin distribution of control I/O terminals for VD5L

| Pin number | Signal name | Pin number | Signal name | Pin number | Signal name |
|------------|-------------|------------|-------------|------------|-------------|
| 1          | DO2-        | 6          | DO1-        | 11         | DO3-        |
| 2          | DO2+        | 7          | DO1+        | 12         | DO3+        |
| 3          | SS          | 8          | -           | 13         | -           |
| 4          | DI2         | 9          | DI1         | 14         | -           |
| 5          | DI4         | 10         | DI3         | 15         | -           |

Table 4-11 CN2 Interface Definition

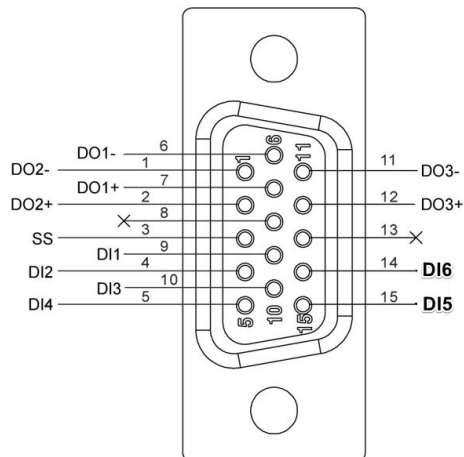


Figure 4-7 Shape and pin distribution of control I/O terminals for VD5E

| Pin number | Signal name | Pin number | Signal name | Pin number | Signal name |
|------------|-------------|------------|-------------|------------|-------------|
| 1          | DO2-        | 6          | DO1-        | 11         | DO3-        |
| 2          | DO2+        | 7          | DO1+        | 12         | DO3+        |
| 3          | SS          | 8          | -           | 13         | -           |
| 4          | DI2         | 9          | DI1         | 14         | DI6         |
| 5          | DI4         | 10         | DI3         | 15         | DI5         |

Table 4-12 CN2 Interface Definition



#### 4.4.2 Digital Input and Output Signals

Table 4-13 DI/DO signal description

| Pin number | Signal name | Default function          |
|------------|-------------|---------------------------|
| 9          | DI1         | None                      |
| 4          | DI2         | Fault and warning clear   |
| 10         | DI3         | Forward drive prohibition |
| 5          | DI4         | Reverse drive prohibition |
| 3          | SS          | Power input (12 to 24V)   |
| 6          | DO1-        | Rotation detection        |
| 7          | DO1+        |                           |
| 1          | DO2-        | Fault signal              |
| 2          | DO2+        |                           |
| 11         | DO3-        | Servo ready               |
| 12         | DO3+        |                           |

##### 1) Digital input circuit

Taking DI1 as an example, the interface circuits of DI1 to DI4 are exactly the same.

When the control device(HMI/PLC) is relay output

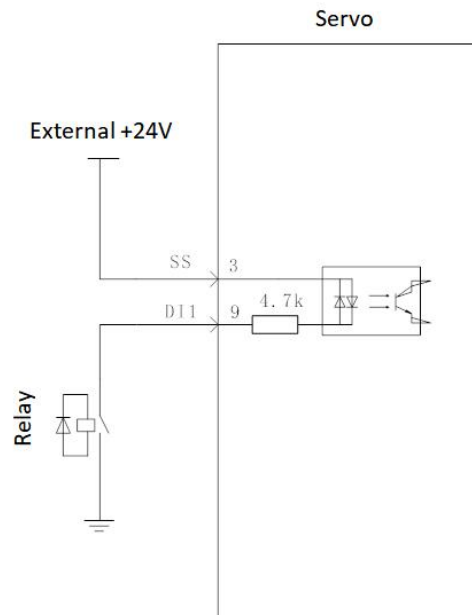


Figure 4-8 Relay output

When the control device(HMI/PLC) is open collector output

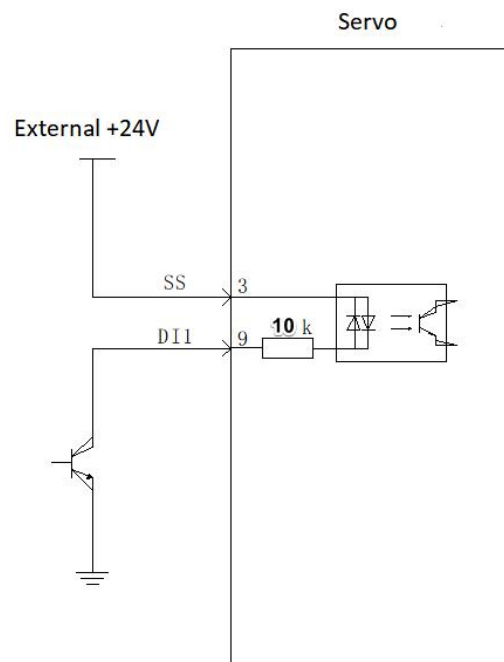


Figure 4-9 Open collector output

**Digital output circuit**

Taking DO1 as an example, the interface circuits of DO1 ~ DO3 are exactly the same.

When the control device(HMI/PLC) is relay input

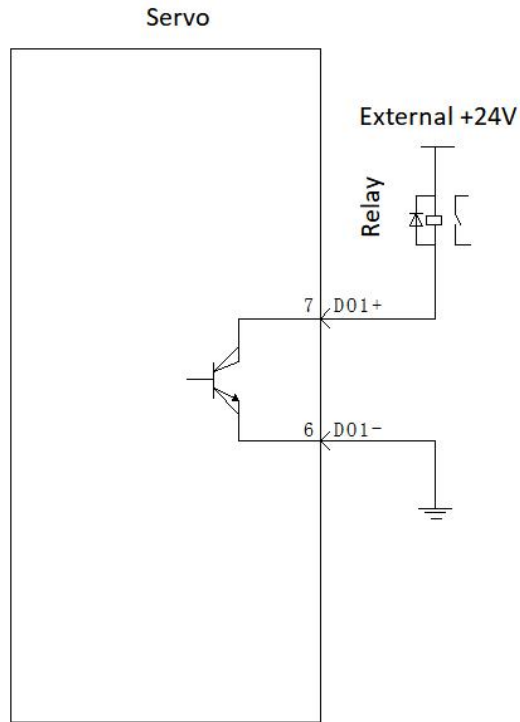
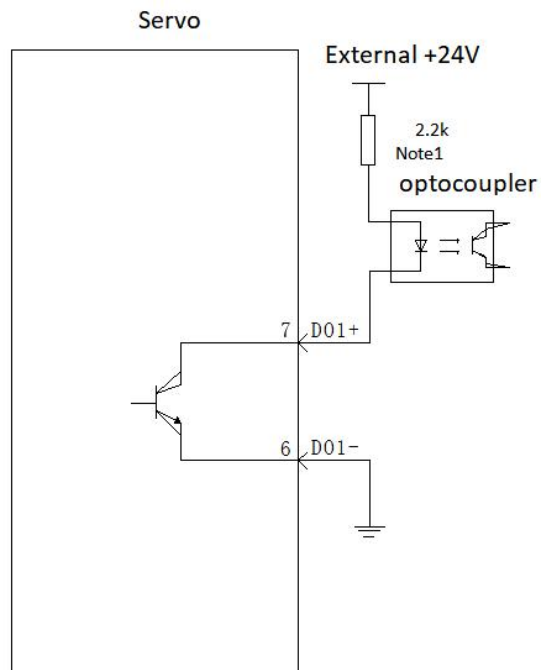


Figure 4-10 Relay input

When the control device(HMI/PLC) is optocoupler input



Note1: The maximum current should not exceed 50ma

Figure 4-11 Optocoupler input

#### 4.4.3 Brake Wiring

The brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-operating state, and keeps the motor locked in position, so that the moving part of the machine will not move due to its own weight or external force.

The brake input signal is non-polar, and the user needs to prepare 24V power supply. The standard connection diagram of brake signal BK and brake power supply is as follows:

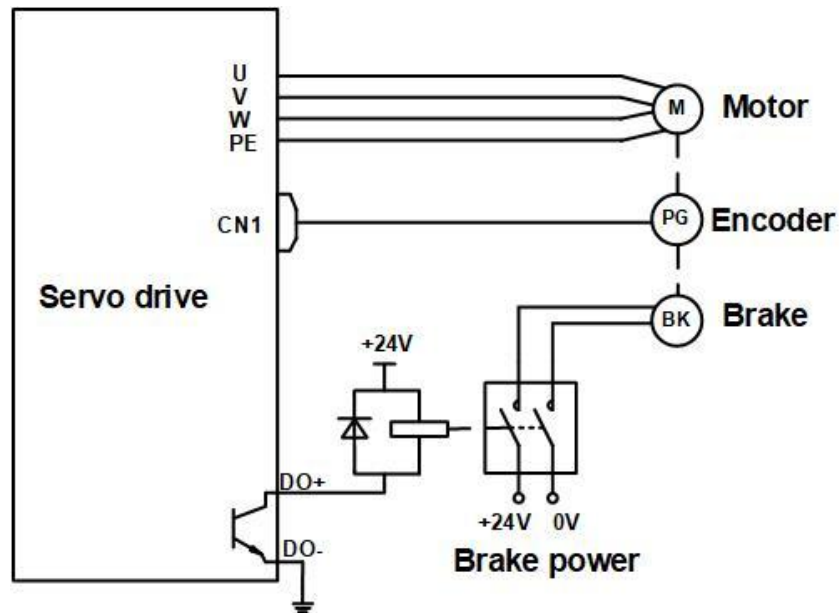


Figure 4-12 Brake wiring (taking three-phase 220V input as an example)

## 4.5 Communication Signal Wiring

The CN5 port of the first servo drive is connected to Wecon PLC LX6V. ( VD5L is the same as VD5E)

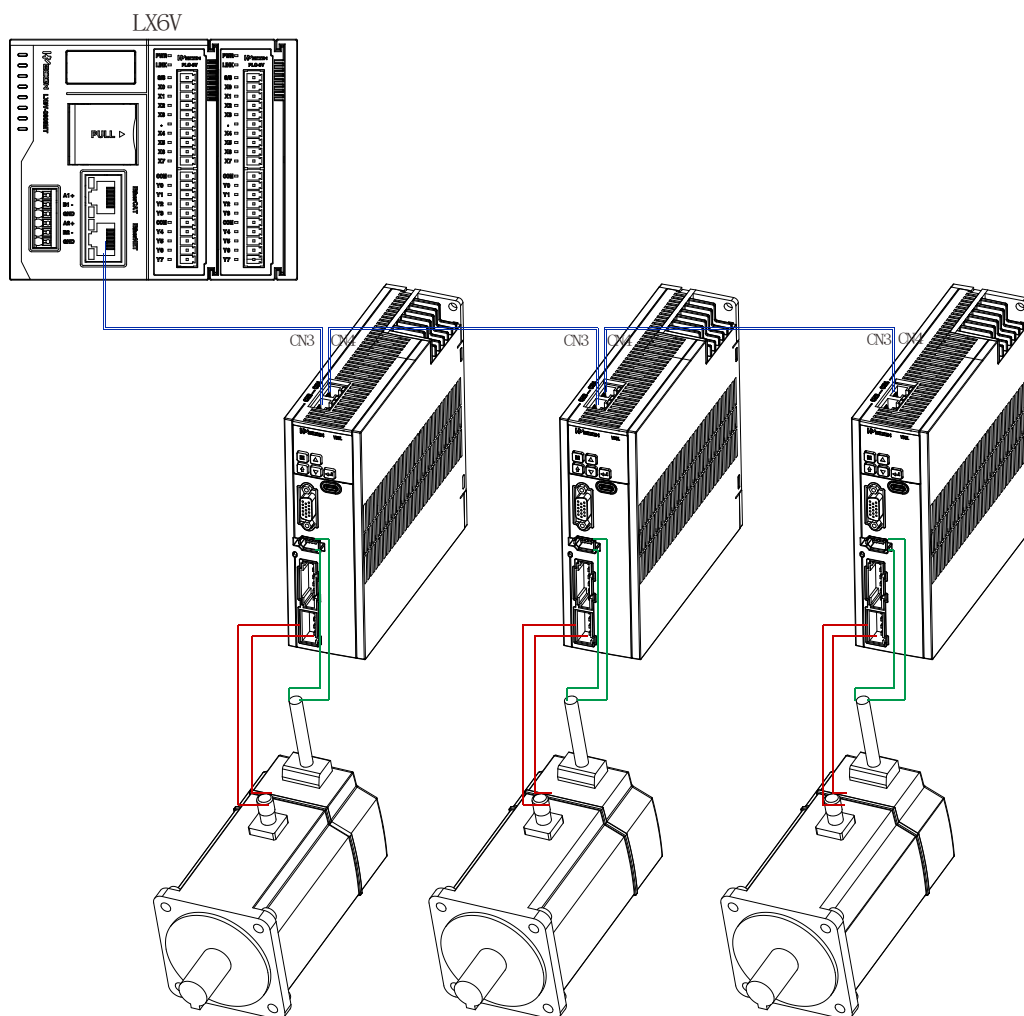


Figure 4-13 Communication topology networking schema

Table 4-14 CN5\ CN6 interface definition

| Pin | Name | Function description |
|-----|------|----------------------|
| 1   | TX+  | Data send+           |
| 2   | TX-  | Data send-           |
| 3   | RX+  | Data receive+        |
| 4   | -    | -                    |
| 5   | -    | -                    |
| 6   | RX-  | Data receive-        |
| 7   | -    | -                    |
| 8   | -    | -                    |

## Chapter 5 Panel Composition

### 5.1 Panel Composition

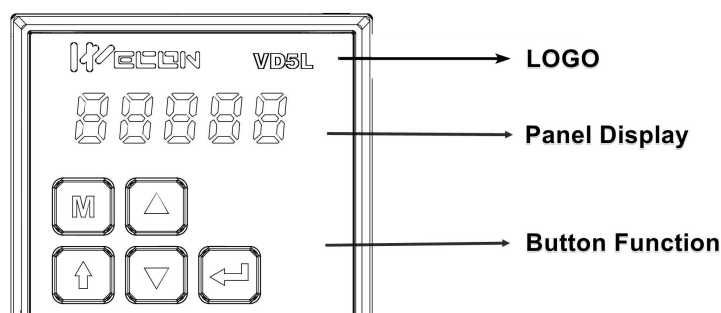


Figure 5-1 Appearance schematic diagram of servo drive panel

The panel of Wecon VD5L series bus servo drive is composed of a display (5-bit LED digital tube) and buttons, which can be used for various display and parameter setting functions of servo drive. Taking parameter setting as an example, the conventional functions of buttons are shown in Table 5-1.

Table 5-1 Brief introduction of key function

| Icon | Name    | Function                                                                                                |
|------|---------|---------------------------------------------------------------------------------------------------------|
|      | Mode    | ① Mode switching<br>② Return to the previous menu                                                       |
|      | Up      | Increase the value of the LED flashing bit                                                              |
|      | Down    | Decrease the value of the LED flashing bit                                                              |
|      | SHIFT   | ① Change the LED flashing bit<br>② View the high-order values of data with a length greater than 4 bits |
|      | Confirm | ① Enter the next menu<br>① Execute instructions such as storing parameter setting values                |

### 5.2 Panel Display

When servo drive is in operation, the panel could be used for status display, parameter display, fault display and monitoring display of the servo.

**Status display:** Display the current operating status of servo drive.

**Parameter display:** Display the object dictionary and the setting value of the object dictionary corresponding to different functions.

**Fault display:** Display the fault code of servo drive.

**Monitor display:** Display the current operating parameter values of servo drive.

### 5.2.1 Display Switching

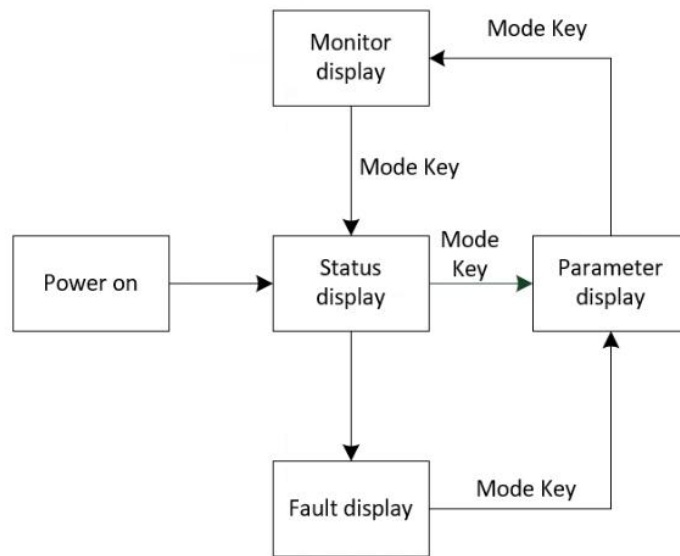


Figure 5-2 Switching schema of each display type of panel

#### Description:

- ① Power on, the panel display of the servo drive enters [status display mode]
- ② When an operation failure occurs, the panel immediately switches to the bit failure display mode, and all the digital tubes flash synchronously, press the "mode" key to switch to the parameter display mode.
- ③ Press the "Mode" key to switch between different display modes. The switching conditions are shown in Figure 5-2.

### 5.2.2 Status Display

| Display | Name                          | Display occasion                                         | Meaning                                                                                                                                          |
|---------|-------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|         | reset<br>Servo initialization | Servo drive is powered on within 1 second                | The servo drive is in an initialized or reset state. After waiting for initialization or reset to complete, automatically switch to other states |
|         | nr<br>Servo is not ready      | After initialization is complete, but servo is not ready | The servo drive is in a non-operational state                                                                                                    |
|         | ry<br>Servo ready             | Servo ready                                              | The servo is in a ready state, waiting for the upper computer to give an enable signal                                                           |
|         | rn<br>Servo is running        | Servo enable signal is active (S-ON is ON status)        | The servo drive is in operation                                                                                                                  |

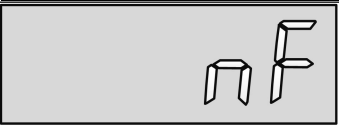
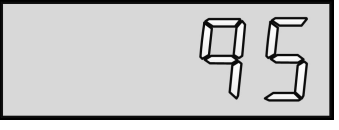
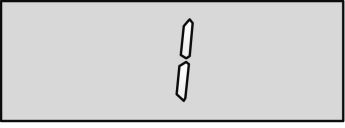
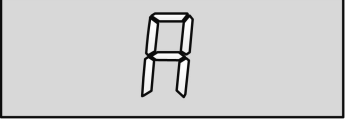
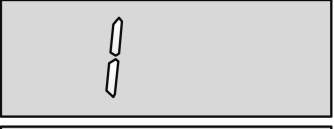
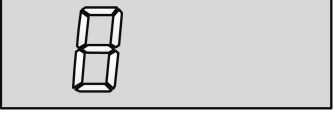
|                                                                                                                                                                            |                                     |                                 |                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                           | nF<br>Servo trouble-free            | Servo drive has no fault        | Servo drive has no fault                                                                                                                                                                                                                                                                                                            |
|                                                                                           | qs<br>Servo fast stop               | The servo is in fast stop state | The servo is in fast stop state                                                                                                                                                                                                                                                                                                     |
| <br>     | 1 ~ A<br>Control mode               | -                               | Displays the current operation mode of the servo drive in hexadecimal digital form:<br><br>1: Profile Position Mode<br><br>3: Profile velocity mode<br><br>4: Profile torque mode<br><br>6: Homing mode<br><br>8: Cyclic Synchronous Position Mode<br><br>9: Cyclic Synchronous speed Mode<br><br>A: Cyclic synchronous torque mode |
| <br> | 1 ~ 8<br>Communication status       | -                               | Displays the Ether CAT state machine status of the slave station in character form:<br><br>1: Initialization state<br><br>2: Pre-operating status<br><br>4: Safe operation status<br><br>8: Operating status                                                                                                                        |
|                                                                                         | CN6 Interface Connection Indication | -                               | Keep dark constantly: No communication connection detected                                                                                                                                                                                                                                                                          |
|                                                                                         | CN5 Interface Connection Indication | -                               | Keep bright constantly: A communication connection has been established                                                                                                                                                                                                                                                             |

Table 5-2 Status display example



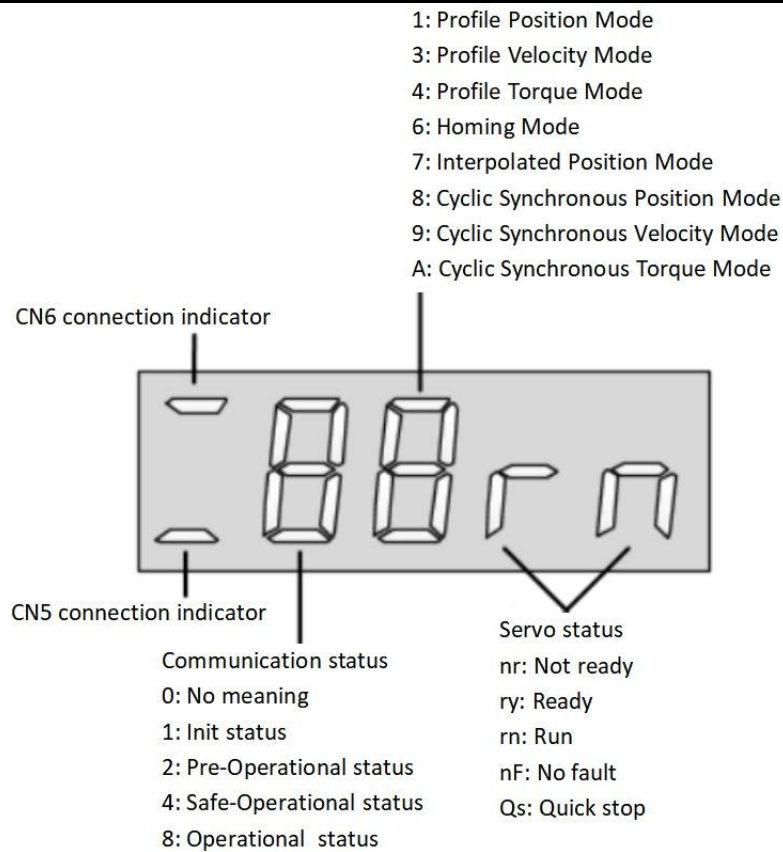


Figure 5-3 Status indication schema

### 5.2.3 Parameter Display

Wecon VD5L series bus servo drive is divided into 13 groups of function codes according to different parameters and functions, which can quickly locate the position of function codes according to the group of function codes. For specific parameters, please refer to “**Chapter 8 Object Dictionary**”.

#### (1) Parameter group display

The parameter display is the display of different function codes. The format of the function code is PXX.YY, where PXX represents the group number of the function code, and YY represents the number within the function code group.

| Display | Name                       | Content                       |
|---------|----------------------------|-------------------------------|
| PXX.YY  | Function code group number | Number in function code group |

For example, the function code 2000.01 is shown as follows:

| Display                                                                             | Name                  | Content                                                             |
|-------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------|
|  | Function code 2000-01 | 00: Function code group number<br>01: Number in function code group |

#### (2) Display of different length data

##### ① Data display of four digits and below

Using single page display, if it is a signed number, the highest bit of the data is "-".

| Display |  |  |
|---------|--|--|
|         |  |  |

Examples:

Display Data more than five bits

Display in pages from low to high digits, each 4 bits is a page. Display method: current page + current value, as shown, switch the current page by pressing the "shift" key.

For example: 2147483646 is displayed as follows:

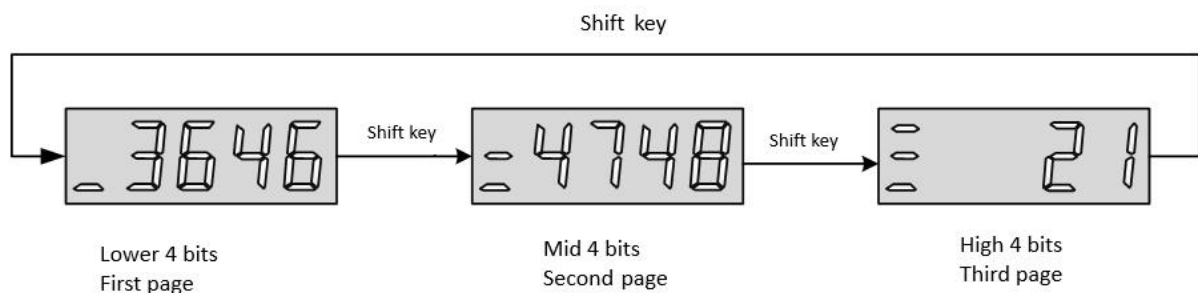


Figure 5-4 2147483646 Display Action

For example: -2147483647 is displayed as follows:

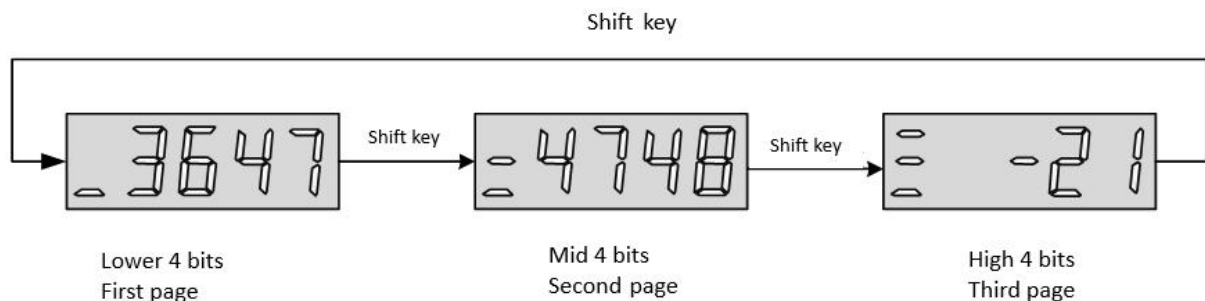


Figure 5-5 -2147483647 Display Operation

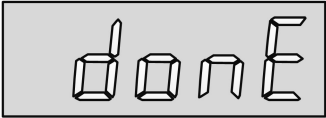
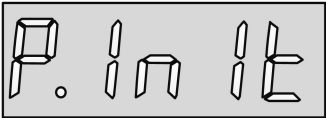
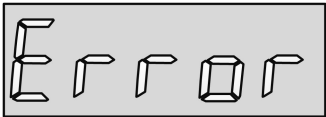
### (3) Decimal point display

Digital tube of individual bit data ". " represents the decimal point, and the decimal point ". " no flashing, as shown below:

| Display |  |
|---------|--|
|         |  |

### (4) Parameter setting display

Table 5-3 Parameter setting display

| Display                                                                           | Name                                                 | Display occasion                                                                  | Meaning                                                                                 |
|-----------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
|  | Done<br>Parameter setting<br>completed               | Restore factory<br>settings                                                       | Factory reset successful.                                                               |
|  | P.Init<br>Parameter restore factory<br>setting value | Restore factory<br>settings                                                       | The servo drive is in the<br>process of parameter<br>restoration to factory<br>settings |
|  | Error<br>parameter error                             | Parameter setting<br>exceeds the limit<br>(Or not allowed to<br>exceed the limit) | Prompt that the parameter<br>setting exceeds the limit                                  |

#### 5.2.4 Fault Display

The panel can display current or historical fault and warning codes. Please refer to the analysis and troubleshooting of faults and warnings"Chapter 7 Failure".

When a single fault or warning occurs, the panel immediately displays the current fault or warning code; when multiple faults or warnings occur, the highest fault code is displayed. When a fault occurs, when switching from the auxiliary function to the parameter display function, the corresponding fault or warning code will be displayed. You can view the current fault and warning codes and the past five fault and warning codes through the monitor display on the panel. You can view the current fault and warning codes and the last five fault and warning codes through the monitoring display of the panel.

Table 5-4 Warning display case

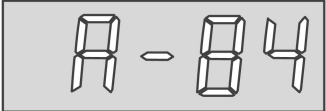
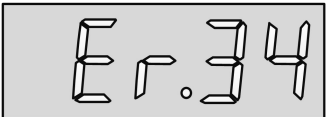
| Display                                                                             | Name                                                        | Content                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------|
|  | Parameter modification that needs<br>to be powered on again | Modified the parameters that need<br>to be re-powered on to take effect |

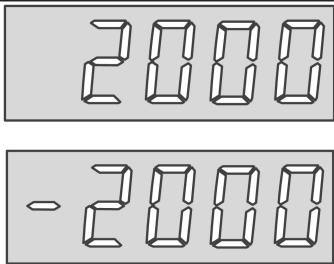
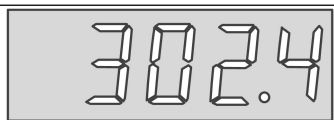
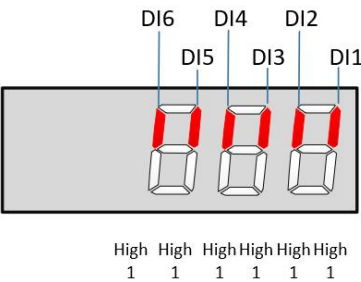
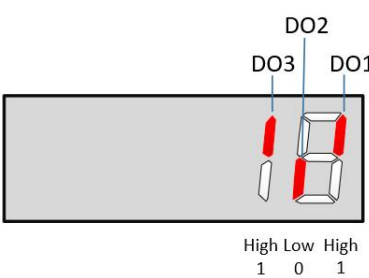
Table 5-5 Fault display case

| Display                                                                             | Name                      | Content                   |
|-------------------------------------------------------------------------------------|---------------------------|---------------------------|
|  | Motor overload protection | Motor overload protection |

### 5.2.5 Monitor Display

After the servo drive is powered on or the servo enable is turned on, you can press the "Mode" key to enter the monitoring display mode.

Table 5-6 Monitoring quantity display schema

| Display                                                                             | Monitoring volume | Name                 | Unit | Meaning                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-------------------|----------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | U0-02             | Servo motor speed    | rpm  | Indicates the actual running speed of servo motor, which is expressed in decimal system                                                                             |
|    | U0-31             | Bus voltage          | V    | Represents the voltage value , the DC bus voltage between P+ and - of the drive                                                                                     |
|   | U0-17             | Input signal status  | -    | Indicates the level status corresponding to the 6 DI terminals. The upper half of the LED light indicates high level, and the lower half light indicates low level. |
|  | U0-19             | Output signal status | -    | Indicates the level status corresponding to the 3 DO terminals. The upper half of the LED light indicates high level, and the lower half light indicates low level. |

## 5.3 Panel Operation

### 5.3.1 Parameter Setting

The servo drive panel can be used to set parameters. For details, please refer to "Chapter 8 Object Dictionary" Taking 2000.01 as an example, the control mode of servo drive is changed from position control mode to speed control mode. The specific setting steps are shown in Figure 5-5.

#### Description:

The power supply is in nF state after power on.

Press "Mode" to enter the function code parameter interface.

Press "Confirm" to enter the function code value modification interface after completing the function code selection.

Press the "Up" and "Down" to modify the parameter value.

Press the "Confirm" twice to complete the value modification.

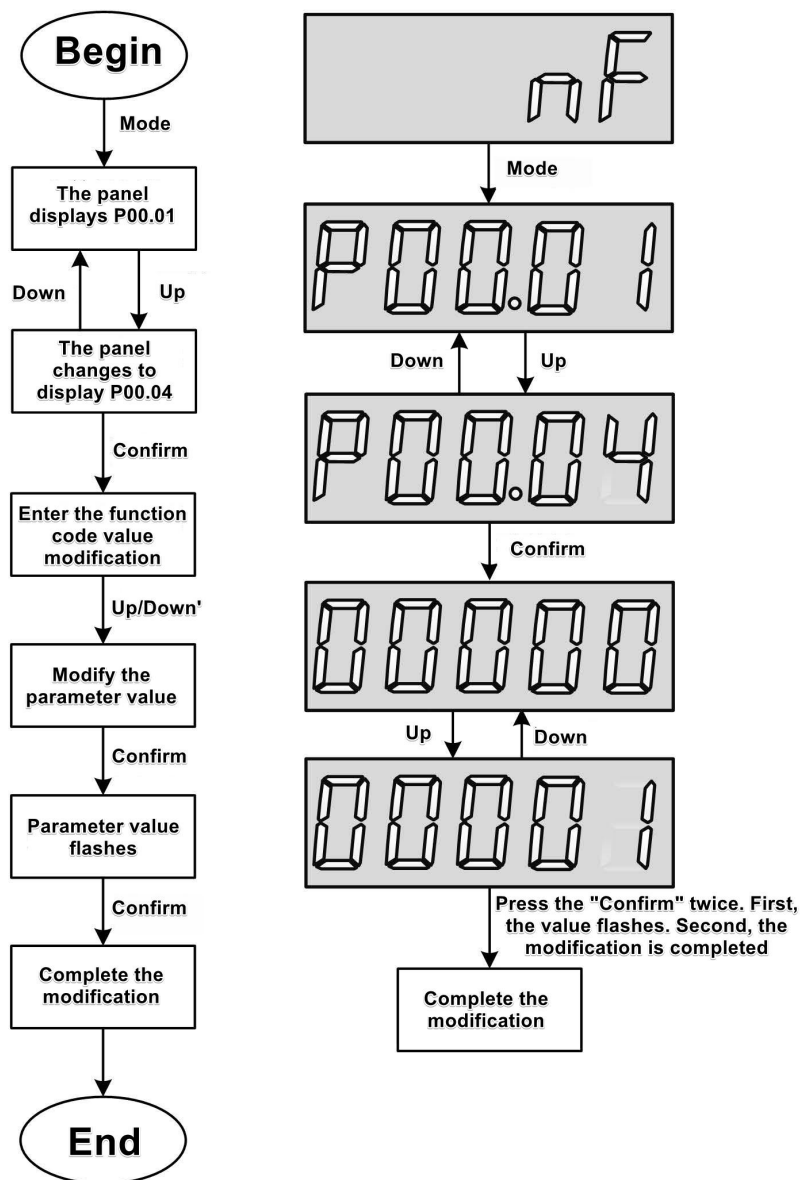


Figure 5-6 Schematic diagram of parameter setting steps

### 5.3.2 Jog Operation

In order to test run the servo motor and the servo drive, you can use the jog running function. The operation steps are shown in.

#### Description:

① Adjust the function code to P10.01 after power on.

Press the "Enter" key to enter the next menu to set the "JOG Speed".

After the "JOG jog speed" setting is completed, press the "Enter" key, the panel displays "JOG" in a flashing state, press the "Enter" key again to enter the JOG mode.

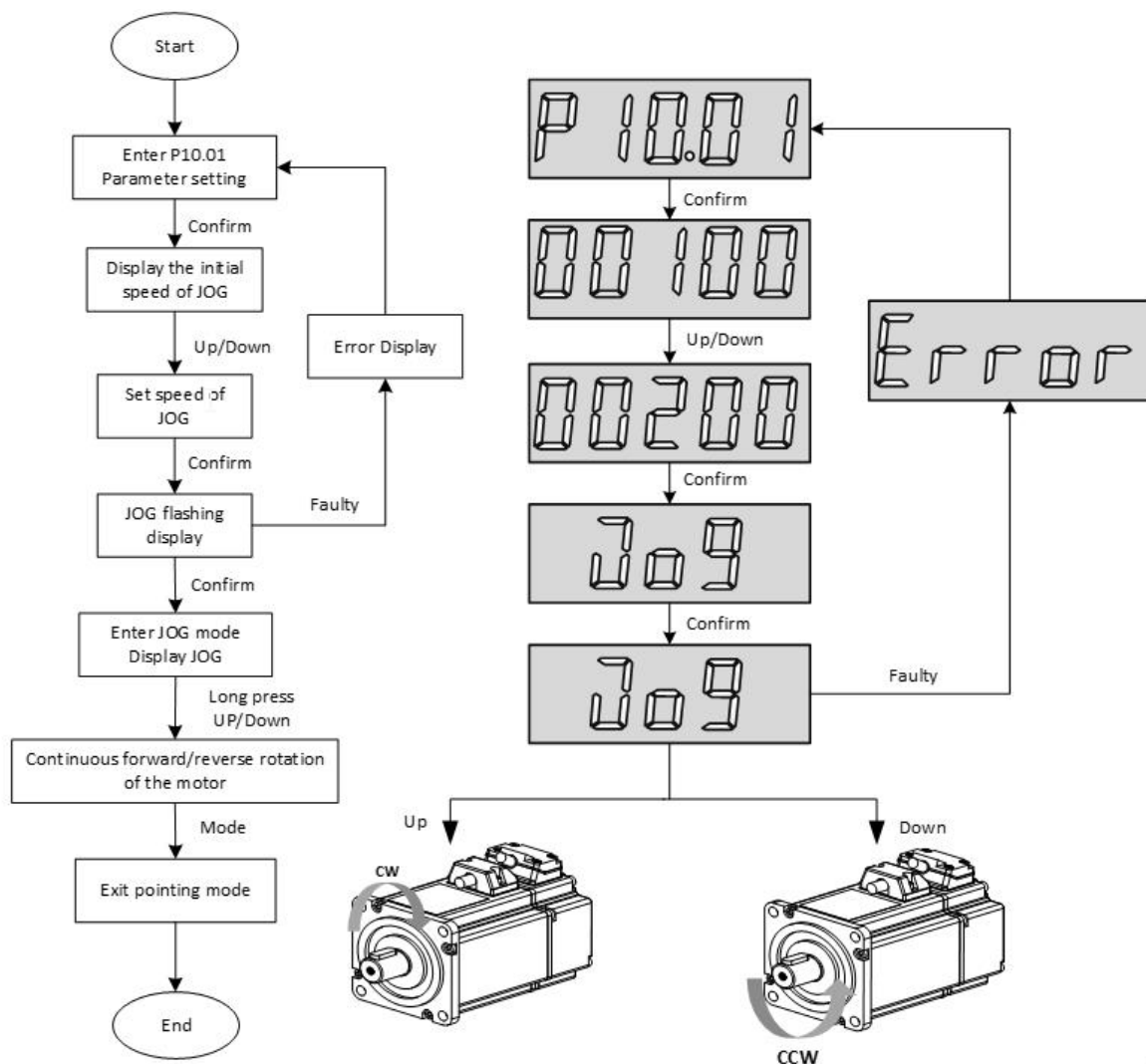
Long press the "Up" key and "Down" key to realize the forward and reverse rotation of the motor.

Press the "Mode" key to exit the JOG mode.

Note 1: Press the Up/Down key for a long time, and the motor will continue to rotate; Press the Up/Down key, and the motor will inching and rotating.

Note 2: Exit the "inching operation" status through the "Mode" keyboard and return to the superior menu at the same time.

Note 3: Display Error cause: Please refer to the corresponding fault code "Chapter 10 Failure".



### 5.3.3 Factory Reset

The factory settings can be restored through the servo drive panel. The specific operation steps are shown in Figure 5-8.

**Steps:**

- ① After power on, modify the function code to P10.02.
- ② Press the "Enter" key to enter the next menu to set the parameters.
- ③ After the parameter is set to 1, press the "Confirm" key, at this time, the digital tube flashes to display "00001", and press the "Confirm" key again, and the digital tube displays P.init.
- ④ Long press the "Enter" key for 3s, the panel digital tube will gradually light up from left to right until 88888 is displayed.
- ⑤ You can release the "confirm" key during the display of 8.8. 8.8. 8.
- ⑥ Digital tube shows done, indicating that the factory settings are restored. At this time, it is recommended to re-power up and down the servo drive.

Note 1: Display Error Reason: When the parameter value of P10.02 is set beyond the set range (0 ~ 1), Error will be displayed.

Note 2: When the setting value is displayed as 0, press the Down key, and the panel will display Error. After displaying for 1 second, the setting value will automatically jump to 1.

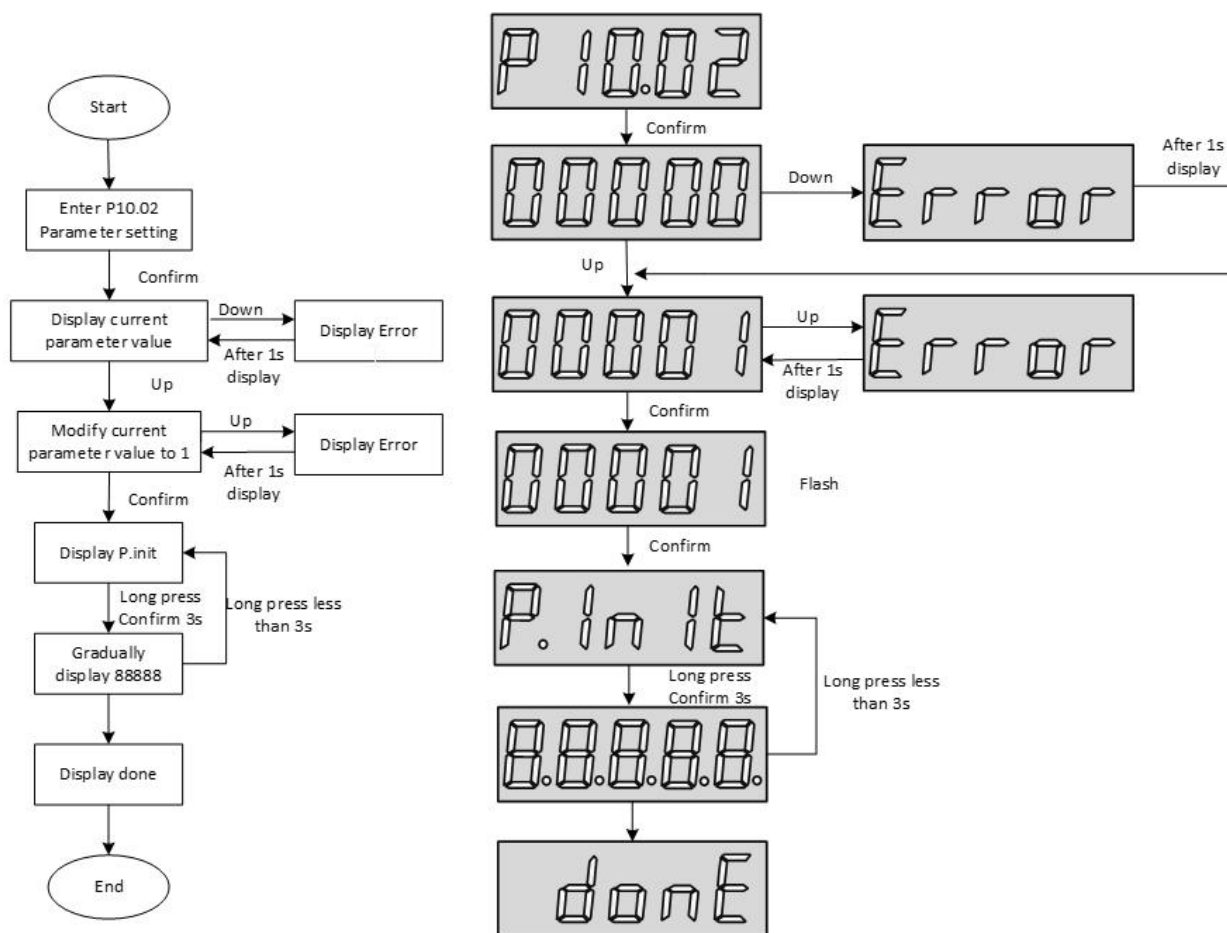


Figure 5-8 Restore factory setting steps



## Chapter 6 Communication Network Configuration

### 6.1 EtherCAT Operation

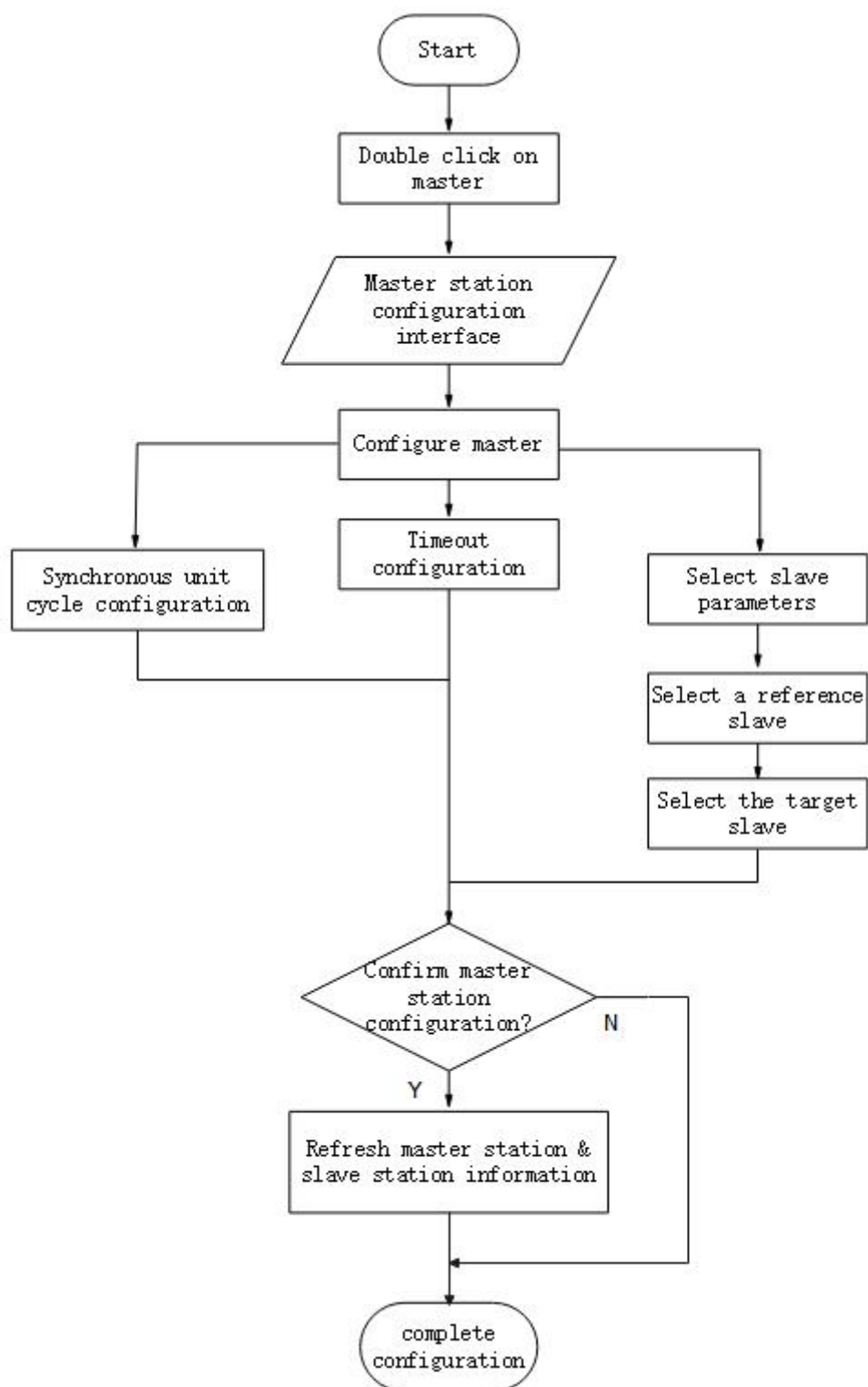


Figure 6-1 EtherCAT Operation Configuration Flow

## 6.2 EtherCAT Communication Fundamentals

### 6.2.1 EtherCAT Communication Specification

| Layer             | Content                 | Specification                          |
|-------------------|-------------------------|----------------------------------------|
| Application layer | PDO                     | Variable PDO mapping                   |
|                   | SDO                     | SDO request, SDO reply                 |
|                   | CIA 402                 | Cyclic Synchronous Position Mode (CSP) |
|                   |                         | Cyclic Synchronous Velocity Mode (CSV) |
|                   |                         | Cyclic Synchronous Torque Mode (CST)   |
| Physical layer    |                         | Profile Torque Mode (PT)               |
|                   |                         | Homing Mode (HM)                       |
|                   | Transport protocol      | 100BASE-TX (IEEE802.3)                 |
|                   | Communication interface | RJ45 Port * 2 (IN, OUT)                |

### 6.2.2 Communication Structure

Wecon VD5L series bus servo drives adopt IEC 61800-7 (CiA402)-CANOpen motion control sub-protocol.

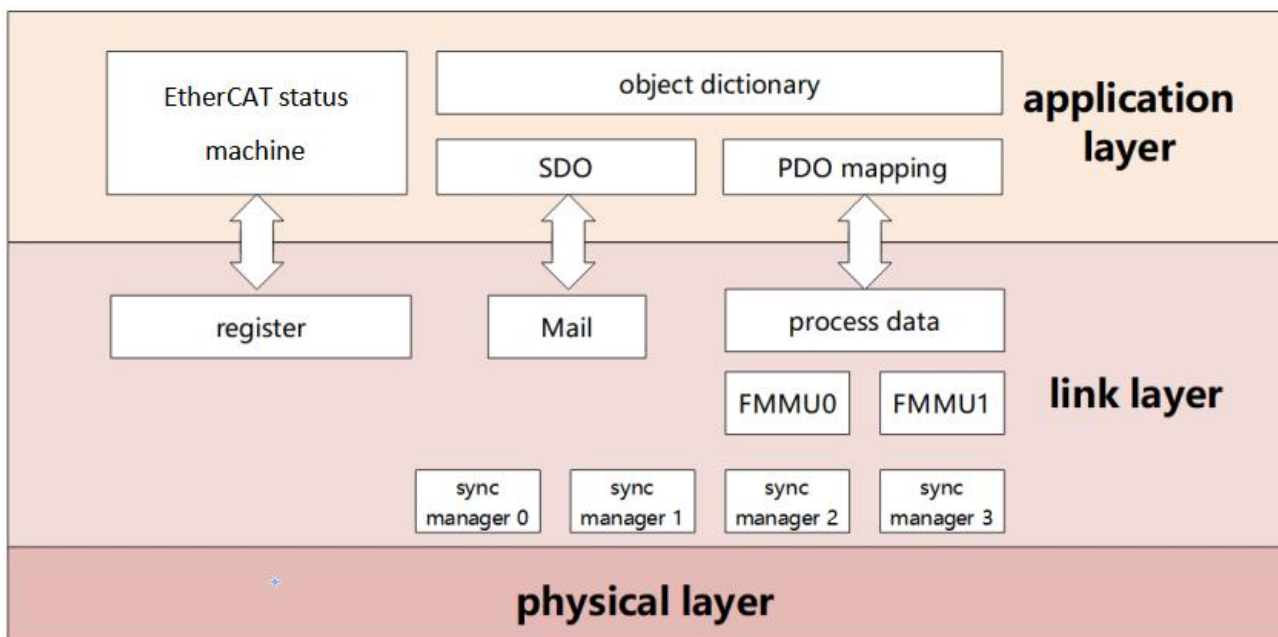


Figure 6-2 Communication structure

PDO (Process Data Object) is composed of Object Dictionary (Object Dictionary) which can be mapped in PDO, and the content of process data is defined according to PDO mapping.

Email is a kind of aperiodic communication and can read and write all object dictionaries.

### 6.2.3 State Machines

EtherCAT devices support four states and are responsible for coordinating the state relationship between master and slave applications at initialization and running:

Init: Initialization, abbreviated as I;

Pre-Operational: Pre-Operational, abbreviated as P;

Safe-Operational: Safe operation, abbreviated as S;

Operational: Operational, abbreviated as O.

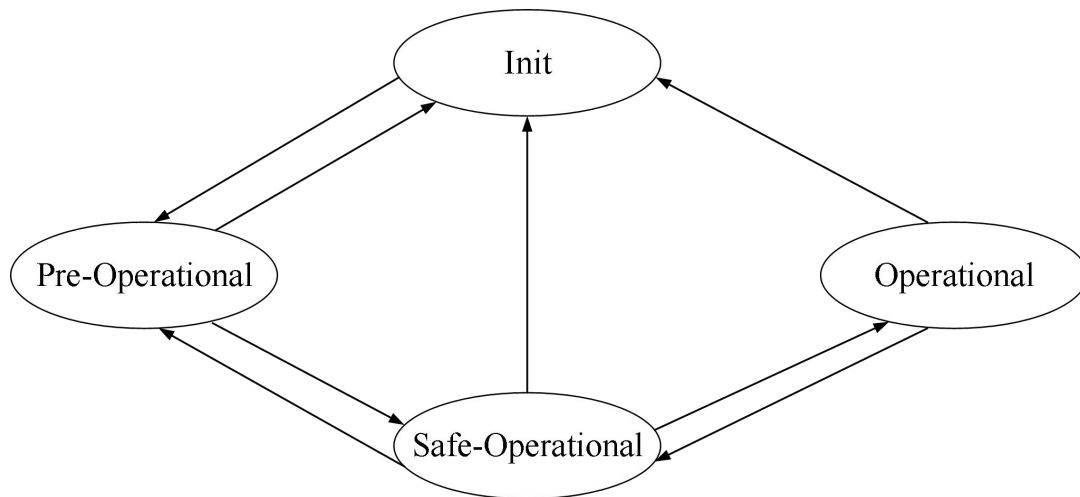


Figure 6-3 Communication structure

When changing from initialization state to operational state, it must be changed in the order of "initialization → pre-Operational → safe Operational → Operational"!

Leapfrog transition when returning from operational state. Refer to the following table for state transition operation and initialization process:

| Status                           | Operation                                                                                                                                                                                                                         |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Initialization                   | There is no communication in the application layer, and the master station can only read and write ESC registers                                                                                                                  |
| Initialization → pre-operational | The master station configures the site address of the slave station;<br>Configure Email channels;<br>Configure DC distributed clock;<br>Request "pre-Operational" status                                                          |
| Pre-operation                    | Application Layer Email Data Communication (SDO)                                                                                                                                                                                  |
| Pre-operation → safe operation   | The master station uses Email to initialize the process data mapping;<br>The master station configures the SM channel used for process data communication;<br>The main station is configured with FMMU;;<br>Request "safe status" |
| Safe operation                   | Allow input data to be read without output signal (SDO, TPDO)                                                                                                                                                                     |
| Safe operation → operation       | The master station sends valid output data;<br>Request "operation" status                                                                                                                                                         |
| Operation                        | Input and output are all valid and can use Email communication (SDO, TPDO, RPDO)                                                                                                                                                  |

### 6.2.4 Communication Indicator Lamp

The communication indicator for the VD5L servo drive is located on the CN5 (IN), CN6 (OUT) sockets, as shown in Figure 6-5As shown in.

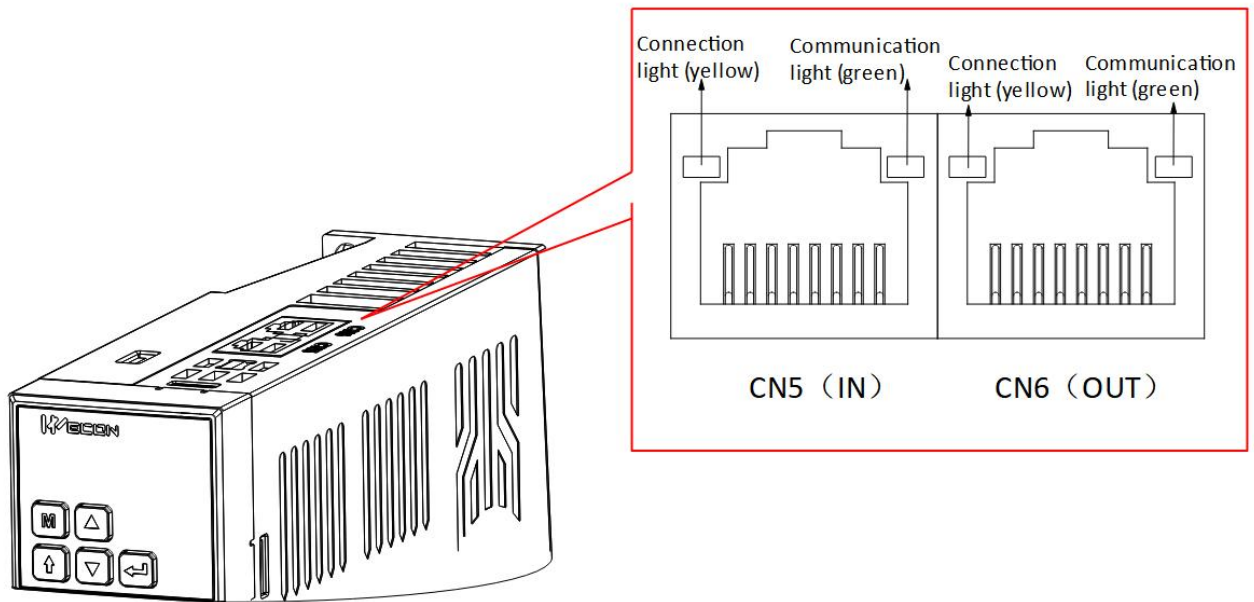


Figure 6-4 Communication indicator position

#### (1) Connection lamp (yellow)

Used to display the status of CN5 and CN6 communication interfaces, and the display contents are shown in the following table.

| Connection lamp status | Explanation                                    |
|------------------------|------------------------------------------------|
| OFF                    | The port is not connected to the network cable |
| ON                     | The port is connected to the network cable     |

#### (2) Communication lamp (green)

Used to display the status of CN5 and CN6 communication connections, as shown in the following table.

| Connection lamp status | Explanation                                                             |
|------------------------|-------------------------------------------------------------------------|
| ON                     | No communication connection was established with the master station     |
| BLINKING               | A communication connection has been established with the master station |

### 6.2.5 Process Data PDO

PDO outputs process data in real time. PDO can be divided into RPDO (for receiving instructions from master station) and TPDO (for feeding back its own status from slave station).

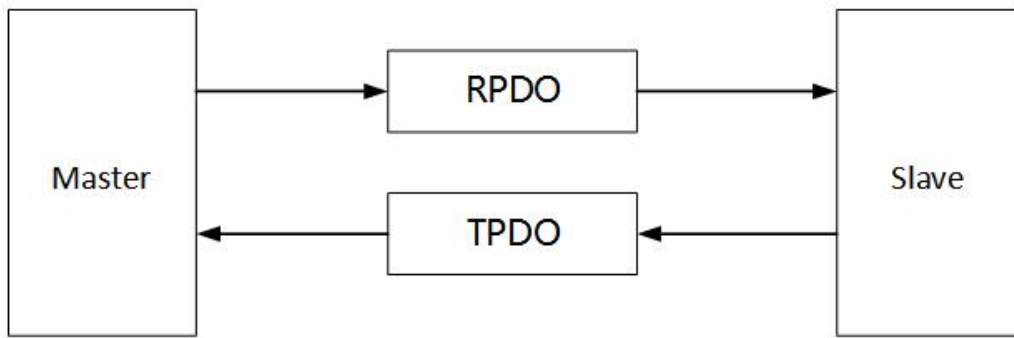


Figure 6-5 PDO schematic diagram

## (1) PDO mapping parameters

PDO mapping is used to establish the mapping relationship between object dictionary and PDO. 1600h-17FFh is RPDO, 1A00h-1BFFh is TPDO:

| Name | Parameter     | Properties       |
|------|---------------|------------------|
| RPDO | 1600h         | Variable mapping |
|      | 1701h ~ 1702h | Fixed mapping    |
| TPDO | 1A00h         | Variable mapping |
|      | 1B01h         | Fixed mapping    |

The following figure is an example of RxPDO mapping.

| Index | Sub index | Name            | Data type |
|-------|-----------|-----------------|-----------|
| 6040  | --        | Control word    | UINT      |
| 607A  | --        | Target position | DINT      |

**RxPDO  
(1600h)**

1

2

...

10

| Index | Sub-index | Data type |
|-------|-----------|-----------|
| 6040  | 00        | UINT      |
| 607A  | 00        | DINT      |
| ...   | ...       | ...       |
| □□□□  | □□        |           |

Figure 6-6 Examples of RxPDO mapping

The data type is defined as follows:

| Data type | Description    | Numerical range            |
|-----------|----------------|----------------------------|
| SINT      | Signed 8bit    | -128 ~ 127                 |
| USINT     | Unsigned 8bit  | 0 ~ 255                    |
| INT       | Signed 16bit   | -32768 ~ 32767             |
| UINT      | Unsigned 16bit | 0~65535                    |
| DINT      | Signed 32bit   | -21247483648 ~ 21247483647 |
| UDINT     | Unsigned 32bit | 0 ~ 4294967295             |

|        |              |       |
|--------|--------------|-------|
| STRING | String Value | ASCII |
|--------|--------------|-------|

The following figure is an example of TxPDO mapping.

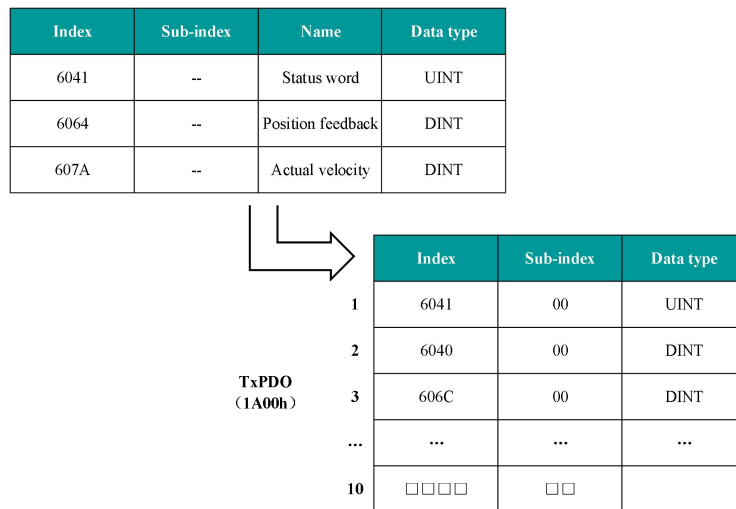


Figure 6-8 Examples of TxPDO mapping

The following figure is an example of a SyncManager PDO mapping.

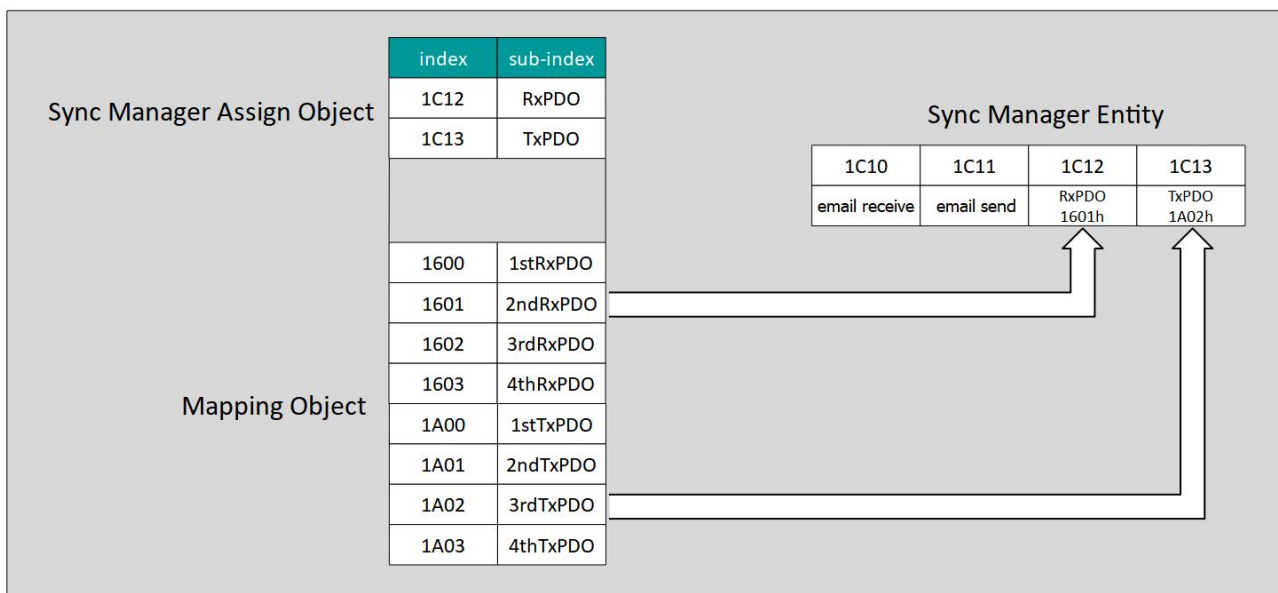


Figure 6-8 SyncManager PDO Mapping Example

## (2) Synchronize management of PDO allocation settings

In EtherCAT periodic data communication, process data can contain multiple PDO mapping data objects. The data objects 0x1C10 ~ 0x1C2F used in CoE protocol define the corresponding PDO mapping object list of SM (Synchronous Management Channel), and multiple PDO can be mapped in different sub-indexes.

| Index (hex) | Sub-index (hex) | Content                                                       |
|-------------|-----------------|---------------------------------------------------------------|
| 1C12        | 01              | Choose to use one of 0x1600, 0x1701-0x1705 as the actual RPDO |
| 1C13        | 01              | Select to use one of 0x1A00, 0x1B01-0x1B04 as the actual TPDO |

## (3) PDO configuration

The PDO mapping parameter contains a pointer to the PDO corresponding process data that the PDO needs to send or receive, including index, sub-index and mapping object length. The sub-index 0 records the number N of

objects mapped by the PDO, and the length of each PDO data can reach 4N bytes at most, which can map one or more objects at the same time. Sub-index ~ N is the mapping content. The mapping parameter content is defined as follows:

| Number of digits | 31    | ... | 16 | 15        | ... | 8 | 7             | ... | 0 |
|------------------|-------|-----|----|-----------|-----|---|---------------|-----|---|
| Description      | Index |     |    | Sub-index |     |   | Object length |     |   |

The index and sub-index together determine the position of the object in the object dictionary, and the object length indicates the specific bit length of the object (hexadecimal representation)

| Object length | Bit length |
|---------------|------------|
| 08h           | 8          |
| 10h           | 16         |
| 20h           | 32         |

For example, the mapping parameter of 6040h-00 (control word) is 60400010h



#### Notice

◆ PDO configuration can only be designed when the EtherCAT communication state machine is in pre-operation (Pre-Operational, panel display **2**), otherwise .

◆ PDO configuration parameters cannot be stored in the EEPROM. Therefore, after each power-on, please reconfigure the mapping object, otherwise, the mapping object is the default parameter of the drive.

◆ The SDO fault codes are returned when:

- ① Modify PDO parameters in non-pre-running state;
- ② Pre-write values other than 1600/1701~1702 in 1C12;
- ③ Pre-write values other than 1A00/1B01 in 1C13.

◆ No more than 10 variable mappings can be added, otherwise servo activation will fail.

### 6.2.6 Email Data SDO

EtherCAT Email data SDO is used to transmit aperiodic data, such as configuration of communication parameters, servo drive operation parameters and so on. EtherCAT's CoE service types include:

① Emergency information; ② SDO request; ③ SDO response; ④ TxPDO; ⑤ RxPDO; ⑥ Remote TxPDO sending request; ⑦ Remote RxPDO sending request; ⑧ SDO information.

Wecon VD5L series bus servo drives currently support ② SDO request and ③ SDO response.

### 6.2.7 Distributed Clock

Distributed clock enables all EtherCAT devices to use the same system time, thus controlling the synchronous execution of tasks of each device. The slave station device can generate a synchronization signal according to the synchronized system time. Wecon VD5L series bus servo drives only support DC synchronous mode.

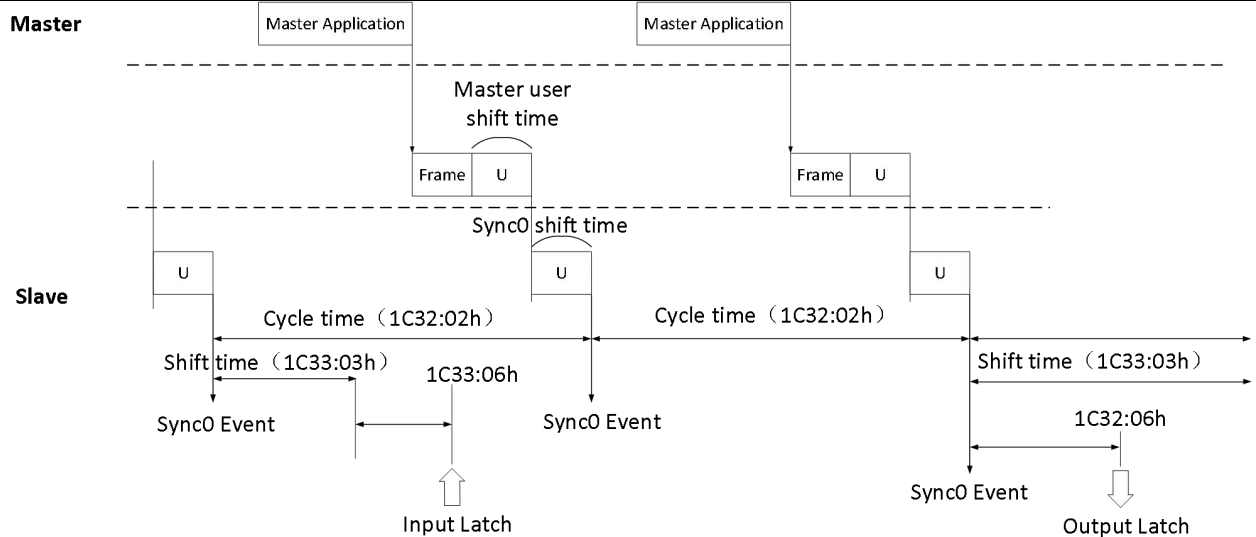


Figure 6-9 DC Synchronous Mode Schematic Diagram

### 6.2.8 Status Indication

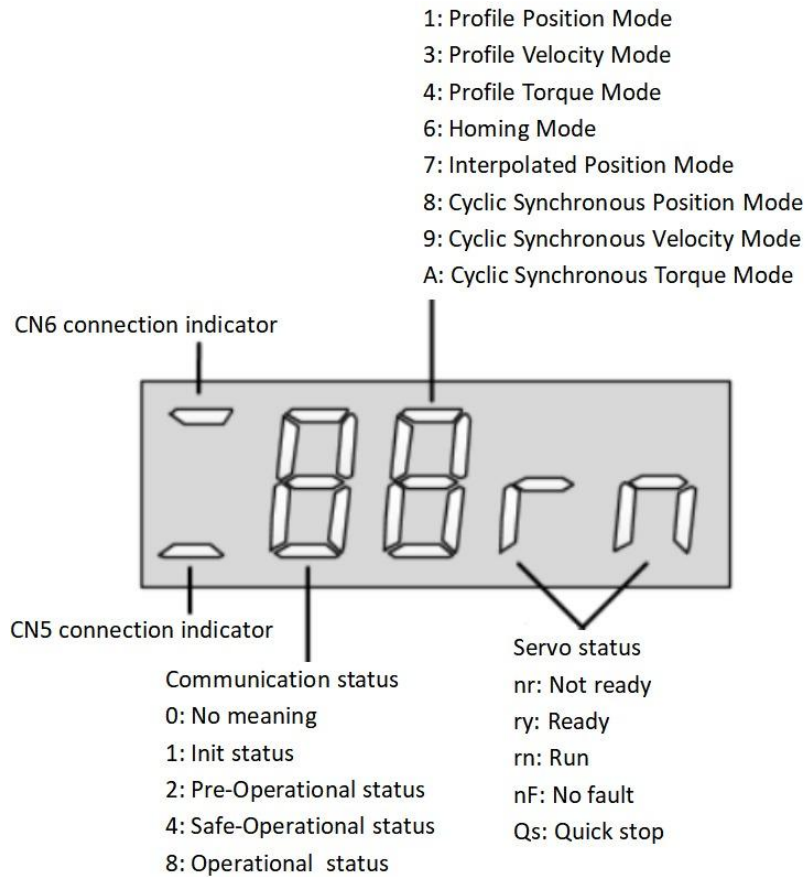


Figure 6-10 Status indication schema

#### Description:

##### (1) Communication connection status

The first digit tube from the left of the 5-bit LED indicator on the servo drive panel is used to display the connection status of the two Ethernet communication ports: upper "-" CN6 (OUT) and lower "-" CN5 (IN)

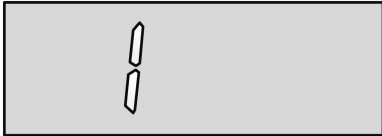
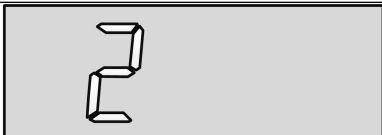
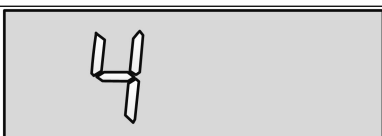
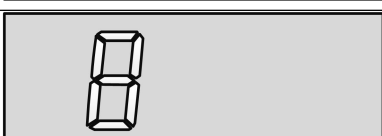
Long dark: No communication connection detected



Long Bright: A communication connection has been established

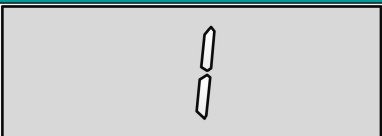
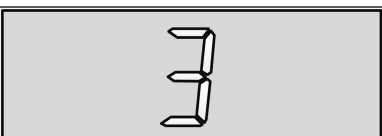
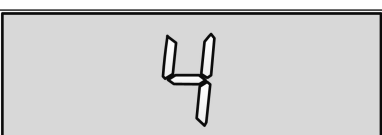
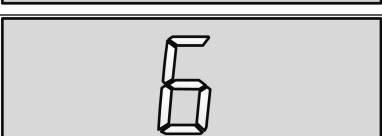
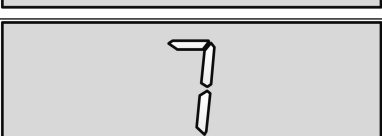
## (2) Communication Operating status

The servo drive panel of the 5-bit LED indicator lamp is the second digit tube from the left, which is used to display the EtherCAT state machine status of the slave station in character form.

| Panel display                                                                     | Meaning               |
|-----------------------------------------------------------------------------------|-----------------------|
|  | Initialization state  |
|  | Pre-operation status  |
|  | Safe operation status |
|  | Operating status      |

## (3) Display of servo operation mode

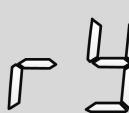
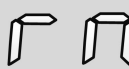
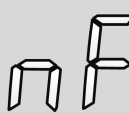
Servo drive panel 5-bit LED indicator from the left of the third digit tube, used to display hexadecimal digital form display servo drive current operation mode.

| Panel display                                                                       | Meaning                       |
|-------------------------------------------------------------------------------------|-------------------------------|
|  | Profile position control mode |
|  | Profile speed control mode    |
|  | Profile torque control mode   |
|  | Homing mode                   |
|  | Interpolation mode            |

|                                                                                   |                                  |
|-----------------------------------------------------------------------------------|----------------------------------|
|  | Cyclic Synchronous Position mode |
|  | Cyclic synchronous speed mode    |
|  | Cyclic synchronous torque mode   |

**(4) Servo status display**

Servo drive panel 5-bit LED indicator from the left of the fourth and fifth digit tube, used to display the servo status of the slave station.

| Panel display                                                                       | Meaning         |
|-------------------------------------------------------------------------------------|-----------------|
|    | Not ready nr    |
|   | Get ready ry    |
|  | Run rn          |
|  | Failure-free nF |
|  | Quick stop      |

### 6.2.9 Introduction to CiA402 Control

The use of Wecon VD5L Series Bus Type servo drives must be guided according to the procedure specified in Standard 402 Protocol.

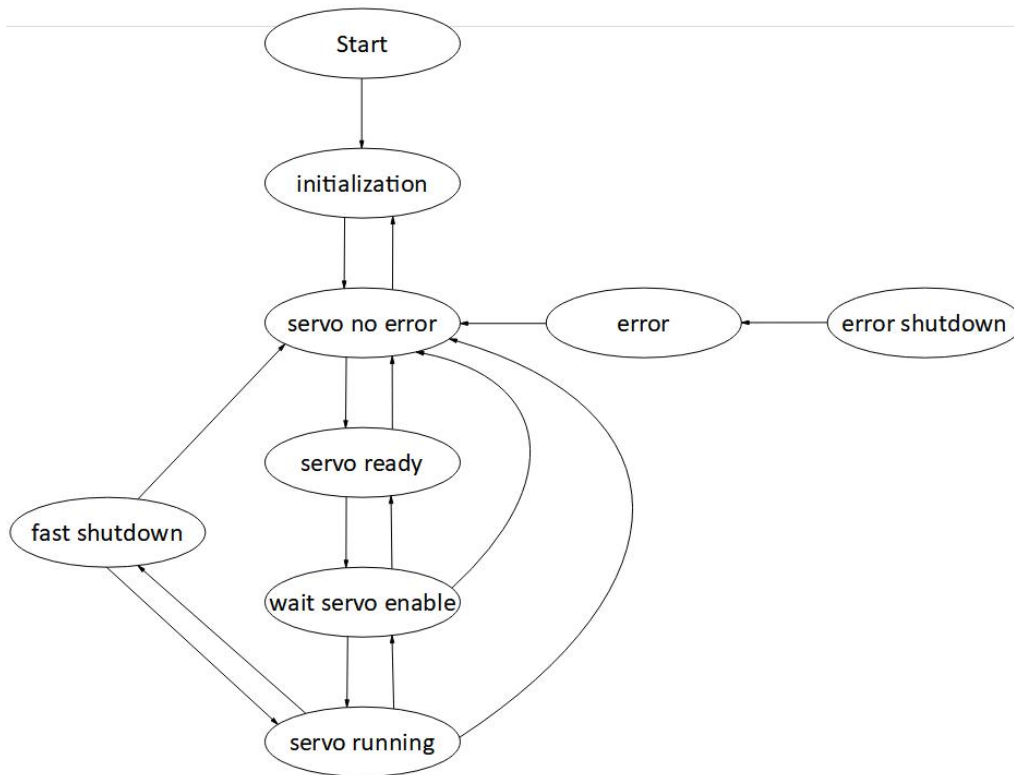


Figure 6-11 CiA402 state machine switching schema

| Status                       | Description                                                                                                                        |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Initialization               | Drive initialization, internal self-test has completed.<br>Parameters cannot be set, and servo drive function cannot be performed. |
| Servo trouble-free           | There is no fault in the servo drive.<br>Parameters can be set.                                                                    |
| Servo ready                  | Servo drives are ready.<br>Parameters can be set.                                                                                  |
| Wait to turn on servo enable | The servo drive waits to turn on the servo enable.<br>Parameters can be set.                                                       |
| Servo operation              | The servo drive is running normally.                                                                                               |
| Quick shutdown               | The servo drive is performing the quick shutdown function.<br>Only function codes with the attribute "Run valid" can be set.       |
| Malfunction shutdown         | The servo drive is performing the fault shutdown function.<br>Only function codes with the attribute "Run valid" can be set.       |
| fault                        | Failure shutdown is complete, and all drive functions are disabled.<br>Allow parameters to be changed to troubleshoot.             |

### 6.2.10 Basic Characteristics

The EtherCAT network cable is connected to the CN5 (IN), CN6 (OUT) interfaces, and its electrical characteristics conform to IEEE 802.3 standard.

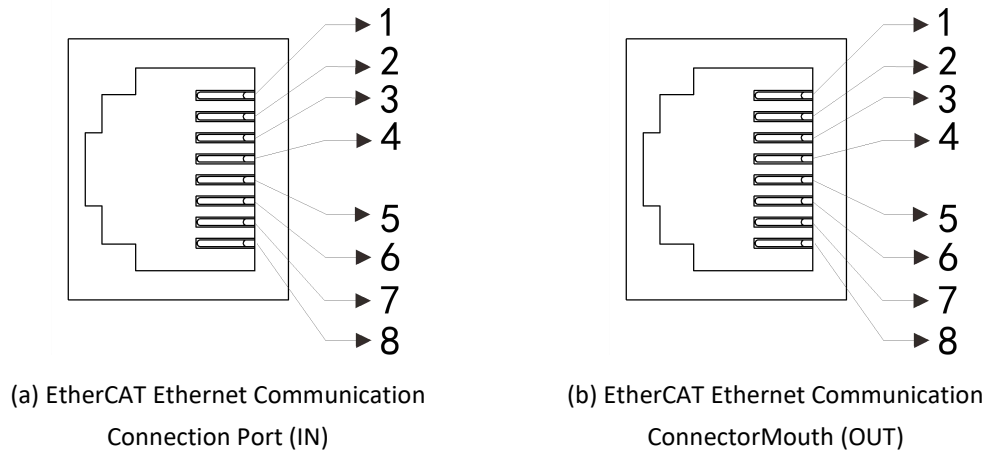


Figure 6-12 Communication port

| Pin | Name | Function description |
|-----|------|----------------------|
| 1   | TX+  | Sending data+        |
| 2   | TX-  | Sending data-        |
| 3   | RX+  | Receiving data+      |
| 4   | -    | -                    |
| 5   | -    | -                    |
| 6   | RX-  | Receiving data-      |
| 7   | -    | -                    |
| 8   | -    | -                    |

EtherCAT communication topology connections are very flexible, taking cable connections and ring connections as examples:

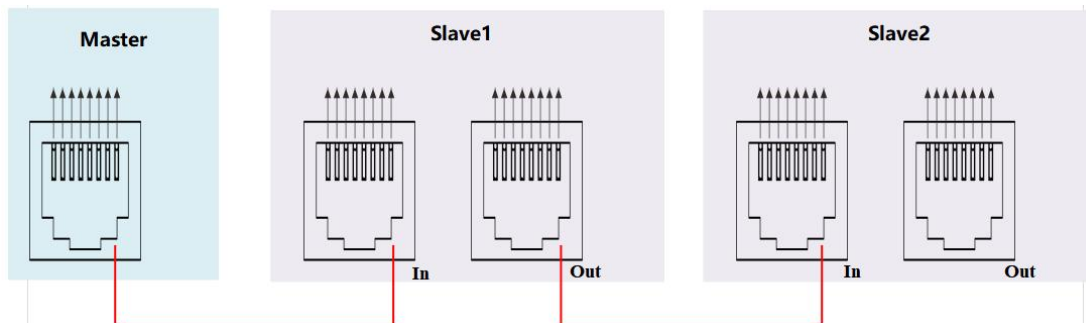


Figure 6-13 Cable connection

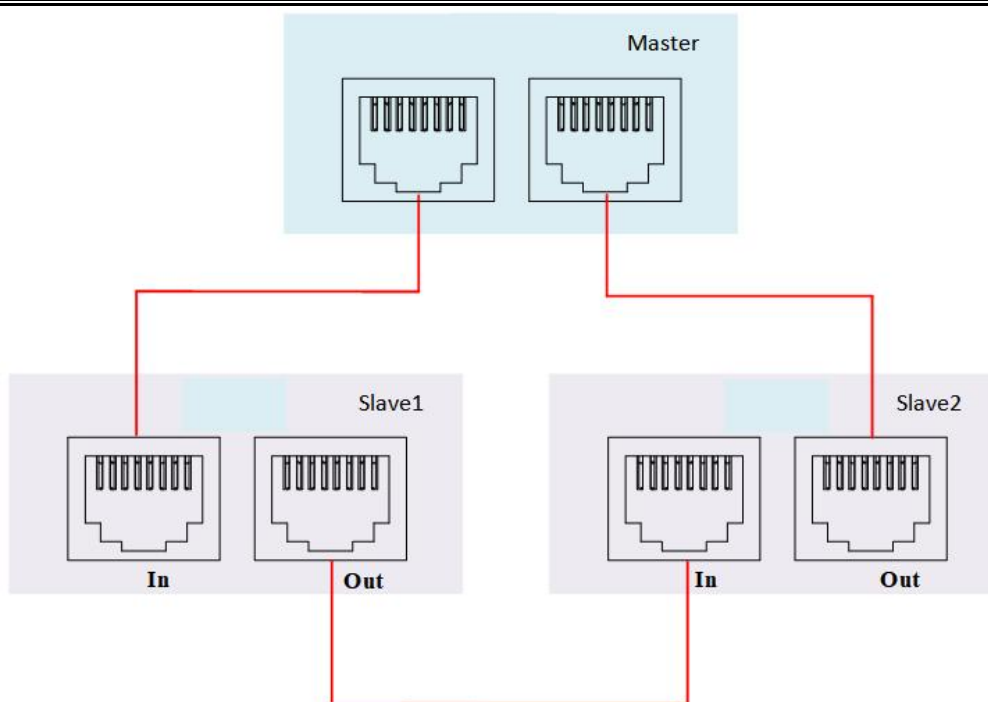


Figure 6-114 Ring connection

# Chapter 7 Operation Running

## 7.1 Basic Settings

### 7.1.1 Pre-operation Inspection

Table 7-1 Check contents before operation

| Number                    | Content                                                                                                                                                                      |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wiring                    |                                                                                                                                                                              |
| 1                         | The main circuit input terminals (L1, L2 and L3) of servo drive must be properly connected.                                                                                  |
| 2                         | The main circuit output terminals (U, V, W) of the servo drive and the main circuit cables (U, V, W) of the servo motor must have the same phase and be connected correctly. |
| 3                         | The main circuit power input terminals (L1, L2 and L3) and the main circuit output terminals (U, V and W) of servo drive cannot be short-circuited.                          |
| 4                         | The wiring of each control signal cable of the servo drive is correct: the external signal wires such as brake and overtravel protection have been reliably connected.       |
| 5                         | Servo drive and servo motor must be grounded reliably.                                                                                                                       |
| 6                         | When using an external braking resistor, the short wiring between drive C and D must be removed.                                                                             |
| 7                         | The force of all cables is within the specified range.                                                                                                                       |
| 8                         | The wiring terminals have been insulated.                                                                                                                                    |
| Environment and Machinery |                                                                                                                                                                              |
| 1                         | There is no iron filings, metal, etc. that can cause short circuits inside or outside the servo drive.                                                                       |
| 2                         | The servo drive and external braking resistor are not placed on combustible objects.                                                                                         |
| 3                         | The installation, axis and mechanical structure of the servo motor have been firmly connected.                                                                               |

### 7.1.2 Power on

#### (1) Connect the main circuit power supply

After power on the main circuit, the bus voltage indicator shows no abnormality, and the panel display "ry", indicating that the servo drive is in an operational state, waiting for the upper computer to give the servo enable signal.

If the drive panel displays other fault codes, please refer to [“Chapter 10 Faults”](#) to analyze and eliminate the cause of the fault.

#### (2) Set the servo drive enable (S-ON) to invalid (OFF)

Please refer to "6.2.9 CiA402 Control Introduction" for relevant process description

### 7.1.3 Jog Operation

Inching operation is used to judge whether the servo motor can rotate normally, and whether there is abnormal vibration and abnormal sound when rotating. Inching operation can be through panel inching operation function, and the motor takes the current stored value of object dictionary P10-01 (200A-01) as inching speed.

#### (1) Panel jog operation

Enter P10-01 (200A-01) through panel key operation. After pressing the confirmation key, the panel will display the current inching speed. At this time, the inching running speed can be adjusted by pressing the "up" or "down" key; After adjusting the inching speed, press the "Confirm" key. At this time, the panel displays "JOG" and is in a flashing state. Press the "Confirm" key again to enter the inching operation mode (at this time, the motor is powered on!) . Press the "up" key and "down" key for a long time to realize the continuous forward or reverse rotation of the motor. Press the "Mode" key to exit the inching operation mode. Please refer to "5.3.2 JOG running".

| Index code | Name      | Setting method  | Valid time        | Default | Range  | Definition | Unit |
|------------|-----------|-----------------|-------------------|---------|--------|------------|------|
| 200A-01    | JOG speed | Execute Setting | Valid immediately | 0       | 0~3000 | JOG speed  | rpm  |

#### (2) Jog operation of the servo debugging platform

Open the jog operation interface of the software "Wecon SCTool", set the jog speed value in the "set rotating speed" in the "manual operation", click the "servo on" button on the interface, and then achieve the jog forward and reverse function through the "forward rotation" or "reverse rotation" button on the interface. After clicking the "Servo Close" button, exit the inching operation mode.



#### Notice

- ◆ The communication control function of EtherCAT master station and the inching operation of servo drive can not be used at the same time;
- ◆ If you enter the inching mode, you need to exit the inching operation before you can use EtherCAT to control;
- ◆ If you enter the EtherCAT activation step, you need to exit the EtherCAT control before you can perform the inching operation of the servo drive.

#### 7.1.4 Rotation Direction Selection

By setting the rotate direction, the rotate direction of the motor can be changed without changing the polarity of the input command

| Index code | Name             | Setting method   | Valid time        | Default | Range  | Definition                                                                                                                                           | Unit |
|------------|------------------|------------------|-------------------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2000-04    | Rotate direction | Shutdown Setting | Valid immediately | 0       | 0 to 1 | Forward rotation: Face the motor shaft to watch<br><br>0: Standard setting (CW is forward rotation)<br><br>1: Reverse mode (CCW is forward rotation) | -    |

#### 7.1.5 Braking Resistance

The servo motor is in the generator state when decelerating or stopping, the motor will transfer energy back to the drive, which will increase the bus voltage. When the bus voltage exceeds the braking point, The drive can consume the feedback energy in the form of thermal energy through the braking resistor. braking resistors can be built-in or external, but they cannot be used at the same time. When selecting an external braking resistor, the short tab on the servo drive needs to be removed.

The basis for judging whether the braking resistor is built-in or external.

- (1) The maximum brake energy calculated value > the maximum brake energy absorbed by capacitor, and the brake power calculated value ≤ the built-in braking resistor power, use the built-in braking resistor.
- (2) The maximum brake energy calculated value > the maximum brake energy absorbed by capacitor, and the brake power calculated value > the built-in braking resistor power, use external braking resistor.

| Index code | Name                       | Setting method  | Valid time        | Default | Range  | Definition                                                                                                                                                                                                                               | Unit |
|------------|----------------------------|-----------------|-------------------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2000-09    | Braking resistance setting | Execute Setting | Valid immediately | 0       | 0 to 3 | 0: use built-in braking resistor<br>1: use external braking resistor and natural cooling<br>2: use external braking resistor and forced air cooling; (cannot be set)<br>3: No braking resistor is used, it is all absorbed by capacitor. | -    |



|         |                                      |                 |                   |     |            |                                                                                              |          |
|---------|--------------------------------------|-----------------|-------------------|-----|------------|----------------------------------------------------------------------------------------------|----------|
| 2000-0A | External braking resistor resistance | Execute Setting | Valid immediately | 50  | 0 to 65535 | Used to set the resistance value of the external braking resistor of a certain type of drive | $\Omega$ |
| 2000-0B | External braking resistor power      | Execute Setting | Valid immediately | 100 | 0 to 65535 | It is used to set the external braking resistor power of a certain type of drive.            | W        |

### 7.1.6 Servo Operation

#### (1) Set servo enable (S-ON) to active (ON)

The servo drive is in a operation state, and the monitor displays "rn", but because there is no command input at this time, the servo motor does not rotate and is in a locked state.

S-ON can be configured and selected according to the function selection of DI terminal in DIDO configuration of object dictionary.

#### (2) Input the instruction and the motor rotates

Input appropriate instructions during operation, first run the motor at a low speed, and observe the rotation to see if it conforms to the set rotation direction. Through Wecon SCTools software, the actual running speed, bus voltage and other parameters of the motor were observed.

#### (3) Timing diagram of power on

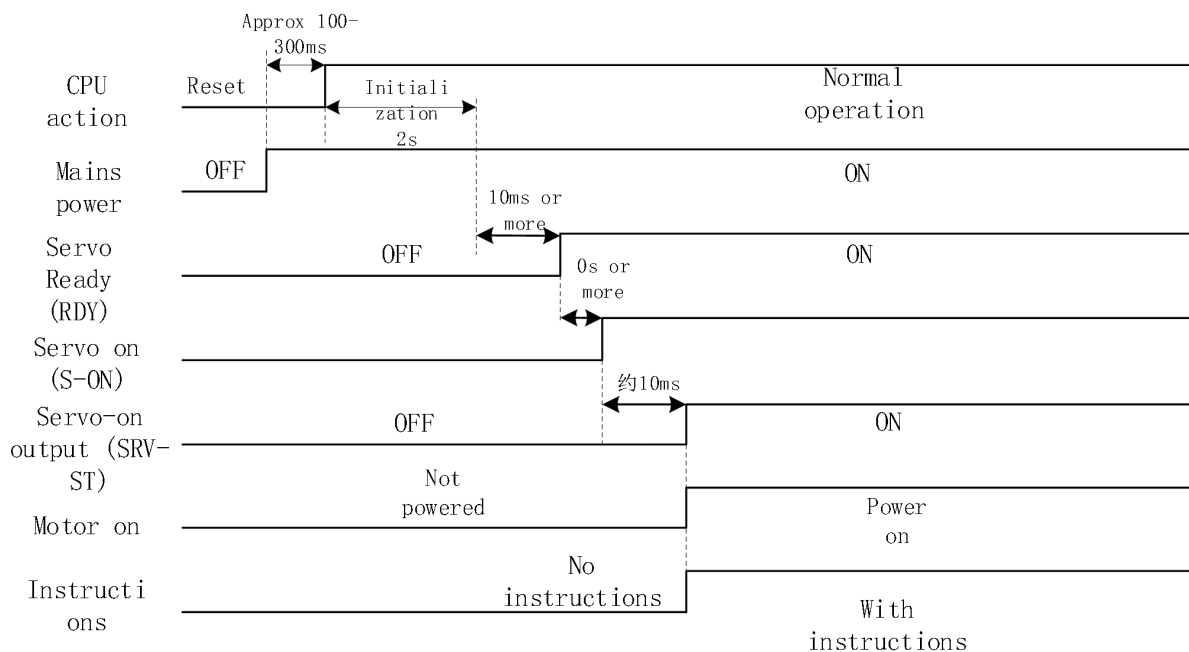


Figure 7-1 Power on timing diagram

### 7.1.7 Servo Stop

According to different stop modes, it can be divided into free stop and zero-speed stop, and their respective characteristics are shown in Table 7-2. According to the shutdown status, it can be divided into free running status and position keeping lock, as shown in Table 7-3:

Table 7-2 Comparison of two shutdown modes

| Stop mode       | Stop description                                                                                                                                           | Stop characteristics                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Free stop       | Servo motor is not energized and decelerates freely to 0. The deceleration time is affected by factors such as mechanical inertia and mechanical friction. | Smooth deceleration, small mechanical shock, but slow deceleration process. |
| Zero-speed stop | Servo drive outputs reverse braking torque, and the motor quickly decelerates to zero-speed.                                                               | Rapid deceleration with mechanical shock, but fast deceleration process.    |

Table 7-3 Comparison of two shutdown states

| Stop status     | Free operation status                                                                              | Position locked                                                                     |
|-----------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Characteristics | After the motor stops rotating, the motor is not energized, and the motor shaft can rotate freely. | After the motor stops rotating, the motor shaft is locked and cannot rotate freely. |

**Servo enable (S-ON) OFF shutdown**

Relevant parameters of servo OFF shutdown mode are shown in Table 7-4.

Table 7-4 Parameter details of servo OFF shutdown mode

| Index code | Name                | Setting method | Valid time        | Default | Range  | Definition                                                                                                                  | Unit |
|------------|---------------------|----------------|-------------------|---------|--------|-----------------------------------------------------------------------------------------------------------------------------|------|
| 2000-05    | Servo OFF stop mode | Stop setting   | Valid immediately | 0       | 0 to 1 | 0: Free stop and the motor axis remains free state;<br>1: Zero speed shutdown, and the motor shaft remains in a free state. | -    |

**(3) Emergency stop**

It is free shutdown mode at present, and the motor shaft remains in a free state. The corresponding configuration and selection could be selected through the DI terminal function of the function code "DIDO configuration".

**(3) Overtravel shutdown**

Overtravel means that the movable part of the machine exceeds the set area. In some occasions where the servo moves horizontally or vertically, it is necessary to limit the movement range of the workpiece. The overtravel is generally detected by limit switches, photoelectric switches or the multi-turn position of the encoder, that is, hardware overtravel or software overtravel.

Once the servo drive detects the action of the limit switch signal, it will immediately force the speed in the current direction of rotation to 0 to prevent it from continuing, and it will not be affected for reverse rotation. The overtravel shutdown is fixed at zero speed and the motor shaft remains locked.

The corresponding configuration and selection can be selected through the DI terminal function of the object dictionary "DIDO configuration". The default function of DI3 is POT and DI4 is NOT, as shown.

| Function code | Name                            | Setting method    | Effective time        | Default | Range   | Definition                                                                                                                                   | Unit |
|---------------|---------------------------------|-------------------|-----------------------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------|------|
| P06-08        | DI_3 channel function selection | Operation setting | Power on again        | 3       | 0 to 32 | 0: Close (Not in use)<br>01: S-ON servo enabled<br>02: A-CLR<br>03: POT<br>04: NOT<br>06: CL<br>08: E-STOP<br>26: HOMEORG<br>Other: Reserved | -    |
| P06-09        | DI_3 channel function select    | Operation setting | Effective immediately | 0       | 0 to 1  | Select enabled DI_3 port type<br>0: Hardware DI_3 input port<br>1: Virtual VDI_3 input port                                                  | -    |
| P06-10        | DI_3 channel function select    | Operation setting | Effective immediately | 0       | 0 to 1  | Select enabled DI_4 port type<br>0: Hardware DI_4 input port<br>1: Virtual VDI_4 input port                                                  | -    |
| P06-11        | DI_4 channel function select    | Operation setting | Power on again        | 4       | 0 to 32 | 0: Close (Not in use)<br>01: S-ON servo enabled<br>02: A-CLR<br>03: POT<br>04: NOT<br>06: CL<br>08: E-STOP<br>26: HOMEORG<br>Other: Reserved | -    |
| P06-12        | DI_4 channel function select    | Operation setting | Effective immediately | 0       | 0 to 1  | DI port input logic validity function selection<br>0: Hardware DI_4 input port<br>1: Virtual VDI_4 input port                                | -    |

|        |                                    |                   |                       |   |        |                                                                                             |   |
|--------|------------------------------------|-------------------|-----------------------|---|--------|---------------------------------------------------------------------------------------------|---|
| P06-13 | DI_4 input channel function select | Operation setting | Effective immediately | 0 | 0 to 1 | Select enabled DI_4 port type<br>0: Hardware DI_4 input port<br>1: Virtual VDI_4 input port | - |
|--------|------------------------------------|-------------------|-----------------------|---|--------|---------------------------------------------------------------------------------------------|---|

#### (4) Malfunction stop

When the machine fails, the servo will perform a fault stop operation. The current stop mode is fixed to the free stop mode, and the motor axis remains in a free state.

#### 7.1.8 Brake Holding Device

The brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-operating state, and keeps the motor locked in position, so that the moving part of the machine will not move due to its own weight or external force.



#### Notice

The brake device is built into the servo motor, which is only used as a non-energized fixed special mechanism. It cannot be used for braking purposes, and can only be used when the servo motor is kept stopped;

- ⚠ After the servo motor stops, turn off the servo enable (S-ON) in time;
- ⚠ The brake coil has no polarity;
- ⚠ When the brake coil is energized (that is, the brake is open), magnetic flux leakage may occur at the shaft end and other parts. If users need to use magnetic sensors and other device near the motor, please pay attention!
- ⚠ When the motor with built-in brake is in operation, the brake device may make a clicking sound, which does not affect the function.

#### (1) Wiring of brake device

Brake input signal is no polar. You need to use 24V power . The standard wiring between brake signal BK and brake power is as below.

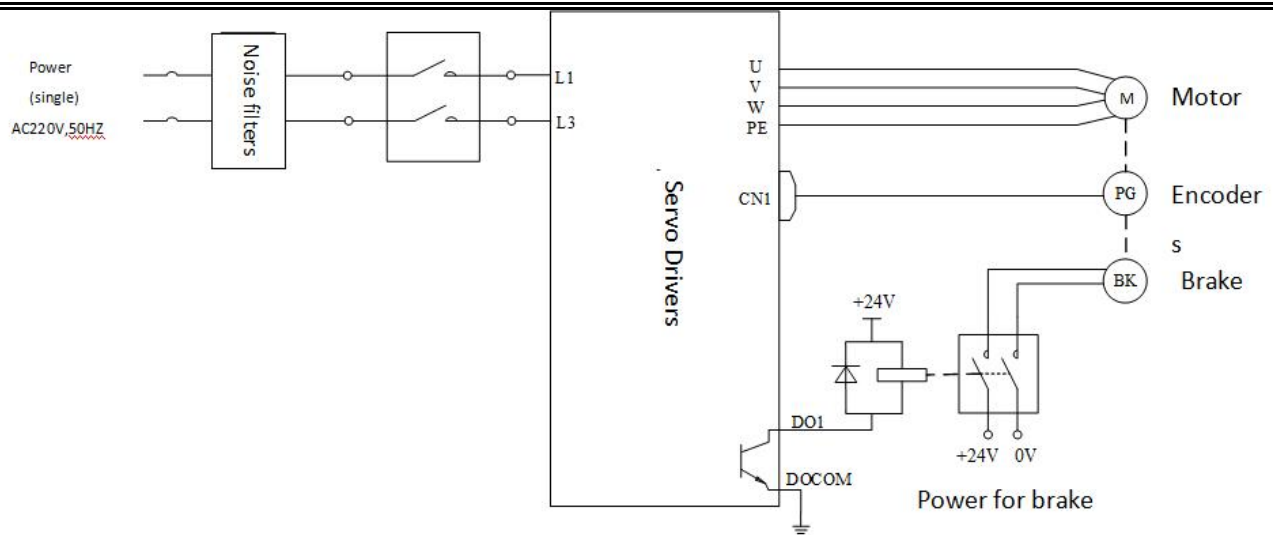


Figure 7-2 Brake wiring

**Notice**

- ① The length of the motor brake cable needs to fully consider the voltage drop caused by the cable resistance, and the brake operation needs to ensure that the voltage input is 24V.
- ② It is recommended to use the power supply alone for the brake device. If the power supply is shared with other electrical device, the voltage or current may decrease due to the operation of other electrical device, which may cause the brake to malfunction.
- ③ It is recommended to use cables above 0.5 mm<sup>2</sup>.

**(2) Brake software setting**

For a servo motor with brake, one DO terminal of servo drive must be configured as function 141 (BRK-OFF, brake output), and the valid logic of the DO terminal must be determined.

Related function code

| DO function code | Function name         | Function                                                                  |
|------------------|-----------------------|---------------------------------------------------------------------------|
| 141              | BRK-OFF, brake output | The output signal indicates that the brake of the servo motor is released |

Table 7-6 Relevant parameters of brake setting

| Index code | Name                                             | Setting method  | Valid time        | Default | Range | Definition                                                                                                                                                                                            | Unit |
|------------|--------------------------------------------------|-----------------|-------------------|---------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2001-1E    | Delay from brake output to instruction reception | Running setting | Valid immediately | 250     | 0~500 | Set delay that from the brake (BRK-OFF) output is ON to servo drive allows to receive input instruction. Between. When the brake output (BRK-OFF) is not allocated, this function code has no effect. | ms   |

|         |                                                                                        |                 |                   |     |        |                                                                                                                                                                                                                                       |     |
|---------|----------------------------------------------------------------------------------------|-----------------|-------------------|-----|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 2001-1F | In the static state, delay from the brake output is OFF to the motor is not energized. | Execute Setting | Valid immediately | 150 | 1~1000 | When the motor is in a static state, set the delay time from the brake (BRK-OFF) output is OFF to the servo drive is in the non-powered state.<br>When the brake output (BRK-OFF) is not allocated, this function code has no effect. | ms  |
| 2001-20 | Rotation status, when the brake output OFF, the speed threshold.                       | Execute Setting | Valid immediately | 30  | 0~3000 | When the motor is rotating, the motor speed threshold that is allowed when the brake (BRK-OFF) output is OFF.<br>When the brake output (BRK-OFF) is not allocated, this function code has no effect.                                  | rpm |
| 2001-21 | Rotation status, servo enable OFF to brake output OFF Delay                            | Execute Setting | Valid immediately | 500 | 1~1000 | The motor is rotating, the delay time that is allowed from the brake (BRK-OFF) output OFF to the servo enable (S-ON) OFF.<br>When the brake output (BRK-OFF) is not allocated, this function code has no effect.                      | ms  |

According to the state of the servo drive, the working sequence of the brake mechanism can be divided into the brake sequence in the normal state of the servo drive and the brake sequence in the fault state of the servo drive.

### (3) Servo drive brake timing in normal status

The brake timing of the normal state can be divided into:

The servo motor is stationary (the actual speed of the motor is lower than 20rpm) and the servo motor is rotating (the actual speed of the motor is 20 rpm and above).

#### 1) Brake timing when the servo motor is stationary

When the servo enable is changed from ON to OFF, if the actual speed of the current motor is lower than 20rpm, the servo drive acts according to the stationary braking timing, and the specific timing actions are as follows Figure 7-18As shown in.



#### Notice

(1) After the brake output is set from OFF to ON, do not input the position/speed/torque command during 2001-1Eh, otherwise the command will be lost or run incorrectly.

⚠ When applied to a vertical axis, the external force or the weight of the mechanical moving part may cause the machine to move slightly. When the servo motor is stationary, and the servo enable is OFF, the brake output will be OFF immediately. However, the motor is still powered on within the time of 2001-1Fh to prevent mechanical movement due to its own weight or external force.

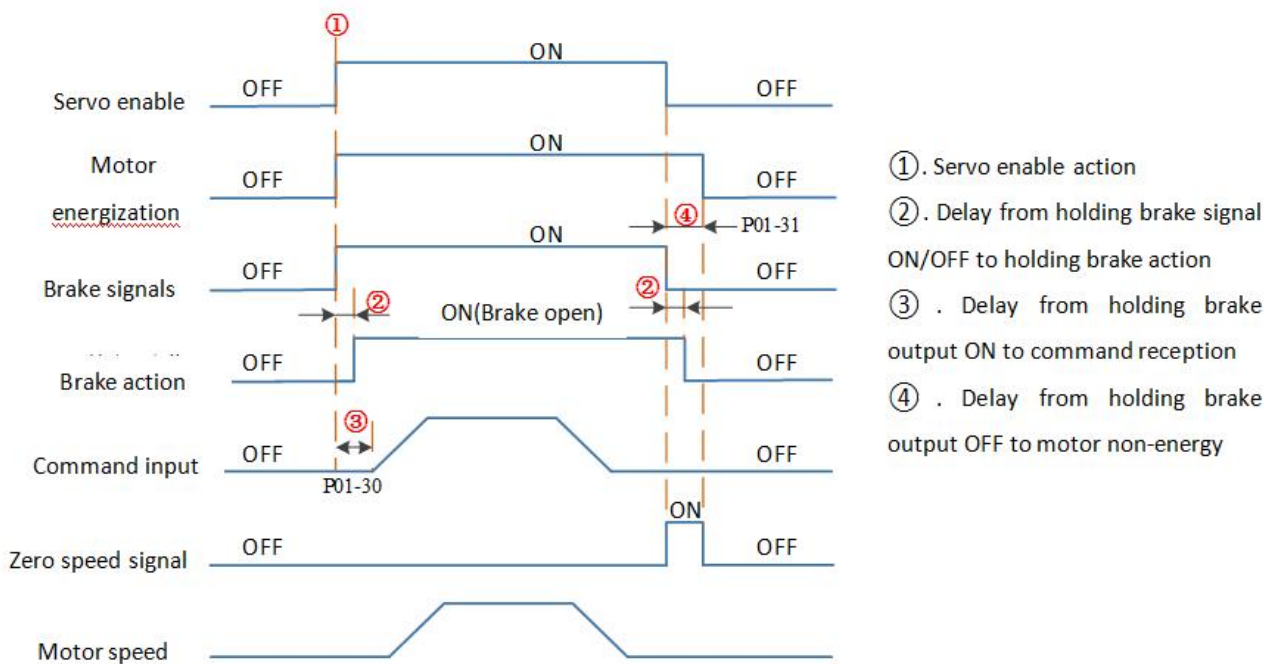


Figure 7-3 Braking timing when the motor is stationary

Note: Please refer to the relevant specifications of the motor for the delay time of the brake contact at ② in the figure.

#### 2) The brake timing when the servo motor is rotating

When the servo enable is from ON to OFF, if the actual motor speed is greater than or equal to 20 rpm, the drive will act in accordance with the rotation brake sequence. The specific sequence action is shown in Figure 7-4.



## Notice

- ◆ When the servo enable is turned from OFF to ON, within 2001-30, do not input position, speed or torque instructions, otherwise the instructions will be lost or operation errors will be caused;
- ◆ When the servo motor rotates, the servo enable is OFF and the servo motor is in the zero-speed shutdown state, but the brake output must meet any of the following conditions before it could be set OFF:
  - 2001-21h time has not arrived, but the motor has decelerated to the speed set in 2001-20h;
  - 2001-21h time is up, but the motor speed is still higher than the set value of 2001-20h.
- ◆ After the brake output changes from ON to OFF, the motor is still in communication within 50ms to prevent the mechanical movement from moving due to its own weight or external force.

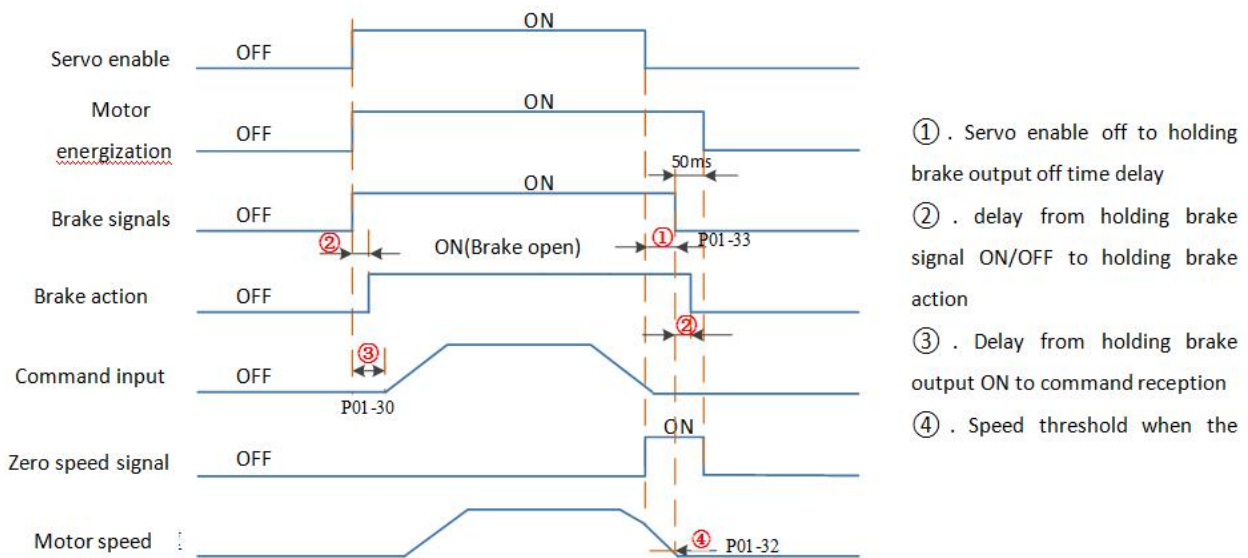


Figure 7-4 Braking timing when the motor rotates

**(4) Brake timing when the servo drive fails**

The brake timing (free stop) in the fault status is as follows.

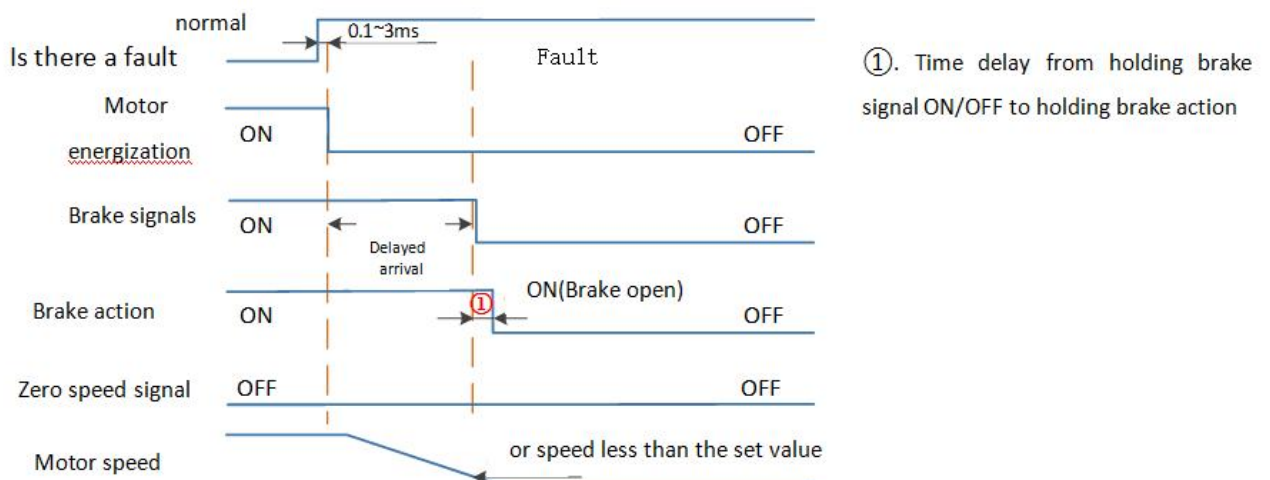




Figure 7-5 Braking timing in fault state (free stop)

Note: The "delay arrival" of the brake signal is about 20ms, and the actual parameter is subject to the motor manufacturer.

## 7.2 Servo State Setting

The use of Wecon VD5L Series Bus Type servo drives must be guided according to the procedure specified in Standard 402 Protocol.

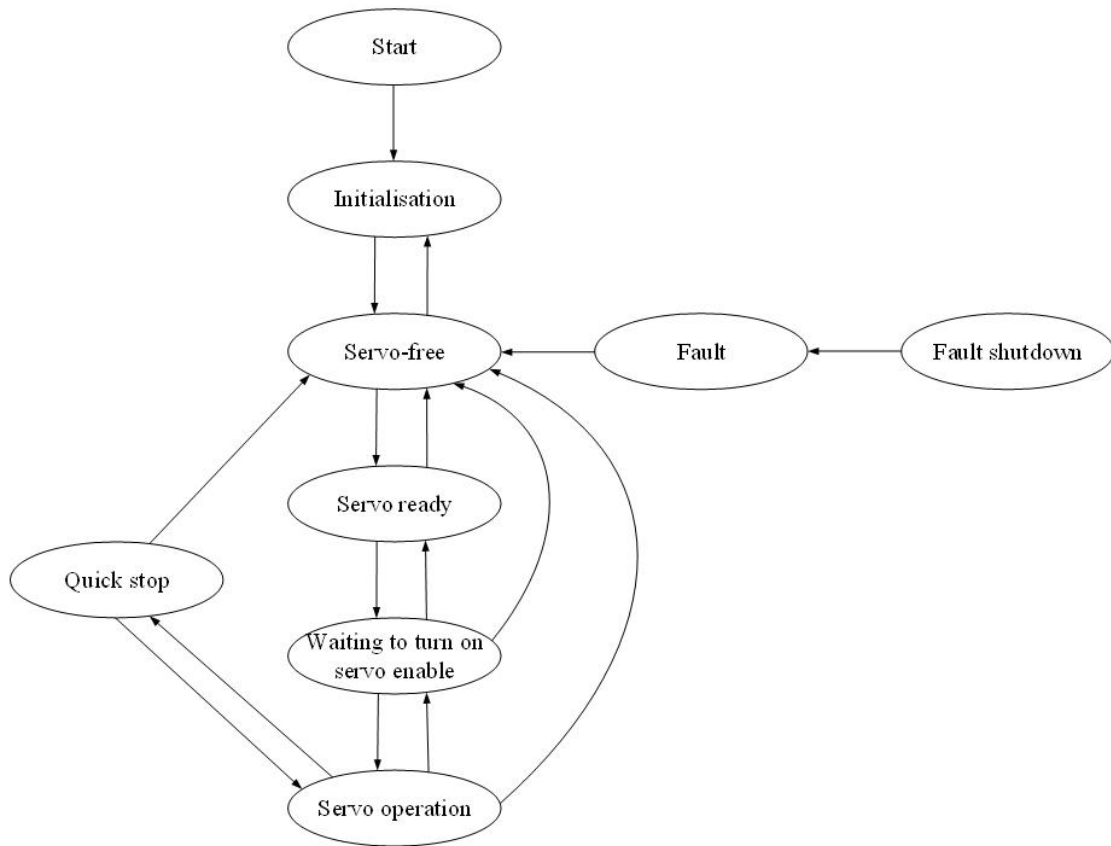


Figure 7-6 CiA402 state machine switching schema

| Status                | Description                                                                                                                        |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Initialization        | Drive initialization, internal self-test has completed.<br>Parameters cannot be set, and servo drive function cannot be performed. |
| Servo no error        | There is no fault in the servo drive.<br>Parameters can be set.                                                                    |
| Servo ready           | Servo drives are ready.<br>Parameters can be set.                                                                                  |
| Wait for servo enable | The servo drive waits to turn on the servo enable.<br>Parameters can be set.                                                       |
| Servo operation       | The servo drive is running normally.                                                                                               |
| Quick stop            | The servo drive is performing the quick shutdown function.<br>Only function codes with the attribute "Run valid" can be set.       |
| Error stop            | The servo drive is performing the fault shutdown function.<br>Only function codes with the attribute "Run valid" can be set.       |
| Fault                 | Failure shutdown is complete, and all drive functions are disabled.<br>Allow parameters to be changed to troubleshoot.             |

|                 |                    |
|-----------------|--------------------|
| State switching | Control word 6040h |
|-----------------|--------------------|

|                                                      |                                                                                                                                                |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      |                                                                                                                                                |
| Power on =>Initialization                            | Natural transition without control command                                                                                                     |
| Initialization =>Servo trouble-free                  | Natural transition without control command<br>If there is an error in the initialization process, go directly to the "failure shutdown" state. |
| Servo trouble-free =>Servo ready                     | 0x0006                                                                                                                                         |
| Servo ready =>Wait to turn on servo enable           | 0x0007                                                                                                                                         |
| Wait to turn on servo enable<br>=>Servo operation    | 0x000F                                                                                                                                         |
| Servo operation =>Wait to turn on servo enable       | 0x0007                                                                                                                                         |
| Wait to turn on servo enable<br>=>Servo ready        | 0x0006                                                                                                                                         |
| Servo ready =>Servo trouble-free                     | 0x0000                                                                                                                                         |
| Servo operation =>Servo ready                        | 0x0006                                                                                                                                         |
| Servo operation =>Servo trouble-free                 | 0x0000                                                                                                                                         |
| Wait to turn on servo enable<br>=>Servo trouble-free | 0x0000                                                                                                                                         |
| Servo operation =>Quick shutdown                     | 0x0002                                                                                                                                         |
| Quick shutdown =>Servo trouble-free                  | The quick shutdown mode 605A is selected as 0 ~ 3. After the shutdown is completed, it will transition naturally without control instruction.  |
| =>Failure shutdown                                   | Once the servo drive fails, it automatically switches to the "fault shutdown" state without control instruction.                               |
| Failure shutdown =>Malfunction                       | After the fault shutdown is completed, it will make a natural transition without control instructions.                                         |
| Failure =>Servo trouble-free                         | 0x80                                                                                                                                           |
| Quick shutdown =>Servo operation                     | The quick shutdown mode 605A is selected as 0 ~ 3, and 0x0F is sent after the shutdown is completed.                                           |

### 7.2.1 Control Word

| 6040h | Name         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------|--------------|-------------------|-------------------|---------|-----------|----------------------|------|
|       | Control word | Operation setting | Valid immediately | 0       | 0~65535   | Basic settings       | -    |

Used to set control instructions. It is meaningless to assign each bit of a control word separately, and it must be combined with other bits to form a certain control instruction.

bit0 ~ bit3 have the same meaning in each control mode of servo drive, and commands must be sent in sequence before the servo drive can be switched according to CiA402 state machine.

| Bit   | Name                           | Description                                                                                                                        |
|-------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 0     | Servo operation can be started | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 1     | Turn on the main circuit       | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 2     | Quick shutdown                 | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 3     | Servo operation                | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 4 ~ 6 | Operation mode                 | It is related to the operation mode of servo drive                                                                                 |
| 7     | Fault reset                    | Used to clear reset faults:<br>The rising edge of bit7 is valid;<br>bit7 is kept at 1, and other control instructions are invalid. |

### 7.2.2 Status Word

| 6041h | Name        | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------|-------------|-------------------|-------------------|---------|-----------|----------------------|------|
|       | Status word | Operation setting | Valid immediately | 0       | 0~65535   | -                    | -    |

Used to reflect the status of servo drive.

| Bit   | Name                                  | Description |
|-------|---------------------------------------|-------------|
| 0     | Servo ready                           | 0: Invalid  |
|       |                                       | 1: Valid    |
| 1     | Servo operation can be started        | 0: Invalid  |
|       |                                       | 1: Valid    |
| 2     | Servo operation                       | 0: Invalid  |
|       |                                       | 1: Valid    |
| 3     | Fault                                 | 0: Invalid  |
|       |                                       | 1: Valid    |
| 4     | Electrical connection of main circuit | 0: Invalid  |
|       |                                       | 1: Valid    |
| 5     | Quick shutdown                        | 0: Invalid  |
|       |                                       | 1: Valid    |
| 6     | Servo is not operational              | 0: Invalid  |
|       |                                       | 1: Valid    |
| 7     | Warning                               | 0: Invalid  |
|       |                                       | 1: Valid    |
| 8     | -                                     | -           |
| 9     | Remote control                        | 0: Invalid  |
|       |                                       | 1: Valid    |
| 10    | Target arrival                        | 0: Invalid  |
|       |                                       | 1: Valid    |
| ..... |                                       |             |

Bit 0 ~ bit 9 have the same meaning in all control modes of servo drive. After the control word 6040h sends commands in sequence, the servo feeds back the determined state.

| Setting value (binary number) | Description                |
|-------------------------------|----------------------------|
| xxxx xxxx x0xx 0000           | Servo is not ready         |
| xxxx xxxx x1xx 0000           | Startup failure            |
| xxxx xxxx x01x 0001           | Servo ready                |
| xxxx xxxx x01x 0011           | Start up                   |
| xxxx xxxx x01x 0111           | Servo enable               |
| xxxx xxxx x00x 0111           | Malfunction shutdown valid |
| xxxx xxxx x0xx 1111           | Fault response valid       |
| xxxx xxxx x0xx 1000           | Fault                      |

## 7.3 Servo Mode Settings

### 7.3.1 Servo Mode Introduction

The object dictionary 6060h is used to display servo modes supported by servo drives.

| 6060h | Name                 | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|-------|----------------------|------------------|-------------------|---------|-----------|----------------------|------|
|       | Servo mode selection | Shutdown setting | Valid immediately | 0       | 0 ~ 10    | -                    | -    |

Used to set the operation mode of servo drive.

| Setting value | Name                             | Remark                                                                   |
|---------------|----------------------------------|--------------------------------------------------------------------------|
| 0             | -                                |                                                                          |
| 1             | Profile position control mode    |                                                                          |
| 2             | -                                |                                                                          |
| 3             | Profile speed control mode       |                                                                          |
| 4             | Profile torque control mode      | Please refer to "7.7 Profile Torque Mode (PT)" for details               |
| 5             | -                                |                                                                          |
| 6             | Homing mode                      | Please refer to "7.5 Homing Mode (HM)" for details                       |
| 7             | Interpolation mode               |                                                                          |
| 8             | Cyclic Synchronous Position mode | Please refer to "7.4 Cyclic Synchronous Position mode (CSP)" for details |
| 9             | Cyclic synchronous speed mode    | Please refer to "7.5 Cyclic Synchronous Velocity mode (CSP)" for details |
| 10            | Cyclic synchronous torque mode   | Please refer to "7.6 Cyclic Synchronous Torque mode (CSP)" for details   |

### 7.3.2 Mode Switching

Pay attention to the following when switching modes:

- ① Whatever the servo drive state is, the unexecuted position command will be discarded after switching from the Cyclic Synchronous Position mode to other modes.
- ② Whatever the servo drive state is, after switching into other modes from the cyclic synchronous velocity mode, servo first executes ramp shutdown, and then switch into other modes after the shutdown is completed.
- ③ When the servo drive is running the homing mode, it is not allowed to switch to other modes; When homing is completed or interrupted (failure or invalid enable), other modes can be switched into.
- ④ When the servo drive is in run state, when switching from other modes to cyclic synchronous mode, please send command at an interval of at least 1ms, otherwise instructions will be lost or wrong.

### 7.3.3 Communication Cycles Supported by Different Modes

| Mode<br>Cycle time | Cyclic Synchronous<br>Position mode | Cyclic synchronous<br>velocity mode | Homing Mode |
|--------------------|-------------------------------------|-------------------------------------|-------------|
| 125us              | ✓                                   | ✓                                   | ✓           |

## 7.4 Cyclic Synchronous Position Mode (CSP)

### 7.4.1 Control Block Diagram

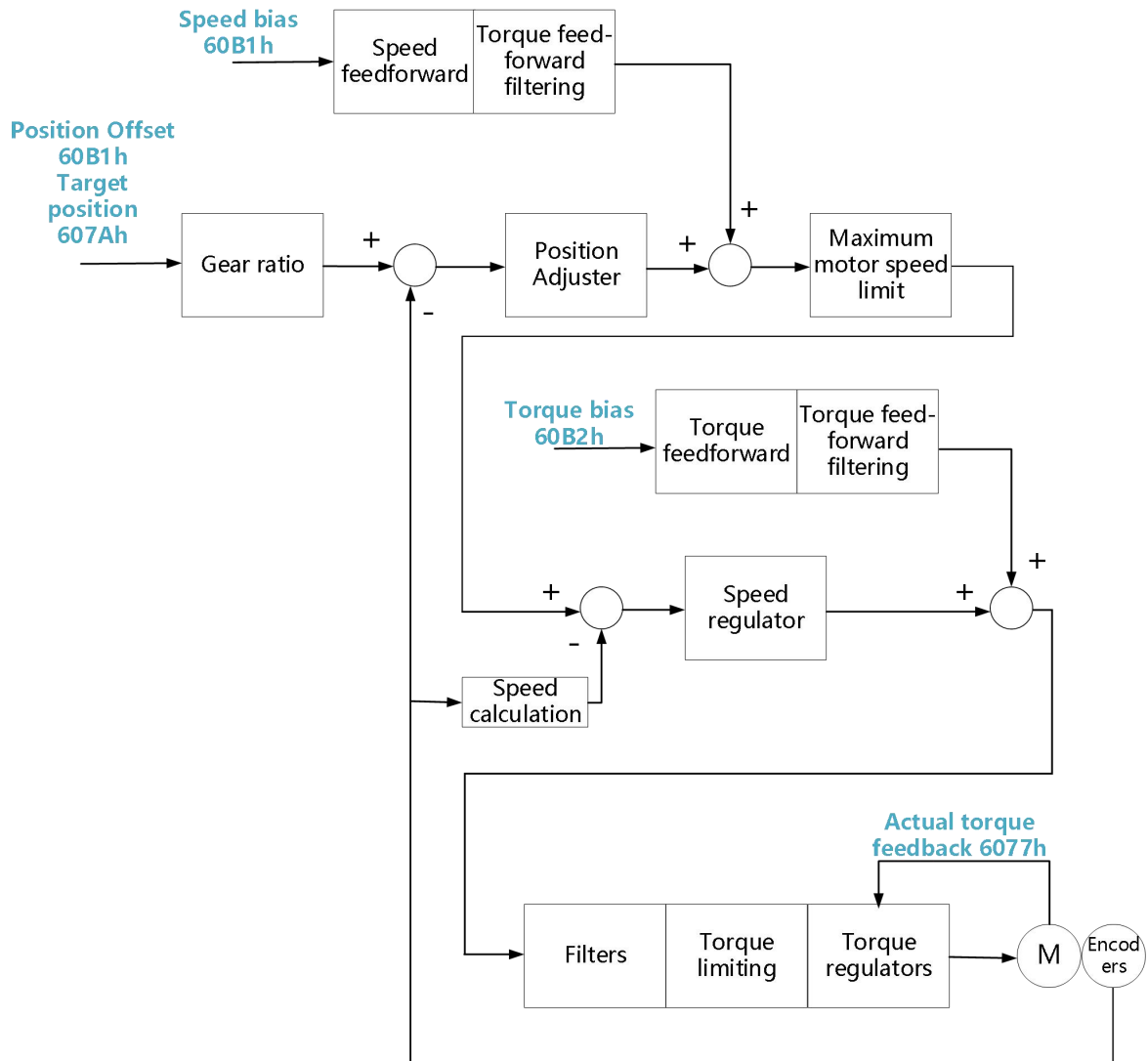
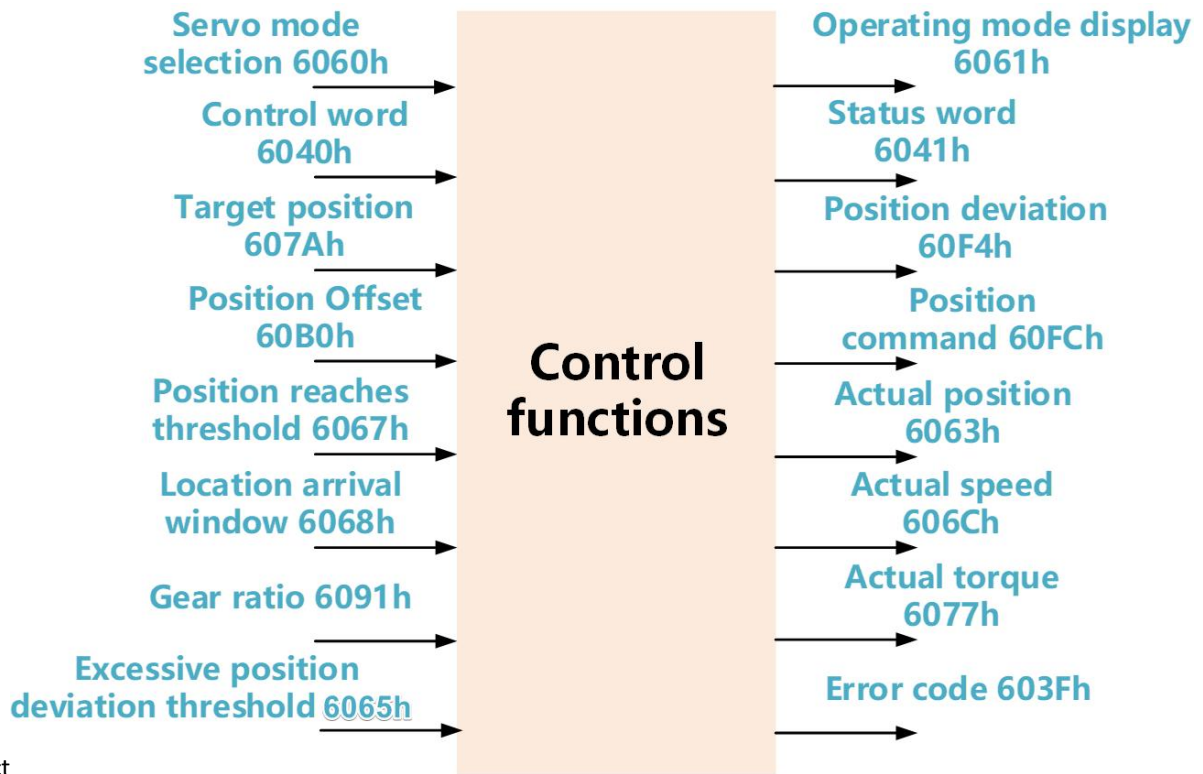


Figure 7-7 Input and output



object

#### 7.4.2 Related Objects

(1) Control word 6040h

| Bit | Name                           | Description                                                      |
|-----|--------------------------------|------------------------------------------------------------------|
| 0   | Servo operation can be started | When bit0 to bit3 are all 1, it indicates the start of operation |
| 1   | Turn on the main circuit       |                                                                  |
| 2   | Quick shutdown                 |                                                                  |
| 3   | Servo operation                |                                                                  |

(2) Status word 6041h

| Bit | Name                                    | Description |
|-----|-----------------------------------------|-------------|
| 10  | Target arrival                          | -           |
| 11  | Software internal position overrun      | -           |
| 12  | Slave station following instruction     | -           |
| 13  | Following error                         | -           |
| 14  | DDL motor angle identification complete | -           |
| 15  | Homing completed                        | -           |



| Index (Hex) | Object dictionary name                    | Accessibility  | Unit               | Bit length | Set range               |
|-------------|-------------------------------------------|----------------|--------------------|------------|-------------------------|
| 603F        | Error code                                | Read only      | -                  | 16         | 0~65535                 |
| 6040        | Control word                              | Read and write | -                  | 16         | 0~65535                 |
| 6041        | Status word                               | Read only      | -                  | 16         | 0~65535                 |
| 6060        | Servo mode selection                      | Read and write | -                  | 8          | 0 ~ 10                  |
| 6061        | Run mode display                          | Read only      | -                  | 8          | 0 ~ 10                  |
| 6062        | Position command                          | Read only      | Instruction unit   | 32         | -                       |
| 6063        | Position feedback                         | Read only      | Encoder unit       | 32         | -                       |
| 6064        | Position feedback                         | Read only      | Instruction unit   | 32         | -                       |
| 6065        | Threshold of excessive position deviation | Read and write | Instruction unit   | 32         | 0 ~ $2^{32}-1$          |
| 6067        | Position reaches threshold                | Read and write | Encoder unit       | 32         | 0 ~ $2^{32}-1$          |
| 6068        | Position arrival window                   | Read and write | ms                 | 32         | 0~65535                 |
| 606C        | Actual speed                              | Read only      | Instruction unit/s |            | $-2^{31} \sim 2^{31}-1$ |
| 6077        | Actual torque                             | Read only      | 0.1%               |            | -3000 to 3000           |
| 607A        | Target location                           | Read and write | Instruction unit   | 32         | $-2^{31} \sim 2^{31}-1$ |
| 6091: 01    | Electronic gear ratio numerator           | Read and write | -                  | 32         | $1 \sim 2^{32}-1$       |
| 6091: 02    | Electronic gear ratio denominator         | Read and write | -                  | 32         | $1 \sim 2^{32}-1$       |
| 2002-01     | 1st position loop gain                    | Read and write | 0.1Hz              | 16         | 0~6200                  |
| 2002-02     | 1st speed loop gain                       | Read and write | 0.1Hz              | 16         | 0~35000                 |
| 2002-03     | 1st speed loop integral time constant     | Read and write | 0.1ms              | 16         | 100~65535               |
| 2002-09     | Speed feedforward gain                    | Read and write | 0.1%               | 16         | 0~1000                  |
| 2002-0A     | Speed feedforward filter time constant    | Read and write | 1ms                | 16         | 0~500                   |
| 2002-0B     | Torque feedforward gain                   | Read and write | 0.1%               | 16         | 0~2000                  |
| 2002-0C     | Torque feedforward filter time constant   | Read and write | 0.01ms             | 16         | 0~10000                 |

### 7.4.3 Related Function Settings

**(1) Positioning Completed**

| Index (Hex) | Name                             | Content                                                                                                                    |
|-------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 6067        | Positioning completion threshold | When the position deviation is in the range of 6067 and the time reaches 6068, the positioning completion signal is valid. |
| 6068        | Positioning completion window    |                                                                                                                            |

**(2) Position deviation limit**

| Index (Hex) | Name                                      | Content                                                                                                                       |
|-------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 6065        | Threshold of excessive position deviation | When the position deviation is greater than the set value of this parameter, Er.36 (excessive position deviation) will occur. |

**7.4.4 Recommended Configuration**

Please refer to the following table for the basic configuration of this mode:

| RPDO                        | TPDO                     | Remark   |
|-----------------------------|--------------------------|----------|
| 6040 (control word)         | 6041 (status word)       | Required |
| 607A (target location)      | 6064 (position feedback) | Required |
| 6060 (servo mode selection) | 6061 (run mode display)  | Optional |

## 7.5 Cyclic Synchronous velocity (CSV)

### 7.5.1 Control diagram

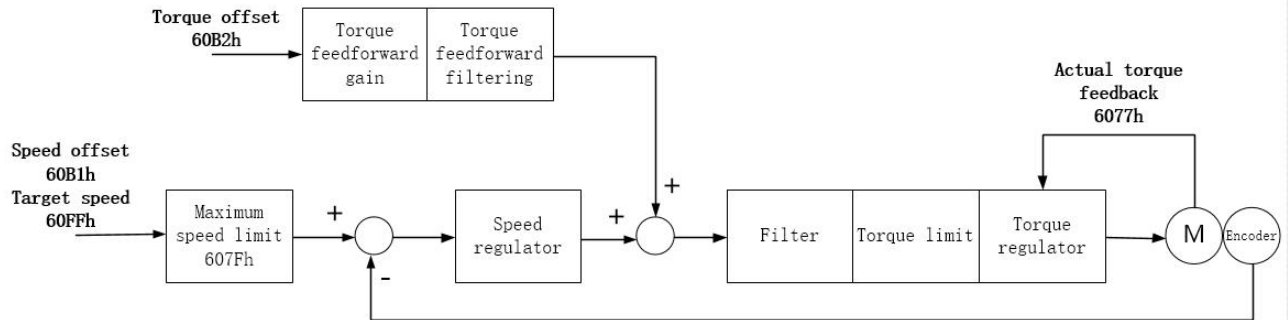


Figure 7-9 Cyclic synchronous speed mode control block diagram

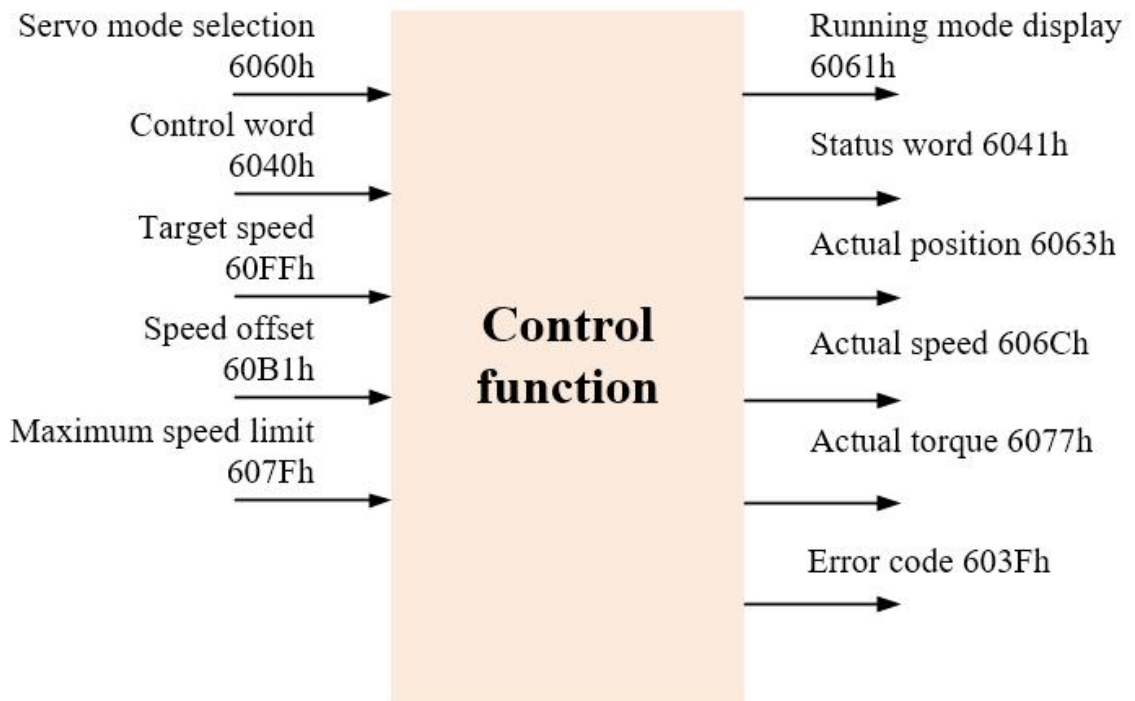


Figure 7-10 Input and output objects

### 7.5.2 Related objects

(1) Control word 6040h

| Bit | Name                           | Description                                                 |
|-----|--------------------------------|-------------------------------------------------------------|
| 0   | Servo operation can be started | When all of bit0-bit3 is 1, it means that it starts running |
| 1   | Connect the main circuit       |                                                             |
| 2   | Quick stop                     |                                                             |
| 3   | Servo running                  |                                                             |
| 8   | Pause                          |                                                             |

## (2) Status word 6041h

| Bit | Name                                | Description |
|-----|-------------------------------------|-------------|
| 10  | Target reach                        | --          |
| 11  | Software internal position overrun  | --          |
| 12  | Slave station following instruction | --          |
| 15  | Homing completed                    | --          |

| Index (Hex) | Object dictionary name                      | Accessibility  | Unit                            | Bit length | Range                   |
|-------------|---------------------------------------------|----------------|---------------------------------|------------|-------------------------|
| 603F        | Error code                                  | Read only      | --                              | 16         | 0 to 65535              |
| 6040        | Control word                                | Read and write | --                              | 16         | 0 to 65535              |
| 6041        | Status word                                 | Read only      | --                              | 16         | 0 to 65535              |
| 6060        | Servo mode selection                        | Read and write | --                              | 8          | 0 to 10                 |
| 6061        | Running mode display                        | Read only      | --                              | 8          | 0 to 10                 |
| 6063        | Position feedback                           | Read only      | Encoder unit                    | 32         | --                      |
| 6064        | Position feedback                           | Read only      | Instruction unit                | 32         | --                      |
| 606C        | Actual speed                                | Read only      | Instruction unit/s              | 32         | --                      |
| 6077        | Actual torque                               | Read only      | 0.1%                            |            | -3000 to 3000           |
| 607F        | Maximum speed                               | Read and write | Instruction unit/s              | 32         | 0 to $2^{32}-1$         |
| 6083        | Acceleration                                | Read and write | Instruction unit/s <sup>2</sup> | 32         | 0 to $2^{32}-1$         |
| 6084        | Deceleration                                | Read and write | Instruction unit/s <sup>2</sup> | 32         | 0 to $2^{32}-1$         |
| 60B1        | Velocity bias                               | Read and write | Instruction unit/s              | 32         | $-2^{31} \sim 2^{31}-1$ |
| 60B2        | Torque offset                               | Read and write | 0.1%                            | 16         | -3000 to 3000           |
| 60E0        | Forward direction maximum torque limit      | Read and write | 0.1%                            | 16         | 0 to 3000               |
| 60E1        | Reverse direction maximum torque limit      | Read and write | 0.1%                            | 16         | 0 to 3000               |
| 60FF        | Target velocity                             | Read and write | Instruction unit/s              | 32         | $-2^{31} \sim 2^{31}-1$ |
| 2002-02     | 1st speed loop gain                         | Read and write | 0.1Hz                           | 16         | 1 to 35000              |
| 2002-03     | 1st velocity loop integration time constant | Read and write | 0.1ms                           | 16         | 100 to 65535            |
| 2002-0B     | Torque feedforward gain                     | Read and write | 0.1%                            | 16         | 0 to 2000               |

|         |                                         |                |        |    |            |
|---------|-----------------------------------------|----------------|--------|----|------------|
| 2002-0C | Torque feedforward filter time constant | Read and write | 0.01ms | 16 | 0 to 10000 |
|---------|-----------------------------------------|----------------|--------|----|------------|

### 7.5.3 Related Function Settings

#### (1) Speed arrival function

| Index (Hex) | Name                    | Content                                                                                                                                                                                                  |
|-------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 606D        | Speed reached threshold | When the difference between the target speed 60FF (converted to motor speed/rpm) and the actual motor speed is in the $\pm 606D$ interval, and the time reaches 606E, the speed arrival signal is valid. |
| 606E        | Velocity arrival window |                                                                                                                                                                                                          |

### 7.5.4 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

| RPDO                        | TPDO                        | Remark   |
|-----------------------------|-----------------------------|----------|
| 6040 (Control word)         | 6041 (Status word)          | Required |
| 60FF (Target speed)         | /                           | Required |
| /                           | 6064 (Position feedback)    | Optional |
| /                           | 606C (Speed feedback)       | Optional |
| 6060 (Servo mode selection) | 6061 (Running mode display) | Optional |

## 7.6 Cyclic Synchronous Torque Mode (CST)

### 7.6.1 Control block diagram

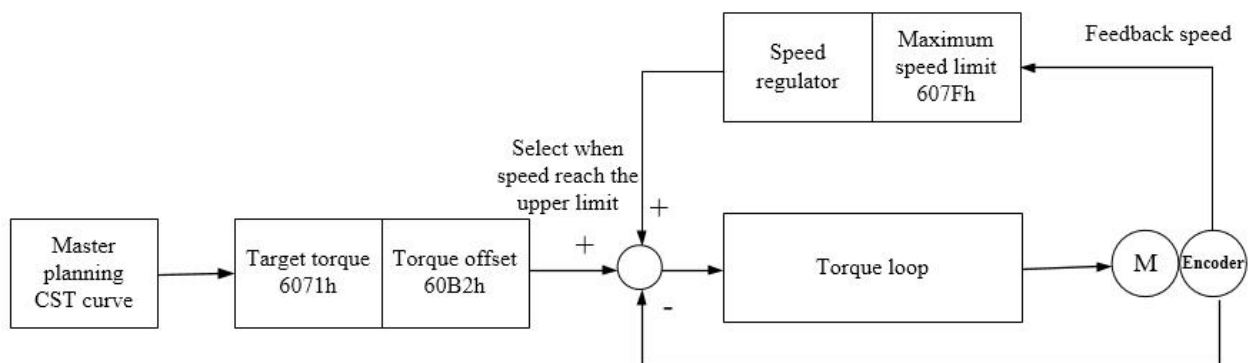


Figure 7-11 Cyclic synchronous torque mode control block diagram

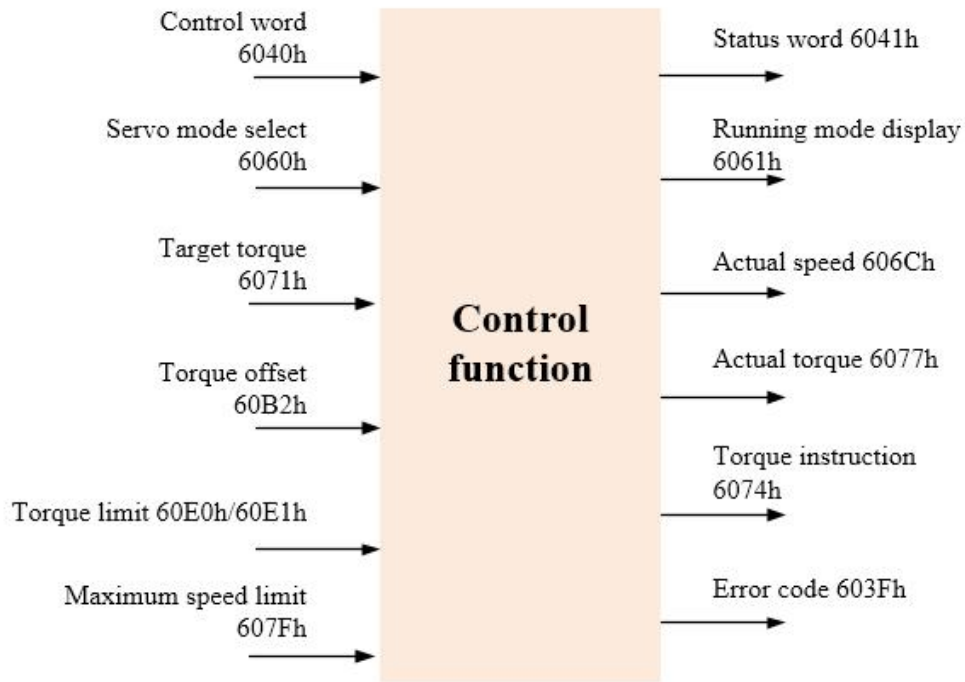


Figure 7-12 Input and output objects

### 7.6.2 Related objects

#### (1) Control word 6040h

| Bit | Name                           | Description                                                    |
|-----|--------------------------------|----------------------------------------------------------------|
| 0   | Servo operation can be started | When all of bit0-bit3 is 1, it means that it starts running    |
| 1   | Connect the main circuit       |                                                                |
| 2   | Quick stop                     |                                                                |
| 3   | Servo running                  |                                                                |
| 8   | Pause                          | 0: Servo settings at bit0~bit3<br>1: The servo is set at 60D5h |

#### (2) Status word 6041h

| Bit | Name                                | Description |
|-----|-------------------------------------|-------------|
| 10  | Target reach                        | --          |
| 12  | Slave station following instruction | --          |
| 15  | Homing completed                    | --          |

| Index (Hex) | Object dictionary name | Accessibility  | Unit        | Bit length | Range                   |
|-------------|------------------------|----------------|-------------|------------|-------------------------|
| 603F        | Error code             | Read only      | --          | 16         | 0 to 65535              |
| 6040        | Control word           | Read and write | --          | 16         | 0 to 65535              |
| 6041        | Status word            | Read only      | --          | 16         | 0 to 65535              |
| 6060        | Servo mode selection   | Read and write | --          | 8          | 0 to 10                 |
| 6061        | Running mode display   | Read only      | --          | 8          | 0 to 10                 |
| 606C        | Actual speed           | Read only      | Instruction | 32         | $-2^{31} \sim 2^{31}-1$ |

|         |                                             |                | unit/s             |    |                 |
|---------|---------------------------------------------|----------------|--------------------|----|-----------------|
| 6071    | Target torque                               | Read and write | 0.1%               | 16 | -3000 to 3000   |
| 6074    | Torque instruction                          | Read only      | 0.1%               | 16 | -3000 to 3000   |
| 6077    | Actual torque                               | Read only      | 0.1%               | 16 | -3000 to 3000   |
| 607F    | Maximum speed                               | Read and write | Instruction unit/s | 32 | 0 to $2^{32}-1$ |
| 60B2    | Torque offset                               | Read and write | 0.1%               | 32 | -3000 to 3000   |
| 60E0    | Forward direction maximum torque limit      | Read and write | 0.1%               | 16 | 0 to 3000       |
| 60E1    | Reverse direction maximum torque limit      | Read and write | 0.1%               | 16 | 0 to 3000       |
| 2002-02 | 1st speed loop gain                         | Read and write | 0.1Hz              | 16 | 0 to 35000      |
| 2002-03 | 1st velocity loop integration time constant | Read and write | 0.1ms              | 16 | 10 to 65535     |
| 2002-0B | Torque feedforward gain                     | Read and write | 0.1%               | 16 | 0 to 2000       |
| 2002-0C | Torque feedforward filter time constant     | Read and write | 0.01ms             | 16 | 0 to 10000      |

### 7.6.3 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

| RPDO                        | TPDO                        | Remark   |
|-----------------------------|-----------------------------|----------|
| 6040 (Control word)         | 6041 (Status word)          | Required |
| 6071 (Target torque)        | /                           | Required |
| /                           | 6064(Position feedback)     | Optional |
| /                           | 606C (Speed feedback)       | Optional |
| /                           | 6077 (torque feedback)      | Optional |
| 6060 (Servo mode selection) | 6061 (running mode display) | Optional |

## 7.7 Profile Torque Mode (PT)

### 7.7.1 Control block diagram

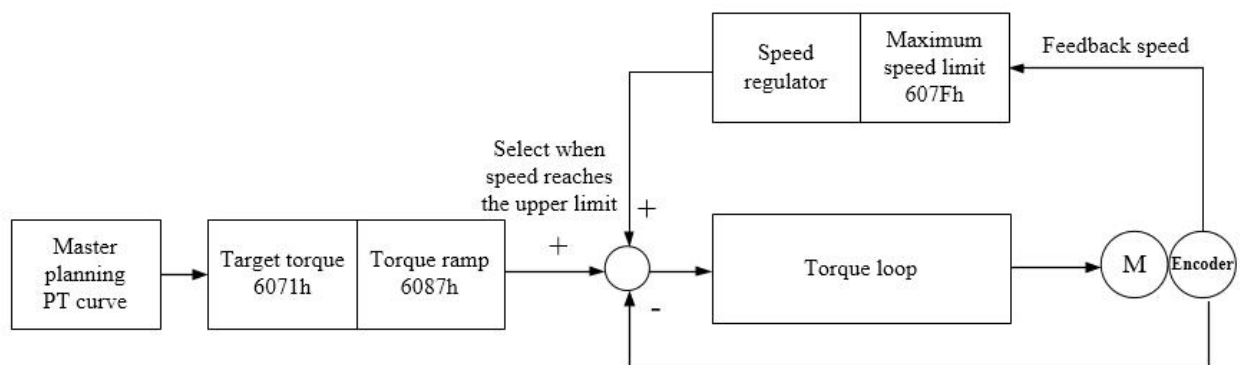


Figure 7-13 Profile torque mode control block diagram

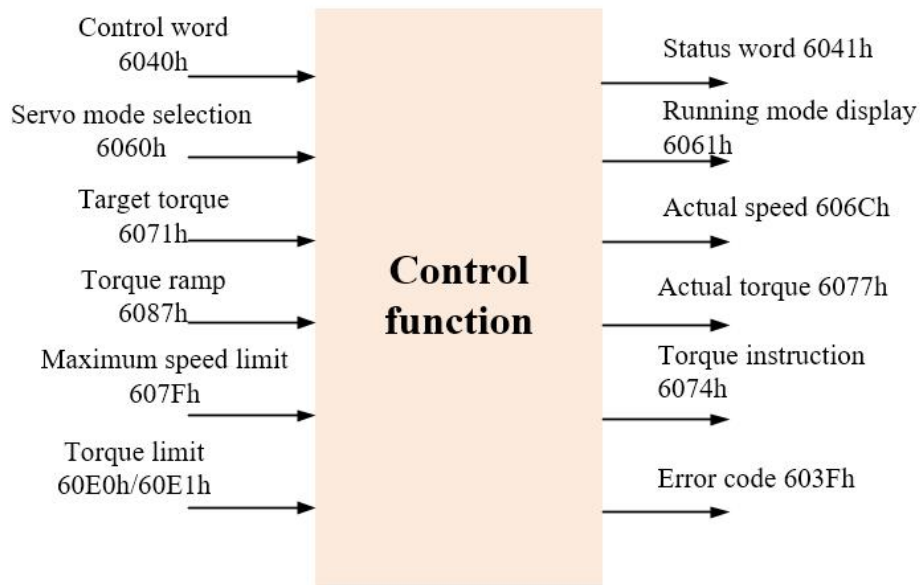


Figure 7-14 Input and output objects

### 7.7.2 Related objects

#### (1) Control word 6040h

| Bit | Name                     | Description                                                     |
|-----|--------------------------|-----------------------------------------------------------------|
| 0   | Servo can be started     | When all of bit0-bit3 is all 1, it means that it starts running |
| 1   | Connect the main circuit |                                                                 |
| 2   | Quick stop               |                                                                 |
| 3   | Servo running            |                                                                 |
| 8   | Pause                    | 0: Servo settings at bit0-bit3<br>1: The servo is set at 60D5h  |

#### (2) Status word 6041h

| Bit | Name                                     | Description |
|-----|------------------------------------------|-------------|
| 10  | Target reach                             | --          |
| 11  | Software internal position exceeds limit | --          |
| 15  | Homing completed                         | --          |

| Index (Hex) | Object dictionary name | Accessibility  | Unit | Bit length | Range      |
|-------------|------------------------|----------------|------|------------|------------|
| 603F        | Error code             | Read only      | --   | 16         | 0 to 65535 |
| 6040        | Control word           | Read and write | --   | 16         | 0 to 65535 |
| 6041        | Status word            | Read only      | --   | 16         | 0 to 65535 |
| 6060        | Servo mode selection   | Read and write | --   | 8          | 0 to 10    |
| 6061        | Running mode display   | Read only      | --   | 8          | 0 to 10    |



|         |                                             |                |                    |    |                         |
|---------|---------------------------------------------|----------------|--------------------|----|-------------------------|
| 606C    | Actual speed                                | Read only      | Instruction unit/s | 32 | $-2^{31} \sim 2^{31}-1$ |
| 6071    | Target torque                               | Read and write | 0.1%               | 16 | -3000 to 3000           |
| 6072    | Maximum torque                              | Read and write | 0.1%               | 16 | -3000 to 3000           |
| 6074    | Torque instruction                          | Read only      | 0.1%               | 16 | -3000 to 3000           |
| 6077    | Actual torque                               | Read only      | 0.1%               | 16 | -3000 to 3000           |
| 607F    | Maximum speed                               | Read and write | Instruction unit/s | 32 | 0 to $2^{32}-1$         |
| 6087    | Torque ramp                                 | Read and write | 0.1%/s             | 32 | 0 to $2^{32}-1$         |
| 60E0    | Forward direction maximum torque limit      | Read and write | 0.1%               | 16 | 0 to 3000               |
| 60E1    | Reverse direction maximum torque limit      | Read and write | 0.1%               | 16 | 0 to 3000               |
| 2002-02 | 1st speed loop gain                         | Read and write | 0.1Hz              | 16 | 0 to 35000              |
| 2002-03 | 1st velocity loop integration time constant | Read and write | 0.1ms              | 16 | 10 to 65535             |
| 2002-0B | Torque feedforward gain                     | Read and write | 0.1%               | 16 | 0 to 2000               |
| 2002-0C | Torque feedforward filter time constant     | Read and write | 0.01ms             | 16 | 0 to 10000              |

### 7.7.3 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

| RPDO                        | TPDO                        | Remark   |
|-----------------------------|-----------------------------|----------|
| 6040 (Control word)         | 6041 (Status word)          | Required |
| 6071 (Target torque)        | /                           | Required |
| /                           | 6064 (Position feedback)    | Optional |
| /                           | 606C (Speed feedback)       | Optional |
| /                           | 6077 (Torque feedback)      | Optional |
| 6060 (Servo mode selection) | 6061 (Running mode display) | Optional |

## 7.8 Homing Mode (HM)

Homing mode is used to find the mechanical origin and locate the positional relationship between the mechanical origin and the mechanical zero.

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

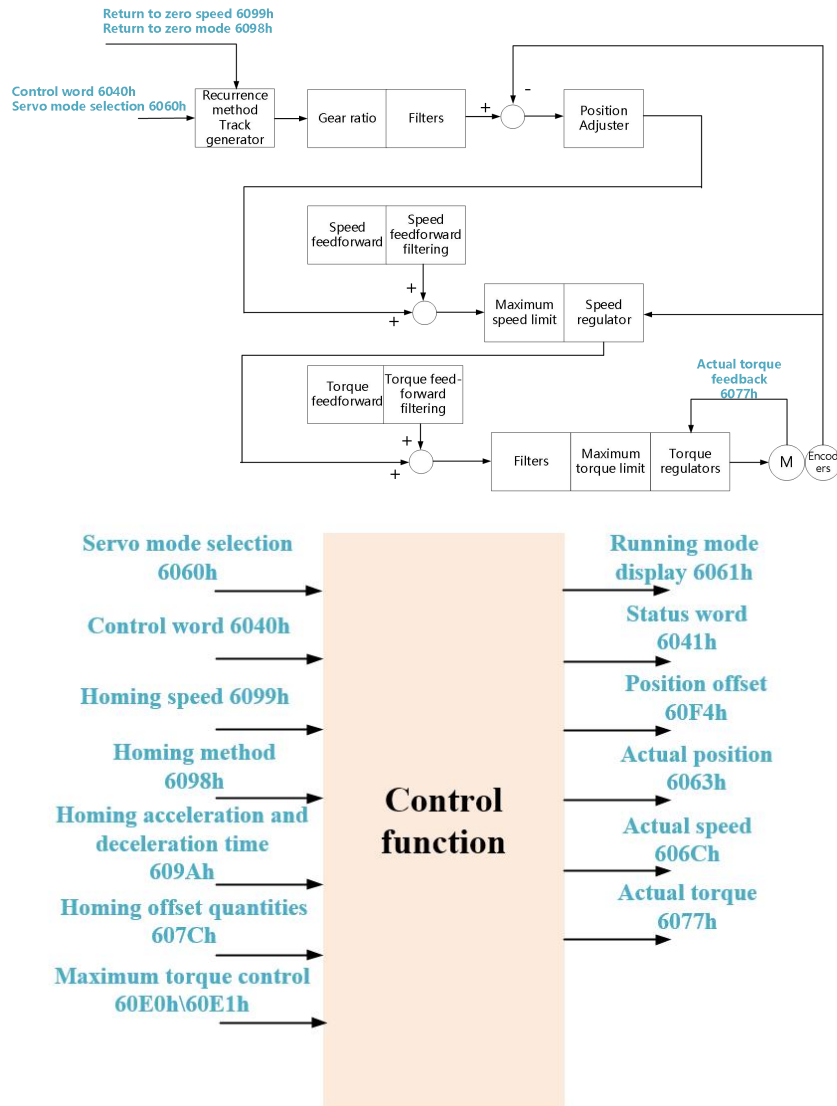
Mechanical origin: Mechanical absolute origin position.

After homing, the stop position of the motor is the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero can be set:

Mechanical origin = mechanical zero + 607Ch (origin offset)

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

### 7.8.1 Control Block Diagram



### 7.8.2 Related Objects

#### (1) Control word 6040h

| Bit | Name                           | Description                                                      |
|-----|--------------------------------|------------------------------------------------------------------|
| 0   | Servo operation can be started | When bit0 to bit3 are all 1, it indicates the start of operation |
| 1   | Turn on the main circuit       |                                                                  |
| 2   | Quick stop                     |                                                                  |
| 3   | Servo operation                |                                                                  |
| 4   | Homing                         | 0 → 1: Start homing<br>1 → 0: End homing                         |

#### (2) Status word 6041h

| Bit | Name                                | Description |
|-----|-------------------------------------|-------------|
| 10  | Target arrival                      | -           |
| 12  | Slave station following instruction | -           |
| 13  | Following error                     | -           |
| 15  | Homing completed                    | -           |

### 7.8.3 Introduction of Homing Mode

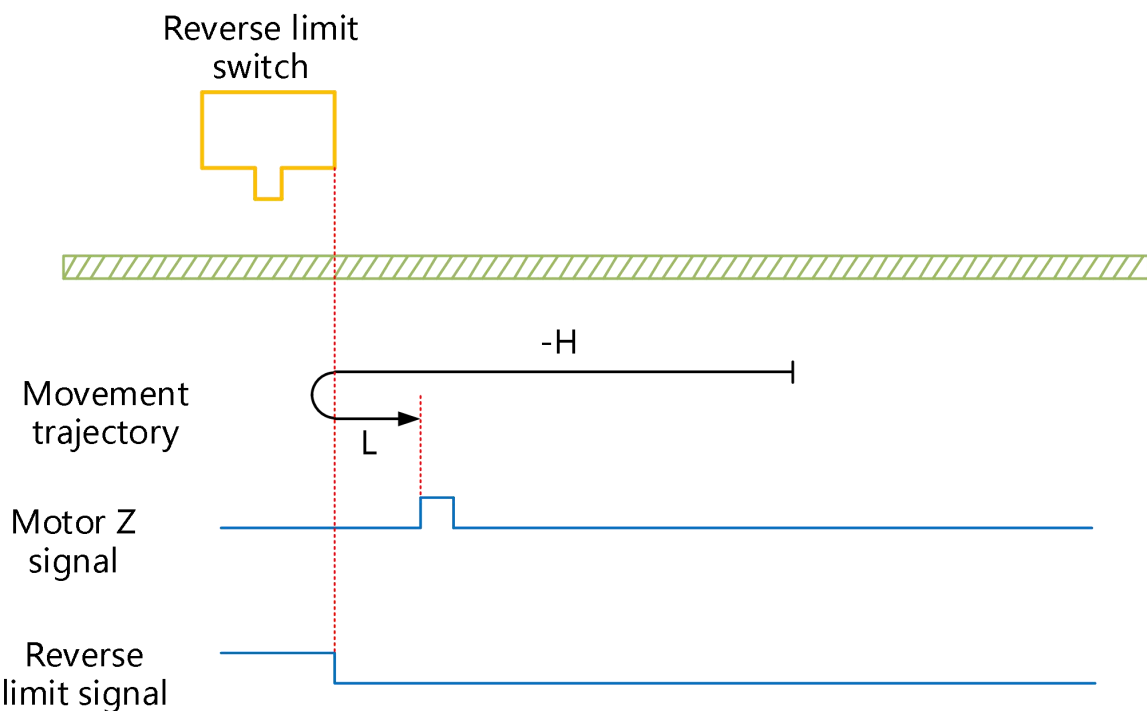
Note: In the figure, "H" stands for 6099: 01h (search for deceleration point signal speed), and "L" stands for 6099: 02h (search for origin signal speed).

#### (1) 6098H = 1

Mechanical origin: Z signal of motor

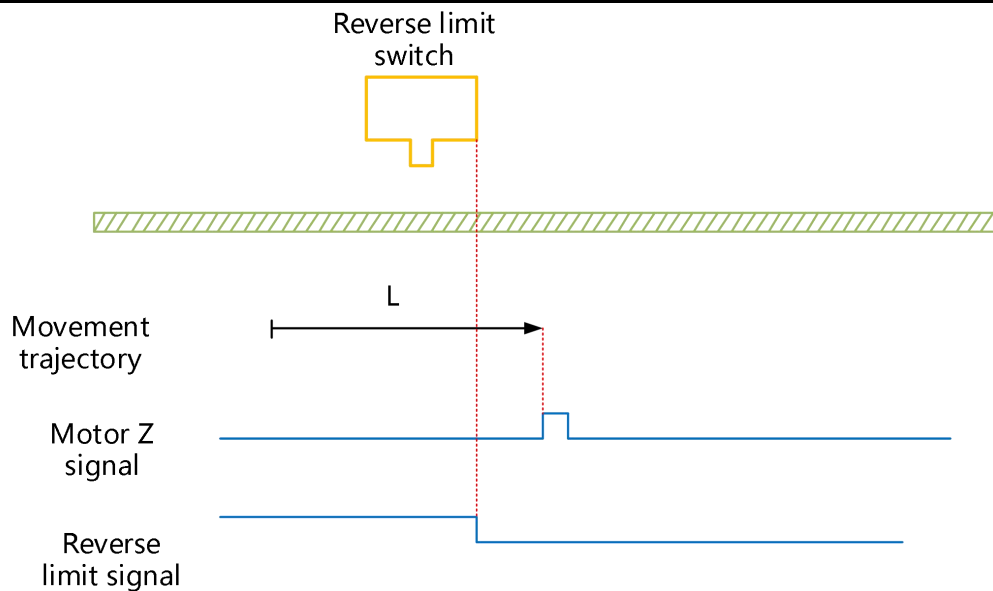
Deceleration point: Reverse limit switch (NOT)

- ① The deceleration point signal is invalid when starting homing



NOT=0 when starting homing, start homing in reverse direction at high speed. After the rising edge of NOT, slow down, change running direction and run in forward direction at low speed, and stop at first Z signal when encountering the falling edge of NOT.

- ② The deceleration point signal is valid when starting homing



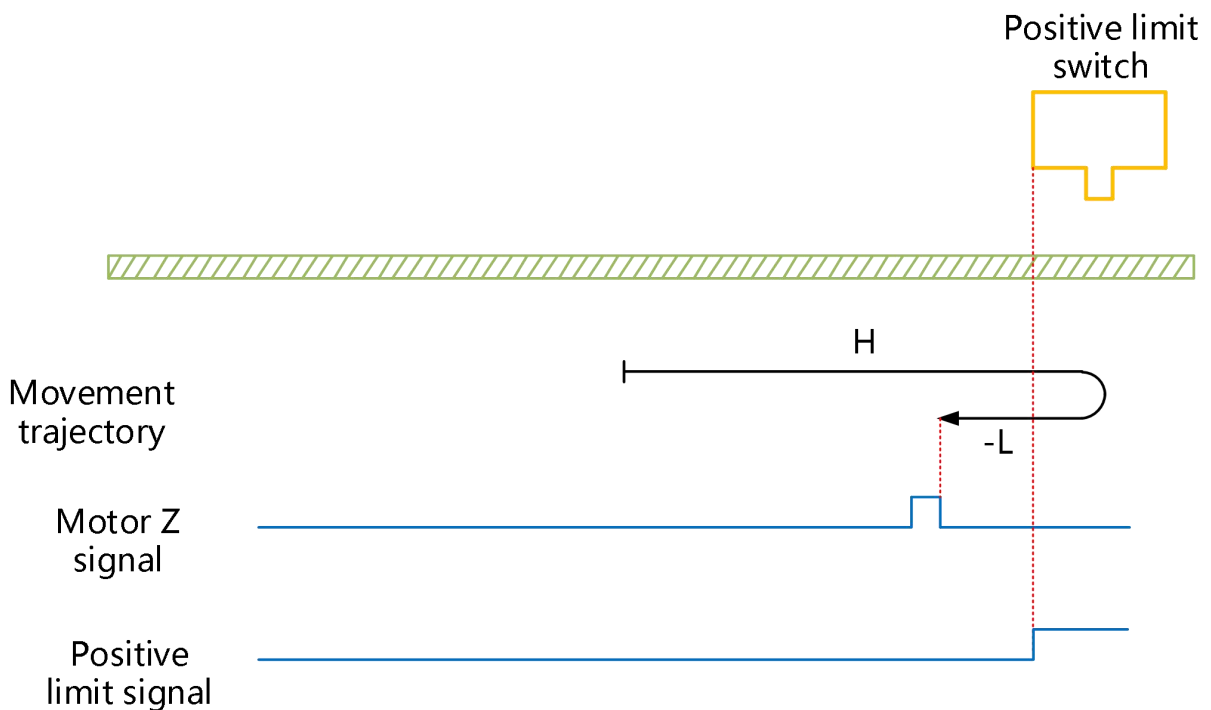
NOT=1 when starting homing, run in forward direction immediately at low speed and start to homing, and stop at the first Z signal when encountering the falling edge of NOT.

## (2) 6098H = 2

Mechanical origin: Z signal of motor

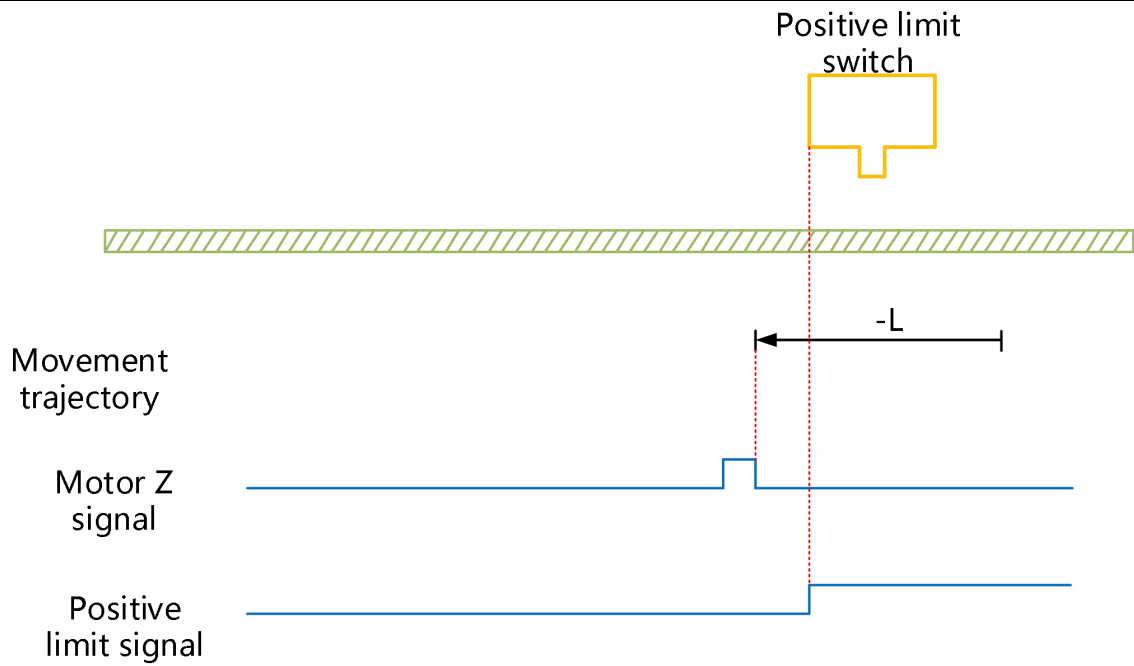
Deceleration point: Forward limit switch (POT)

- ① The deceleration point signal is invalid when starting homing



POT=0 when starting homing, run at a high speed in the forward direction. After encountering the rising edge of POT, motor will decelerate, run in reverse direction low speed, and stop at the first Z signal after encountering the falling edge of POT.

- ② The deceleration point signal is valid when starting homing



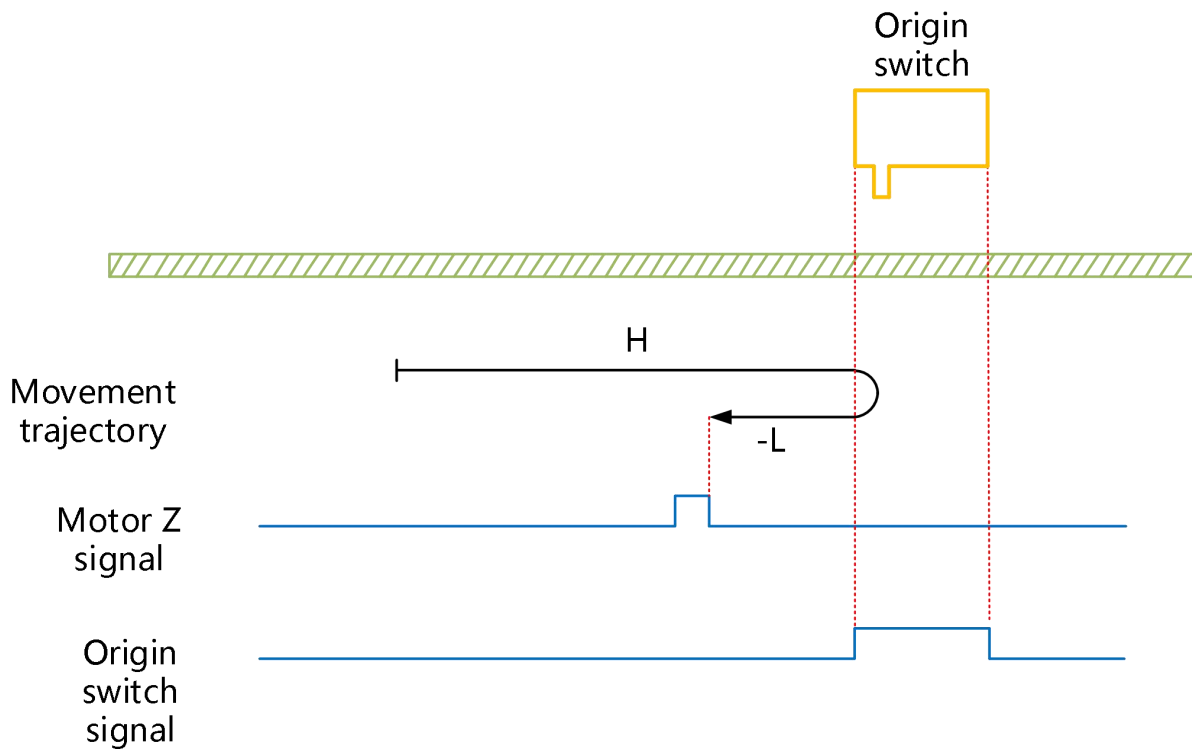
POT=1 when starting to homing, run at low speed directly in the reverse direction, and stops at the first Z signal after encountering the falling edge of POT.

### (3) 6098H = 3

Mechanical origin: Z signal of motor

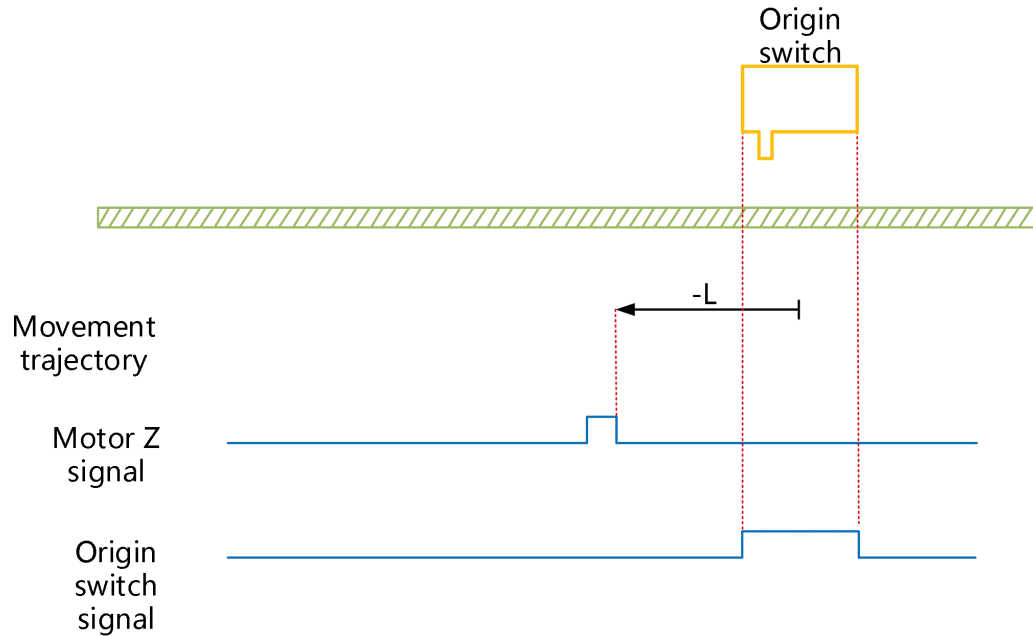
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing in forward direction at high speed. After encountering rising edge of HW, slow down, run in reverse direction at low speed. After receiving the falling edge of HW, continue to run, and then stop when encountering the first Z signal.

② The deceleration point signal is valid when starting homing



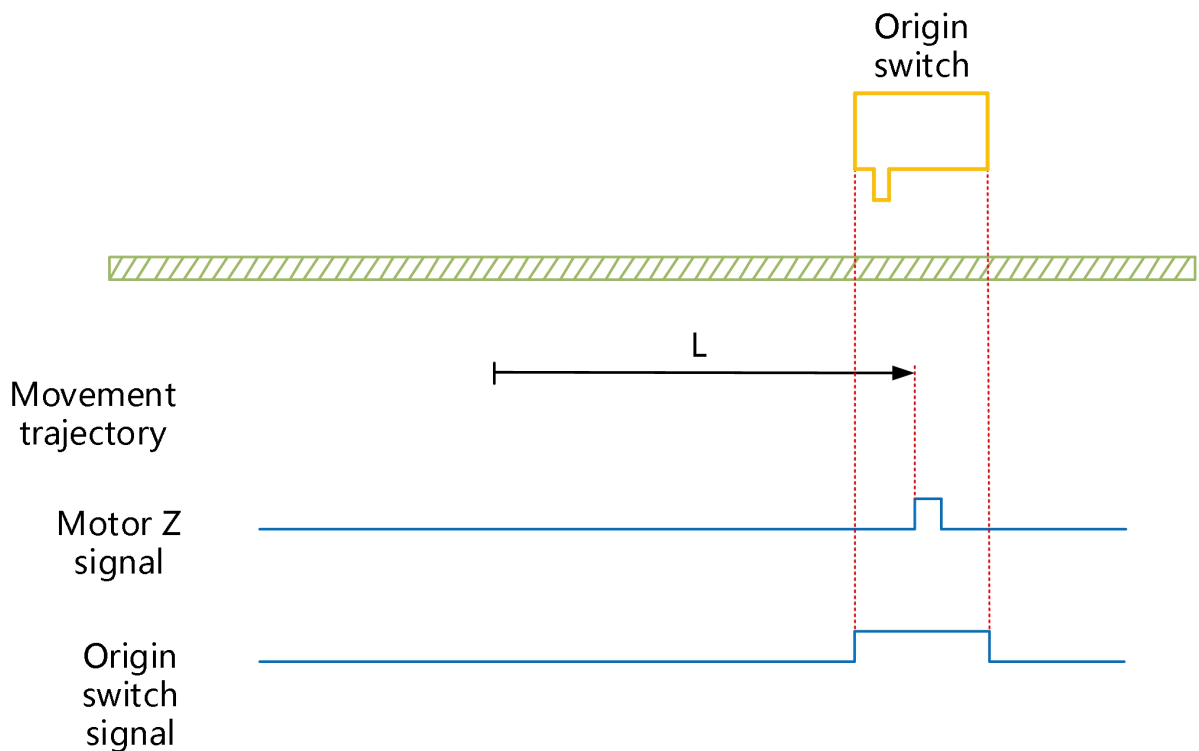
HW=1 when starting homing, start homing at low speed in reverse direction directly, and stop at the first Z signal after encountering the falling edge of HW;

**(4) 6098H = 4**

Mechanical origin: Z signal of motor

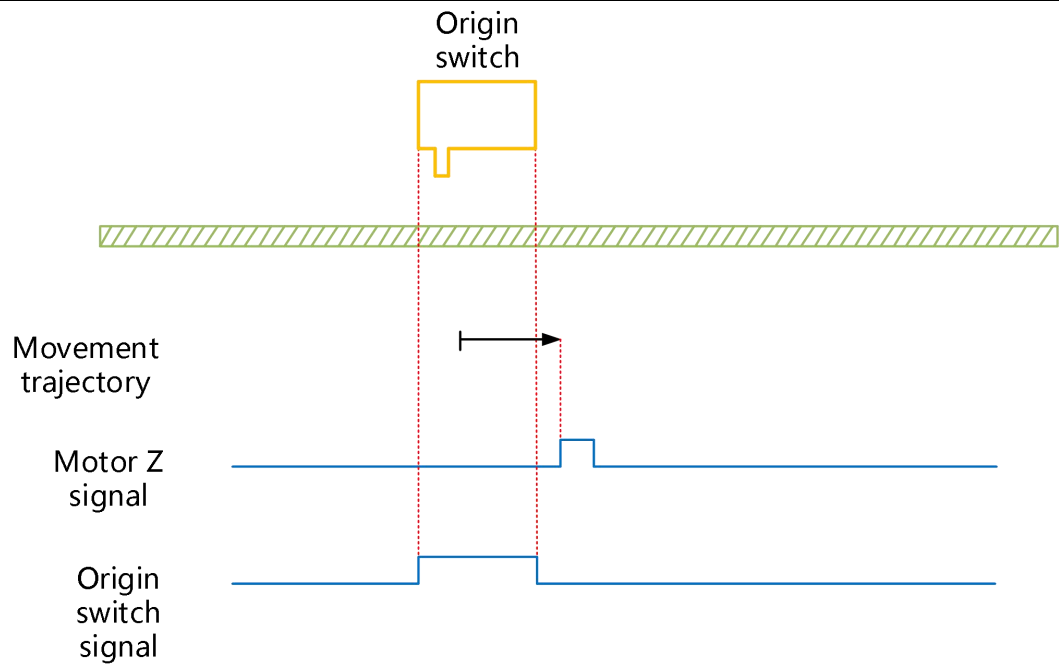
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing at low speed in forward direction directly, and stop at the first Z signal after encountering the rising edge of HW;

② The deceleration point signal is valid when starting homing



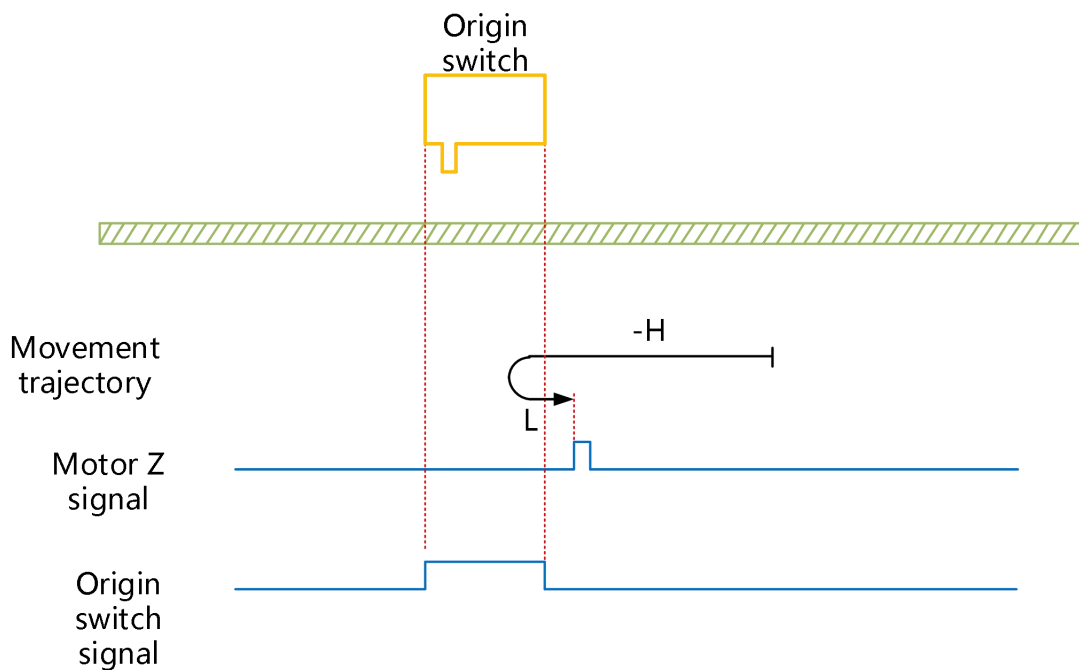
HW=1 when starting homing, start homing at high speed in reverse direction, slow down after encountering the falling edge of HW, change running direction and run in forward direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

**(5) 6098H = 5**

Mechanical origin: Z signal of motor

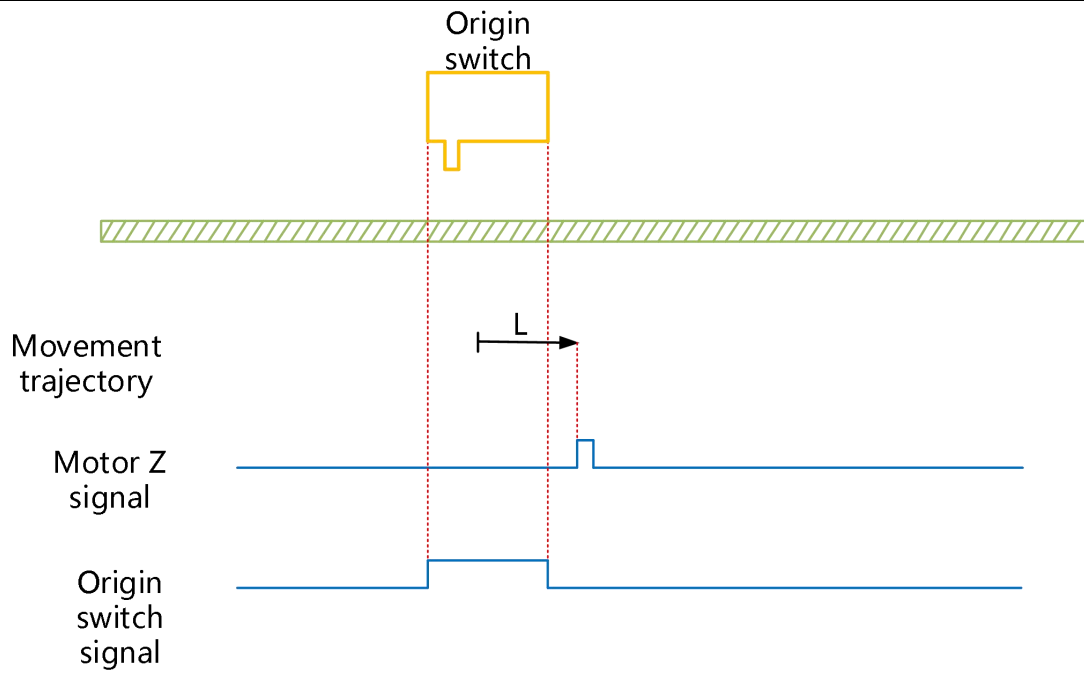
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing at high speed in reverse direction, slow down after encountering the rising edge of HW, change running direction and run in forward direction at low speed, and stop at the first Z signal after encountering the falling edge of HW;

- ② The deceleration point signal is valid when starting homing



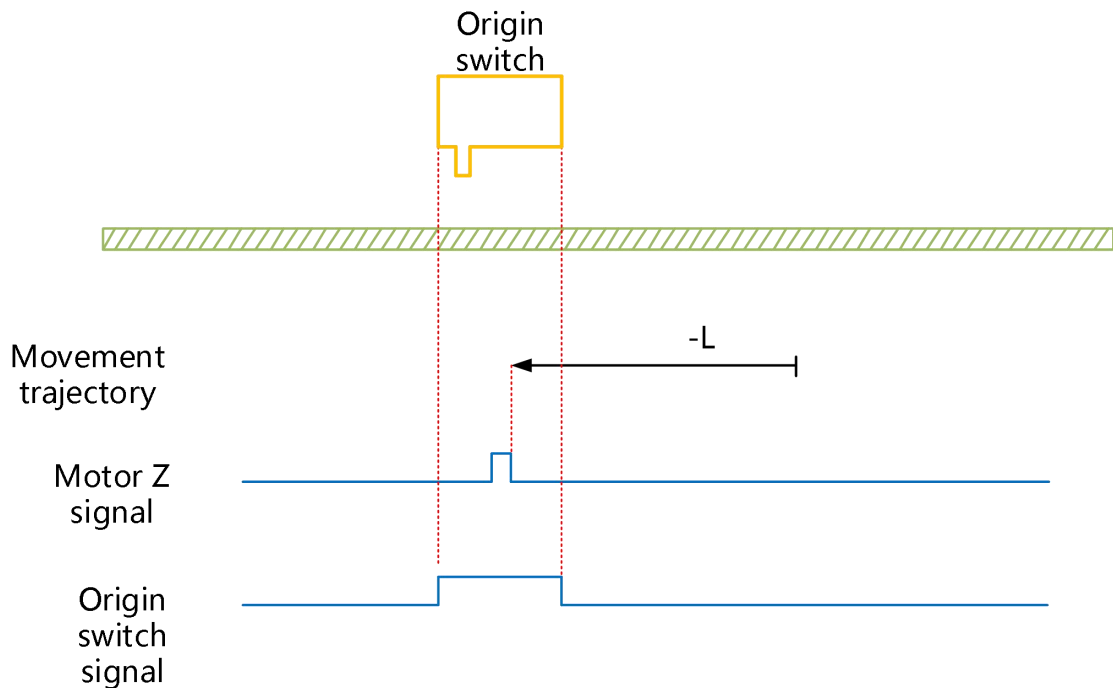
HW=1 when starting homing, start homing at low speed in forward direction directly, and stop at the first Z signal after encountering the falling edge of HW will stop;

**(6) 6098H = 6**

Mechanical origin: Z signal of motor

Deceleration point: Origin switch (HW)

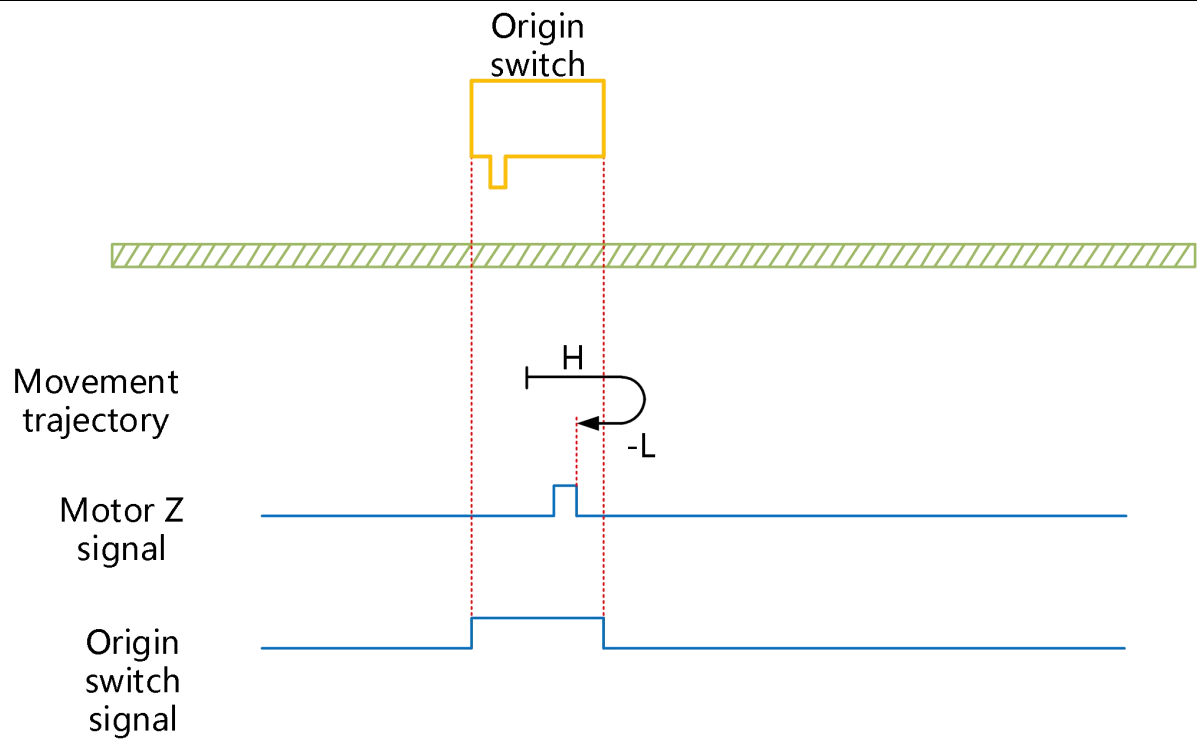
① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing at low speed in reverse direction directly, and stop at the first Z signal after encountering the rising edge of HW;

② The deceleration point signal is valid when starting homing





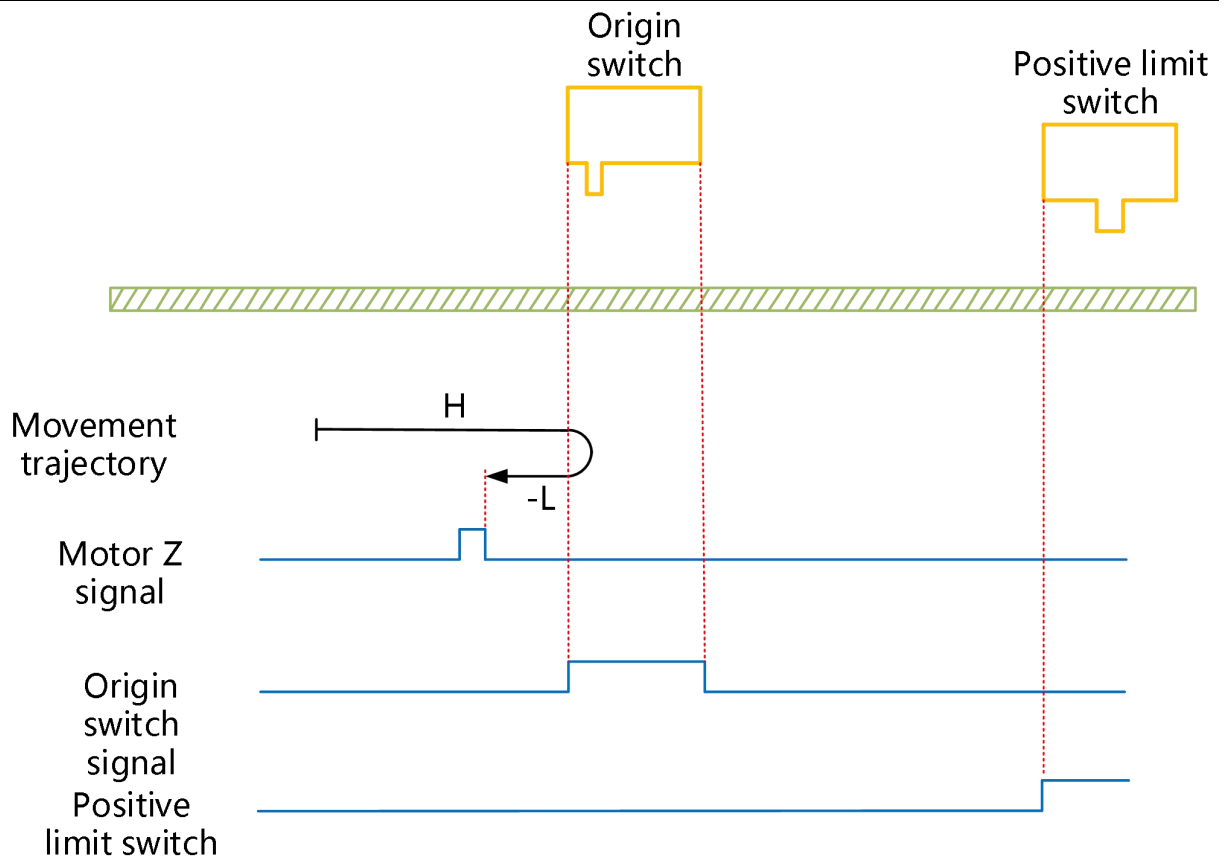
HW=1 when starting homing, start homing at high speed in forward direction, slow down after encountering the falling edge of HW, change running direction and run in reverse direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

**(7) 6098H = 7**

Mechanical origin: Z signal of motor

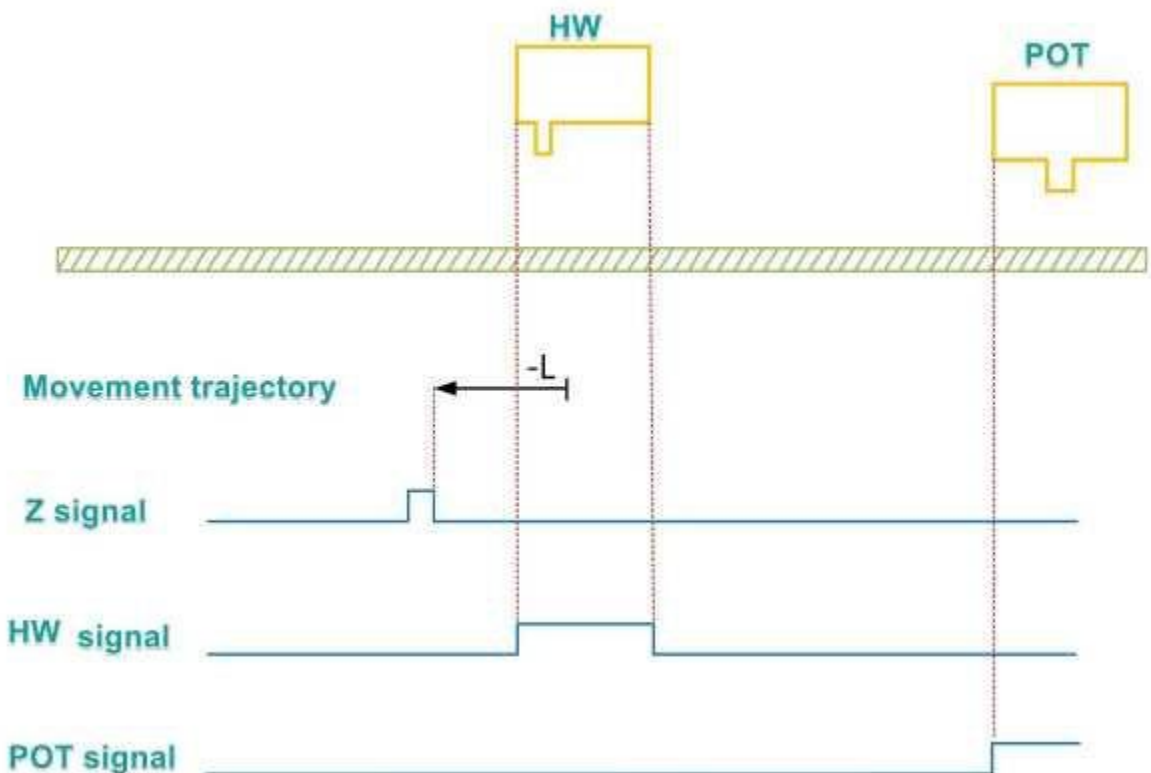
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



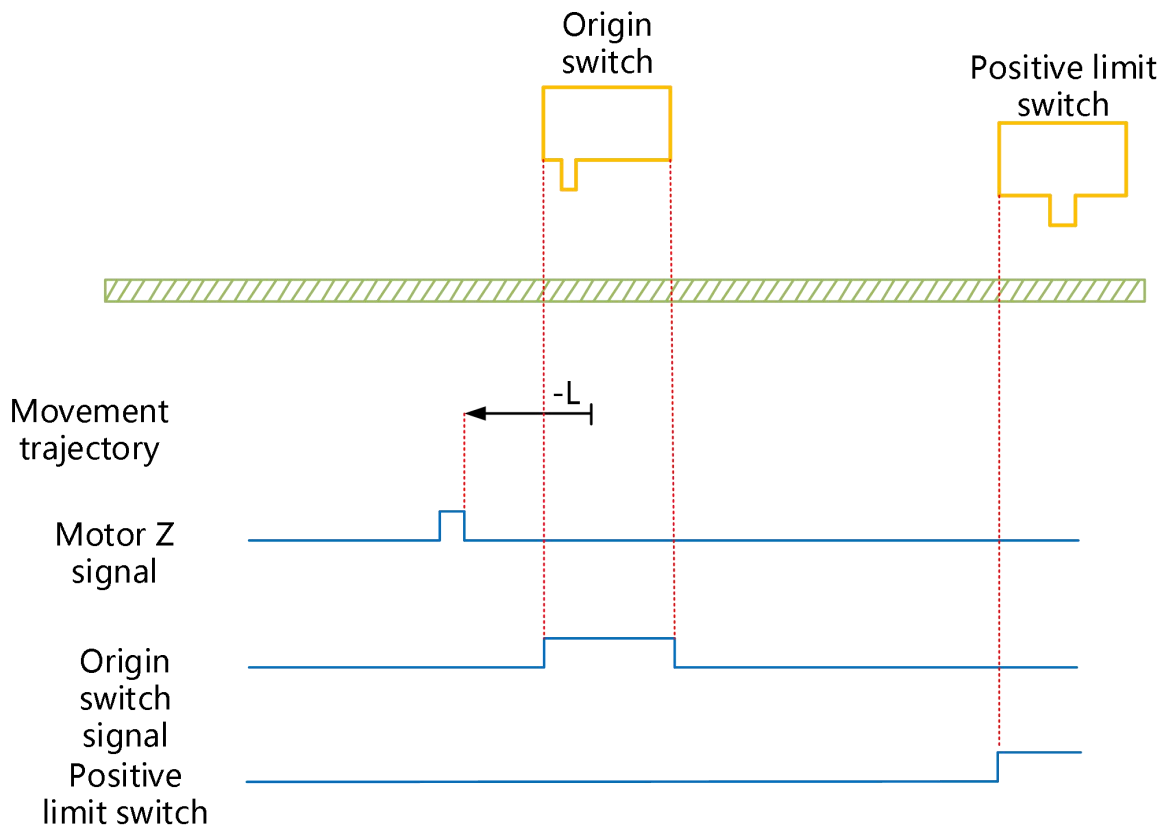
HW=0 when starting homing, start homing at high speed in forward direction. If the limit switch is not encountered, after encountering the rising edge of HW, slow down, change running direction and run in reverse direction at low speed, and stop at the first Z signal after encountering the falling edge of HW;

- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing, start homing at high speed in forward direction. If the limit switch is encountered, automatically change running direction and run in reverse direction at high speed. After encountering HW rising edge, slow down and continue to run at low speed in reverse direction, stop at the first Z signal after encountering the falling edge of HW;

- ③ The deceleration point signal is valid when starting homing



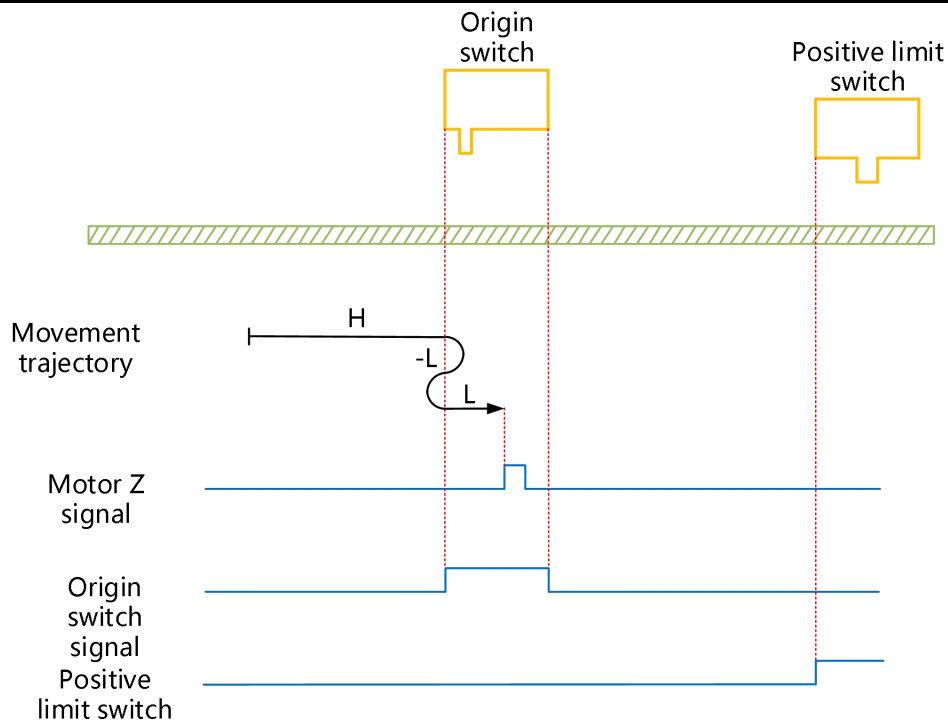
HW=1 when starting homing, start homing at low speed in reverse direction directly, and stop at the first Z signal after encountering the falling edge of HW;

#### (8) 6098H = 8

Mechanical origin: Z signal of motor

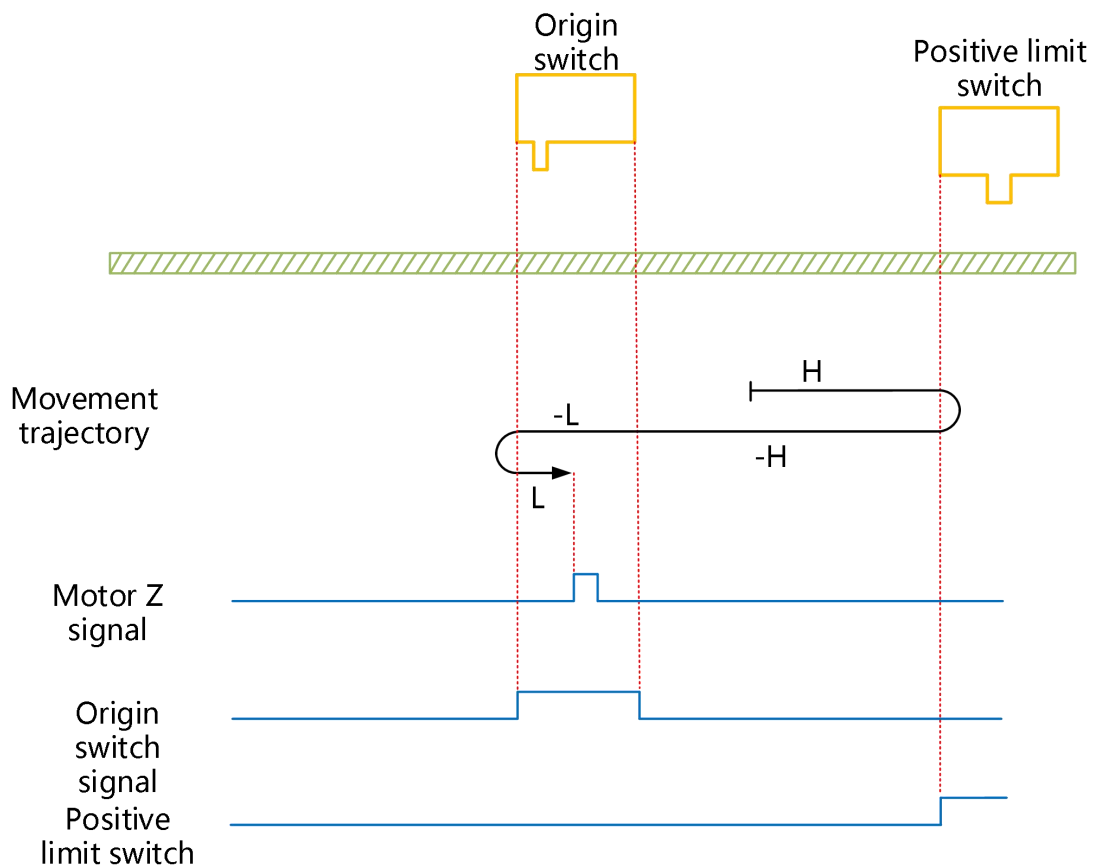
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting to homing, the forward limit switch is not encountered



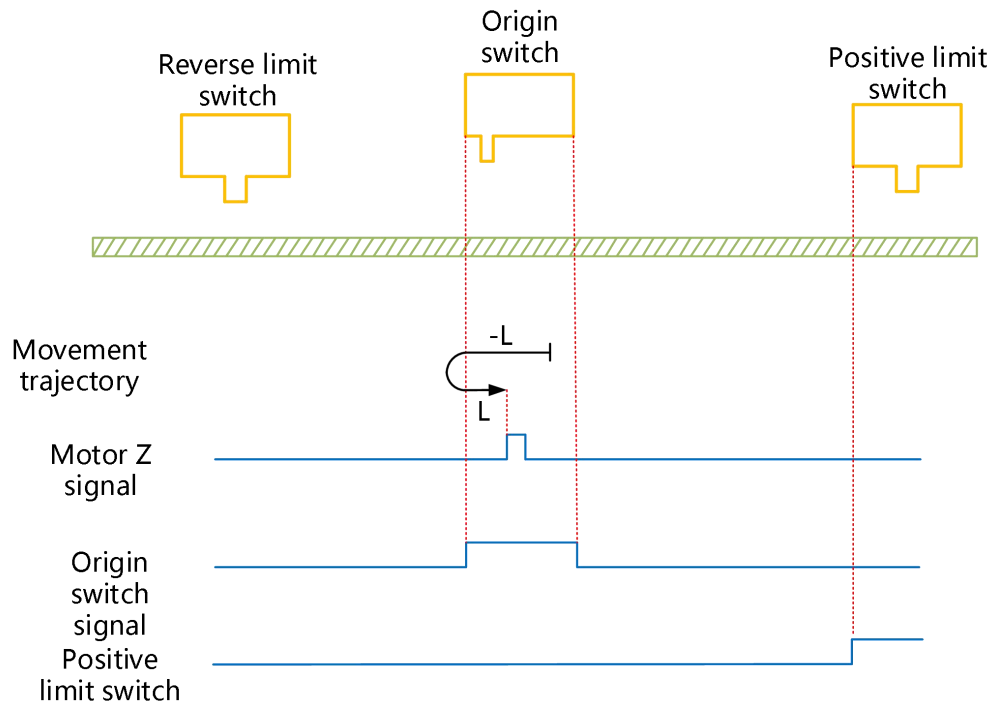
HM-0 when starting homing, start homing at high speed in forward direction. If the limit switch is not encountered, after encountering the rising edge of HW, slow down and change running direction and run in reverse direction at low speed. After encountering the falling edge of HW, change the running direction and run in forward direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing at high speed in forward direction. If limit switch is encountered, automatically change running direction and run in reverse direction at high speed, slow down and run in reverse direction at low speed after encountering HW rising edge; change running direction and run in reverse direction at low speed after encountering HW falling edge, and stop at the first Z signal after encountering HW rising edge;

③ The deceleration point signal is valid when starting homing



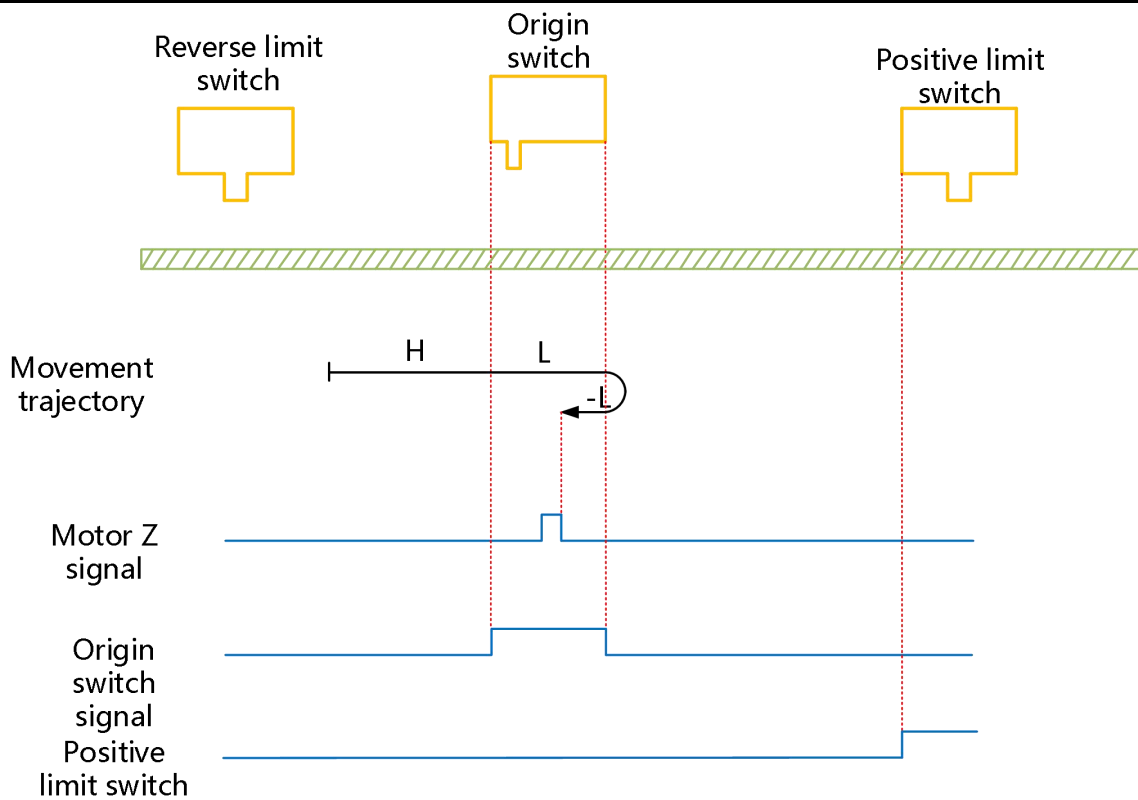
HM=-1 when starting homing, start homing at low speed in reverse direction directly. After encountering the falling edge of HW, change running direction and run in forward direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

**(9) 6098H = 9**

Mechanical origin: Z signal of motor

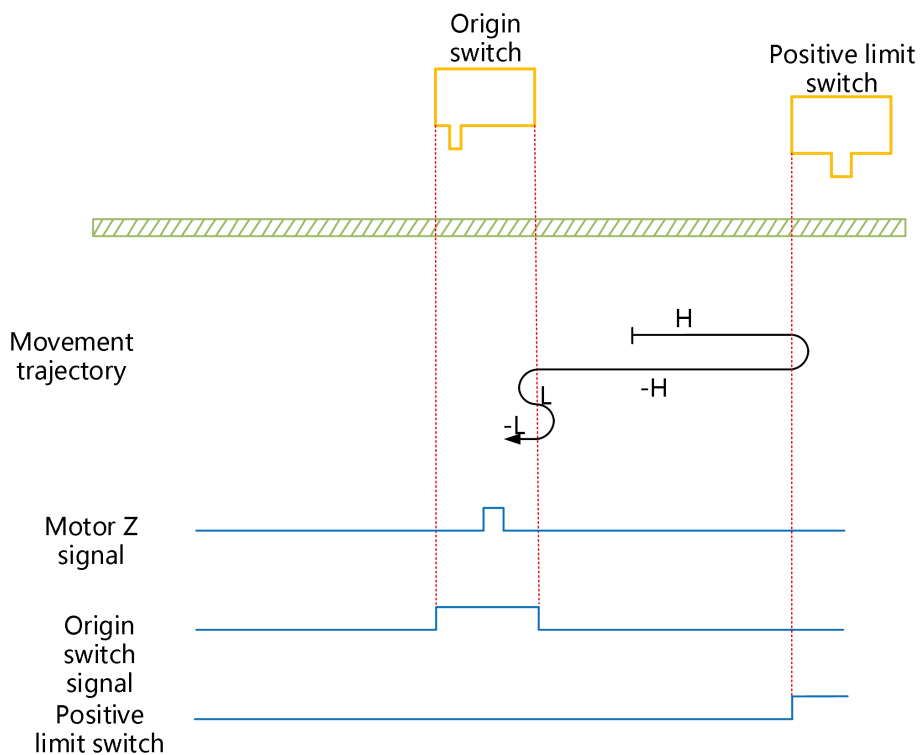
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



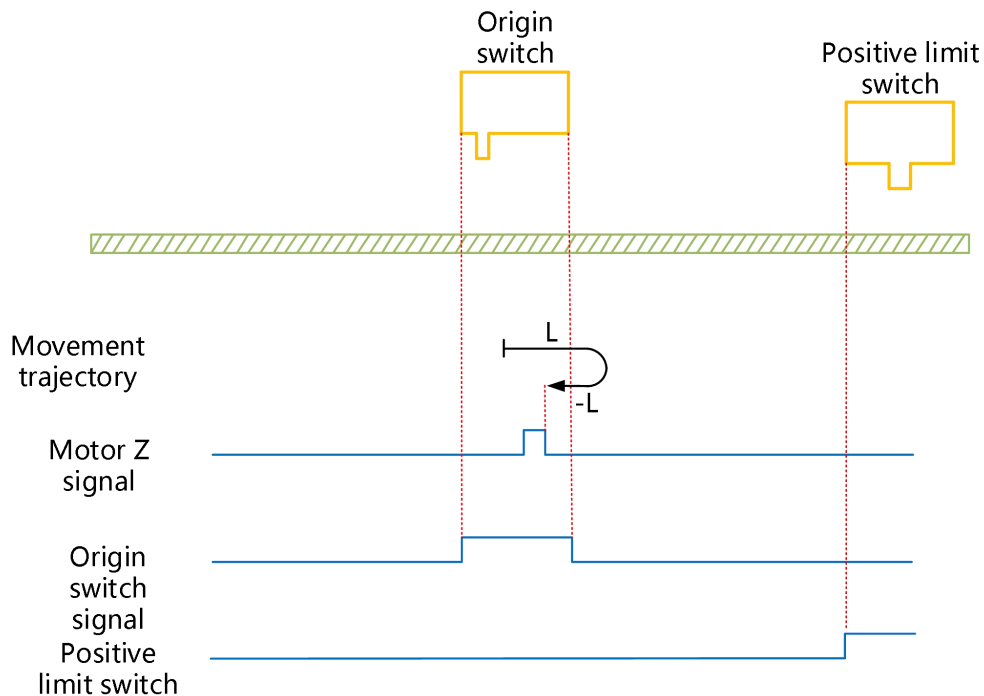
HW=0 when starting homing, start homing at high speed in forward direction. If the limit switch is not encountered, slow down after encountering the rising edge of HW, run at low speed in forward direction; change running direction and run in reverse direction at low speed after encountering the falling edge of HW, and stop at the first Z signal after encountering the rising edge of HW;

- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing, start homing at high speed in forward direction. If the limit switch is encountered, change the running direction automatically and run in reverse direction at high speed; slow down and change the running direction after encountering the rising edge of HW to resume forward operation. Run in forward direction at low speed and change the running direction after encountering the falling edge of HW; stops at first Z signal after encountering the rising edge of HW during running in reverse direction at low speed;

- ③ The deceleration point signal is valid when starting homing



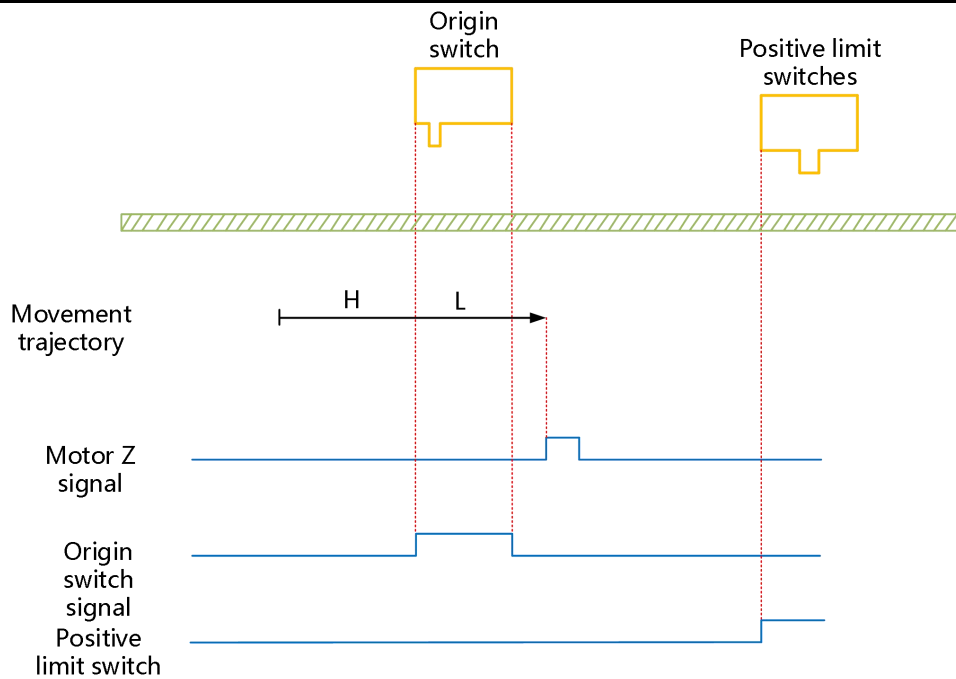
HW=1 when starting homing, start homing directly at low speed in forward direction. After encountering the falling edge of HW, change the running direction and stop at the first Z signal after encountering the rising edge of HW during running in reverse direction at low speed;

#### (10) 6098H=10

Mechanical origin: Z signal of motor

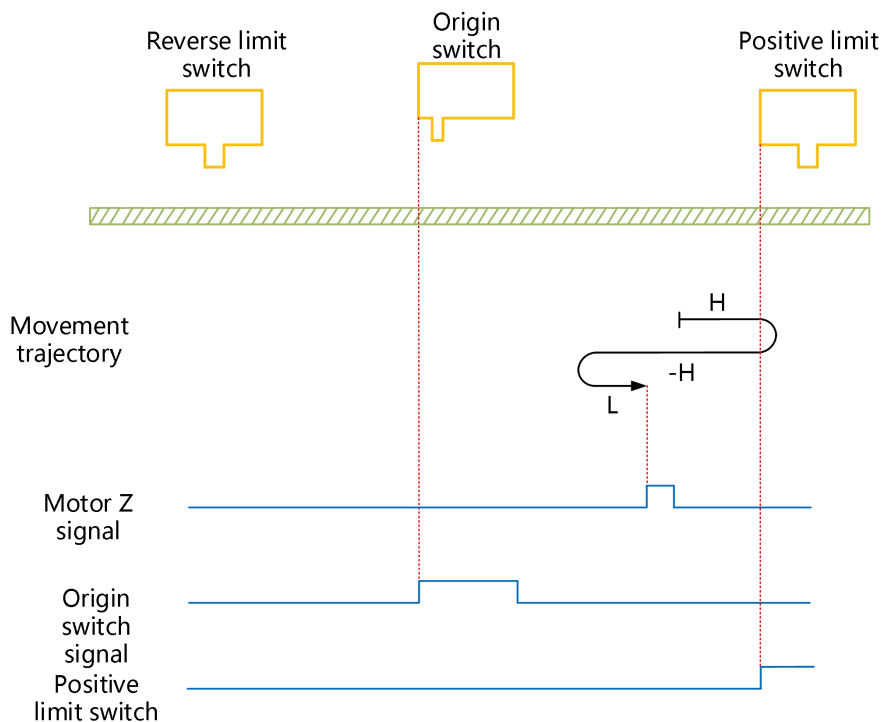
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



HW=0 when starting homing, start homing at high speed in forward direction. If the limit switch is not encountered, slow down and run at low speed in forward direction after encountering the rising edge of HW. After encountering the falling edge of HW, continue to run at low speed in forward, and then stop at the first Z signal encountered;

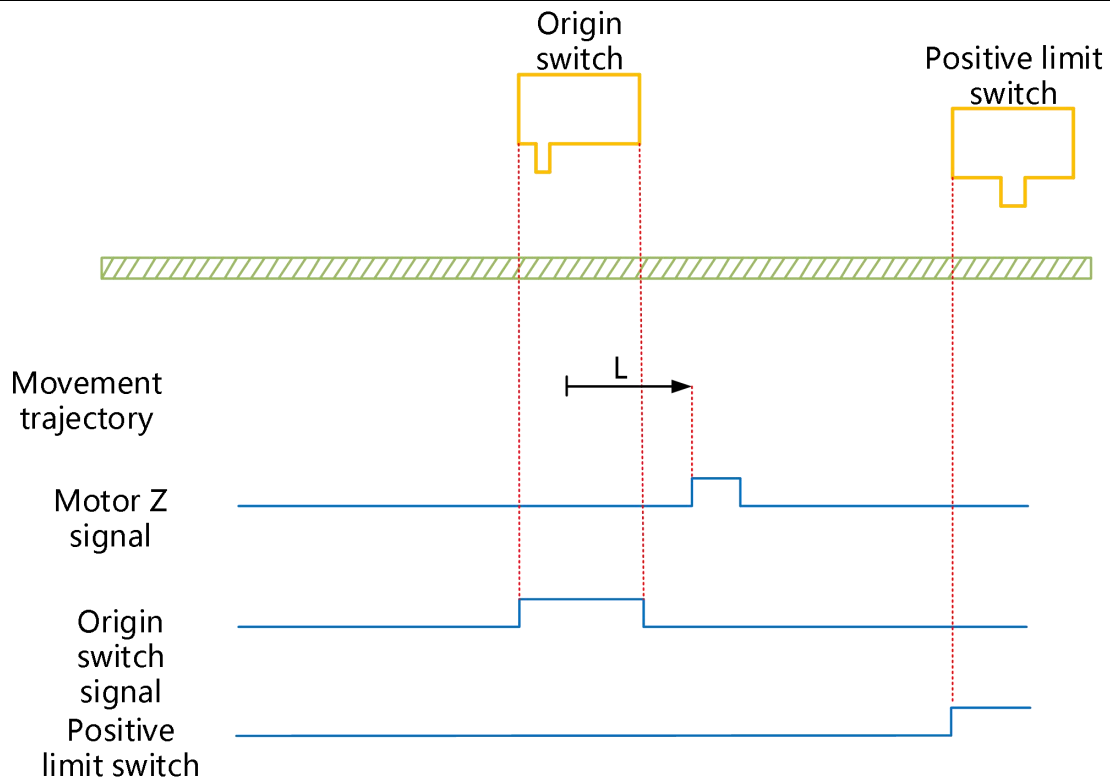
② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing start homing at high speed in forward direction. If the limit switch is encountered, change the running direction automatically and run in reverse direction at high speed. After encountering the rising edge of HW, slow down and change the running direction to resume forward operation, and stop at the first Z signal after encountering the falling edge of HW during running in forward direction at low speed;

③ The deceleration point signal is valid when starting homing





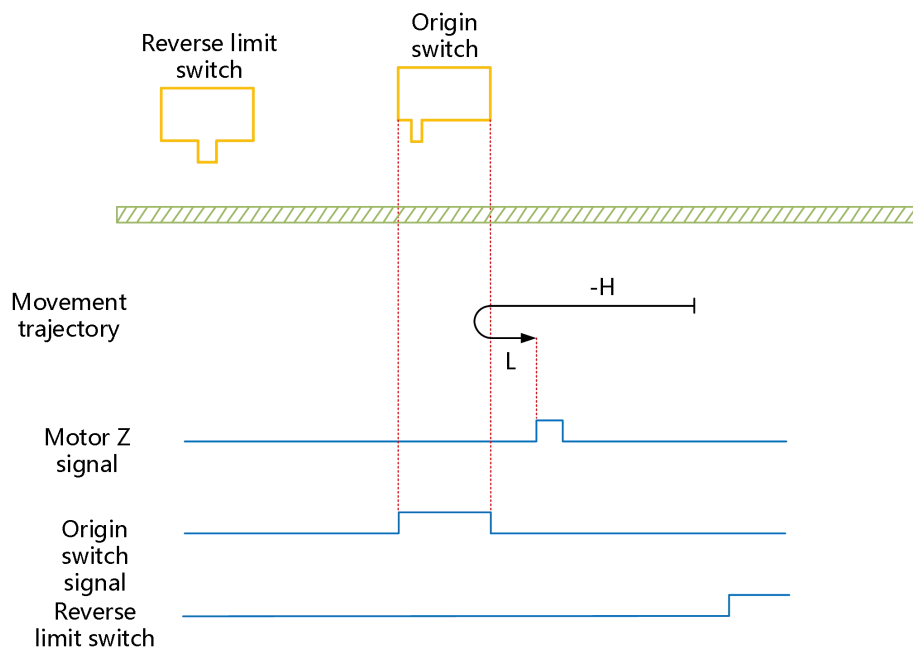
HW=1 when starting homing, start homing directly in forward direction at low speed, and stop at the first Z signal after encountering the falling edge of HW;

#### (11) 6098H=11

Mechanical origin: Z signal of motor

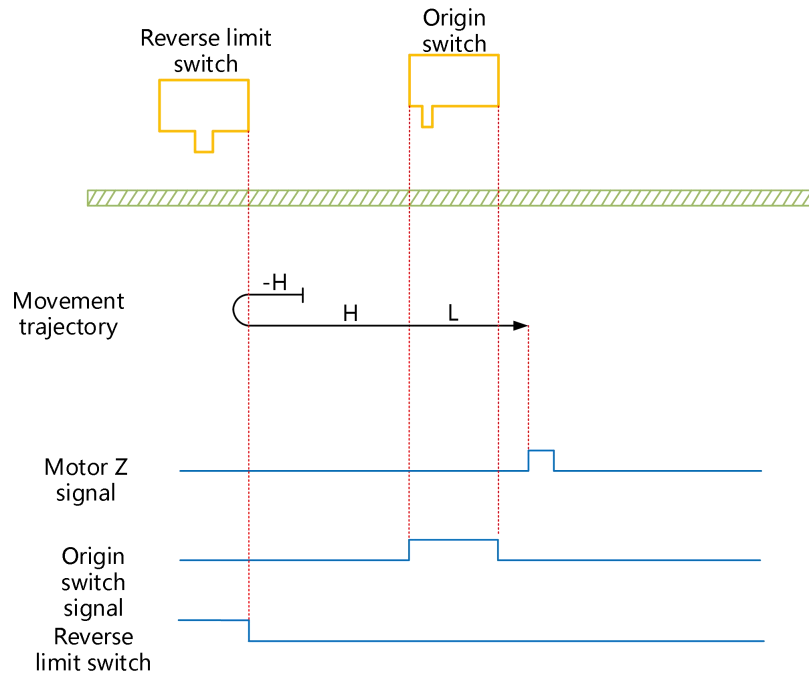
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



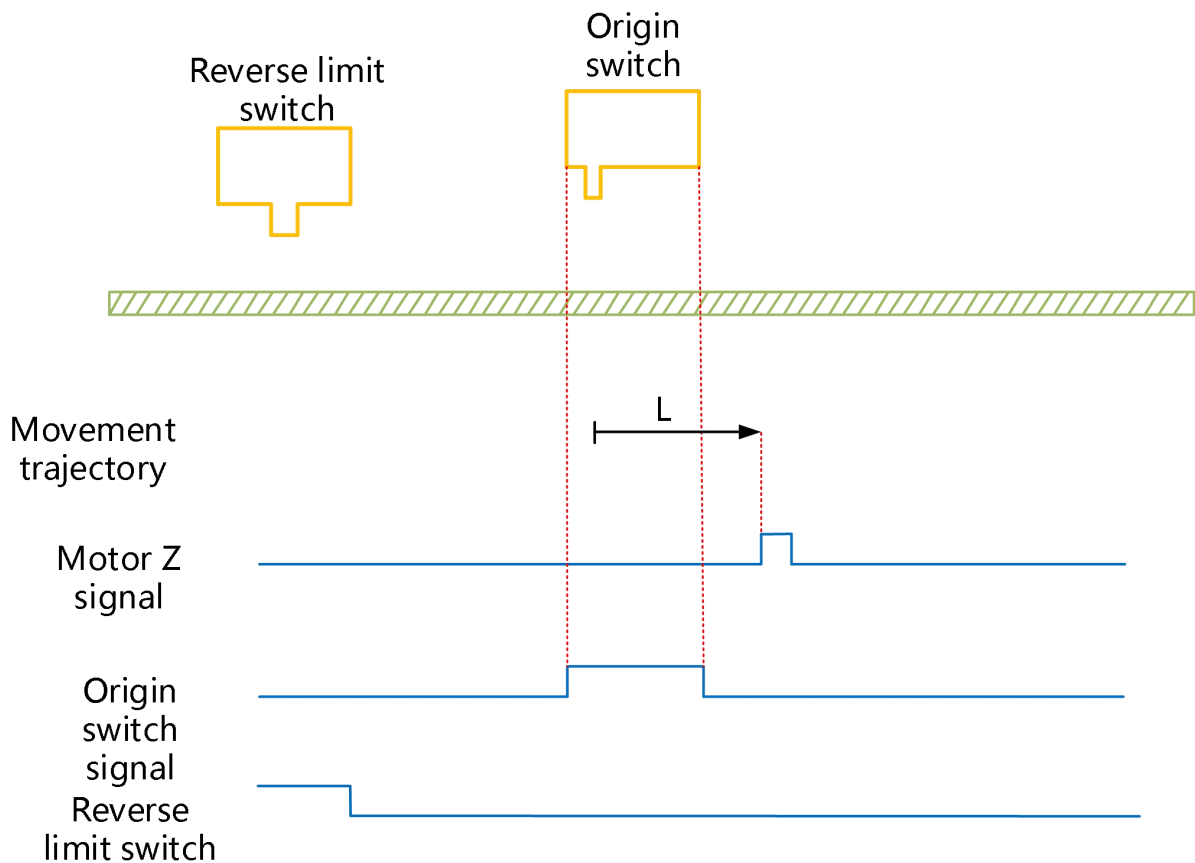
HW=0 when starting homing, start homing at high speed in reverse direction. If the limit switch is not encountered, slow down and change the running direction after encountering the rising edge of HW, and run in forward direction at low speed and stop at the first Z signal after encountering the falling edge of HW;

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing at high speed in reverse direction. If limit switch is encountered, change the running direction automatically and run in forward direction at high speed. After encountering HW rising edge, slow down and continue to run in forward direction at low speed. Stop at the first Z signal after encountering HW falling edge;

③ The deceleration point signal is valid when starting homing



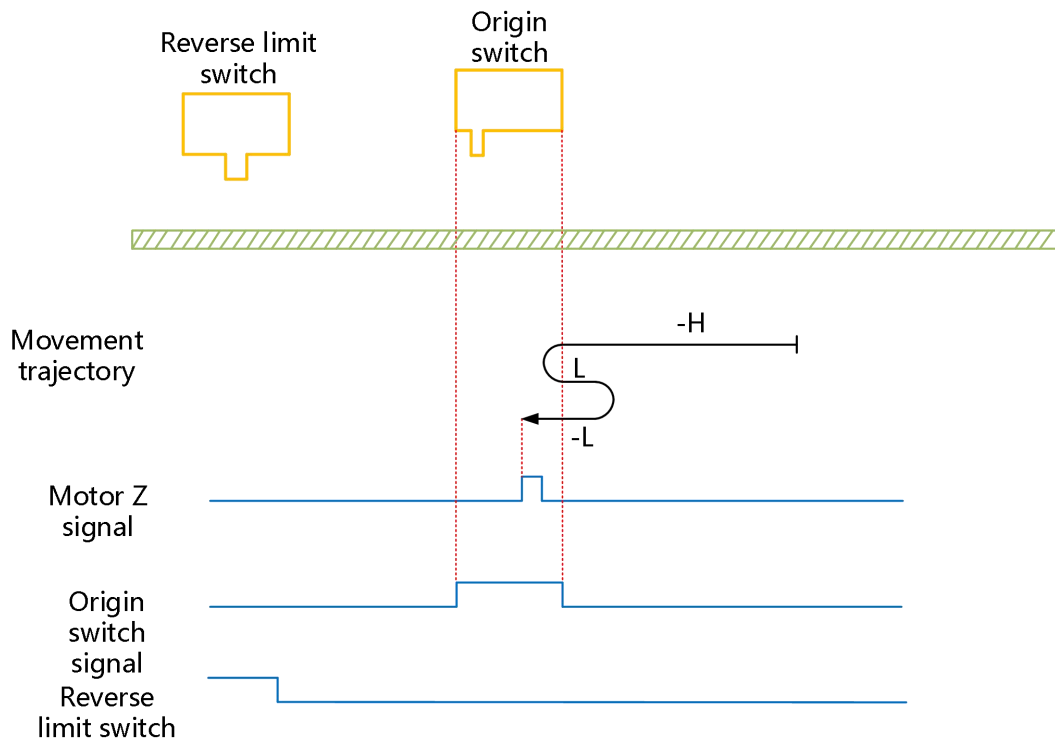
HW=1 when starting homing, it will start homing directly in forward direction at low speed, and stop at the first Z signal after encountering the falling edge of HW;

**(12) 6098H=12**

Mechanical origin: Z signal of motor

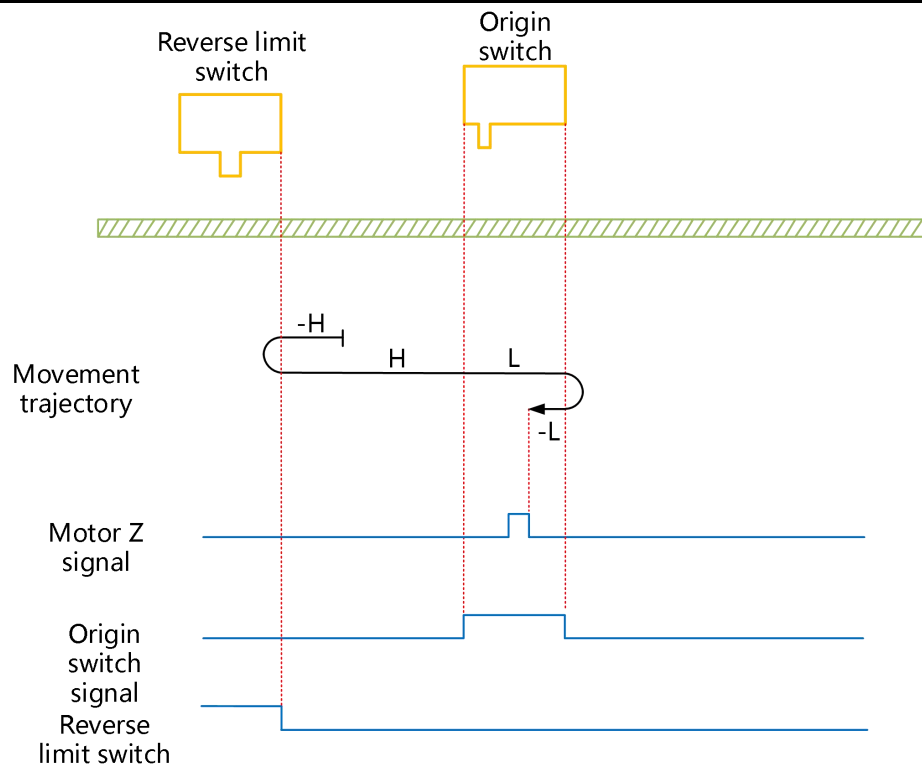
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered.



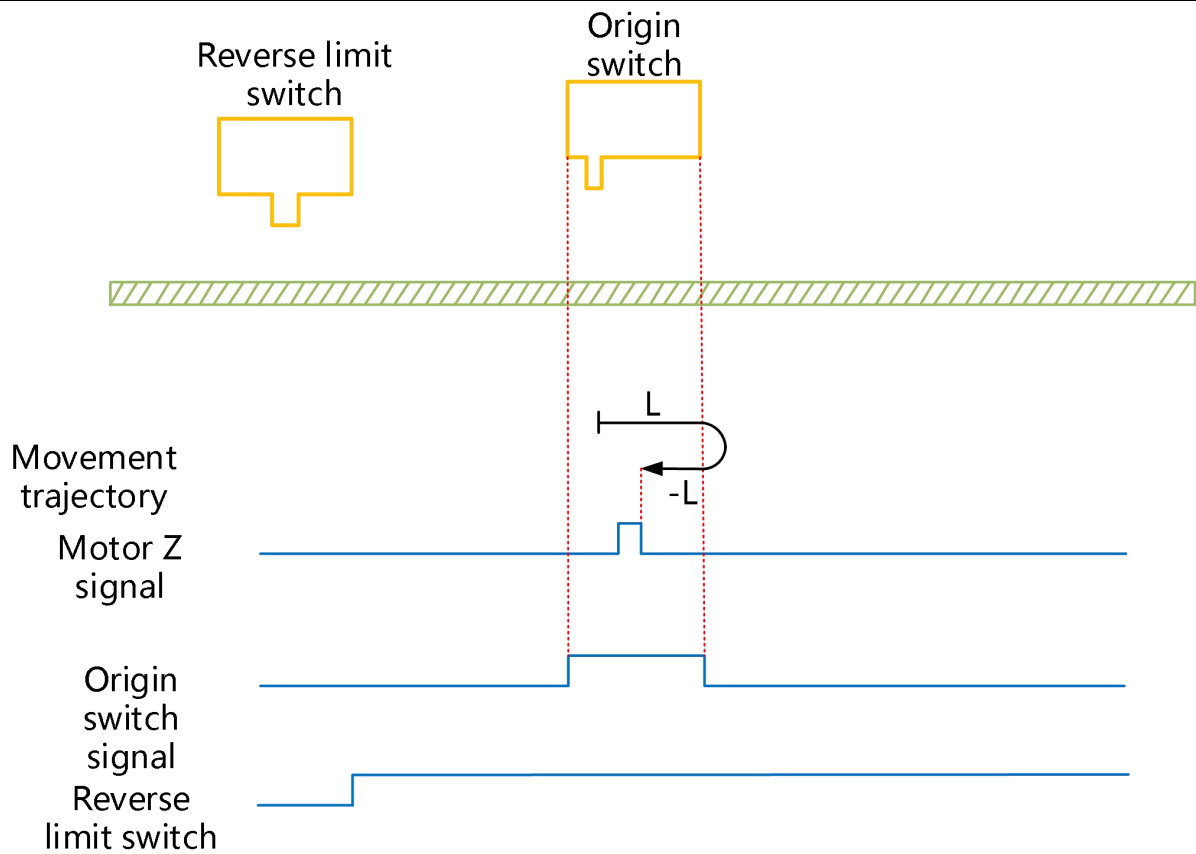
HW=0 when starting homing, start homing in reverse direction at high speed; if limit switch is not encountered; slow down and change the running direction after encountering HW rising edge, run in forward direction at low speed; after encountering HW falling edge, change the running direction and run in reverse direction at low speed and stop at the first Z signal after encountering HW rising edge;

- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically when encountering limit switch and run in forward direction at high speed; slow down after encountering HW rising edge and run in forward direction at low speed; change the running direction after encountering HW falling edge, and run in reverse direction at low speed and stop at the first Z signal after encountering HW rising edge;

- ③ The deceleration point signal is valid when starting homing



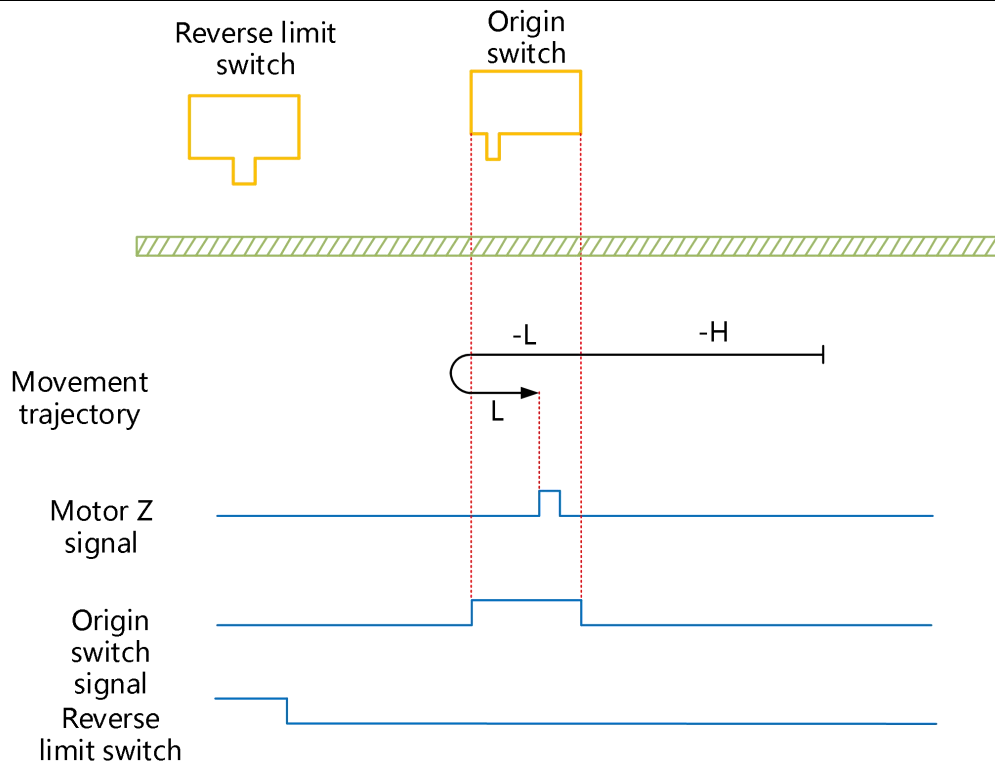
HW=1 when starting homing, start homing in forward direction at low speed. After encountering the falling edge of HW, change the running direction and run in reverse direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

**(13) 6098H=13**

Mechanical origin: Z signal of motor

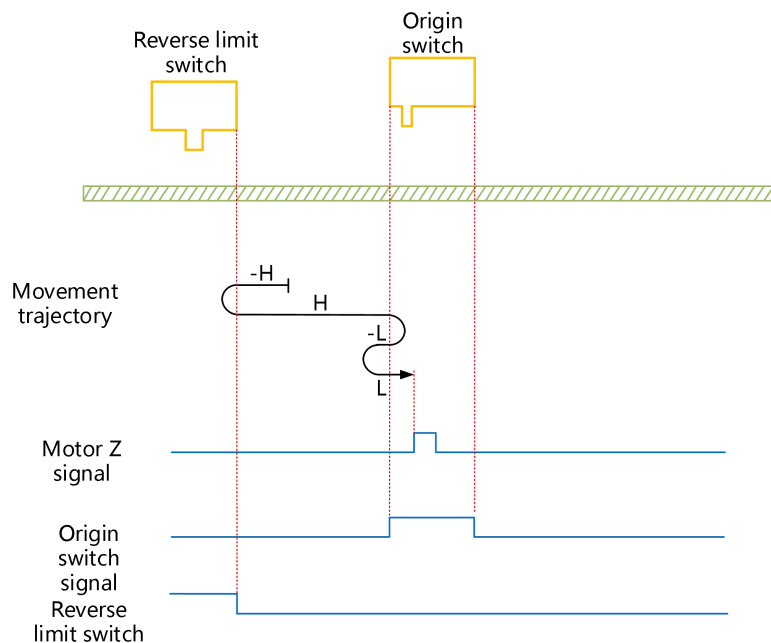
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



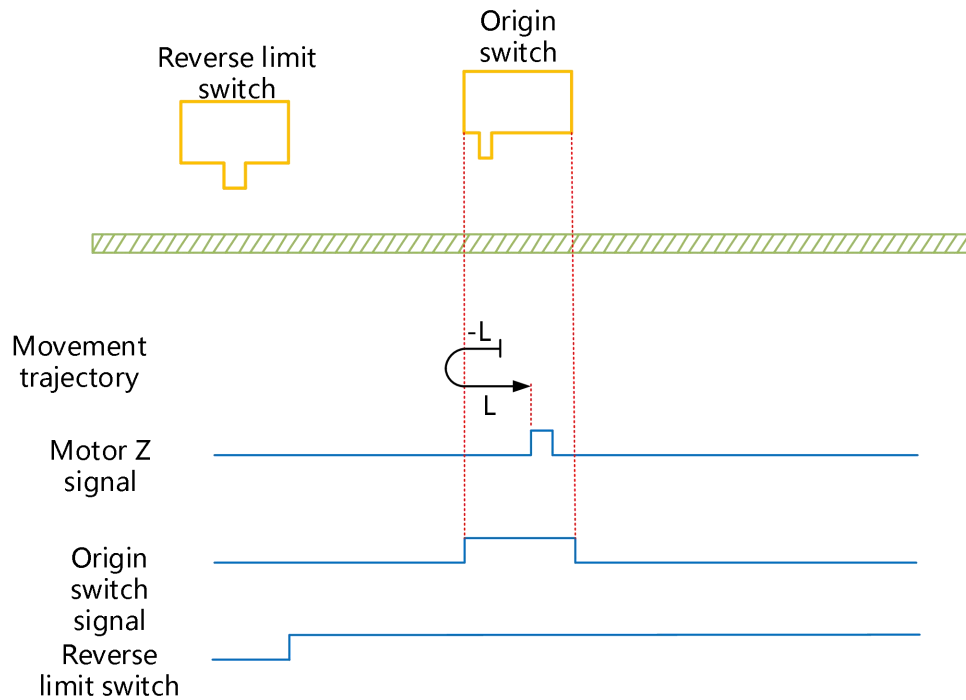
HW=0 when starting homing, start homing in reverse direction at high speed. If the limit switch is not encountered, slow down and run in reverse direction at low speed after encountering the rising edge of HW. After encountering the falling edge of HW, change the running direction and run in forward direction at low speed, and stop at the first Z signal after encountering the rising edge of HW;

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically and run in forward direction at high speed when encountering limit switch, slow down and change the running direction after encountering HW rising edge; run in reverse direction at low speed and change the running direction after encountering HW falling edge; stop at the first Z signal after encountering HW rising edge during running in forward direction at low speed;

## ③ The deceleration point signal is valid when starting homing



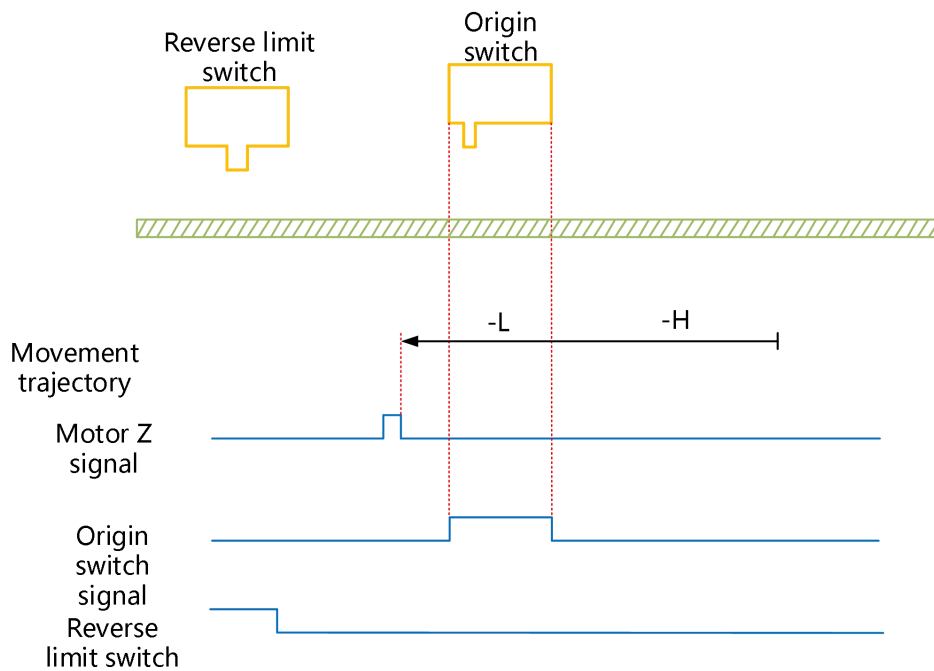
HW=1 when starting homing, start homing directly in reverse direction at low speed. After encountering the falling edge of HW, change the running direction; stop at the first Z signal after encountering the rising edge of HW during running in forward direction at low speed;

**(14) 6098H=14**

Mechanical origin: Z signal of motor

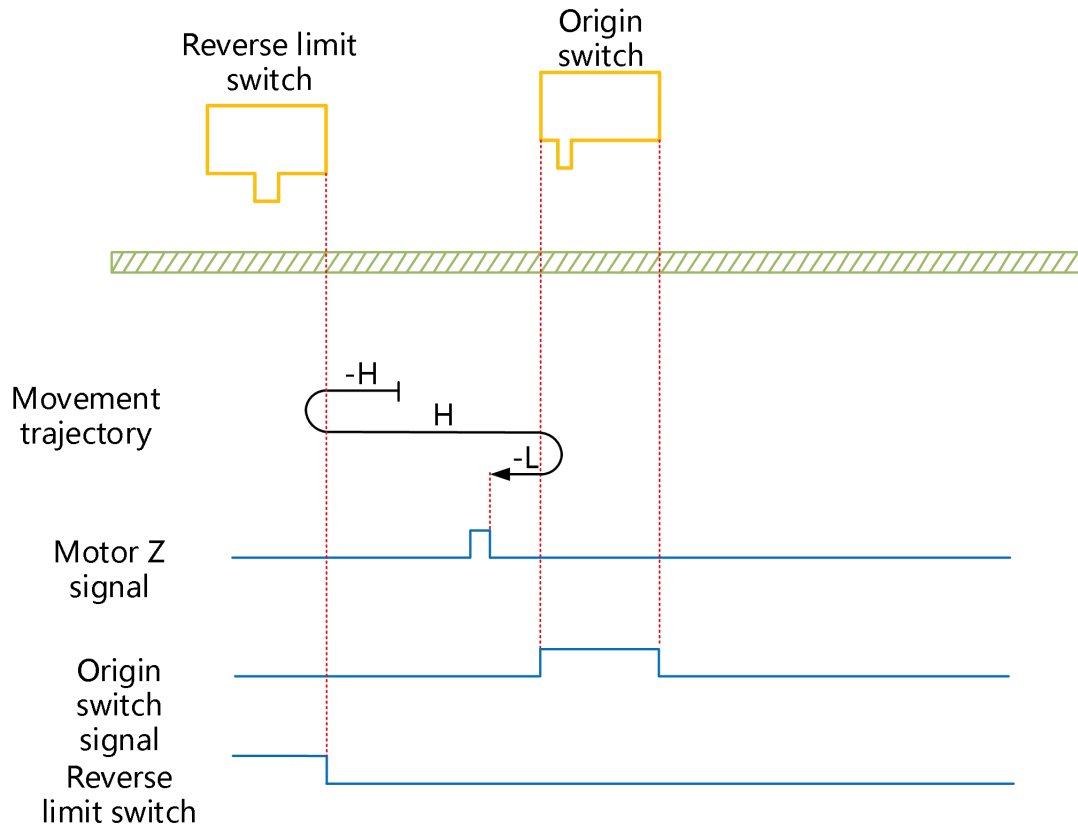
Deceleration point: Origin switch (HW)

## ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



HW=0 when starting homing, start homing in reverse direction at high speed; if limit switch is not encountered; slow down and run in reverse direction at low speed after encountering HW rising edge; after encountering HW falling edge, continue to run in reverse direction at low speed, and then stop at the first Z signal encountered;

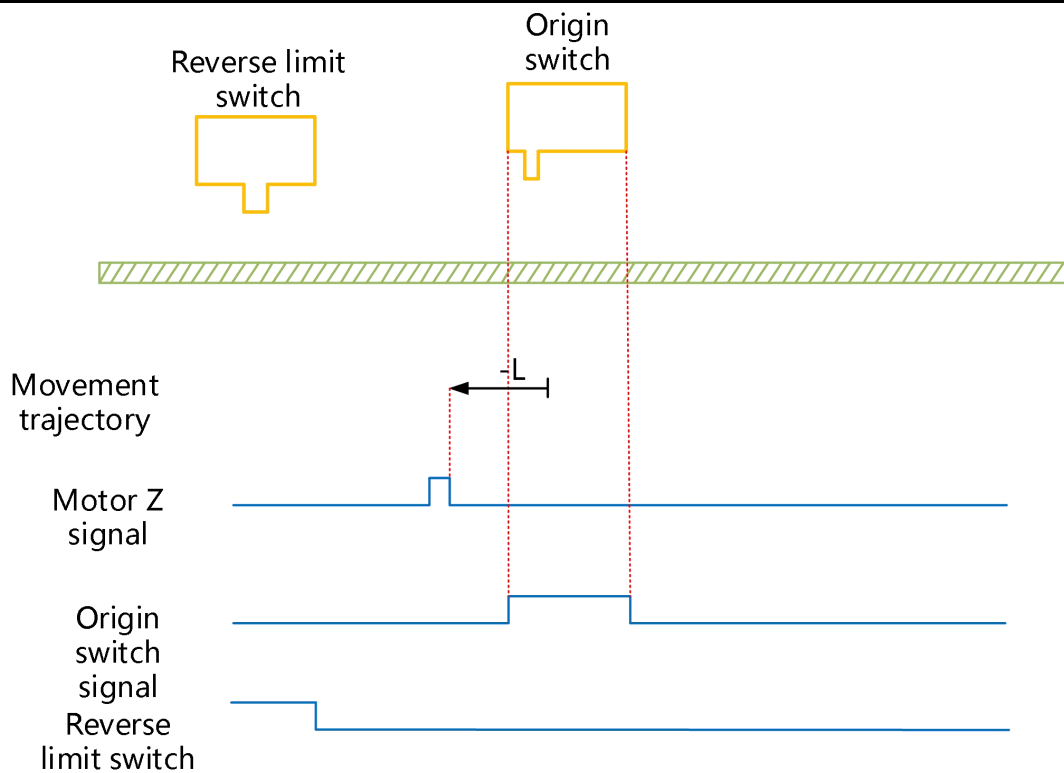
- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed; change the running direction automatically and run in forward direction at high speed when encountering limit switch; slow down and change the running direction when encountering HW rising edge, and stop at the first Z signal after encountering HW falling edge during running in reverse direction at low speed;

- ③ The deceleration point signal is valid when starting homing





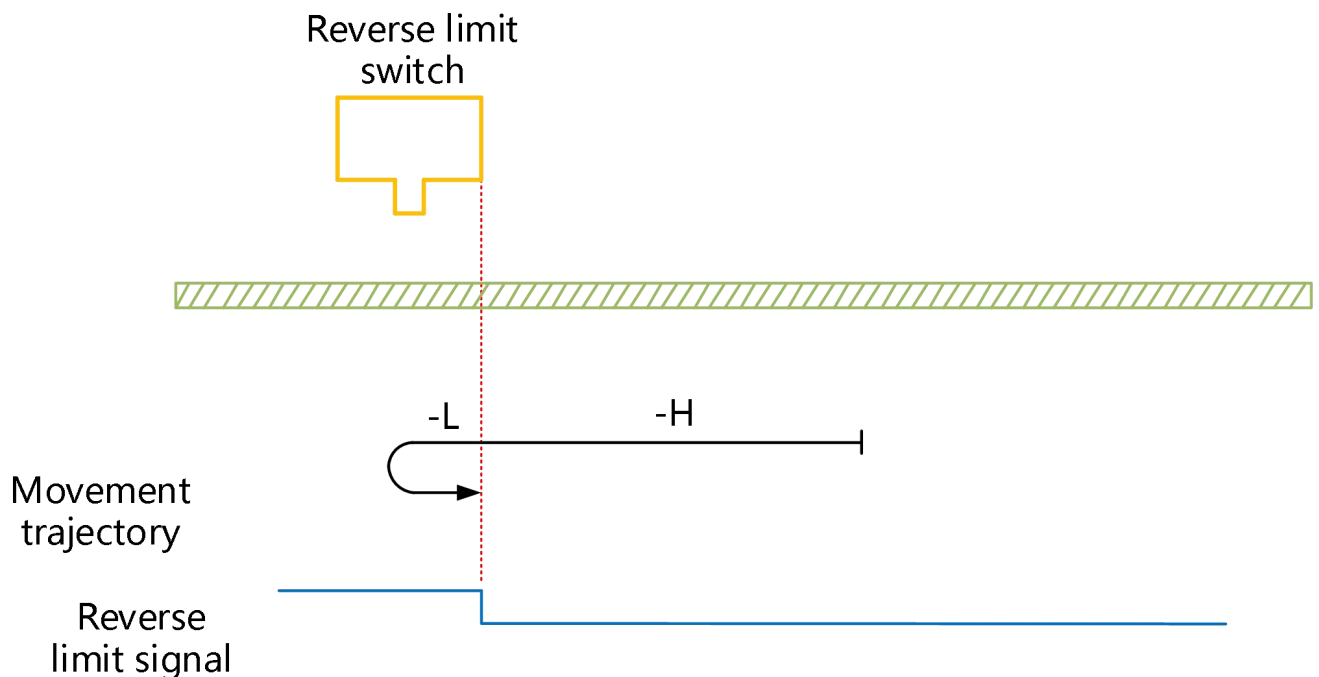
HW=1 when starting homing, start homing in reverse direction at low speed directly, and stop at the first Z signal after encountering the falling edge of HW;

#### (15) 6098H=17

Mechanical origin: reverse overtravel switch (NOT)

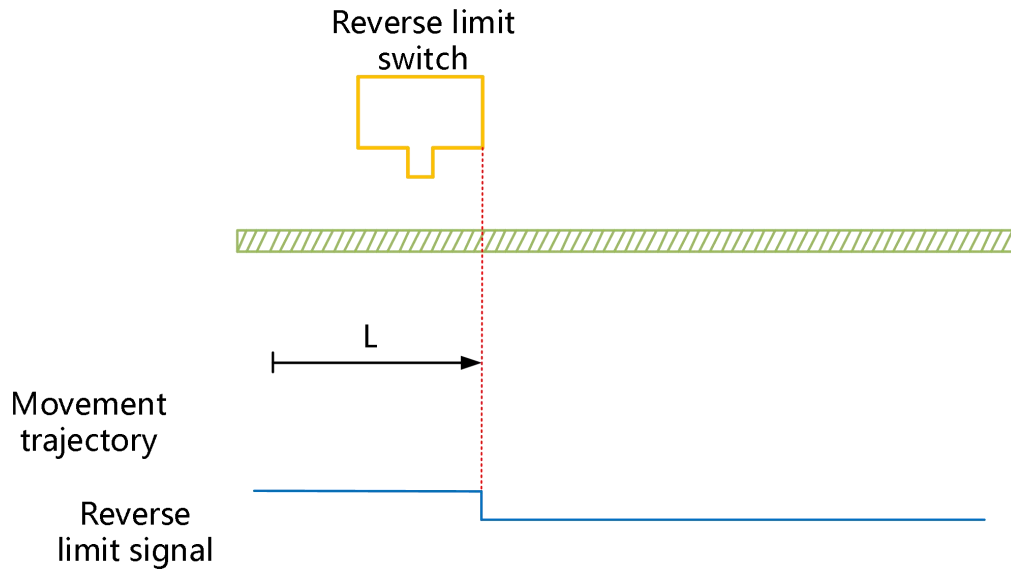
Deceleration point: Reverse overtravel switch (NOT)

① The deceleration point signal is invalid when starting homing



NOT=0 when starting homing, start homing in reverse direction at high speed, slow down and change the running direction after encountering the rising edge of NOT, and run in forward direction at low speed, and stop after encountering the falling edge of NOT;

- ② The deceleration point signal is valid when starting homing



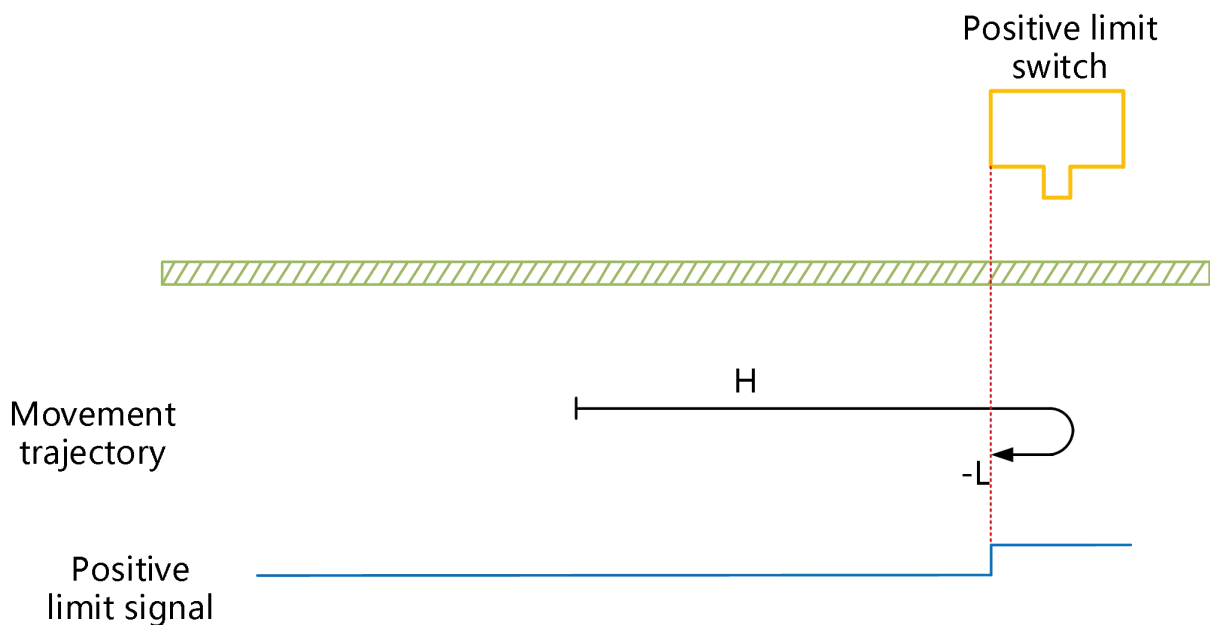
NOT = 1 when starting homing, start homing in forward direction at low speed directly, and stop after encountering the falling edge of NOT.

**(16) 6098H=18**

Mechanical origin: Forward overtravel switch (POT)

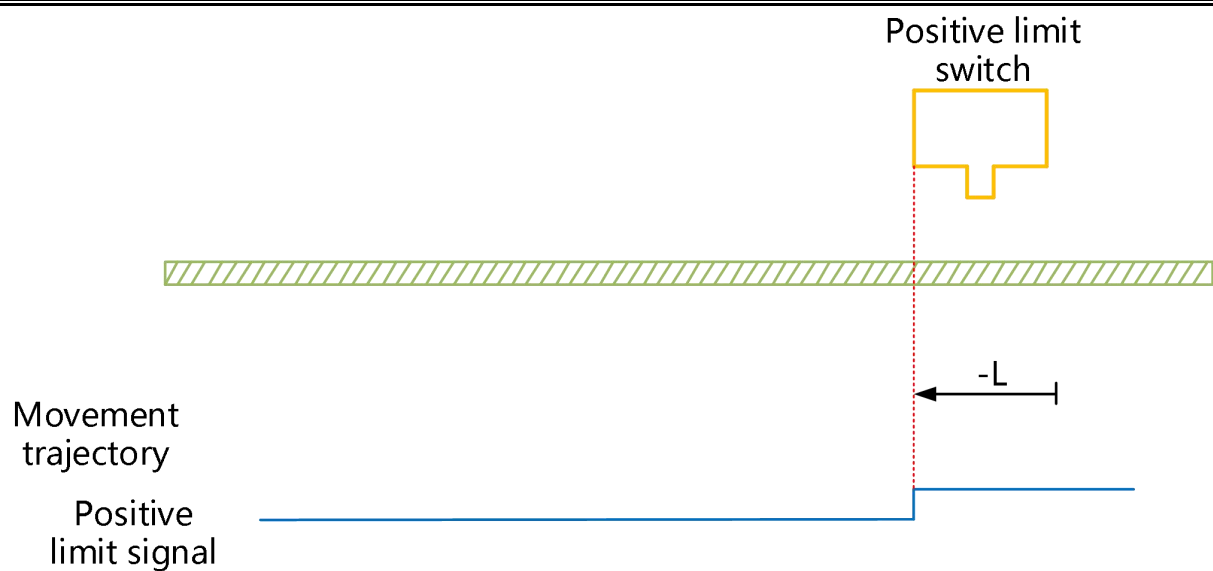
Deceleration point: Forward overtravel switch (POT)

- ① The deceleration point signal is invalid when starting homing



POT=0 when starting homing, start homing in forward direction at high speed, slow down and change the running direction after encountering the rising edge of POT, run in reverse direction at low speed, and stop after encountering the falling edge of POT;

- ② The deceleration point signal is valid when starting homing



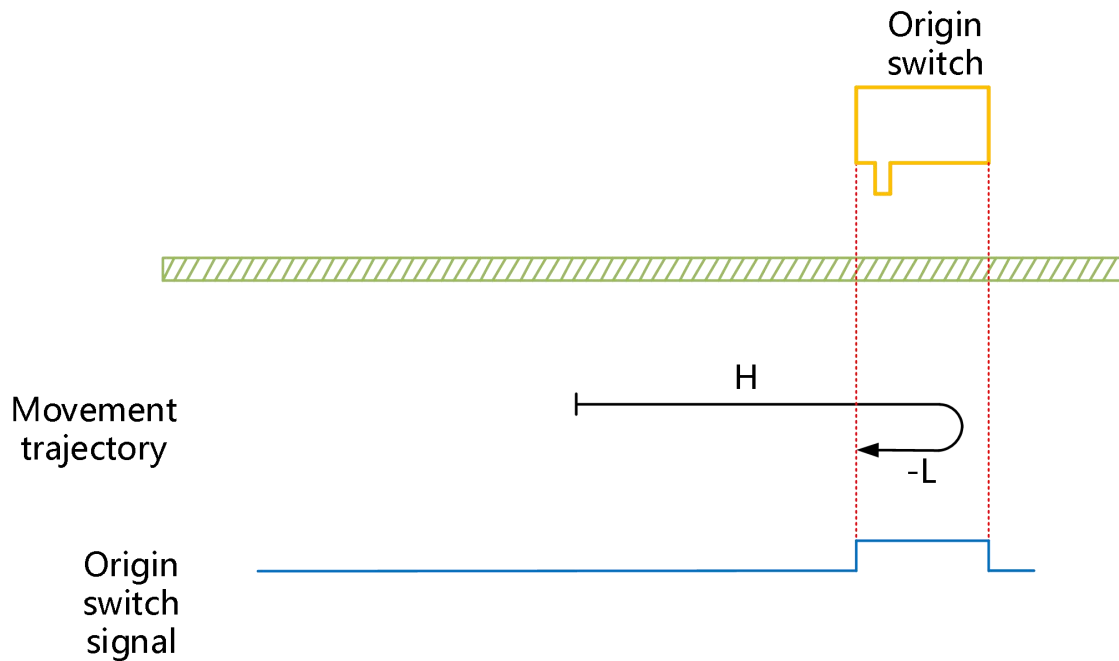
POT=1 when starting homing, start homing in reverse direction at low speed directly, and stop when encountering POT falling edge;

**(17) 6098H=19**

Mechanical Origin: Origin Switch (HW)

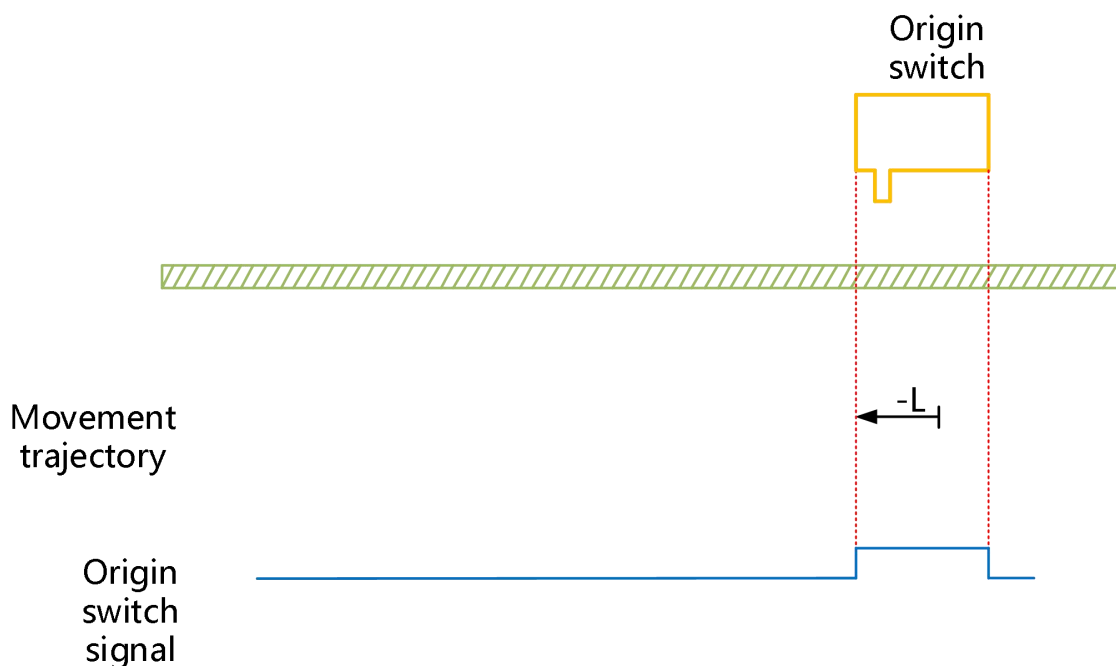
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing in forward direction at high speed, slow down and change the running direction after encountering the rising edge of HW, and run in reverse direction at low speed, and stop when encountering the falling edge of HW;

- ② The deceleration point signal is valid when starting homing



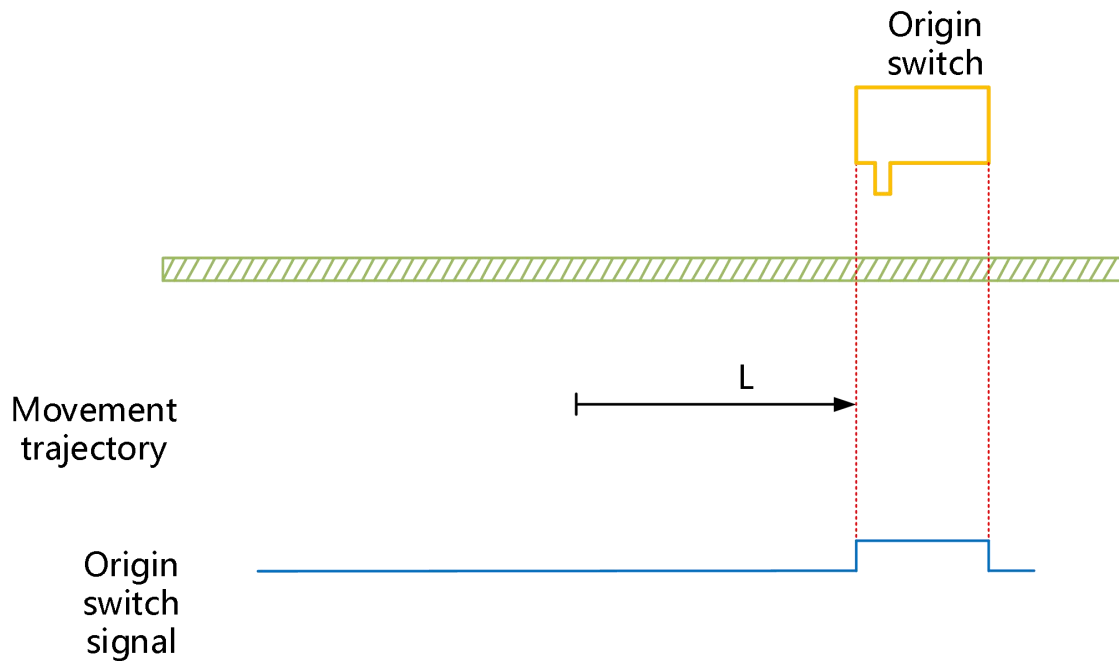
HW=1 when starting homing, start homing in reverse direction at low speed directly, and stop when encountering HW falling edge;

**(18) 6098H=20**

Mechanical Origin: Origin Switch (HW)

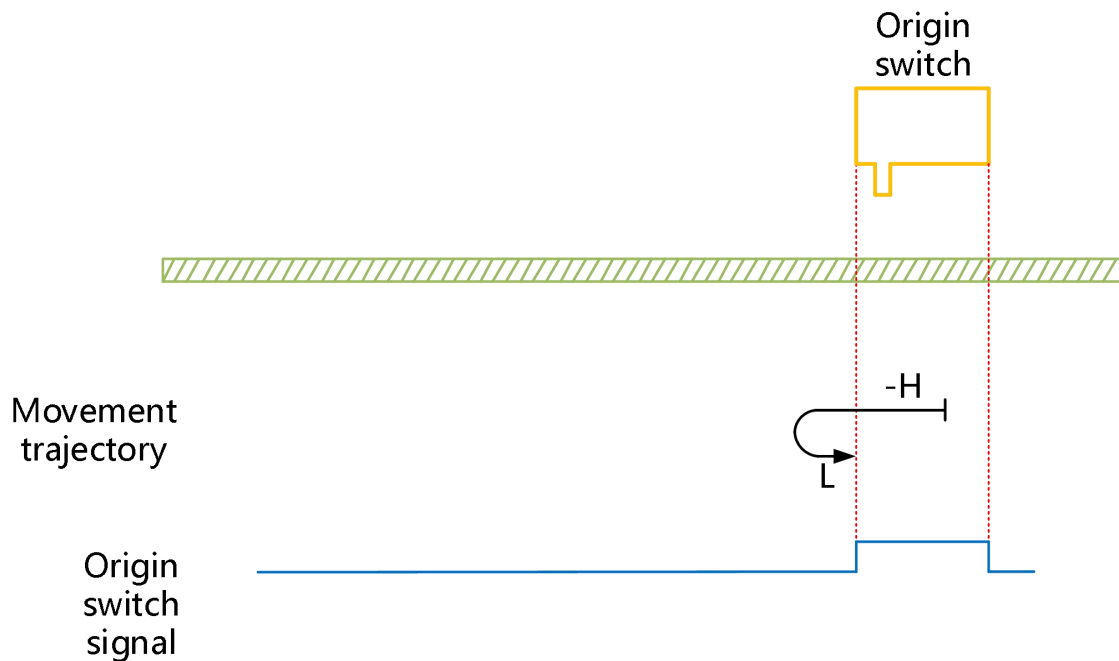
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing in forward direction at low speed directly, and stop after encountering the rising edge of HW;

- ② The deceleration point signal is valid when starting homing



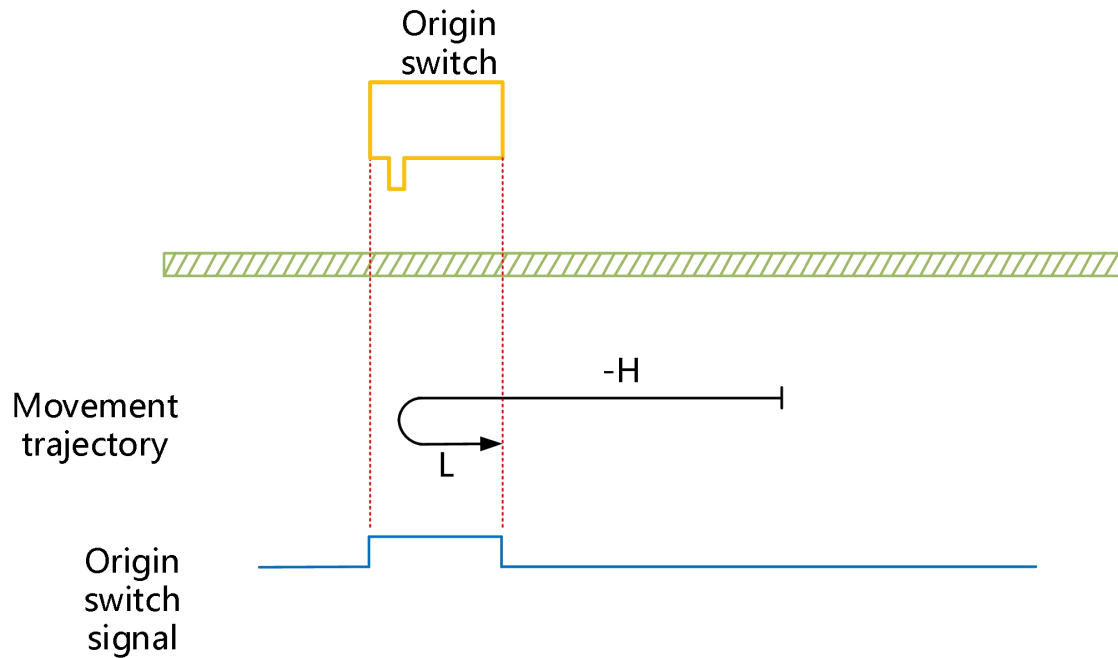
HW=1 when starting homing, start homing in reverse direction at high speed, slow down and change the running direction after encountering HW falling edge, run in forward direction at low speed, and stop when encountering HW rising edge;

**(19) 6098H=21**

Mechanical Origin: Origin Switch (HW)

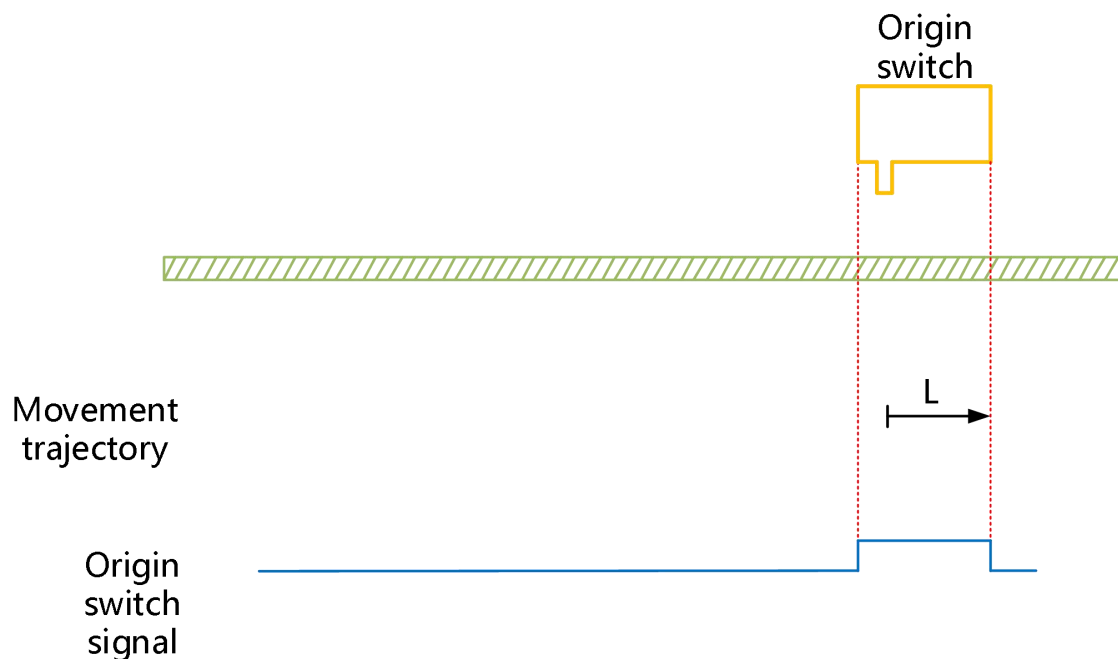
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing in reverse direction at high speed, slow down and change the running direction after encountering the rising edge of HW, run in forward direction at low speed, and stop when encountering the falling edge of HW;

- ② The deceleration point signal is valid when starting homing



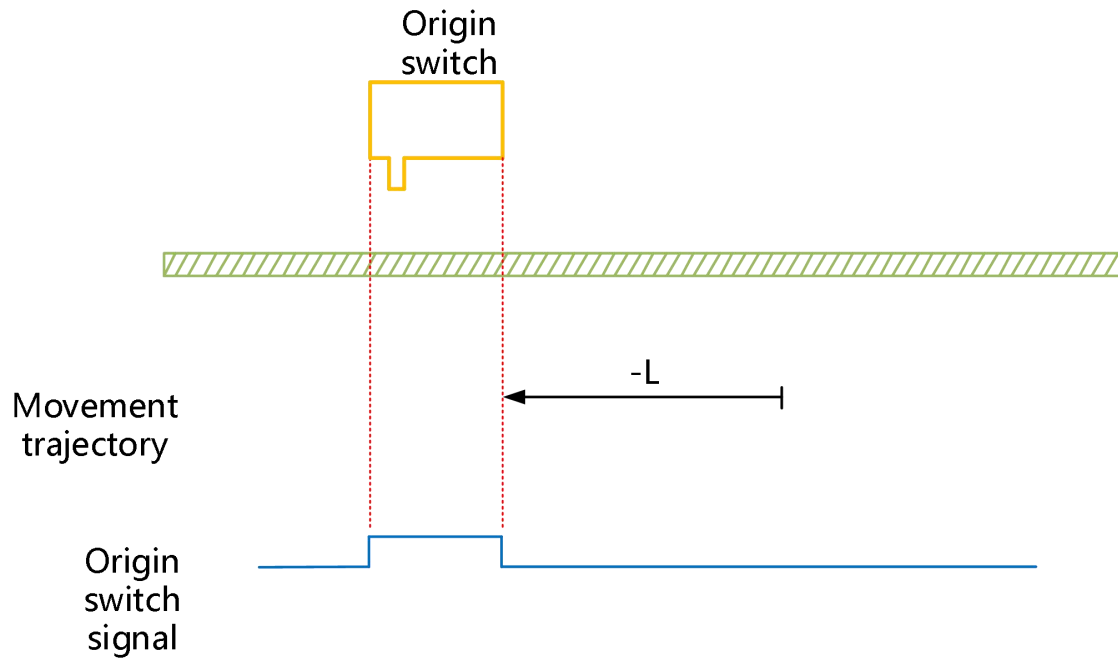
HW=1 when starting homing, start homing in forward direction at low speed directly, and stop after encountering the falling edge of HW;

**(20)6098H=22**

Mechanical Origin: Origin Switch (HW)

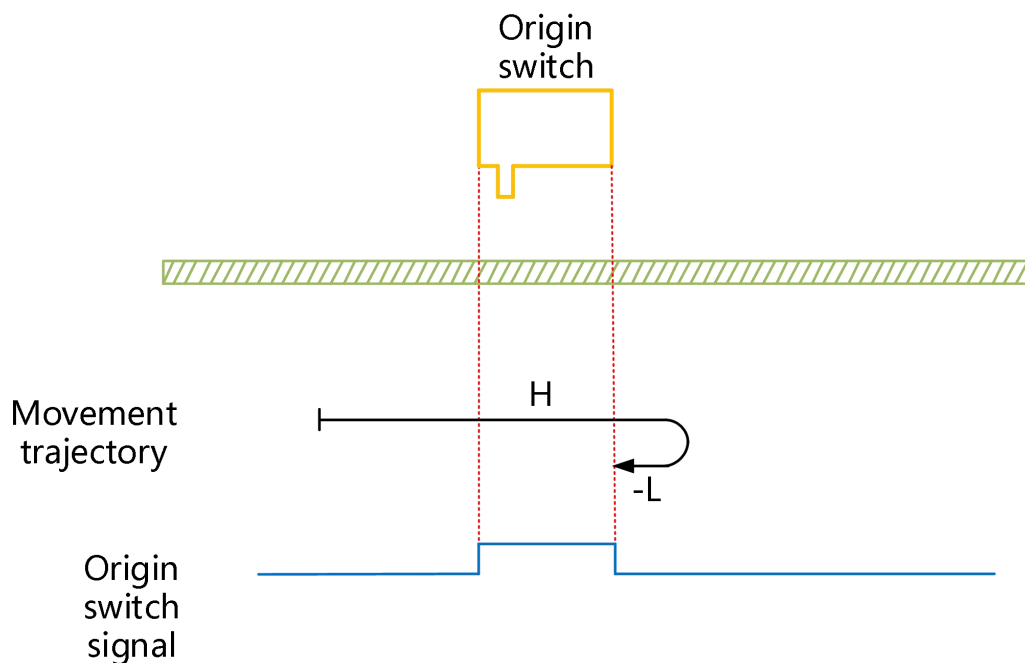
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing



HW=0 when starting homing, start homing in reverse direction at low speed directly and stop when encountering HW rising edge;

- ② The deceleration point signal is valid when starting homing



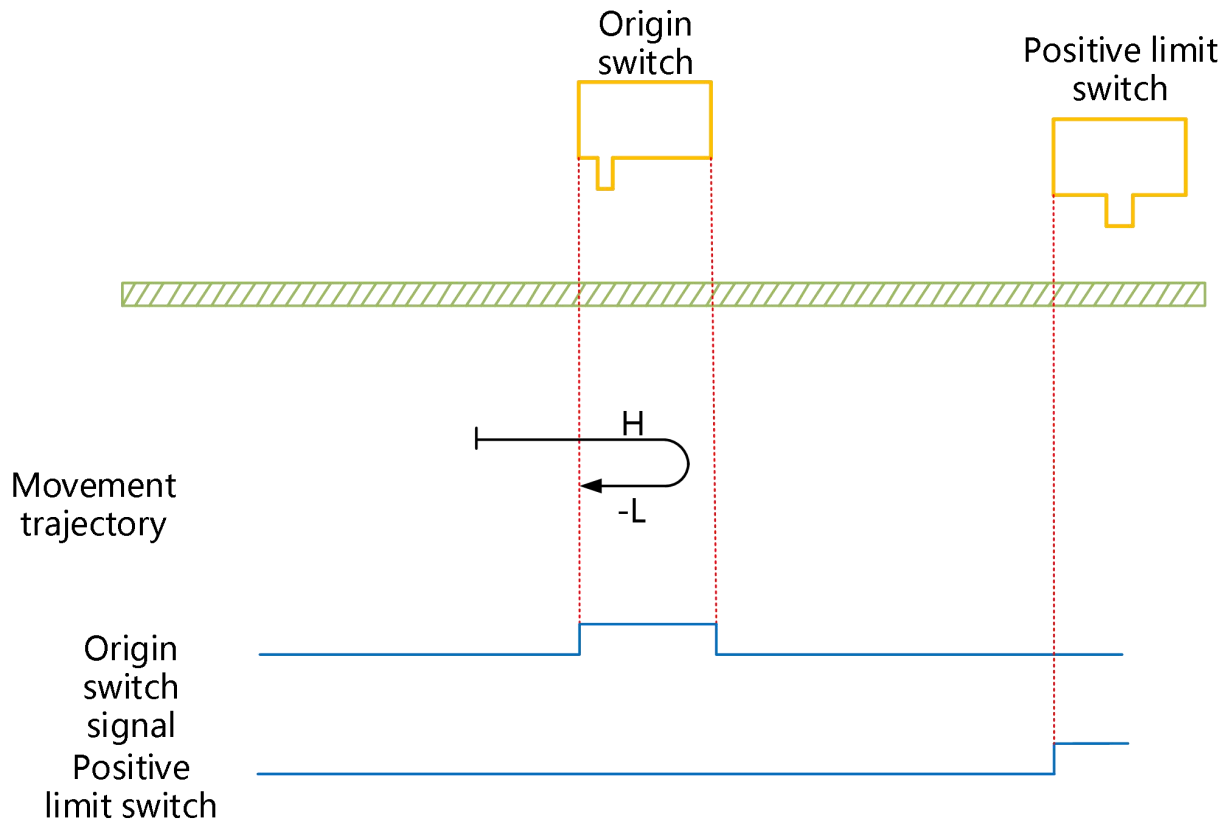
HW=1 when starting homing, start homing in forward direction at high speed, slow down and change the running direction after encountering HW falling edge, run in reverse direction at low speed, and stop when encountering HW rising edge;

**(21)6098H=23**

Mechanical Origin: Origin Switch (HW)

Deceleration point: Origin switch (HW)

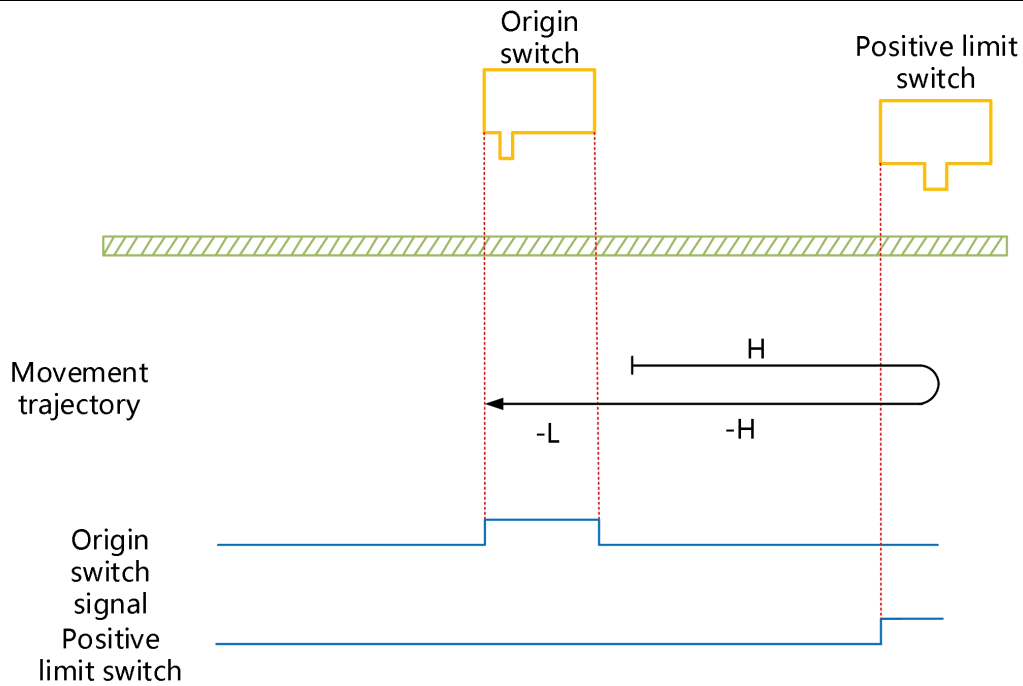
- ① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



HW=0 when starting homing, start homing in forward direction at high speed; limit switch is not encountered; slow down and change the running direction after encountering HW rising edge; run in reverse direction at low speed and stop when encountering HW falling edge;

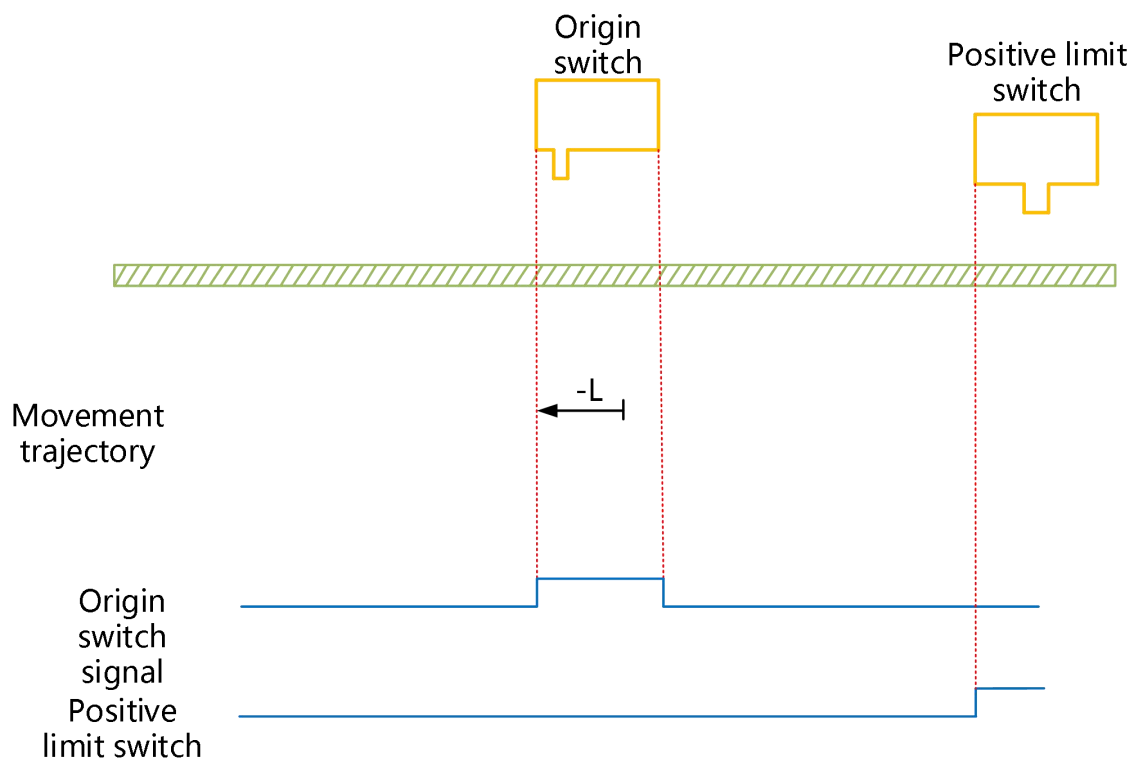
- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered





HW=0 when starting homing, start homing in forward direction at high speed, change the running direction automatically when encountering limit switch, run in reverse direction at high speed and slow down when encountering HW rising edge, continue to run in reverse direction at low speed, and stop when encountering HW falling edge;

③ The deceleration point signal is valid when starting homing



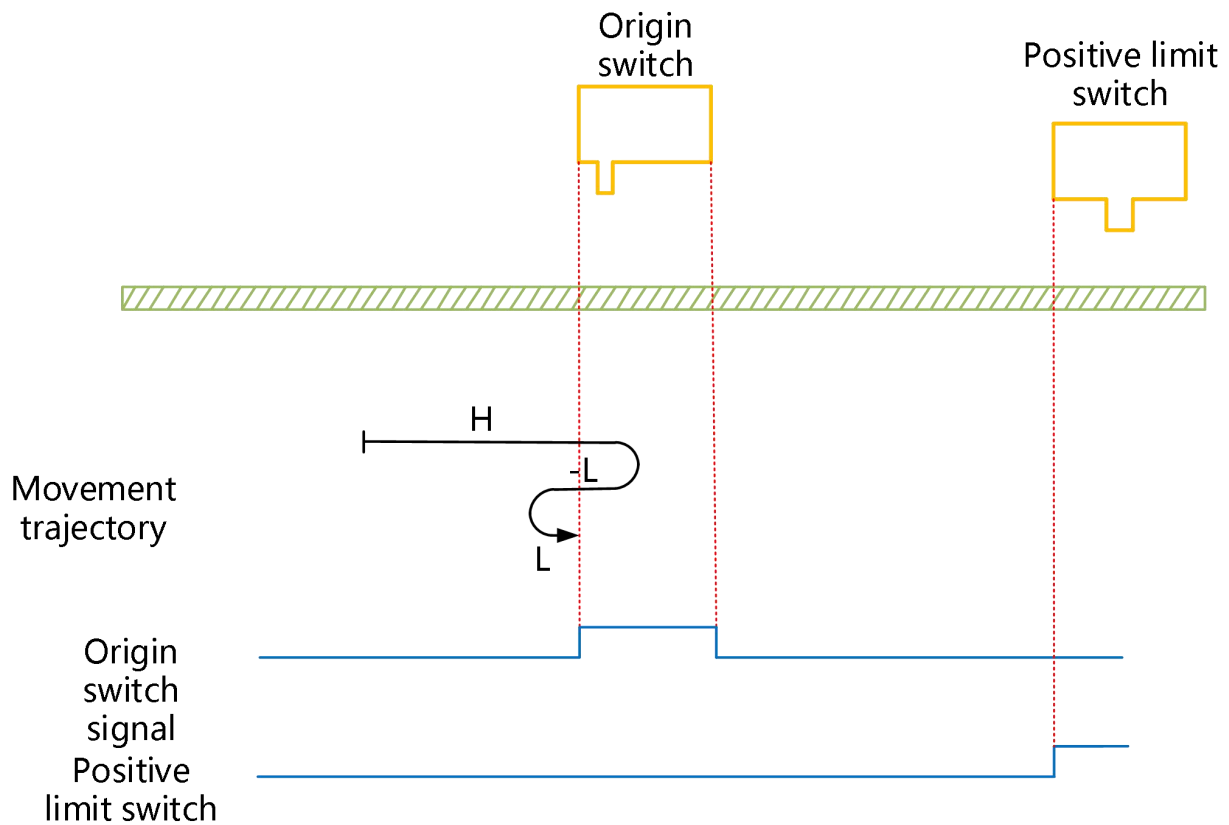
If HW=1 when starting to return to zero, the motor start homing at a low speed in the reverse direction and stop when encountering the falling edge of HW.

**(22)6098H=24**

Mechanical Origin: Origin Switch (HW)

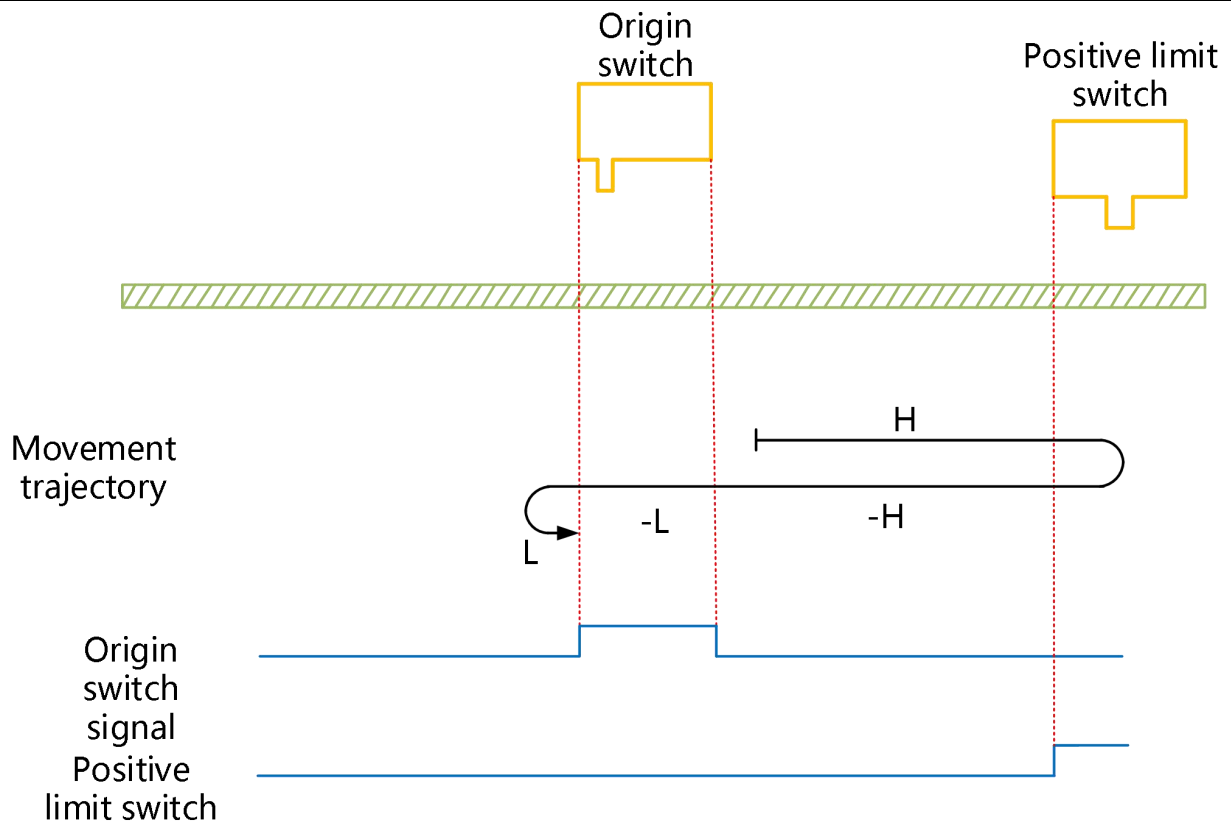
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



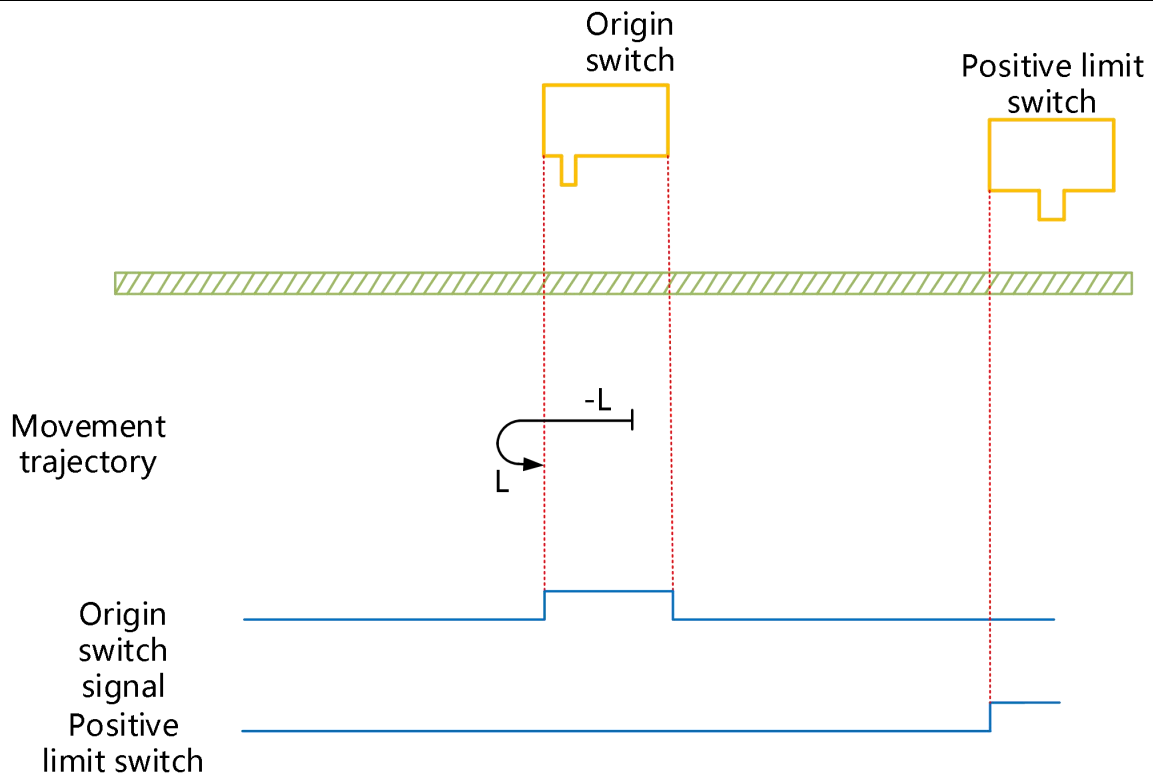
HW=0 when starting homing, start homing in forward direction at high speed; limit switch is not encountered; slow down and change the running direction after encountering HW rising edge, then run in reverse direction at low speed, and change the running direction when encountering HW falling edge, run in forward direction at low speed and stop when encountering HW rising edge;

- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing start homing in forward direction at high speed; change the running direction automatically when encountering limit switch, run in reverse direction at high speed and slow down and run in reverse direction at low speed when encountering HW rising edge; change the running direction and run in forward direction at low speed when encountering HW falling edge, and stop when encountering HW rising edge;

- ③ The deceleration point signal is valid when starting homing



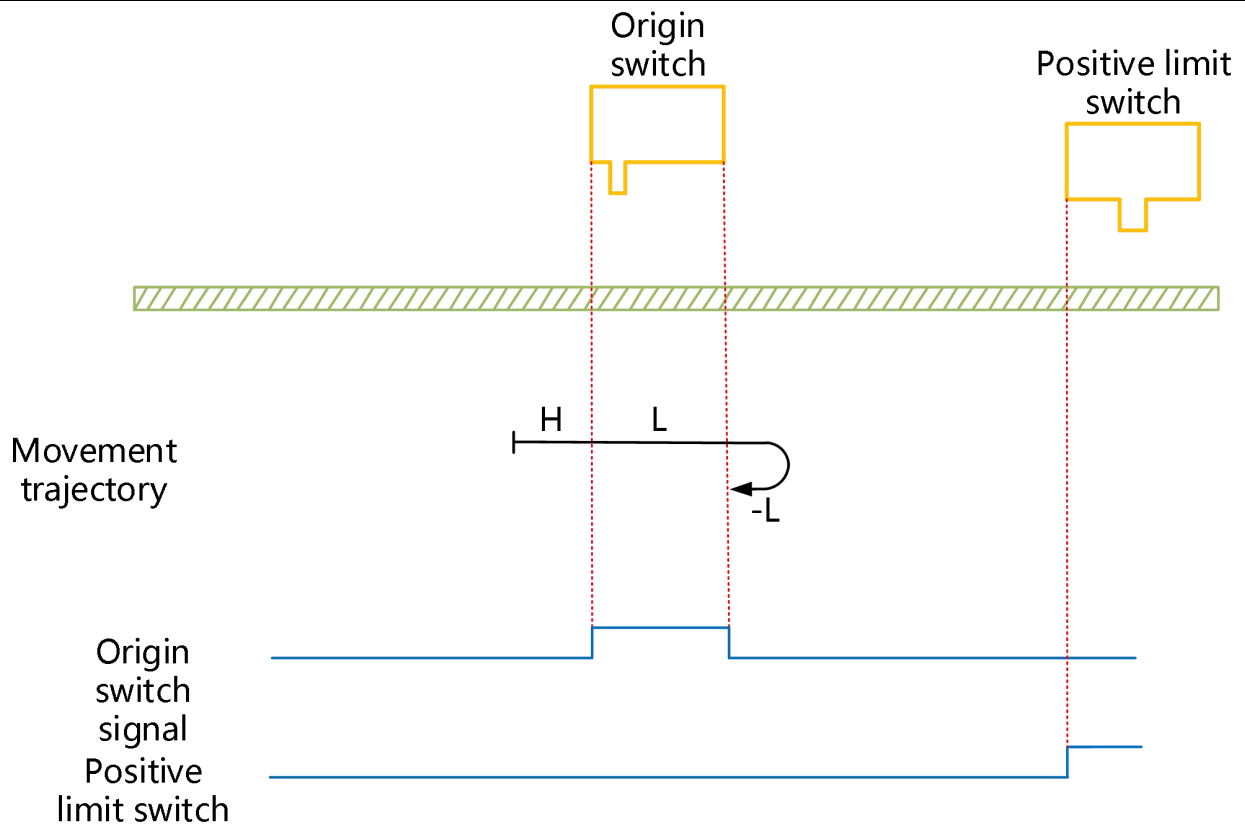
HW=1 when starting homing, start homing in reverse direction at low speed directly; after encountering the falling edge of HW, change the running direction and run in forward direction at low speed, and stop when encountering the rising edge of HW;

**(23)6098H=25**

Mechanical Origin: Origin Switch (HW)

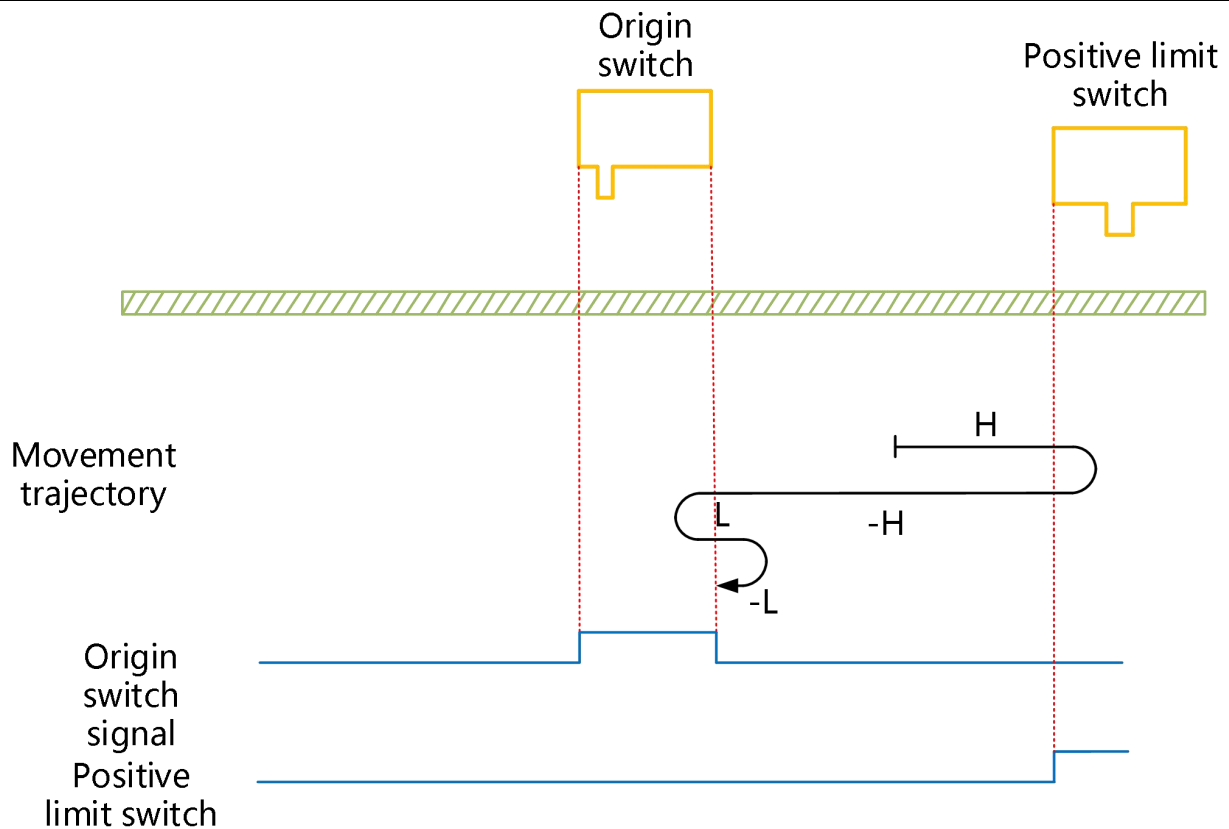
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



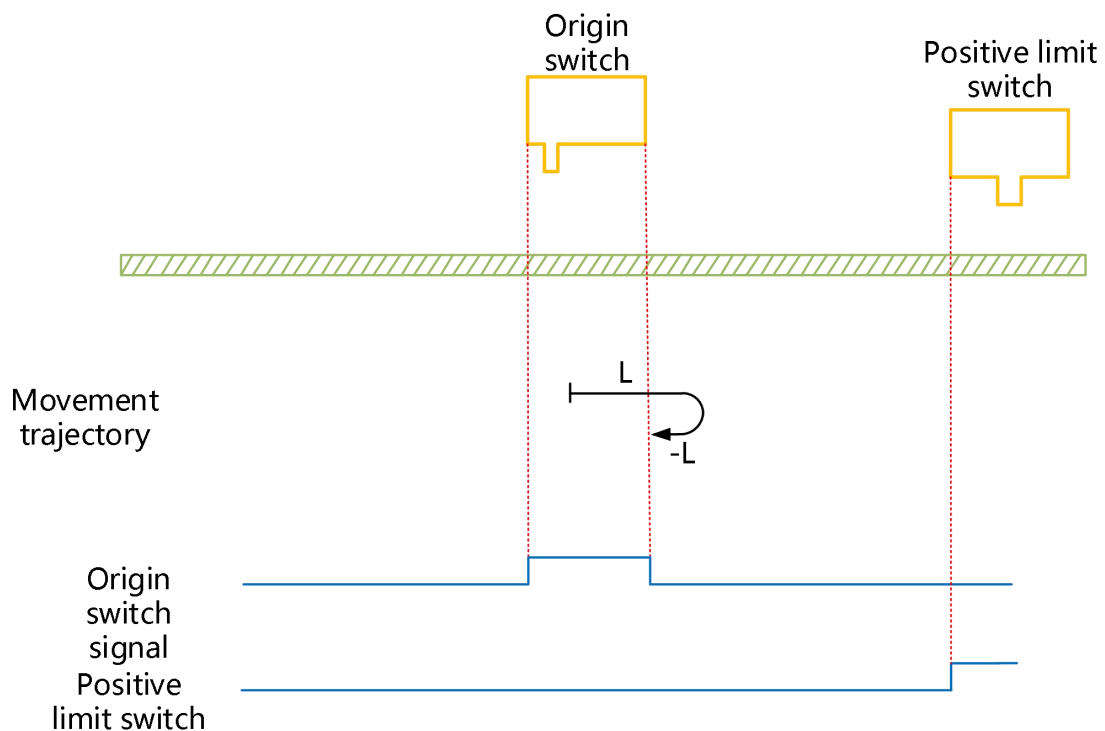
HW=0 when starting homing start homing in forward direction at high speed; limit switch is not encountered; slow down after encountering HW rising edge, run in forward direction at low speed, change the running direction and run in reverse direction at low speed after encountering HW falling edge, and stop when encountering HW rising edge;

- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered.



HW=0 when starting homing, start homing in forward direction at high speed, change the running direction automatically and run in reverse direction at high speed when encountering limit switch; slow down and change the running direction after encountering HW rising edge to resume forward operation; run in forward direction at low speed and change the running direction after encountering HW falling edge; run in reverse direction at low speed and stop when encountering HW rising edge;

③ The deceleration point signal is valid when starting homing



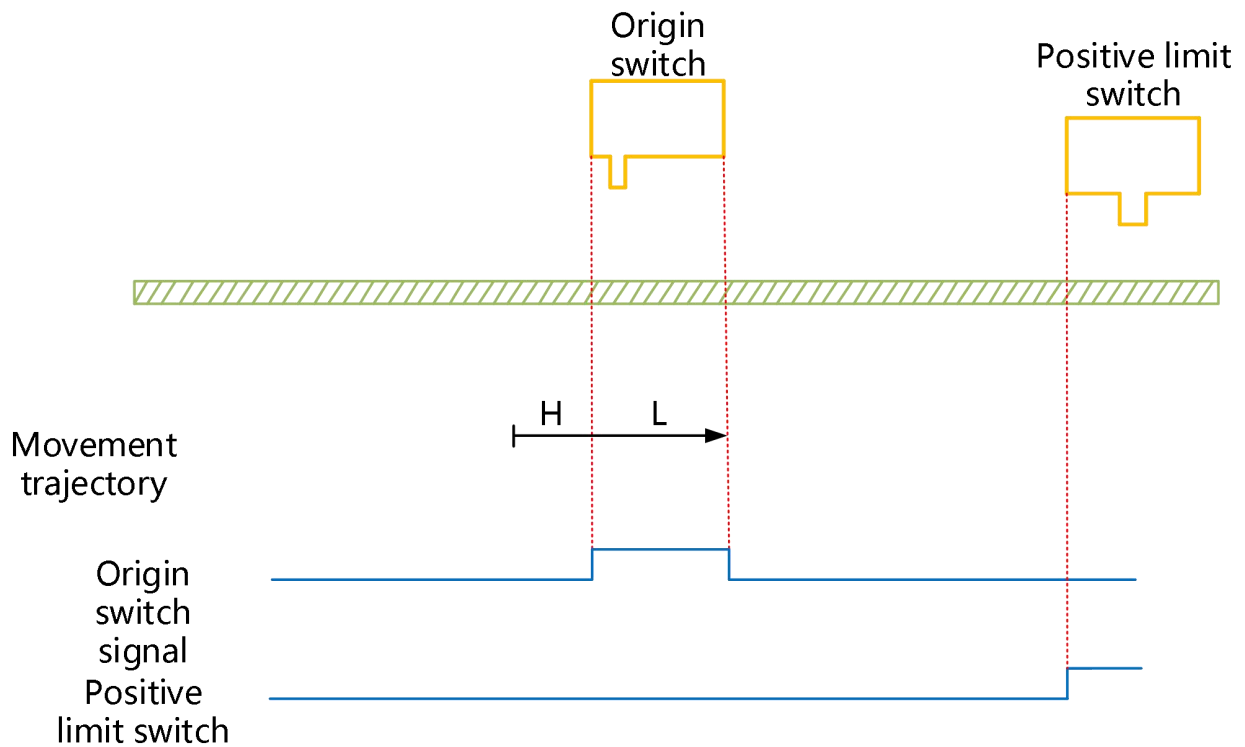
HW=1 when starting homing, when, start homing in the forward direction at low speed directly. After encountering the falling edge of HW, change the running direction and run in verse direction at low speed and stop when encountering the rising edge of HW.

**(24) 6098H=26**

Mechanical Origin: Origin Switch (HW)

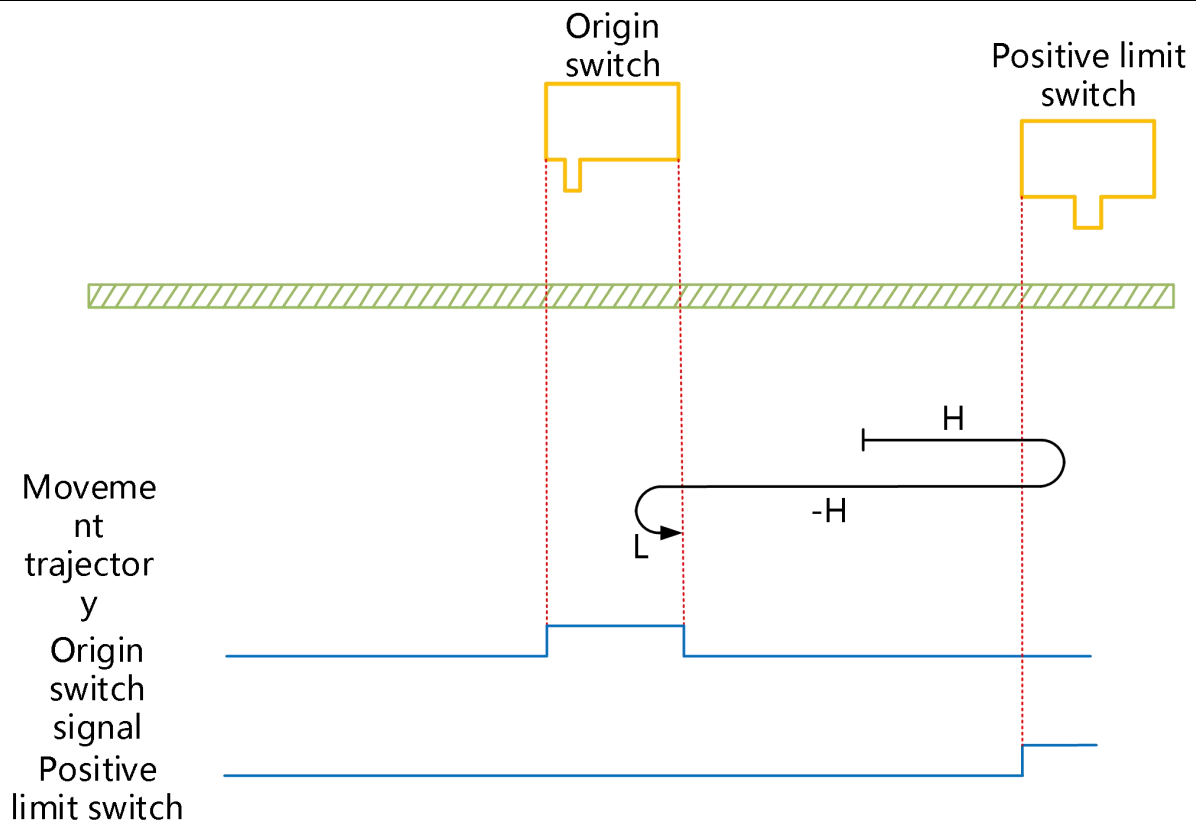
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



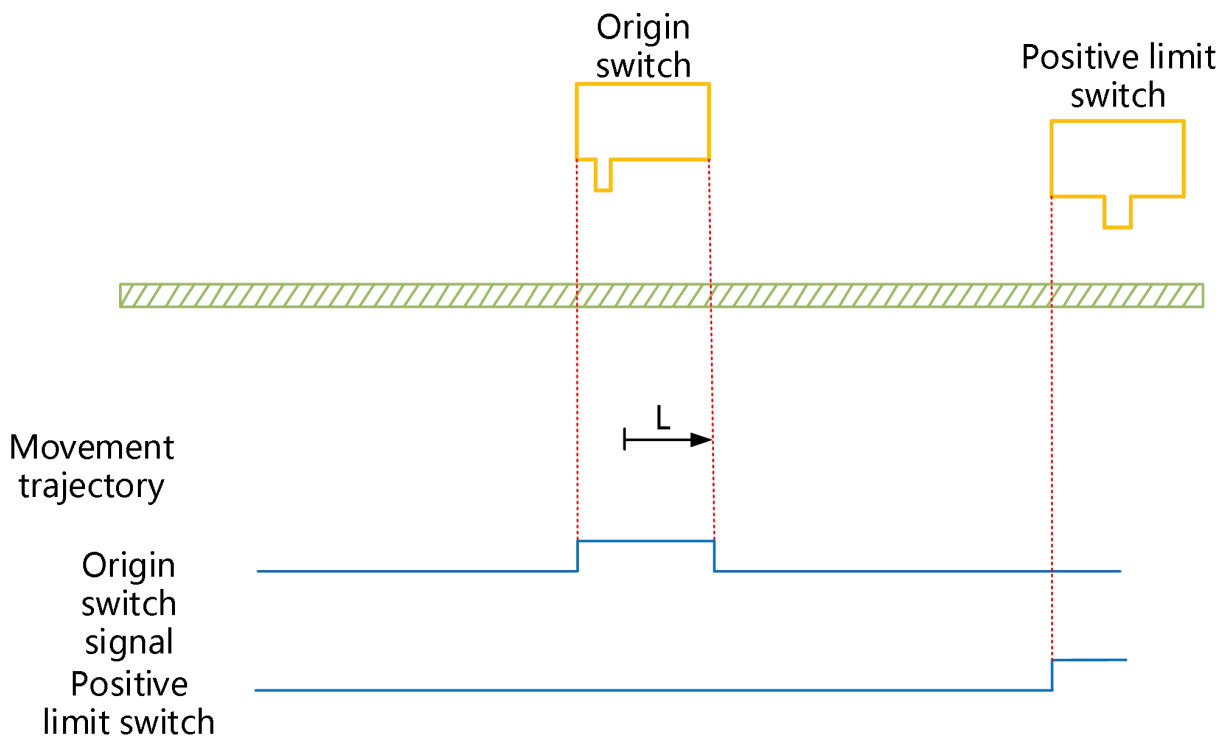
HW=0 when starting homing, start homing in forward direction at high speed; limit switch is not encountered; slow down after encountering HW rising edge, run in forward direction at low speed, and stop when encountering HW falling edge;

- ② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



HW=0 when starting homing, start homing in forward direction at high speed, change the running direction automatically and run in reverse direction at high speed when encountering limit switch; slow down and change the running direction when encountering HW rising edge to resume forward operation, run in forward direction at low speed and stop when encountering HW falling edge;

③ The deceleration point signal is valid when starting homing



HW=1 when starting homing, start homing in forward direction at low speed directly, and stop when encountering HW falling edge;

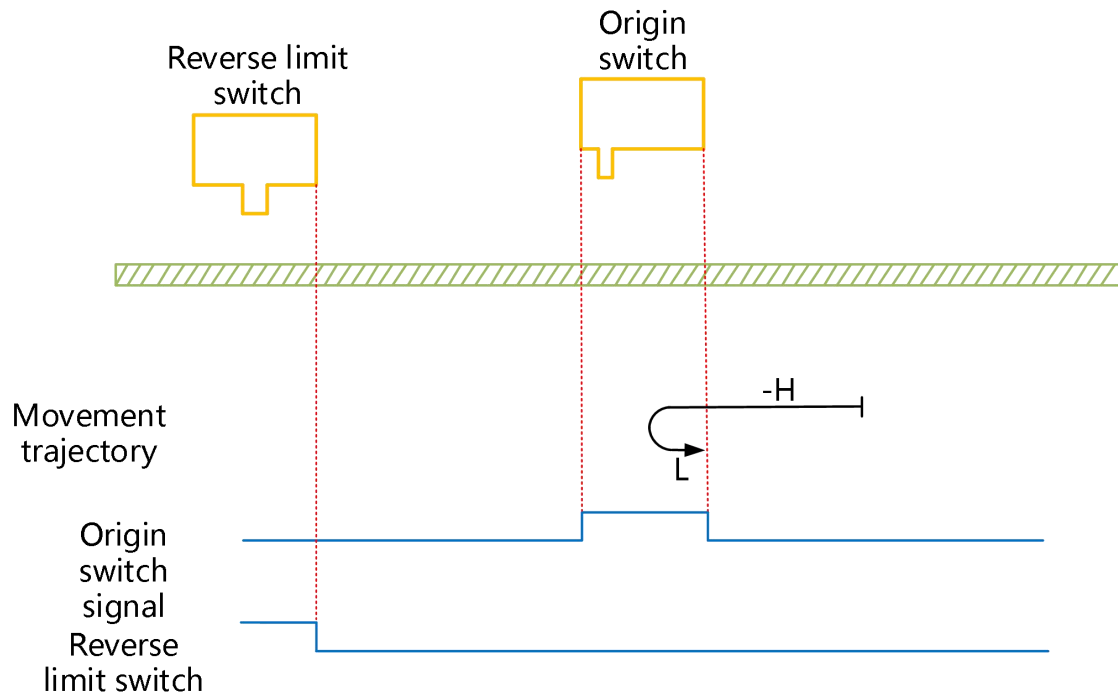


**(25) 6098H=27**

Mechanical Origin: Origin Switch (HW)

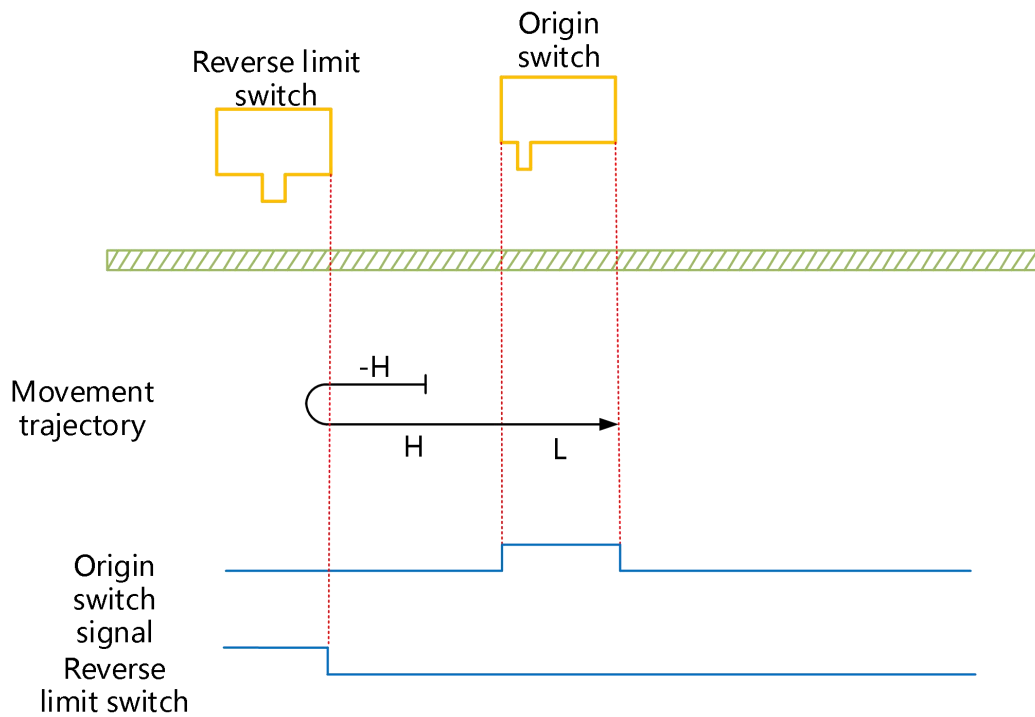
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



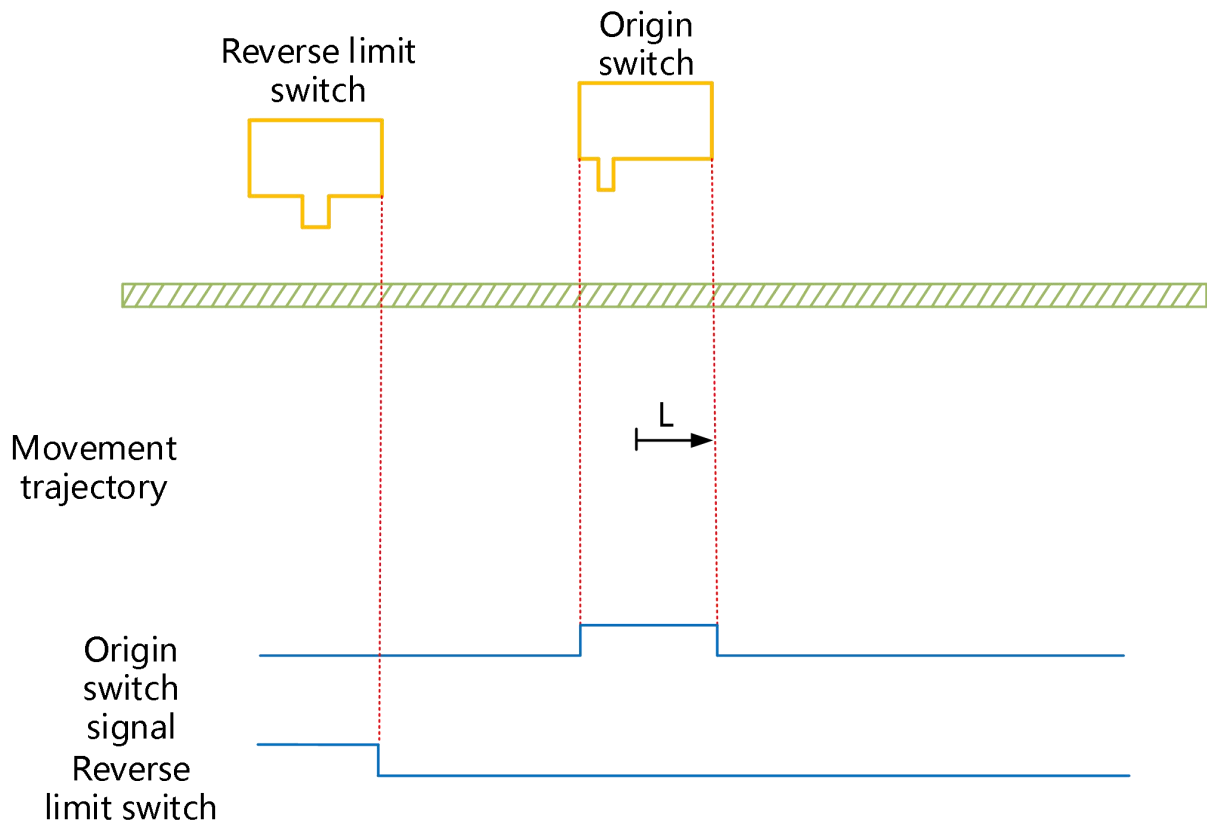
HW=0 when starting homing, start homing in reverse direction at high speed; limit switch is not encountered; slow down and change the running direction after encountering rising edge of HW, run in forward direction at low speed and stop when encountering HW falling edge;

- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically when encountering limit switch and run in forward direction at high speed; slow down when encountering HW rising edge, continue to run in forward direction at low speed and stop when encountering HW falling edge;

- ③ The deceleration point signal is valid when starting homing



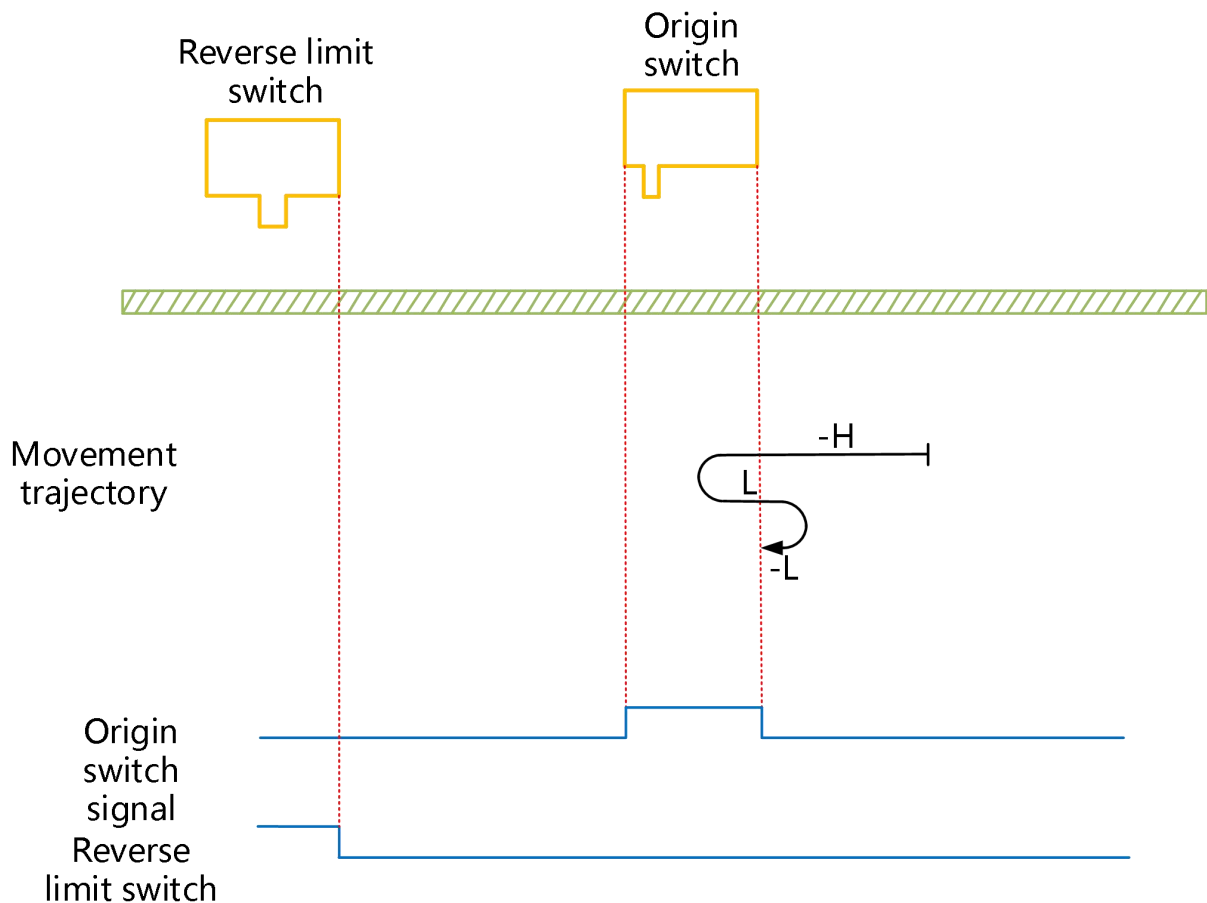
HW=1 when starting homing, start homing in forward direction at low speed directly, and stop when encountering HW falling edge;

**(26) 6098H=28**

Mechanical Origin: Origin Switch (HW)

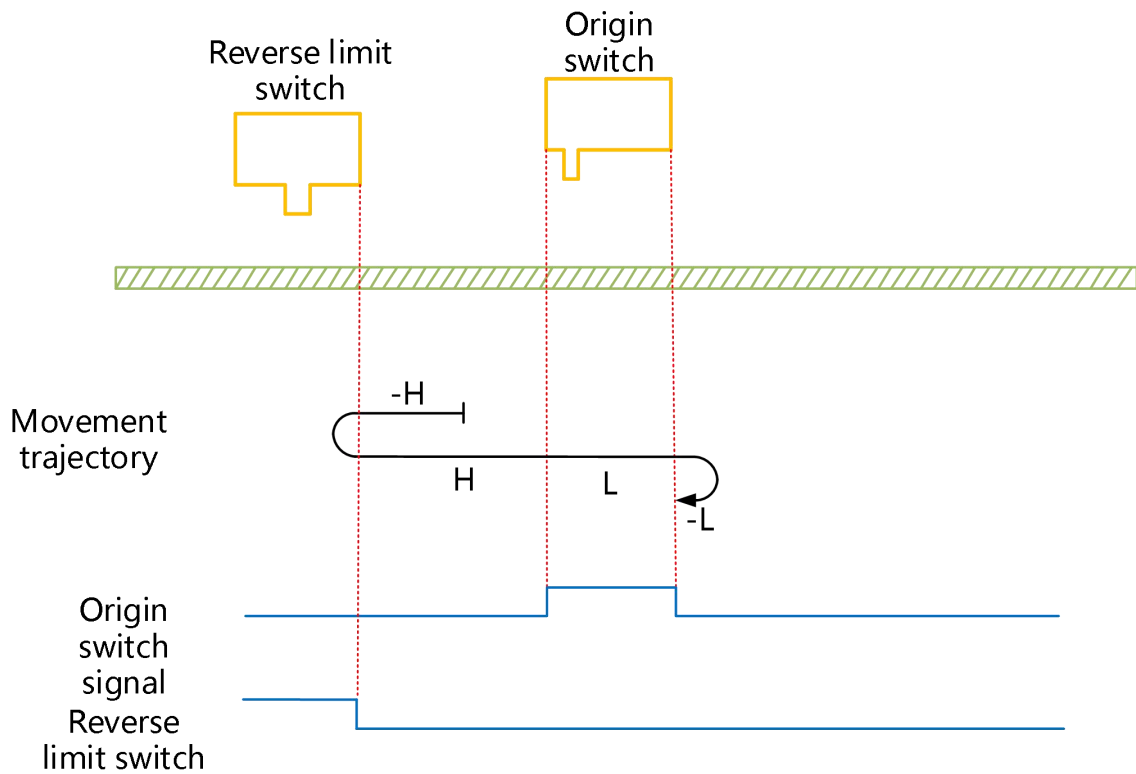
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



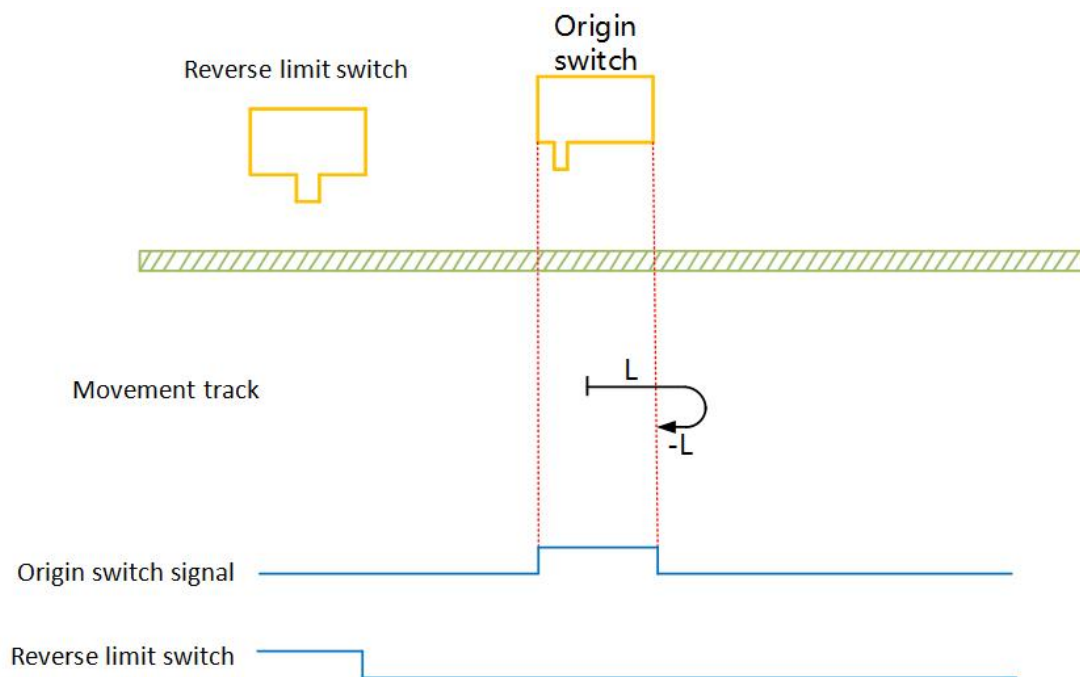
HW=0 when starting homing, start homing in reverse direction at high speed; limit switch is not encountered; slow down and change the running direction after encountering HW rising edge, run in forward direction at low speed; change the running direction after encountering HW falling edge, run in reverse direction at low speed and stop when encountering HW rising edge;

- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically when encountering limit switch and run in forward direction at high speed; slow down and run in forward direction at low speed when encountering HW rising edge; change the running direction and run in reverse direction at low speed when encountering HW falling edge, and stop when encountering HW rising edge;

③ The deceleration point signal is valid when starting homing



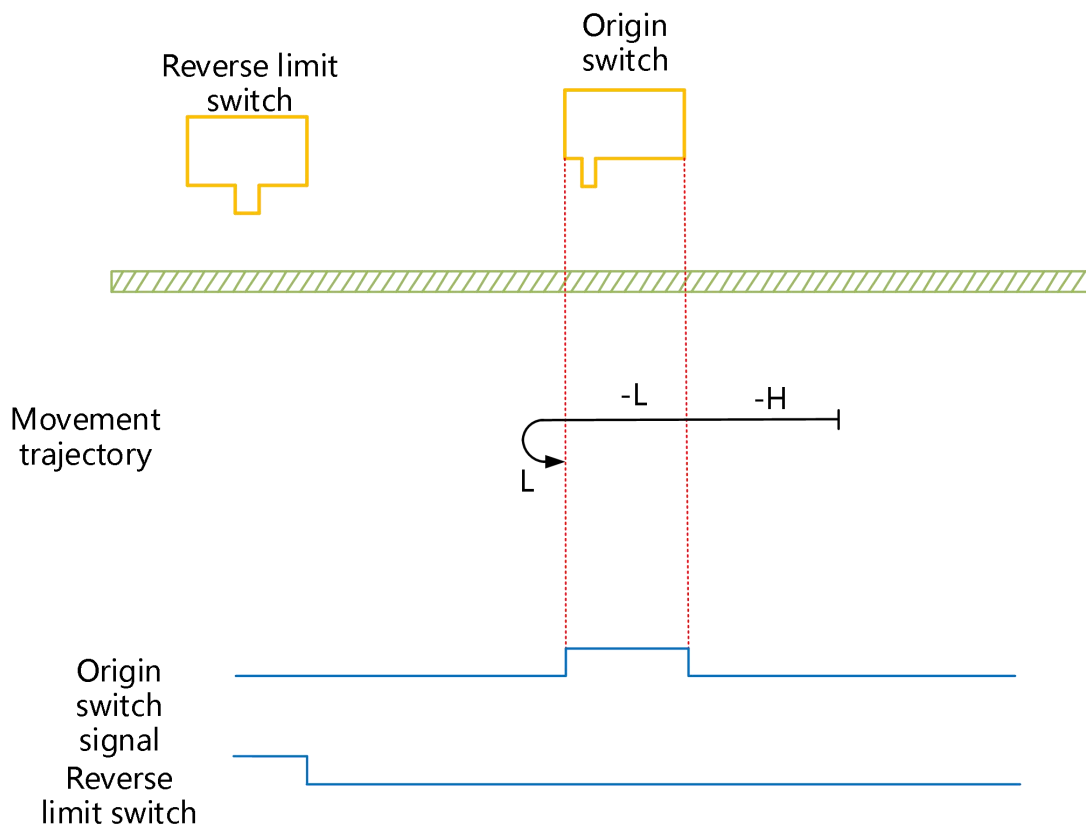
HW=1 when starting homing, start homing in forward direction at low speed directly. After encountering the falling edge of HW, change the running direction and run in reverse direction at low speed and stop when encountering the rising edge of HW;

**(27) 6098H=29**

Mechanical Origin: Origin Switch (HW)

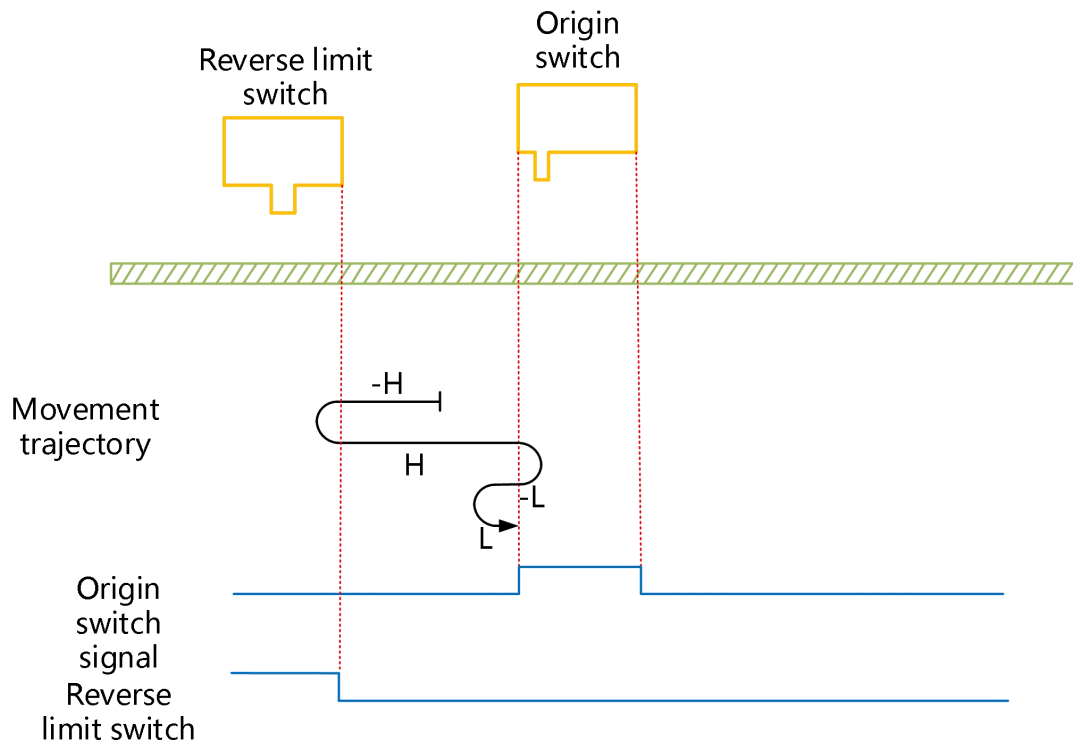
Deceleration point: Origin switch (HW)

- ① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered.



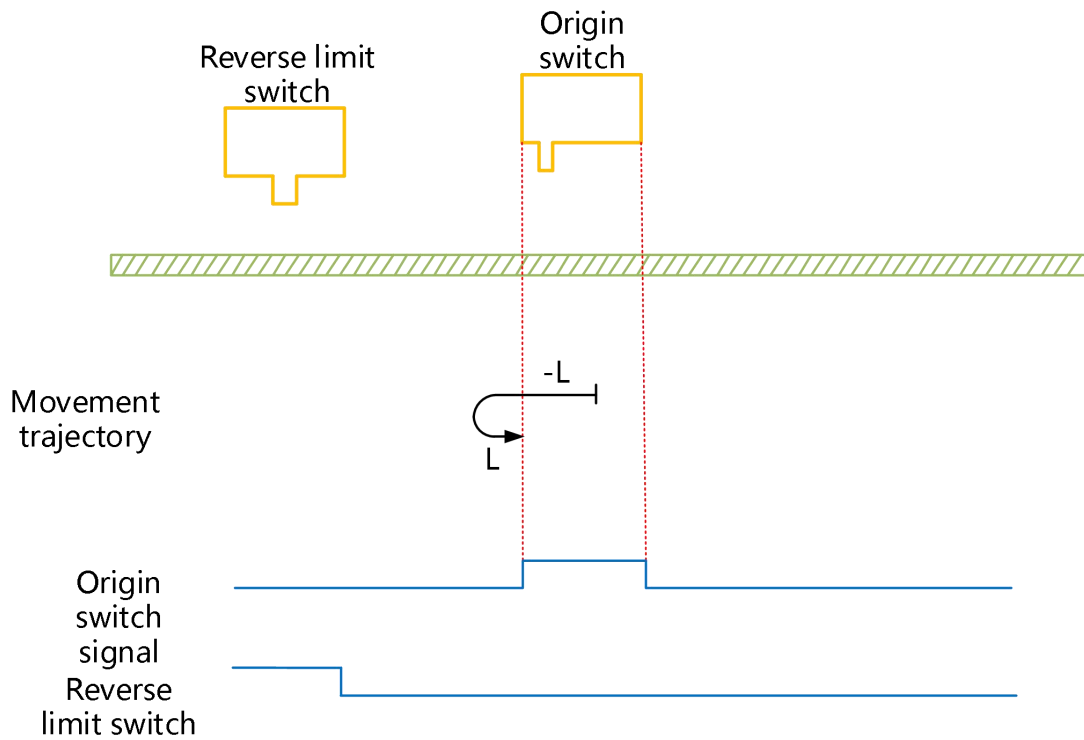
HW=0 when starting homing, start homing in reverse direction at high speed directly; limit switch is not encountered; slow down after encountering HW rising edge, run in reverse direction at low speed; change the running direction after encountering HW falling edge and run in forward direction at low speed and stop when encountering HW rising edge;

- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically when encountering limit switch and run in forward direction at high speed; slow down and change the running direction when encountering HW rising edge; run in reverse direction at low speed; change the running direction after encountering the falling edge of HW, then run in forward direction at low speed and stop when encountering HW rising edge;

- ③ The deceleration point signal is valid when starting homing



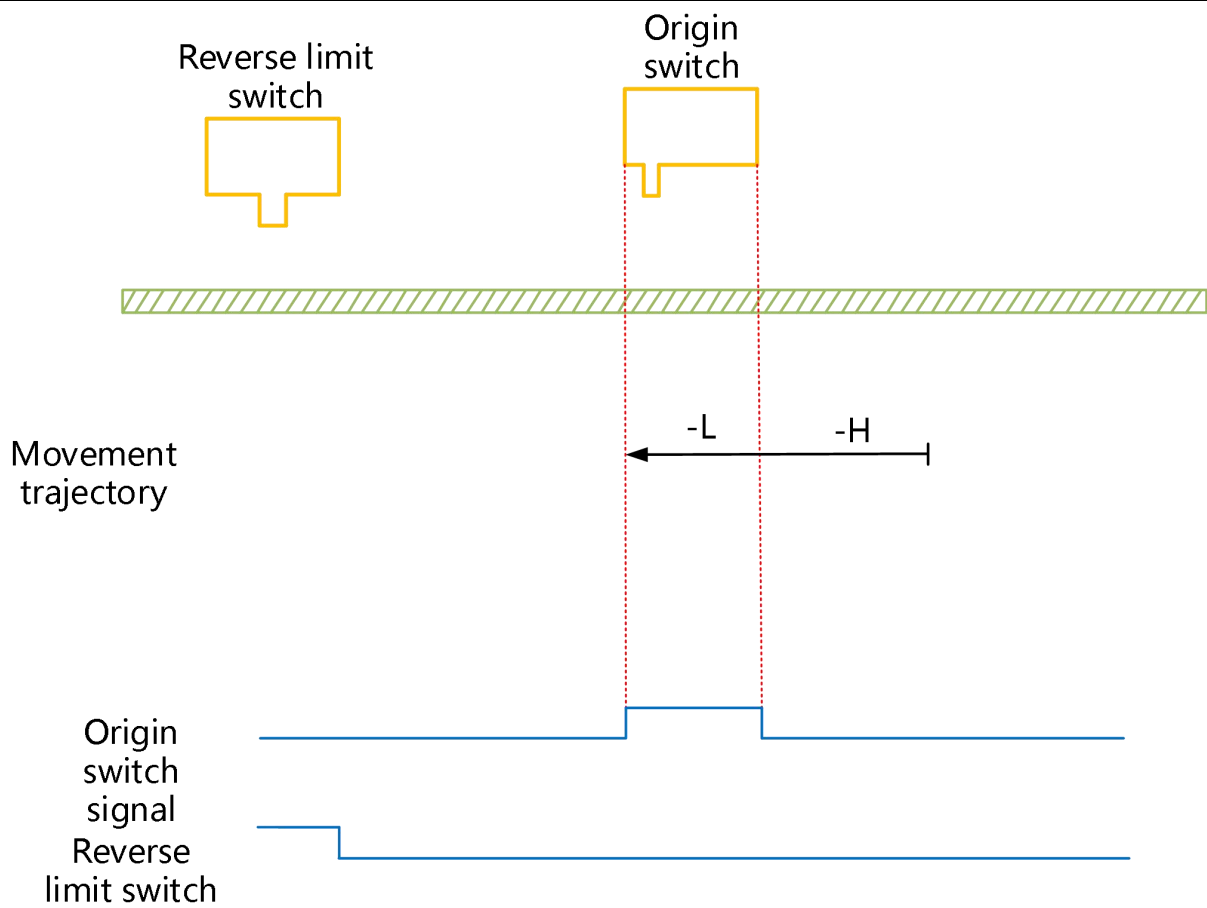
HW=1 when starting homing, start homing in reverse direction at low speed directly. After encountering the falling edge of HW, change the running direction; stop when encountering the rising edge of HW during running in forward direction at low speed.

**(28) 6098H=30**

Mechanical Origin: Origin Switch (HW)

Deceleration point: Origin switch (HW)

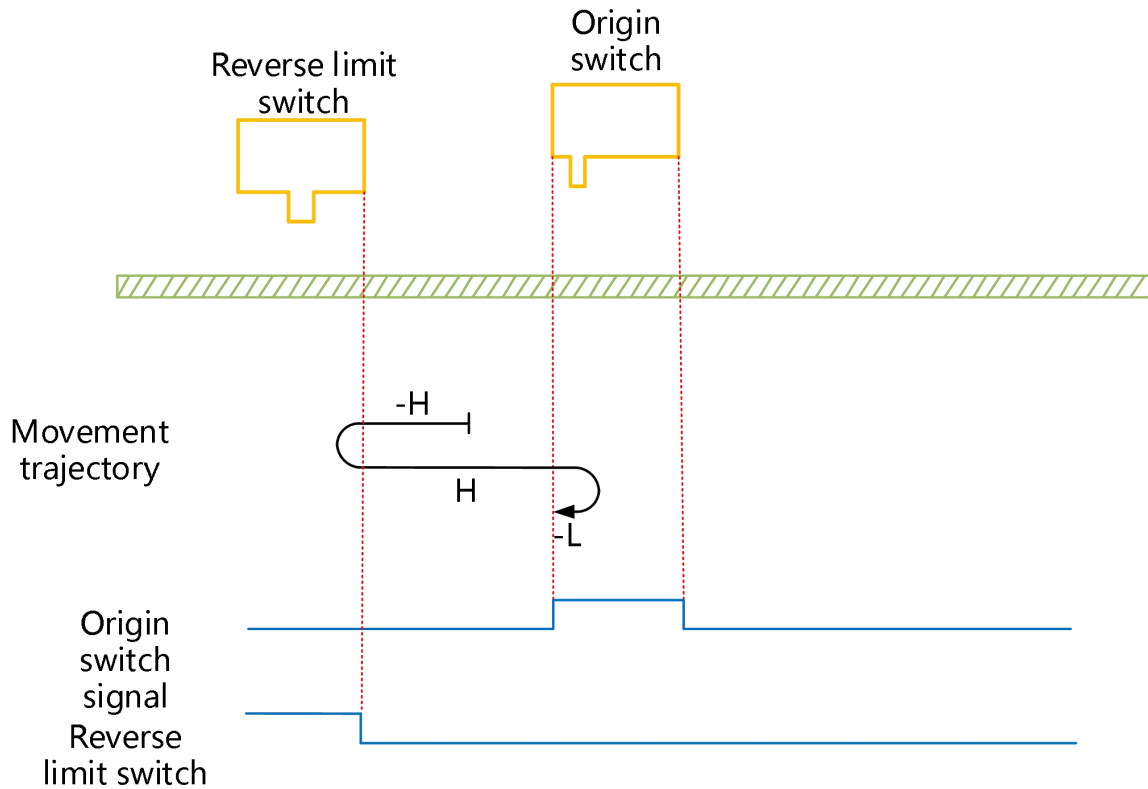
① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



HW=0 when starting homing, start homing in reverse direction at high speed; limit switch is not encountered; slow down after encountering HW rising edge, run in reverse direction at low speed, and stop when encountering HW falling edge;

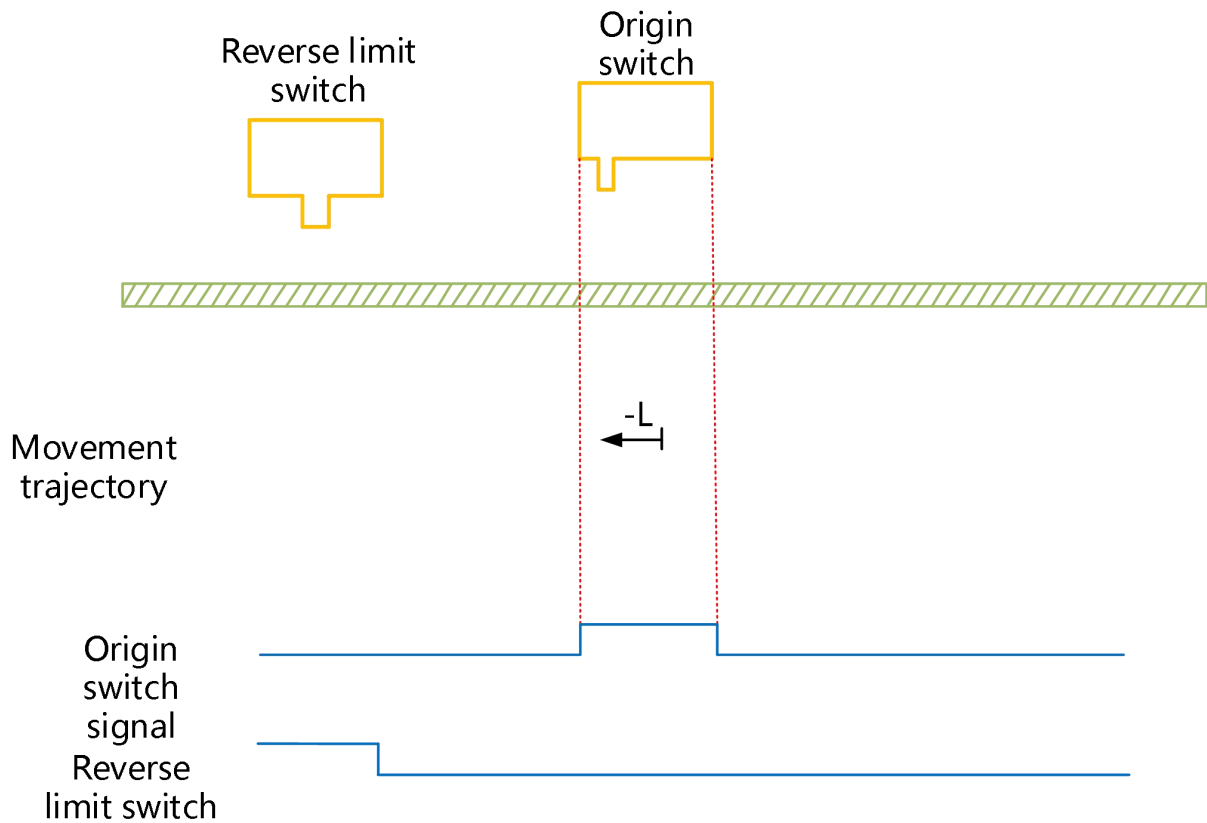
- ② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered





HW=0 when starting homing, start homing in reverse direction at high speed, change the running direction automatically when encountering limit switch and run in forward direction at high speed; slow down and change the running direction when encountering HW rising edge, and stop when encountering HW falling edge during running in reverse direction at low speed;

- ③ The deceleration point signal is valid when starting homing.



HW=1 when starting homing, start homing in reverse direction at low speed directly, and stop when encountering HW falling edge;

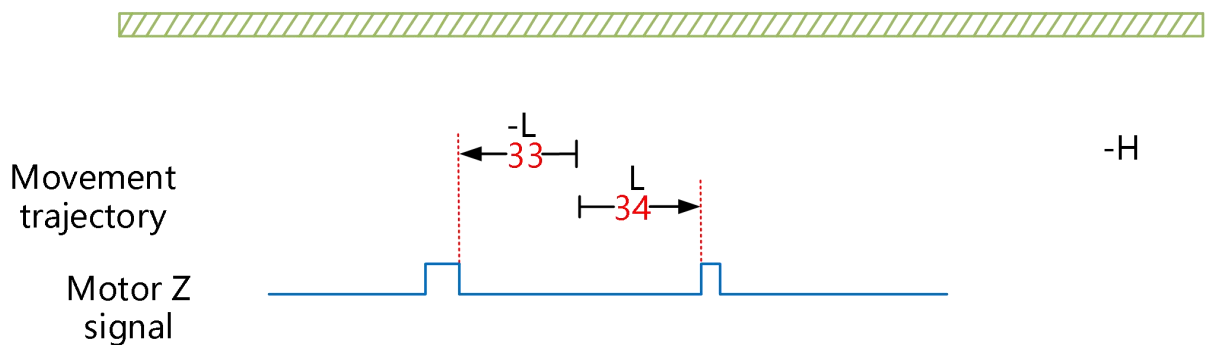
**(29) 6098H=33 and 34**

Mechanical origin: Z signal

Deceleration point: None

Homing mode 33: running in reverse direction at low speed, stop at the first Z signal encountered

Homing mode 34: running in forward direction at low speed, stop at the first Z signal encountered



**(30) 6098h=35**

Homing mode 35: take the current position as the mechanical origin, and after triggering the origin to homing

(6040 control word: 0x0F → 0x1F)

After returning to the origin, the position feedback 6064h is set to the origin offset 607Ch.

## 7.9 Accessibility Function

### 7.9.1 Touch Probe

The probe function refers to the function of the servo drive recording the current position information (command unit) and storing it in the specified register when the DI signal or motor Z signal specified by the external device changes. Please pay attention to the following when using it:

- ① In the case of the same probe, try to avoid using the rising edge and the falling edge at the same time;
- ② When using the Z signal, only the rising edge can be used, not the falling edge;
- ③ For single-trigger probes, if you need to trigger again, please clear 60B8h to 0 before setting the value. The

VD5L bus servo drive supports 2 types of probe functions, then DI5 is probe 1 and DI6 is probe 2.

| BIT | Touch Probe Function(60B8h)                                                                                  | Touch Probe Status Word (60B9h)                                                                                     |
|-----|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 0   | Probe 1 enable<br>0: Disable probe 1<br>1: Enable probe 1                                                    | Probe 1 enable<br>0: Disable probe 1<br>1: Enable probe 1                                                           |
| 1   | Probe 1 trigger mode.<br>0: Single trigger<br>1: Continuous trigger                                          | Probe 1 rising edge latch.<br>0: Probe 1 rising edge latch not executed<br>1: Probe 1 rising edge latch executed    |
| 2   | Probe 1 trigger signal selection.<br>0: DI5 set 18 trigger<br>1: Z signal trigger                            | Probe 1 falling edge latch.<br>0: Probe 1 falling edge latch not executed<br>1: Probe 1 falling edge latch executed |
| 3   | Reserved                                                                                                     | Reserved                                                                                                            |
| 4   | Probe 1 rising edge latch.<br>0: Do not use probe 1 rising edge latch<br>1: Use probe 1 rising edge latch    | Reserved                                                                                                            |
| 5   | Probe 1 falling edge latch.<br>0: Do not use probe 1 falling edge latch<br>1: Use probe 1 falling edge latch | Reserved                                                                                                            |
| 6   | Reserved                                                                                                     | Probe 1 trigger signal selection.<br>0: DI trigger<br>1: Z signal trigger                                           |
| 7   | Reserved                                                                                                     | Probe 1 triggers DI signal selection.<br>0: DI is low level<br>1: DI is high level                                  |
| 8   | Probe 2 enable<br>0: Disable probe 2<br>1: Enable probe 2                                                    | Probe 2 enable<br>0: Disable probe 2<br>1: Enable probe 2                                                           |

|    |                                                                                                              |                                                                                                                     |
|----|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 9  | Probe 2 trigger mode.<br>0: Single trigger<br>1: Continuous trigger                                          | Probe 2 rising edge latch.<br>0: Probe 2 rising edge latch not executed<br>1: Probe 2 rising edge latch executed    |
| 10 | Probe 2 trigger signal selection.<br>0: DI set 19 trigger<br>1: Z signal trigger                             | Probe 2 falling edge latch.<br>0: Probe 2 falling edge latch not executed<br>1: Probe 2 falling edge latch executed |
| 11 | Reserved                                                                                                     | Reserved                                                                                                            |
| 12 | Probe 2 rising edge latch.<br>0: Do not use probe 2 rising edge latch<br>1: Use probe 2 rising edge latch    | Reserved                                                                                                            |
| 13 | Probe 2 falling edge latch.<br>0: Do not use probe 2 falling edge latch<br>1: Use probe 2 falling edge latch | Reserved                                                                                                            |
| 14 | Reserved                                                                                                     | Probe 2 trigger signal selection.<br>0: DI trigger<br>1: Z signal trigger                                           |
| 15 | Reserved                                                                                                     | Probe 2 triggers DI signal selection.<br>0: DI is low level<br>1: DI is high level                                  |

1. Set the probe to trigger the DI signal: The DI functions corresponding to probe 1 and probe 2 are DI5 and DI6 by default.

◆**Note:** If other functions such as Instruction inversion are set for P6-14 and P6-17, the use of the probe function will not be affected. That is, when DI5 or DI6 is started, the probe function and the corresponding function code function will take effect together and will not affect each other.

| Servo Parameter | Description                                                             |
|-----------------|-------------------------------------------------------------------------|
| P6-14           | The default setting of DI5 terminal function is probe 1                 |
| P6-17           | The default setting of DI6 terminal function is probe 2                 |
| P6-15           | DI5 logic selection.<br>0: Low level is valid<br>1: High level is valid |
| P6-18           | DI6 logic selection.<br>0: Low level is valid<br>1: High level is valid |

2. Set the probe function (60B8h) and probe status word (60B9h). The meaning of each bit is shown in the following table. For example, if you use the rising and falling edges of probe 1 and probe 2, and DI single trigger, set 60B8h=3131h (12593 in decimal). When DI5 and DI6 signals are rising, probe 1 and probe 2 will latch at 60BAh and 60BCh respectively; when DI5 and DI6 signals are falling, probe 1 and probe 2 will latch at 60BBh and 60BDh respectively. If you want to perform single trigger again, you need to set 60B8h=0, 60B8h=3131h.

| Index(Hex) | Object dictionary             | R/O            | Unit             | Bits | Setting range          |
|------------|-------------------------------|----------------|------------------|------|------------------------|
| 60B8       | Touch probe function          | Read and write | -                | 16   | 0~65535                |
| 60B9       | Touch probe status word       | Read only      | -                | 16   | 0~65535                |
| 60BA       | Probe 1 rising edge position  | Read only      | Instruction unit | 32   | -2147483648~2147483647 |
| 60BB       | Probe 1 falling edge position | Read only      | Instruction unit | 32   | -2147483648~2147483647 |
| 60BC       | Probe 2 rising edge position  | Read only      | Instruction unit | 32   | -2147483648~2147483647 |
| 60BD       | Probe 2 falling edge position | Read only      | Instruction unit | 32   | -2147483648~2147483647 |

## Chapter 8 Object Dictionary

### 8.1 Overview of Object Dictionaries

#### 8.1.1 Object Dictionary Area Allocation

The object dictionary of CoE (CANopen over EtherCAT) specified in CIA 402 and the object dictionary of VD5L series are composed as follows:

| Index         | Content                              |
|---------------|--------------------------------------|
| 0000h ~ 0FFFh | Data type region                     |
| 1000h ~ 1FFFh | Communication sub-protocol area      |
| 2000h ~ 5FFFh | Vendor customized area               |
| 6000h ~ 9FFFh | Standard equipment sub-protocol area |
| A000h ~ FFFFh | Reserved                             |

#### 8.1.2 Explanation of Related Terms in Object Dictionary

★Index: The position of objects of the same class in the object dictionary, expressed in hexadecimal.

★Sub-index: Under the same index, there are multiple objects, and each object is biased under the same index.

★Accessibility: See the following table for details:

| Accessibility | Description         |
|---------------|---------------------|
| RW            | Read and write      |
| RO            | Read only           |
| WR_PREOP      | Write in preop mode |

★Can it be mapped: See the following table for details:

| Accessibility | Description         |
|---------------|---------------------|
| NO            | Unmappable          |
| RPDO          | Can be used as RPDO |
| TPDO          | Can be used as TPDO |

★Set to take effect: See the following table for details:

| Set conditions    | Description                         | Set conditions    | Description                                                                                                                       |
|-------------------|-------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Shutdown setting  | It can be set in the shutdown state | Valid immediately | The set value will take effect immediately after the parameter is modified and downloaded                                         |
| Operation setting | Can be set in any state             | Power-on again    | After the parameters are modified and downloaded, the servo drive needs to be powered down and then powered up, and the set value |

|  |  |  |                 |
|--|--|--|-----------------|
|  |  |  | can take effect |
|--|--|--|-----------------|

★Data display range: upper and lower limits of parameters.

★Default value: The factory setting value of the parameter.

★Data type: The type of data, as shown in the following table:

| Data type | Description    | Numerical range            |
|-----------|----------------|----------------------------|
| SINT      | Signed 8bit    | -128 ~ 127                 |
| USINT     | Unsigned 8bit  | 0 ~ 255                    |
| INT       | Signed 16bit   | -32768 ~ 32767             |
| UINT      | Unsigned 16bit | 0~65535                    |
| DINT      | Signed 32bit   | -21247483648 ~ 21247483647 |
| UDINT     | Unsigned 32bit | 0 ~ 4294967295             |
| STRING    | String Value   | ASCII                      |

★Related modes: See the following table for specific contents:

| Accessibility | Description                                              |
|---------------|----------------------------------------------------------|
| ALL           | This parameter is related to all modes                   |
| CSP/CSV/HM    | This parameter is only related to the corresponding mode |
| -             | This parameter is independent of the control mode        |

## 8.2 Communication Sub-protocol Area (1000h to 1FFFh)

| 1000                                              | Parameter name            | Accessibility | Data mapping | Data type | Data display range | Default | Correlation mode |
|---------------------------------------------------|---------------------------|---------------|--------------|-----------|--------------------|---------|------------------|
|                                                   | Device Type (Device Type) | RO            | No           | UDINT     | -                  | -       | -                |
| Used to describe the CoE device subprotocol type. |                           |               |              |           |                    |         |                  |

| 1001                            | Parameter name                  | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|---------------------------------|---------------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                 | Error register (Error register) | RO            | No           | USINT          | -                  | 0x00    | -                |
| Used to describe error records. |                                 |               |              |                |                    |         |                  |

| 1008                              | Parameter name            | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|-----------------------------------|---------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                   | Device name (Device name) | RO            | No           | STRING         | -                  | -       | -                |
| Used to describe the device name. |                           |               |              |                |                    |         |                  |

| 1009                                               | Parameter name                                                | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|----------------------------------------------------|---------------------------------------------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                                    | Manufacturer hardware version (Manufacturer Hardware Version) | RO            | No           | STRING         | -                  | -       | -                |
| Used to describe the manufacturer hardware version |                                                               |               |              |                |                    |         |                  |

| 100A                                               | Parameter name                                                | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|----------------------------------------------------|---------------------------------------------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                                    | Manufacturer software version (Manufacturer Software Version) | RO            | No           | STRING         | -                  | -       | -                |
| Used to describe the Manufacturer software version |                                                               |               |              |                |                    |         |                  |

| 1018                                 | Parameter name        | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|--------------------------------------|-----------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                      | ID Object (ID Object) | -             | -            | -              | -                  | -       | -                |
| Used to describe device information. |                       |               |              |                |                    |         |                  |

| 01h                                       | Parameter name        | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|-------------------------------------------|-----------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                           | Vendor ID (Vendor ID) | RO            | No           | UDINT          | -                  | 0x000000FF | -                |
| Serial number used to describe the drive. |                       |               |              |                |                    |            |                  |

| 02h                                             | Parameter name              | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|-------------------------------------------------|-----------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                                 | Product Code (Product Code) | RO            | No           | UDINT          | -                  | 0x10003101 | -                |
| Used to describe the encoding inside the drive. |                             |               |              |                |                    |            |                  |

| 03h | Parameter name | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|-----|----------------|---------------|--------------|----------------|--------------------|---------|------------------|
|-----|----------------|---------------|--------------|----------------|--------------------|---------|------------------|



|                                                   |                                   |               |              |                |                    |            |                  |
|---------------------------------------------------|-----------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                                   | Revision Number (Revision Number) | RO            |              | UDINT          | -                  | 0x00000001 | -                |
| Upgrade record number used to describe the drive. |                                   |               |              |                |                    |            |                  |
| 04h                                               | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                   | Serial Number (Serial Number)     | RO            | No           | UDINT          | -                  | 0x00001419 | -                |
| Used to describe a serial number.                 |                                   |               |              |                |                    |            |                  |

|                                    |                                   |               |              |                |                    |            |                  |
|------------------------------------|-----------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
| 1600                               | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | RxPDO                             | -             | -            | -              | -                  | -          | -                |
| Mapping object for setting RxPDO.  |                                   |               |              |                |                    |            |                  |
| 01h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | First mapping object (RxPDO_SI1)  | RW            | RPDO         | UDINT          | -                  | 0x60400010 | -                |
| Mapping object for setting RxPDO1. |                                   |               |              |                |                    |            |                  |
| 02h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Second mapping object (RxPDO_SI2) | RW            | RPDO         | UDINT          | -                  | 0x607A0020 | -                |
| Mapping object for setting RxPDO2. |                                   |               |              |                |                    |            |                  |
| 03h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Third mapping object (RxPDO_SI3)  | RW            | RPDO         | UDINT          | -                  | 0x60B80010 | -                |
| Mapping object for setting RxPDO3. |                                   |               |              |                |                    |            |                  |
| 04h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Fourth mapping object (RxPDO_SI3) | RW            | RPDO         | UDINT          | -                  | 0x60600008 | -                |
| Mapping object for setting RxPDO4. |                                   |               |              |                |                    |            |                  |

|                                    |                                   |               |              |                |                    |            |                  |
|------------------------------------|-----------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
| 1701                               | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | RxPDO                             | -             | -            | -              | -                  | -          | -                |
| Mapping object for setting RxPDO.  |                                   |               |              |                |                    |            |                  |
| 01h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | First mapping object (RxPDO_SI1)  | RW            | RPDO         | UDINT          | -                  | 0x60400010 | -                |
| Mapping object for setting RxPDO1. |                                   |               |              |                |                    |            |                  |
| 02h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Second mapping object (RxPDO_SI2) | RW            | RPDO         | UDINT          | -                  | 0x607A0020 | -                |
| Mapping object for setting RxPDO2. |                                   |               |              |                |                    |            |                  |
| 03h                                | Parameter name                    | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Third mapping object              | RW            | RPDO         | UDINT          | -                  | 0x60B80010 | -                |

|                                    |                                       |               |              |                |                    |            |                  |
|------------------------------------|---------------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                    | (RxPDO_SI3)                           |               |              |                |                    |            |                  |
| Mapping object for setting RxPDO3. |                                       |               |              |                |                    |            |                  |
| 04h                                | Parameter name                        | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The fourth mapping object (RxPDO_SI4) | RW            | RPDO         | UDINT          | -                  | 0x60600008 | -                |
| Mapping object for setting RxPDO4. |                                       |               |              |                |                    |            |                  |

|                                    |                                        |               |              |                |                    |            |                  |
|------------------------------------|----------------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
| 1702                               | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | RxPDO                                  | -             | -            | -              | -                  | -          | -                |
| Mapping object for setting RxPDO.  |                                        |               |              |                |                    |            |                  |
| 01h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | First mapping object (RxPDO_SI1)       | RW            | RPDO         | UDINT          | -                  | 0x60400010 | -                |
| Mapping object for setting RxPDO1. |                                        |               |              |                |                    |            |                  |
| 02h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Second mapping object (RxPDO_SI2)      | RW            | RPDO         | UDINT          | -                  | 0x607A0020 | -                |
| Mapping object for setting RxPDO2. |                                        |               |              |                |                    |            |                  |
| 03h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Third mapping object (RxPDO_SI3)       | RW            | RPDO         | UDINT          | -                  | 0x60FF0020 | -                |
| Mapping object for setting RxPDO3. |                                        |               |              |                |                    |            |                  |
| 04h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The fourth mapping object (RxPDO_SI4)  | RW            | RPDO         | UDINT          | -                  | 0x60710008 | -                |
| Mapping object for setting RxPDO4. |                                        |               |              |                |                    |            |                  |
| 05h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The fifth mapping object (RxPDO_SI5)   | RW            | RPDO         | UDINT          | -                  | 0x60600008 | -                |
| Mapping object for setting RxPDO5. |                                        |               |              |                |                    |            |                  |
| 06h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Sixth mapping object (RxPDO_SI6)       | RW            | RPDO         | UDINT          | -                  | 0x60B80010 | -                |
| Mapping object for setting RxPDO6. |                                        |               |              |                |                    |            |                  |
| 07h                                | Parameter name                         | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The seventh mapping object (RxPDO_SI7) | RW            | RPDO         | UDINT          | -                  | 0x607F0020 | -                |
| Mapping object for setting RxPDO7. |                                        |               |              |                |                    |            |                  |

|                                   |                |               |              |                |                    |         |                  |
|-----------------------------------|----------------|---------------|--------------|----------------|--------------------|---------|------------------|
| 1A00                              | Parameter name | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                   | TxPDO          | -             | -            | -              | -                  | -       | -                |
| Mapping object for setting TxPDO. |                |               |              |                |                    |         |                  |
| 01h                               | Parameter name | Accessibility | Data         | Data           | Data display       | Default | Correlation      |

|                                    |                                           |               | mapping      | structure      | range              |            | mode             |
|------------------------------------|-------------------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                    | First mapping object<br>(TxPDO_SI1)       | RW            | TPDO         | UDINT          | -                  | 0x60410010 | -                |
| Mapping object for setting TxPDO1. |                                           |               |              |                |                    |            |                  |
| 02h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Second mapping object<br>(TxPDO_SI2)      | RW            | TPDO         | UDINT          | -                  | 0x60640020 | -                |
| Mapping object for setting TxPDO2. |                                           |               |              |                |                    |            |                  |
| 03h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Third mapping object<br>(TxPDO_SI3)       | RW            | TPDO         | UDINT          | -                  | 0x60B90010 | -                |
| Mapping object for setting TxPDO3. |                                           |               |              |                |                    |            |                  |
| 04h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The fourth mapping object<br>(TxPDO_SI4)  | RW            | TPDO         | UDINT          | -                  | 0x60BA0020 | -                |
| Mapping object for setting TxPDO4. |                                           |               |              |                |                    |            |                  |
| 05h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The fifth mapping object<br>(TxPDO_SI5)   | RW            | TPDO         | UDINT          | -                  | 0x60BC0020 | -                |
| Mapping object for setting TxPDO5. |                                           |               |              |                |                    |            |                  |
| 06h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Sixth mapping object<br>(TxPDO_SI6)       | RW            | TPDO         | UDINT          | -                  | 0x603F0010 | -                |
| Mapping object for setting TxPDO6. |                                           |               |              |                |                    |            |                  |
| 07h                                | Parameter name                            | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | The seventh mapping object<br>(TxPDO_SI7) | RW            | TPDO         | UDINT          | -                  | 0x60610008 | -                |
| Mapping object for setting TxPDO7. |                                           |               |              |                |                    |            |                  |

| 1B01                               | Parameter name                       | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|------------------------------------|--------------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                    | TxPDO                                | -             | -            | -              | -                  | -          | -                |
| Mapping object for setting TxPDO.  |                                      |               |              |                |                    |            |                  |
| 01h                                | Parameter name                       | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | First mapping object<br>(TxPDO_SI1)  | RW            | TPDO         | UDINT          | -                  | 0x603F0010 | -                |
| Mapping object for setting TxPDO1. |                                      |               |              |                |                    |            |                  |
| 02h                                | Parameter name                       | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Second mapping object<br>(TxPDO_SI2) | RW            | TPDO         | UDINT          | -                  | 0x60410010 | -                |
| Mapping object for setting TxPDO2. |                                      |               |              |                |                    |            |                  |
| 03h                                | Parameter name                       | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                    | Third mapping object<br>(TxPDO_SI3)  | RW            | TPDO         | UDINT          | -                  | 0x60640020 | -                |
| Mapping object for setting TxPDO3. |                                      |               |              |                |                    |            |                  |

| 04h                                | Parameter name                        | Accessibility | Data mapping | Data structure | Data display range | Default     | Correlation mode |
|------------------------------------|---------------------------------------|---------------|--------------|----------------|--------------------|-------------|------------------|
|                                    | The fourth mapping object (TxPDO_SI4) | RW            | TPDO         | UDINT          | -                  | 0x60770010  | -                |
| Mapping object for setting TxPDO4. |                                       |               |              |                |                    |             |                  |
| 05h                                | Parameter name                        | Accessibility | Data mapping | Data structure | Data display range | Default     | Correlation mode |
|                                    | The fifth mapping object (TxPDO_SI5)  | RW            | TPDO         | UDINT          | -                  | 0x60F40020  | -                |
| Mapping object for setting TxPDO5. |                                       |               |              |                |                    |             |                  |
| 06h                                | Parameter name                        | Accessibility | Data mapping | Data structure | Data display range | Default     | Correlation mode |
|                                    | Sixth mapping object (TxPDO_SI6)      | RW            | TPDO         | UDINT          | -                  | 0x606100108 | -                |
| Mapping object for setting TxPDO6. |                                       |               |              |                |                    |             |                  |

| 1C12                                                 | Parameter name                                  | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|------------------------------------------------------|-------------------------------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                                      | RxPDO assign                                    | -             | -            | -              | -                  | -       | -                |
| Used to set up RPDO assignments.                     |                                                 |               |              |                |                    |         |                  |
| 01h                                                  | Parameter name                                  | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                                      | Index of objects allocated by RPDO (RPDO Index) | RW            | No           | UINT           | -                  | 0x1701  | -                |
| The index used to set the allocation object of RPDO. |                                                 |               |              |                |                    |         |                  |
| 1C13                                                 | Parameter name                                  | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                                      | TxPDO assign                                    | -             | -            | -              | -                  | -       | -                |
| Used to set TPDO assignments.                        |                                                 |               |              |                |                    |         |                  |
| 01h                                                  | Parameter name                                  | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                                      | Index of objects assigned by TPDO (TPDO Index)  | RW            | No           | UINT           | -                  | 0x1B01  | -                |
| The index of the allocation object used to set TPDO. |                                                 |               |              |                |                    |         |                  |

| 1C32                                                           | Parameter name                                                    | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|----------------------------------------------------------------|-------------------------------------------------------------------|---------------|--------------|----------------|--------------------|---------|------------------|
|                                                                | Synchronize management of output parameters (SM output parameter) | -             | -            | -              | -                  | -       | -                |
| Used to describe synchronization management output parameters. |                                                                   |               |              |                |                    |         |                  |
| 01h                                                            | Parameter name                                                    | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                                                | Synchronization type (Synchronization Type)                       | RW            | No           | UINT           | -                  | 0x0002  | -                |
| Used to set the synchronization type.                          |                                                                   |               |              |                |                    |         |                  |
| 02h                                                            | Parameter name                                                    | Accessibility | Data mapping | Data structure | Data display range | Default | Correlation mode |
|                                                                | Cycle Time                                                        | RO            | No           | UINT           | -                  | 0x0000  | -                |
| Reflects the period of DC SYNC0.                               |                                                                   |               |              |                |                    |         |                  |

| 04h                                                                               | Parameter name                                                   | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                                                                   | Synchronization Types support<br>(Synchronization Types support) | RO            | No           | UINT           | -                  | 0x0004     | -                |
| Displays the type of distributed clock.                                           |                                                                  |               |              |                |                    |            |                  |
| 05h                                                                               | Parameter name                                                   | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                                                   | Minimum cycle time<br>(Minimum Cycle Time)                       | RO            | No           | UDINT          | -                  | 0x0001E848 | -                |
| Displays the minimum synchronization period supported by the slave station in ns. |                                                                  |               |              |                |                    |            |                  |

| 1C33                                                                              | Parameter name                | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|-----------------------------------------------------------------------------------|-------------------------------|---------------|--------------|----------------|--------------------|------------|------------------|
|                                                                                   | SM input parameter            | -             | -            | -              | -                  | -          | -                |
| Used to describe synchronization management input parameters.                     |                               |               |              |                |                    |            |                  |
| 01h                                                                               | Parameter name                | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                                                   | Synchronization type          | RO            | No           | UINT           | -                  | 0x0022     | -                |
| Used to set the synchronization type.                                             |                               |               |              |                |                    |            |                  |
| 02h                                                                               | Parameter name                | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                                                   | Cycle time                    | RO            | No           | UDINT          | -                  | 0x0000     | -                |
| Reflect the period of DC SYNC0.                                                   |                               |               |              |                |                    |            |                  |
| 04h                                                                               | Parameter name                | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                                                   | Synchronization Types support | RO            | No           | UINT           | -                  | 0x0004     | -                |
| Displays the type of distributed clock.                                           |                               |               |              |                |                    |            |                  |
| 05h                                                                               | Parameter name                | Accessibility | Data mapping | Data structure | Data display range | Default    | Correlation mode |
|                                                                                   | Minimum cycle time            | RO            | No           | UDINT          | -                  | 0x0001E848 | -                |
| Displays the minimum synchronization period supported by the slave station in ns. |                               |               |              |                |                    |            |                  |

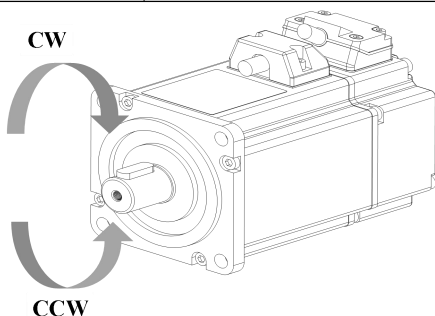
### 8.3 Vendor Customized Area (2000h to 2FFFh)

#### Group 2000h: Basic Settings

| P00-04<br>2000-04 | Parameter name                  | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|-------------------|---------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
|                   | Rotate direction<br>RotationDir | Shutdown setting | Valid immediately | 0       | 0 to 1    | Basic settings       | -    |

Set the positive direction of the motor rotation when viewed from the motor axis.

| Setting value | Rotation direction                | Remark                                                         |
|---------------|-----------------------------------|----------------------------------------------------------------|
| 0             | Take CW as the forward direction  | Viewed from the motor axis, the motor rotates clockwise        |
| 1             | Take CCW as the forward direction | Viewed from the motor axis, the motor rotates counterclockwise |



| P00-09<br>2000-09 | Parameter name                          | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Braking resistance setting<br>ExtResSel | Operation setting | Valid immediately | 0       | 0 to 3    | Basic settings       | -    |

Used to set the mode of absorbing and releasing braking energy.

| Setting value | Brake resistance setting                                            | Remark                                                                            |
|---------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 0             | Use built-in braking resistor                                       | Please refer to "7.1.5 Braking Resistance" to select the appropriate braking mode |
| 1             | Use external braking resistor and natural cooling                   |                                                                                   |
| 2             | Use external braking resistor and forced air cooling (not settable) |                                                                                   |
| 3             | No braking resistors are used, and all are absorbed by capacitance  |                                                                                   |

| P00-10<br>2000-0A | Parameter name                                    | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|---------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | External braking resistor resistance<br>ExtResVal | Operation setting | Valid immediately | 50      | 0~65535   | Basic settings       | Ω    |

Used to set the power of external braking resistor of servo drive. When the maximum braking energy calculated value is greater than the maximum braking energy absorbed by capacitor, and the braking power calculated value is greater than the built-in braking resistor power, use external braking resistor.

If the value of P00-10 is too large, Er.25 (too large braking resistor value) or Er.22 (main power supply is over voltage) will occur.

When external braking resistor is connected, please disconnect the short tab between C and D and connect the external braking resistor between P + and C. Please refer to "2.1.2 Composition of servo drive" for specific operation.

| P00-11<br>2000-0B | Parameter name                               | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | External braking resistor power<br>ExtResPwr | Operation setting | Valid immediately | 100     | 0~65535   | Basic settings       | W    |

Used to set the power of the external braking resistor of the servo drive.  
External braking resistor power "P00-11" is not allowed to be less than the calculated value of braking resistor power!

| P00-23<br>2000-17 | Parameter name                                   | Setting method    | Effective time | Default | Set range | Application category | Unit |
|-------------------|--------------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | Z pulse output OZ polarity<br>PulseOutPcPolarity | Operation setting | Power-on again | 0       | 0 to 1    | Basic settings       | -    |

Used to set the logic level of Z pulse.

| Setting value | Function                        |
|---------------|---------------------------------|
| 0             | Z pulse is active at high level |
| 1             | Z pulse is active at low level  |

| P00-24<br>2000-18 | Parameter name                         | Setting method    | Effective time | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | Z pulse output width<br>PulseOutZWidth | Operation setting | Power on again | 3       | 1~200     | Basic settings       | ms   |

Set the width of Z pulse output.

| Setting value | Function          |
|---------------|-------------------|
| 1             | Pulse width 1ms   |
| 2             | Pulse width 2ms   |
| ...           | ...               |
| 200           | Pulse width 200ms |

| P00-29<br>2000-1D | Parameter name                                                     | Setting method   | Effective time    | Default | Set range | Application category | Unit |
|-------------------|--------------------------------------------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
|                   | The number of equivalent position units<br>EquPositionUnitsPerTurn | Shutdown setting | Valid immediately | 10000   | 0~131072  | Basic settings       | -    |

The number of equivalent position units when the motor rotates one circle. Used for position deviation display of oscilloscope and monitoring quantity.

| P00-30<br>2000-1E | Parameter name                                                    | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | Shield multi-turn absolute encoder battery fault<br>EncBatErrMask | Operation setting | Power-on again | 0       | 0 to 1    | Basic settings       | -    |



Used to set the battery fault alarm setting function of multi-turn absolute value encoder.

| Setting value | Function   | Remark                                                                                                                                                |
|---------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | Unshielded | Detect battery undervoltage and battery low voltage faults of multi-turn absolute value encoder                                                       |
| 1             | Shield     | Shield multi-turn absolute encoder battery under voltage and battery low-voltage fault. This would cause mechanical failure, please use with caution. |

| P00-31<br>2000-1F | Parameter name                                                                      | Setting method    | Effective time    | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Encoder read-write verification exception threshold setting<br>EncCommWarmThreshold | Operation setting | Valid immediately | 20      | 0 to 100  | Basic settings       | -    |

Encoder read-write verification exception is too frequent. Alarm threshold setting.

0: No alarm;

Others: When this setting value is exceeded, report A-93.

| P00-32<br>2000-20 | Parameter name                                      | Setting method    | Effective time    | Default | Set range | Application category | Unit |
|-------------------|-----------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Communication tolerance setting<br>ECAT Pdo TimeOut | Operation setting | Valid immediately | 2       | 2 to 14   | Basic settings       | -    |

When the master station and the drive perform periodic data exchange, this parameter can be used to set the tolerance for PDO receiving event loss. When the accumulated errors exceed the set threshold, ER.09 is reported.

#### Group 2001h: Control Parameters

| P01-09<br>2001-09 | Parameter name                 | Setting method   | Effective time    | Default | Set range | Application category       | Unit |
|-------------------|--------------------------------|------------------|-------------------|---------|-----------|----------------------------|------|
|                   | Torque Mode Limit Speed Source | Shutdown setting | Valid immediately | 0       | 0~2       | Protection and restriction | -    |

Used to set the maximum speed limit value in torque mode.

| Setting value | Function             | Remarks                                                                      |
|---------------|----------------------|------------------------------------------------------------------------------|
| 0             | Internal speed limit | P1-17 forward speed limit<br>P1-18 reverse speed limit.                      |
| 1             | AI_2 analog input    | Not supported yet!                                                           |
| 2             | Setting via EtherCAT | Set the maximum speed limit through the corresponding EtherCAT communication |

| P01-10 | Parameter name | Setting | Valid time | Default | Set range | Application | Unit |
|--------|----------------|---------|------------|---------|-----------|-------------|------|
|--------|----------------|---------|------------|---------|-----------|-------------|------|

|                |                                          |                   |                   |      |        |                            |     |
|----------------|------------------------------------------|-------------------|-------------------|------|--------|----------------------------|-----|
| <b>2001-0A</b> |                                          | <b>method</b>     |                   |      |        | <b>category</b>            |     |
|                | Maximum speed threshold<br>MaxSpeedLimit | Operation setting | Valid immediately | 3600 | 0~8000 | Protection and restriction | rpm |

Used to set the maximum speed limit value. If the actual speed of motor exceeds this value, Er.32 would occur (Exceed the maximum speed of motor).

|                           |                                        |                       |                   |                |                  |                             |             |
|---------------------------|----------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-11<br/>2001-0B</b> | <b>Parameter name</b>                  | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | Warning speed threshold<br>WarmSpeedTh | Operation setting     | Valid immediately | 3300           | 0 ~8000          | Protection and restriction  | rpm         |

Used to set the limit value of maximum speed. If the actual speed of motor exceeds this value, A-81 would occur (Exceed the maximum speed of motor).

|                           |                                       |                       |                   |                |                  |                             |             |
|---------------------------|---------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-12<br/>2001-0C</b> | <b>Parameter name</b>                 | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | Forward speed threshold<br>PosSpeedTh | Operation setting     | Valid immediately | 3000           | 0~6000           | Protection and restriction  | rpm         |

Used to set the limit value of forward speed.

|                           |                          |                       |                   |                |                  |                             |             |
|---------------------------|--------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-13<br/>2001-0D</b> | <b>Parameter name</b>    | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | NegSpeedTh<br>NegSpeedTh | Operation setting     | Valid immediately | 3000           | 0~6000           | Protection and restriction  | rpm         |

Used to set the limit value of reverse speed

|                           |                                    |                       |                       |                |                  |                             |             |
|---------------------------|------------------------------------|-----------------------|-----------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-14<br/>2001-0E</b> | <b>Parameter name</b>              | <b>Setting method</b> | <b>Effective time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | Torque limit source<br>ToqLimitSrc | Shutdown setting      | Effective immediately | 0              | 0 to 2           | Protection and restriction  | -           |

Used to set the torque limit source.

| Setting value | Restricted source | Remarks                                                                                                      |
|---------------|-------------------|--------------------------------------------------------------------------------------------------------------|
| 0             | Internal          | Internal torque limit.                                                                                       |
| 1             | Reserved          | Reserved                                                                                                     |
| 2             | EtherCAT          | External torque limit, controlled by object dictionaries 6072, 60E0 and 60E1 through EtherCAT communication. |

|                           |                                 |                       |                   |                |                  |                             |             |
|---------------------------|---------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-15<br/>2001-0F</b> | <b>Parameter name</b>           | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | Forward torque limit<br>PToqLim | Operation setting     | Valid immediately | 3000           | 0~3000           | Protection and restriction  | 0.1%        |

When P01-14 is set to 0 (internal), the set value of this function code is used as the limit value of positive torque.  
If the value of P01-15 and P01-16 is set too small, the servo motor may be insufficient torque phenomenon when performing acceleration and deceleration movements. Please refer to "6.4.3 Torque command limit".

|               |                       |                       |                   |                |                  |                             |             |
|---------------|-----------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P01-16</b> | <b>Parameter name</b> | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|---------------|-----------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|

|                                                                                                           |                                 |                      |                      |      |        |                                  |      |
|-----------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|----------------------|------|--------|----------------------------------|------|
| <b>2001-10</b>                                                                                            | Reverse torque limit<br>RToqLim | Operation<br>setting | Valid<br>immediately | 3000 | 0~3000 | Protection<br>and<br>restriction | 0.1% |
| When P01-14 is set to 0 (internal), the setting value of this function code is reverse torque limit value |                                 |                      |                      |      |        |                                  |      |

|                                                                                                                                |                           |                           |                      |                |                  |                                  |             |
|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------|----------------------|----------------|------------------|----------------------------------|-------------|
| <b>P01-17</b>                                                                                                                  | <b>Parameter name</b>     | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b>  | <b>Unit</b> |
| <b>2001-11</b>                                                                                                                 | Torque Mode PSpd<br>Limit | Operation<br>setting      | Valid<br>immediately | 3000           | 0~6000           | Protection<br>and<br>restriction | rmp         |
| When P01-09 is set to 0 (internal), the setting value of this function code is used as the forward speed limit in torque mode. |                           |                           |                      |                |                  |                                  |             |

|                                                                                                                                |                           |                           |                      |                |                  |                                  |             |
|--------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------|----------------------|----------------|------------------|----------------------------------|-------------|
| <b>P01-18</b>                                                                                                                  | <b>Parameter name</b>     | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b>  | <b>Unit</b> |
| <b>2001-12</b>                                                                                                                 | Torque Mode PSpd<br>Limit | Operation<br>setting      | Valid<br>immediately | 3000           | 0~6000           | Protection<br>and<br>restriction | rmp         |
| When P01-09 is set to 0 (internal), the setting value of this function code is used as the forward speed limit in torque mode. |                           |                           |                      |                |                  |                                  |             |

|                                                                                                                                                       |                                 |                           |                      |                |                  |                                  |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------|----------------------|----------------|------------------|----------------------------------|-------------|
| <b>P01-19</b>                                                                                                                                         | <b>Parameter name</b>           | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b>  | <b>Unit</b> |
| <b>2001-13</b>                                                                                                                                        | Torque Limit Time<br>ToqLimTime | Operation<br>setting      | Valid<br>immediately | 1000           | 0~65535          | Protection<br>and<br>restriction | ms          |
| When torque is limited by the setting value of P01-15 or P01-16, and exceeds the setting time, drive would report fault "abnormal torque saturation". |                                 |                           |                      |                |                  |                                  |             |
| <b>Note:</b> When the value of this function code is set to 0, the torque saturation timeout fault detection is not done, and this fault is ignored.  |                                 |                           |                      |                |                  |                                  |             |

|                                                                                |                                                        |                           |                      |                |                  |                                  |             |
|--------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------|----------------------|----------------|------------------|----------------------------------|-------------|
| <b>P01-20</b>                                                                  | <b>Parameter name</b>                                  | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b>  | <b>Unit</b> |
| <b>2001-14</b>                                                                 | Software overcurrent<br>detection<br>SoftOverCurrentDt | Operation<br>setting      | Valid<br>immediately | 8              | 0~65536          | Protection<br>and<br>restriction | -           |
| Software overcurrent detection (set to 0 to shield software overcurrent alarm) |                                                        |                           |                      |                |                  |                                  |             |

|                                                                                                                                                                                                         |                                                                                 |                           |                      |                |                  |                                 |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------|----------------------|----------------|------------------|---------------------------------|-------------|
| <b>P01-30</b>                                                                                                                                                                                           | <b>Parameter name</b>                                                           | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b> | <b>Unit</b> |
| <b>2001-1E</b>                                                                                                                                                                                          | Delay from brake output<br>ON to instruction<br>reception<br>BK_ONtoCmdEnaDelay | Operation<br>setting      | Valid<br>immediately | 250            | 0~500            | -                               | ms          |
| Used to set the braking (BRK-OFF) output ON, until the servo drive allows the start of receiving the input command. When the brake output (BRK-OFF) is not allocated, this function code has no effect. |                                                                                 |                           |                      |                |                  |                                 |             |

|                |                                                                                   |                           |                      |                |                  |                                 |             |
|----------------|-----------------------------------------------------------------------------------|---------------------------|----------------------|----------------|------------------|---------------------------------|-------------|
| <b>P01-31</b>  | <b>Parameter name</b>                                                             | <b>Setting<br/>method</b> | <b>Valid time</b>    | <b>Default</b> | <b>Set range</b> | <b>Application<br/>category</b> | <b>Unit</b> |
| <b>2001-1F</b> | In the static state, delay<br>from the brake output is<br>OFF to the motor is not | Operation<br>setting      | Valid<br>immediately | 150            | 1~1000           | -                               | ms          |

|                                                                                                                                                                                                                                    |                                   |  |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--|--|--|--|--|--|
|                                                                                                                                                                                                                                    | energized.<br>BK_OFFtoPwmOFFDelay |  |  |  |  |  |  |
| When the motor is in a static state, set the delay time from the brake (BRK-OFF) output is OFF to the servo drive is in the non-powered state. When the brake output (BRK-OFF) is not allocated, this function code has no effect. |                                   |  |  |  |  |  |  |

|                                                                                                                                                                                                   | Parameter name                                                                      | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| <b>P01-32</b><br><b>2001-20</b>                                                                                                                                                                   | Rotation status, when the brake output OFF, the speed threshold.<br><br>BK_OFFSpdTh | Operation setting | Valid immediately | 30      | 0~3000    | -                    | rpm  |
| When the motor is rotating, the motor speed threshold that is allowed when the brake (BRK-OFF) output is OFF. When the brake output (BRK-OFF) is not allocated, this function code has no effect. |                                                                                     |                   |                   |         |           |                      |      |

|                                                                                                                                                                                                           | Parameter name                                                                              | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| <b>P01-33</b><br><b>2001-21</b>                                                                                                                                                                           | Rotation status, Delay from servo enable OFF to brake output OFF<br><br>BK_OFFSinceSofDelay | Operation setting | Valid immediately | 500     | 1~2000    | -                    | ms   |
| When the motor rotates, the delay time from the servo enable (S-ON) OFF to the brake (BRK-OFF) output OFF is allowed. When the brake output (BRK-OFF) is not allocated, this function code has no effect. |                                                                                             |                   |                   |         |           |                      |      |

|                                                               | Parameter name                            | Setting method    | Effective time        | Default | Set range | Application category | Unit |
|---------------------------------------------------------------|-------------------------------------------|-------------------|-----------------------|---------|-----------|----------------------|------|
| <b>P01-37</b><br><b>2001-25</b>                               | JOG acceleration time<br>SpdRefJOGAccTime | Operation setting | Effective immediately | 500     | 1 to 5000 | -                    | ms   |
| The time for JOG instruction to accelerate from 0 to 1000rpm. |                                           |                   |                       |         |           |                      |      |

|                                                               | Parameter name                            | Setting method    | Effective time        | Default | Set range | Application category | Unit |
|---------------------------------------------------------------|-------------------------------------------|-------------------|-----------------------|---------|-----------|----------------------|------|
| <b>P01-38</b><br><b>2001-26</b>                               | JOG deceleration time<br>SpdRefJOGDecTime | Operation setting | Effective immediately | 500     | 1 to 5000 | -                    | ms   |
| The time for JOG instruction to decelerate from 1000rpm to 0. |                                           |                   |                       |         |           |                      |      |

### Group 2002h: Gain Adjustment

|                                                                                                                                         | Parameter name                               | Setting method    | Valid time         | Default | Set range | Application category | Unit  |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------|--------------------|---------|-----------|----------------------|-------|
| <b>P02-01</b><br><b>2002-01</b>                                                                                                         | 1st position loop gain<br><br>PosLoop1stGain | Operation setting | Vvalid immediately | 449     | 0 to 6200 | Gain control         | 0.1Hz |
| It is used for setting the proportional gain of the first position loop to determine the responsiveness of the position control system. |                                              |                   |                    |         |           |                      |       |

| P02-02                                                                                                                                  | Parameter name                              | Setting method    | Valid time        | Default | Set range  | Application category | Unit  |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------|-------------------|---------|------------|----------------------|-------|
| 2002-02                                                                                                                                 | The first speed loop gain<br>SpdLoop1stGain | Operation setting | valid immediately | 250     | 0 to 35000 | Gain control         | 0.1Hz |
| It is used for setting the proportional gain of the first position loop to determine the responsiveness of the position control system. |                                             |                   |                   |         |            |                      |       |

| P02-03                                                                                                                  | Parameter name                                     | Setting method    | Valid time        | Default | Set range   | Application category | Unit  |
|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------|-------------------|---------|-------------|----------------------|-------|
| 2002-03                                                                                                                 | speed loop 1st integral time<br>SpdLoop1stIntgTime | Operation setting | Valid immediately | 230     | 10 to 65535 | Gain control         | 0.1ms |
| Used to set the integral constant of the first speed loop. The smaller the set value, the stronger the integral effect. |                                                    |                   |                   |         |             |                      |       |

| P02-04                                                                                                                   | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit  |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|-------|
| 2002-04                                                                                                                  | 2nd position loop gain<br>PosLoop2stGain | Operation setting | Valid immediately | 300     | 0 to 6200 | Gain control         | 0.1Hz |
| Used to set the integral constant of the second speed loop. The smaller the set value, the stronger the integral effect. |                                          |                   |                   |         |           |                      |       |

| P02-05                                                                                                                   | Parameter name                               | Setting method    | Valid time        | Default | Set range  | Application category | Unit  |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------|-------------------|---------|------------|----------------------|-------|
| 2002-05                                                                                                                  | The second speed loop gain<br>SpdLoop2stGain | Operation setting | Valid immediately | 160     | 0 to 35000 | Gain control         | 0.1Hz |
| Used to set the integral constant of the second speed loop. The smaller the set value, the stronger the integral effect. |                                              |                   |                   |         |            |                      |       |

| P02-06                                                                                                                   | Parameter name                                     | Setting method    | Valid time        | Default | Set range | Application category | Unit  |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|-------|
| 2002-06                                                                                                                  | speed loop 2nd integral time<br>SpdLoop2stIntgTime | Operation setting | Valid immediately | 350     | 10~65535  | Gain control         | 0.1ms |
| Used to set the integral constant of the second speed loop. The smaller the set value, the stronger the integral effect. |                                                    |                   |                   |         |           |                      |       |

| P02-07                                     | Parameter name                                        | Setting method    | Valid time                                                                                                                                       | Default | Set range | Application category | Unit |
|--------------------------------------------|-------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|----------------------|------|
| 2002-07                                    | speed loop second integral time<br>SpdLoop2stIntgTime | Operation setting | Valid immediately                                                                                                                                | 1       | 0 to 1    | Gain control         | -    |
| Set the switching mode of the second gain. |                                                       |                   |                                                                                                                                                  |         |           |                      |      |
|                                            |                                                       | Setting value     | Function                                                                                                                                         |         |           |                      |      |
|                                            |                                                       | 0                 | The first gain is fixed. Use DI function 10 (GAIN-SEL, gain switching) to switch:<br>DI logic invalid: PI control;<br>DI logic valid: P control. |         |           |                      |      |
|                                            |                                                       | 1                 | The first gain and the second gain are switched by the setting value of P02-08.                                                                  |         |           |                      |      |

| P02-08  | Parameter name         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 2002-08 | Second Gain Fun Select | Operation setting | Valid immediately | 0       | 0 to 10   | Gain control         | -    |

Used to set the integral constant of the first speed loop. The smaller the set value, the stronger the integral effect.

| Setting value | Condition                               | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | First gain fixed                        | Fixed as the first gain                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1             | Use DI port to switch                   | Use DI function 10(GAIN-SEL, Gain switch)<br>DI logic invalid: first gain (P02-01~P02-03);<br>DI logic valid: second gain (P02-04~P02-06).                                                                                                                                                                                                                                                                                                                                                  |
| 2             | Torque instruction large                | In the previous first gain, when the absolute value of the torque command exceeds (level + hysteresis), it switches to the second gain; in the previous second gain, when the absolute value of the torque command is less than (level - hysteresis) for a period of delay time, it returns to the first gain.                                                                                                                                                                              |
| 3             | Actual torque large                     | In the previous first gain, when the absolute value of the actual torque exceeds (level + hysteresis), it switches to the second gain; in the previous second gain, when the state where the absolute value of the actual torque is less than (level - hysteresis) continues for the delay time, it returns to the first gain.                                                                                                                                                              |
| 4             | Velocity instruction large              | In the previous first gain, when the absolute value of the speed command exceeds (level + hysteresis), it switches to the second gain; in the previous second gain, when the absolute value of the speed command is less than (level - hysteresis) for a period of delay time, it returns to the first gain.                                                                                                                                                                                |
| 5             | Actual instruction large                | In the previous first gain, when the absolute value of the actual speed exceeds (level + hysteresis), it switches to the second gain; in the previous second gain, when the state where the absolute value of the actual speed is less than (level - hysteresis) continues during the delay time, it returns to the first gain.                                                                                                                                                             |
| 6             | Velocity instruction change ratio large | In the previous first gain, when the absolute value of the speed command change rate exceeds (level + hysteresis), switch to the second gain; in the previous second gain, when the absolute value of the speed command change rate is less than (level - hysteresis) for a period of delay time, return to the first gain.                                                                                                                                                                 |
| 7             | Position offset large                   | In the previous first gain, when the absolute value of the position deviation exceeds (level + hysteresis), it switches to the second gain; in the previous second gain, when the absolute value of the position deviation is less than (level - hysteresis) for a period of time, it returns to the first gain.                                                                                                                                                                            |
| 8             | Position instruction                    | In the previous first gain, if the position command is not 0, switch to the second gain; In the previous second gain, if the position command is 0 during the delay time, return to the first gain.                                                                                                                                                                                                                                                                                         |
| 9             | Position completed                      | In the previous first gain, if positioning is not completed, switch to the second gain;<br>In the previous second gain, if the positioning incomplete state continues during the delay time, return to the first gain.                                                                                                                                                                                                                                                                      |
| 10            | Position instruction+actual velocity    | In the previous first gain, if the position command is not 0, switch to the second gain; In the previous second gain, if the position command is 0 during the delay time, keep the second gain; When the delay time is reached, if the absolute value of the current actual speed does not reach (level), the speed integral time constant is fixed at the second integral time constant, and the others return to the first gain. If the absolute value of the actual speed does not reach |

|  |  |  |                                                   |  |
|--|--|--|---------------------------------------------------|--|
|  |  |  | (level-hysteresis), all return to the first gain. |  |
|--|--|--|---------------------------------------------------|--|

| P02-09  | Parameter name     | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|--------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 2002-09 | SpdFeedForwardGain | Operation setting | Valid immediately | 0       | 0~1000    | Gain control         | 0.1% |

It is used for setting the proportional gain of the second position loop to determine the responsiveness of the position control system.

| P02-10  | Parameter name       | Setting method    | Effective time        | Default | Set range | Application category | Unit |
|---------|----------------------|-------------------|-----------------------|---------|-----------|----------------------|------|
| 2002-0A | SpdFeedForwardFilter | Operation setting | Effective immediately | 3       | 0 to 500  | Gain control         | 1ms  |

Used to set the time constant of the one power delay filter associated with the speed feedforward input.

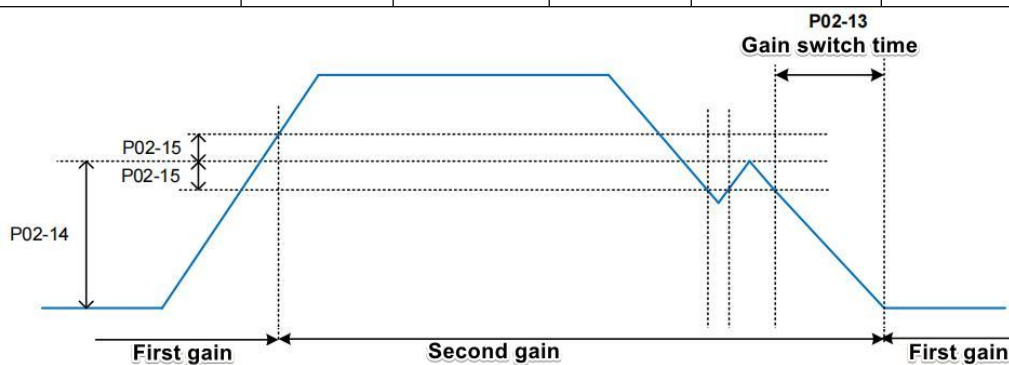
| P02-11  | Parameter name     | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|--------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 2002-0B | ToqFeedForwardGain | Operation setting | Valid immediately | 0       | 0 to 2000 | Gain control         | 0.1% |

Used to set the torque feedforward gain.

| P02-12  | Parameter name       | Setting method    | Valid time        | Default | Set range  | Application category | Unit   |
|---------|----------------------|-------------------|-------------------|---------|------------|----------------------|--------|
| 2002-0C | ToqFeedForwardFilter | Operation setting | Valid immediately | 50      | 0 to 10000 | Gain control         | 0.01ms |

Used to set the time constant of the first-order delay filter associated with the torque feedforward input.

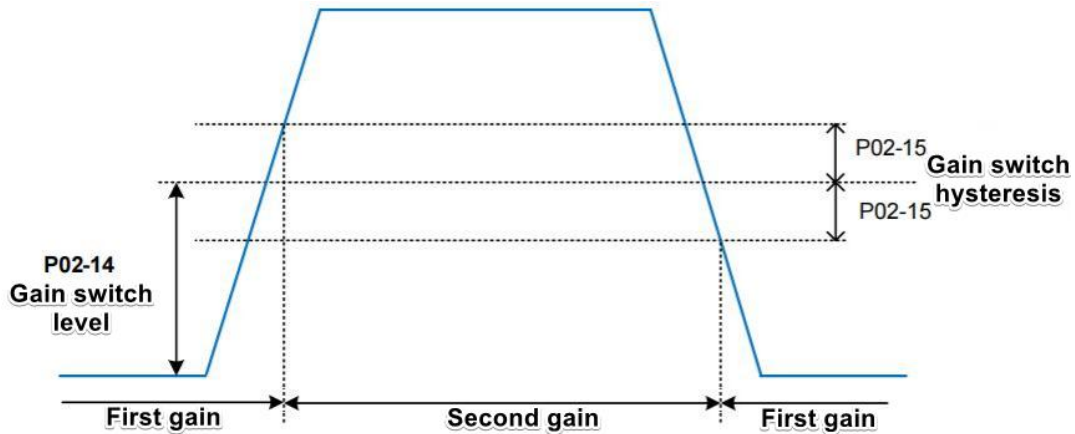
| P02-13  | Parameter name   | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 2002-0D | SecondGainSwTime | Operation setting | Valid immediately | 20      | 0~10000   | Gain control         | 1ms  |



【Note】 This parameter is only valid when the second gain is switched back to the first gain.

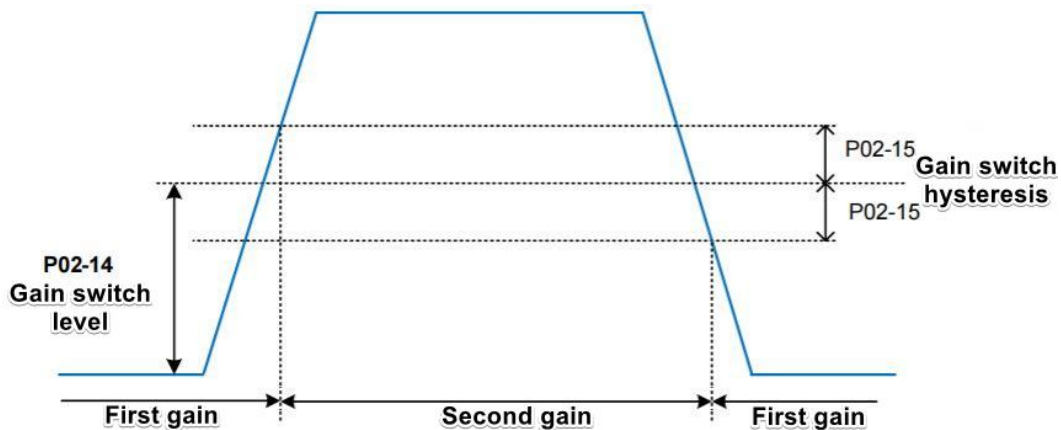
| P02-14<br>2002-0E | Parameter name    | Setting method    | Valid time        | Default | Set range | Application category | Unit                          |
|-------------------|-------------------|-------------------|-------------------|---------|-----------|----------------------|-------------------------------|
|                   | SecondGainSwLevel | Operation setting | Valid immediately | 50      | 0~20000   | Gain control         | Dependent on switch condition |

Used to set the time constant of the primary delay filter associated with the torque feedforward input.



| P02-15<br>2002-0F | Parameter name       | Setting method    | Valid time        | Default | Set range | Application category | Unit                          |
|-------------------|----------------------|-------------------|-------------------|---------|-----------|----------------------|-------------------------------|
|                   | SecondGainHysteresis | Operation setting | Valid immediately | 20      | 0~20000   | Gain control         | Dependent on switch condition |

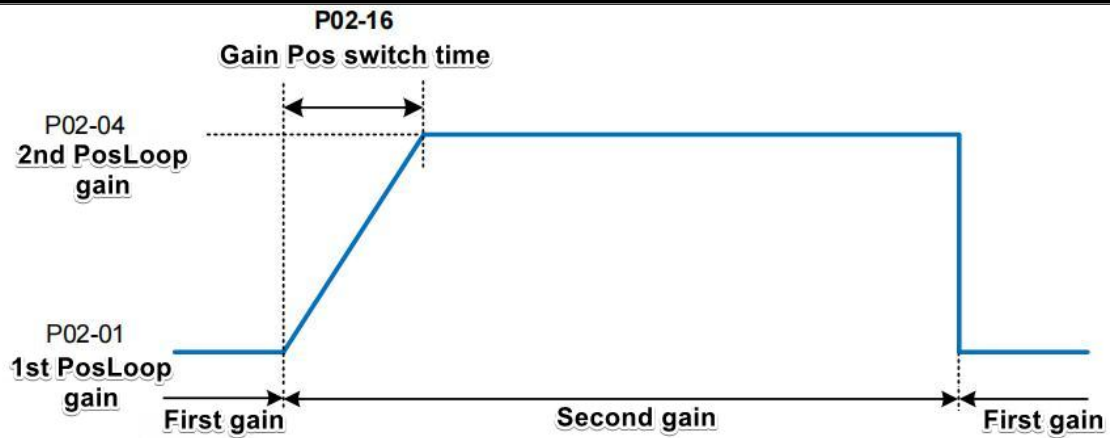
Used to set the time constant of the primary delay filter associated with the torque feedforward input.



| P02-16<br>2002-10 | Parameter name              | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-----------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Second Gain Pos Switch Time | Operation setting | Valid immediately | 30      | 0~10000   | Gain control         | 1ms  |

Set the time when the first position loop 2002-01 (P02-01) switches to the second position loop 2002-04 (P02-04) in position control mode..





If  $2002-04 \leq 2002-01$ , this parameter is invalid and the second gain is switched immediately.

| P02-20  | Parameter name    | Setting method | Valid time        | Default | Set range | Application category | Unit |
|---------|-------------------|----------------|-------------------|---------|-----------|----------------------|------|
| 2002-14 | Model Ctrl Enable | Stop setting   | Valid immediately | 0       | 0 to 1    | Gain control         | -    |

Setting 1 enables the model tracking control function.

| P02-21  | Parameter name  | Setting method    | Valid time        | Default | Set range   | Application category | Unit |
|---------|-----------------|-------------------|-------------------|---------|-------------|----------------------|------|
| 2002-15 | Model Ctrl Gain | Operation setting | Valid immediately | 1000    | 200 to 2000 | Gain control         | 0.1% |

Used to set the torque feedforward gain.

| P02-22  | Parameter name               | Setting method | Valid time        | Default | Set range   | Application category | Unit |
|---------|------------------------------|----------------|-------------------|---------|-------------|----------------------|------|
| 2002-16 | Model Ctrl Gain Compensation | Stop setting   | Valid immediately | 1000    | 500 to 2000 | Gain control         | 0.1% |

Gain compensation affects the damping ratio of the model loop, and the damping ratio increases as the gain compensation increases.

| P02-23  | Parameter name                 | Setting method    | Valid time        | Default | Set range  | Application category | Unit |
|---------|--------------------------------|-------------------|-------------------|---------|------------|----------------------|------|
| 2002-17 | Model Ctrl Positive dir Offset | Operation setting | Valid immediately | 1000    | 0 to 10000 | Gain control         | 0.1% |

Used to set the torque feedforward gain.

| P02-24  | Parameter name                 | Setting method    | Valid time        | Default | Set range  | Application category | Unit |
|---------|--------------------------------|-------------------|-------------------|---------|------------|----------------------|------|
| 2002-18 | Model Ctrl Negative dir Offset | Operation setting | Valid immediately | 1000    | 0 to 10000 | Gain control         | 0.1% |

Used to set the torque feedforward gain.

| P02-25<br>2002-19                        | Parameter name                        | Setting method    | Valid time        | Default | Set range  | Application category | Unit |
|------------------------------------------|---------------------------------------|-------------------|-------------------|---------|------------|----------------------|------|
|                                          | Model Ctrl Speed Forward Compensation | Operation setting | Valid immediately | 1000    | 0 to 10000 | Gain control         | 0.1% |
| Used to set the torque feedforward gain. |                                       |                   |                   |         |            |                      |      |

| P02-26<br>2002-1A                                                                                                                                       | Parameter name         | Setting method | Valid time        | Default | Set range    | Application category | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|-------------------|---------|--------------|----------------------|------|
|                                                                                                                                                         | Second Model Ctrl Gain | Stop setting   | Valid immediately | 1000    | 200 to 20000 | Gain control         | 0.1% |
| Increasing the model tracking control gain can improve the position response performance of the model loop, but too high a gain may cause overshoot.    |                        |                |                   |         |              |                      |      |
| I<br>n<br>c<br>r<br>e<br>a<br>s<br>i<br>n<br>g<br>t<br>h<br>e<br>m<br>o<br>d<br>e<br>l<br>t<br>r<br>a<br>c<br>k<br>i<br>n<br>g<br>c<br>o<br>n<br>t<br>r |                        |                |                   |         |              |                      |      |

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| P02-27                                                                                                                             | Parameter name                         | Setting method       | Valid time           | Default | Set range   | Application category | Unit |
|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------|----------------------|---------|-------------|----------------------|------|
| 2002-1B                                                                                                                            | Second Model Ctrl<br>Gain Compensation | Operation<br>setting | Valid<br>immediately | 1000    | 500 to 2000 | Gain control         | 0.1% |
| Gain compensation affects the damping ratio of the model loop, and the damping ratio increases as the gain compensation increases. |                                        |                      |                      |         |             |                      |      |

| P02-28  | Parameter name                                           | Setting method       | Valid time           | Default | Set range  | Application category | Unit |
|---------|----------------------------------------------------------|----------------------|----------------------|---------|------------|----------------------|------|
| 2002-1C | Model Tracking<br>Vibration Suppression<br>1 Frequency A | Operation<br>setting | Valid<br>immediately | 500     | 10 to 2500 | Gain control         | 0.1% |

| P02-29  | Parameter name                                           | Setting method | Valid time           | Default | Set range  | Application category | Unit  |
|---------|----------------------------------------------------------|----------------|----------------------|---------|------------|----------------------|-------|
| 2002-1D | Model Tracking<br>Vibration Suppression<br>1 Frequency B | Stop setting   | Valid<br>immediately | 700     | 10 to 2500 | Gain control         | 0.1Hz |

#### Group 2003h: Self-adjusting Parameters

| P03-01                                                   | Parameter name                          | Setting method       | Valid time           | Default | Set range | Application category             | Unit |
|----------------------------------------------------------|-----------------------------------------|----------------------|----------------------|---------|-----------|----------------------------------|------|
| 2003-01                                                  | Load inertia ratio<br><br>LoadInerRatio | Operation<br>setting | Valid<br>immediately | 300     | 100~10000 | Automatic<br>parameter<br>tuning | 0.01 |
| Used to set the load inertia ratio, 1.00 ~ 100.00 times. |                                         |                      |                      |         |           |                                  |      |

| P03-02                                                                                                                                   | Parameter name                             | Setting method       | Valid time           | Default | Set range | Application category             | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|----------------------|---------|-----------|----------------------------------|------|
| 2003-02                                                                                                                                  | Load rigidity selection<br><br>RigiditySel | Operation<br>setting | Valid<br>immediately | 14*     | 0~31      | Automatic<br>parameter<br>tuning | -    |
| Set the rigidity of the servo system. The larger the setting value, the faster the response, but too high rigidity will cause vibration. |                                            |                      |                      |         |           |                                  |      |
| *: The factory default value may be different for different models.                                                                      |                                            |                      |                      |         |           |                                  |      |

| P03-03  | Parameter name                   | Setting method       | Valid time           | Default | Set range | Application category             | Unit |
|---------|----------------------------------|----------------------|----------------------|---------|-----------|----------------------------------|------|
| 2003-03 | Self-adjusting mode<br>selection | Operation<br>setting | Valid<br>immediately | 0       | 0 to 2    | Automatic<br>parameter<br>tuning | -    |

|                                                                                                                                                           |                      |                                        |                                                                                                                                                                              |  |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|                                                                                                                                                           | SelfAdjustMode       |                                        |                                                                                                                                                                              |  |  |  |  |
| Used for setting different gain adjustment modes, the related gain parameters can be set manually or automatically according to the rigidity grade table. |                      |                                        |                                                                                                                                                                              |  |  |  |  |
|                                                                                                                                                           | <b>Setting value</b> | <b>Function</b>                        | <b>Description</b>                                                                                                                                                           |  |  |  |  |
|                                                                                                                                                           | 0                    | Self-adjusting mode.                   | Position loop gain, speed loop gain, speed loop integral time constant, torque filter parameter settings are automatically adjusted according to the rigidity grade setting. |  |  |  |  |
|                                                                                                                                                           | 1                    | Manual setting                         | The user manually sets the position loop gain, speed loop gain, speed loop integral time constant and torque filter parameter settings.                                      |  |  |  |  |
|                                                                                                                                                           | 2                    | On cable automatic self-adjusting mode | Not yet realized.                                                                                                                                                            |  |  |  |  |

|                                 |                                                              |                       |                   |                |                  |                             |             |
|---------------------------------|--------------------------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P03-04</b><br><b>2003-04</b> | <b>Parameter name</b>                                        | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                                 | On cable inertia identification sensitivity<br>InerIdOnCable | Operation setting     | Valid immediately | 0              | 0 to 2           | Automatic parameter tuning  | -           |
| Not yet realized.               |                                                              |                       |                   |                |                  |                             |             |

|                                                                                                   |                                                            |                       |                   |                |                  |                             |             |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P03-05</b><br><b>2003-05</b>                                                                   | <b>Parameter name</b>                                      | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                                                                                                   | Number of cycles of inertia identification<br>InerIdCircle | Stop setting          | Valid immediately | 2              | 1 to 20          | Automatic parameter tuning  | Circle      |
| Used to set the load inertia identification process and set the number of rotations of the motor. |                                                            |                       |                   |                |                  |                             |             |

|                                                                                                                                                                                                                                             |                                                         |                       |                   |                |                  |                             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P03-06</b><br><b>2003-06</b>                                                                                                                                                                                                             | <b>Parameter name</b>                                   | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                                                                                                                                                                                                                                             | Maximum speed of inertia identification<br>InerIdMaxSpd | Shutdown setting      | Valid immediately | 1000           | 300 to 2000      | Automatic parameter tuning  | rpm         |
| Used to set the maximum allowable motor speed command in off cable inertia identification mode. The faster the speed during inertia identification, the more accurate the identification result will be. Generally, keep the default value. |                                                         |                       |                   |                |                  |                             |             |

|                                 |                                                               |                       |                   |                |                  |                             |             |
|---------------------------------|---------------------------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P03-07</b><br><b>2003-07</b> | <b>Parameter name</b>                                         | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                                 | Parameter identification rotation direction<br>InerIdRollMode | Shutdown setting      | Valid immediately | 0              | 0 to 2           | Automatic parameter tuning  | -           |

Used to set parameters identification rotation direction.

| Setting value | Rotation direction                         |
|---------------|--------------------------------------------|
| 0             | Forward and reverse reciprocating rotation |
| 1             | Forward one-way rotation                   |
| 2             | Reverse one-way rotation                   |

| P03-08<br>2003-08 | Parameter name                                          | Setting method   | Valid time        | Default | Set range    | Application category       | Unit |
|-------------------|---------------------------------------------------------|------------------|-------------------|---------|--------------|----------------------------|------|
|                   | Parameter identification waiting time<br>InerIdWaitTime | Shutdown setting | Valid immediately | 1000    | 300 to 10000 | Automatic parameter tuning | ms   |

During offcable inertia identification, the time interval between two consecutive speed instructions

## Group 2004h: Vibration Suppression

| P04-01<br>2004-01 | Parameter name                                        | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
|                   | Pulse instruction filtering method<br>PulseFilterType | Shutdown setting | Valid immediately | 0       | 0 to 1    | Position mode        | -    |

Used for setting different gain adjustment modes, the related gain parameters can be set manually or automatically according to the rigidity grade table.

| Setting value | Filtering method                      |
|---------------|---------------------------------------|
| 0             | First-order low-pass filtering method |
| 1             | Mean filtering method                 |

| P04-02<br>2004-02 | Parameter name                                                                     | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------------------------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
|                   | Position command first-order low-pass Filtering time constant<br>LowpassFilterTime | Shutdown setting | Valid immediately | 0       | 0~1000    | Position mode        | ms   |

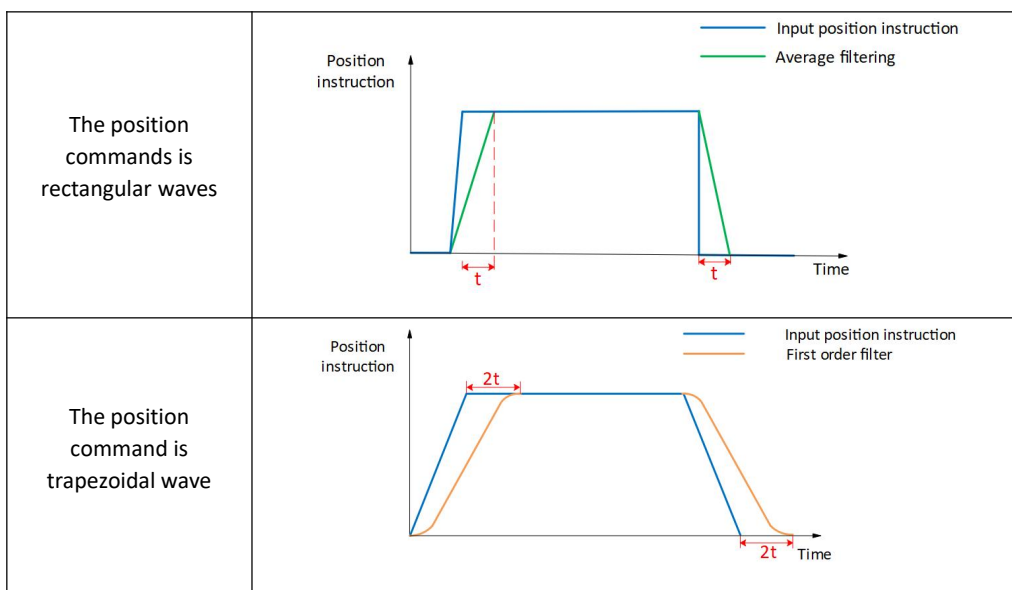
It is used to set the filtering time constant of the first-order low-pass filtering mode.

|                                                   |  |
|---------------------------------------------------|--|
| <p>The position commands is rectangular waves</p> |  |
|                                                   |  |

| P04-03<br>2004-03 | Parameter name                                                       | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
|                   | position command average filter time constant<br>AveragingFilterTime | Shutdown setting | Valid immediately | 0       | 0 to 128  | Position mode        | ms   |



Used to set average filtering time constant.



| P04-04  | Parameter name                               | Setting method    | Valid time        | Default | Set range | Application category  | Unit   |
|---------|----------------------------------------------|-------------------|-------------------|---------|-----------|-----------------------|--------|
| 2004-04 | Torque filter time constant<br>TogFilterTime | Operation setting | Valid immediately | 95      | 7~2500    | Vibration suppression | 0.01ms |

Used to set torque filtering time constant. When the function code P03-03(Self-adjustment mode selection) is set to 0, the parameter is automatically set by servo.

| P04-05  | Parameter name                                  | Setting method    | Valid time        | Default | Set range   | Application category  | Unit |
|---------|-------------------------------------------------|-------------------|-------------------|---------|-------------|-----------------------|------|
| 2004-05 | 1st notch filter frequency<br>NotchFilter1_Freq | Operation setting | Valid immediately | 300     | 250 to 5000 | Vibration suppression | Hz   |

Use to set the center frequency of the 1st notch filter. When the function code is set to 5000, the function of the notch filter is invalid.

| P04-06  | Parameter name                              | Setting method    | Valid time        | Default | Set range | Application category  | Unit |
|---------|---------------------------------------------|-------------------|-------------------|---------|-----------|-----------------------|------|
| 2004-06 | 1st notch filter depth<br>NotchFilter1_Deep | Operation setting | Valid immediately | 100     | 0 to 100  | Vibration suppression | -    |

It is use to set the notch filter depth grade (the ratio between input and output at the center frequency of the notch filter).The larger the set value of this function code is, the smaller the notch filter depth is, and the weaker the suppression effect of mechanical vibration is. However, setting too large could cause system instability.

| P04-07  | Parameter name                              | Setting method    | Valid time        | Default | Set range | Application category  | Unit |
|---------|---------------------------------------------|-------------------|-------------------|---------|-----------|-----------------------|------|
| 2004-07 | 1st notch filter width<br>NotchFilter1_Band | Operation setting | Valid immediately | 4       | 0 to 12   | Vibration suppression | -    |

Use to set the notch filter width grade (the ratio between input and output at the center frequency of the notch filter)

| P04-08<br>2004-08                                                                                                                            | Parameter name                                  | Setting method    | Valid time        | Default | Set range   | Application category  | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------|-------------------|---------|-------------|-----------------------|------|
|                                                                                                                                              | 2nd notch filter frequency<br>NotchFilter2_Freq | Operation setting | Valid immediately | 500     | 250 to 5000 | Vibration suppression | Hz   |
| Use to set the center frequency of the 2nd notch filter. When the function code is set to 5000, the function of the notch filter is invalid. |                                                 |                   |                   |         |             |                       |      |

| P04-09<br>2004-09 | Parameter name                              | Setting method    | Valid time        | Default | Set range | Application category  | Unit |
|-------------------|---------------------------------------------|-------------------|-------------------|---------|-----------|-----------------------|------|
|                   | 2nd notch filter depth<br>NotchFilter2_Deep | Operation setting | Valid immediately | 100     | 0 to 100  | Vibration suppression | -    |

| P04-10<br>2004-0A | Parameter name                              | Setting method    | Valid time        | Default | Set range | Application category  | Unit |
|-------------------|---------------------------------------------|-------------------|-------------------|---------|-----------|-----------------------|------|
|                   | 2nd notch filter width<br>NotchFilter2_Band | Operation setting | Valid immediately | 4       | 0 to 12   | Vibration suppression | -    |

| P04-18<br>2004-12 | Parameter name                                 | Setting method    | Effective time        | Default | Set range | Application category  | Unit   |
|-------------------|------------------------------------------------|-------------------|-----------------------|---------|-----------|-----------------------|--------|
|                   | Speed feedback filter time<br>SpdFdbFilterTime | Operation setting | Effective immediately | 10      | 1 to 1000 | Vibration suppression | 0.01ms |

#### Group 2005h: Signal Input and Output

| P05-16<br>2005-10                                                                                                                                | Parameter name                                      | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                                                                                                  | Rotation detection speed threshold<br>RotateSpdDtTh | Operation setting | Valid immediately | 20      | 0~1000    | Speed mode           | rpm  |
| Set the speed threshold that triggers the motor rotation signal. The motor rotation signal (TGON) is used to confirm that the motor has rotated. |                                                     |                   |                   |         |           |                      |      |

| P05-19<br>2005-13                                                                                                                                                             | Parameter name                                     | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                                                                                                                               | Zero speed output signal threshold<br>SpdZeroOutTh | Operation setting | Valid immediately | 10      | 0~6000    | Speed mode           | rpm  |
| Use to set the speed threshold that triggers the motor rotation signal. Motor output zero speed signal (ZSP) means that the actual speed of the motor is close to stationary. |                                                    |                   |                   |         |           |                      |      |

| P05-20<br>2005-1<br>4 | Parameter name                                   | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-----------------------|--------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                       | Torque reaches threshold<br>TRQ Arrive Threshold | Operation setting | Valid immediately | 100     | 0~300     | Torque mode          | %    |

[P05-20] needs to be used together with [P05-21]  
 When the actual torque reaches the value of [P05-20] + [P05-21], the torque arrival DO becomes valid;  
 When the actual torque drops below the value of [P05-20]- [P05-21], the torque arrival DO becomes invalid.

| P05-21<br>2001-1<br>5 | Parameter name                                    | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-----------------------|---------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                       | Torque reaches hysteresis<br>TRQ ArriveHysteresis | Operation setting | Valid immediately | 10      | 0~20      | Torque mode          | %    |

[P05-21] needs to be used together with [P05-20]

### Group 2006h: DIDO Configuration

| P06-02<br>2006-02 | Parameter name                               | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | DI_1 channel function selection<br>Di1FunSel | Operation setting | Power-on again | 0       | 0~32      | DI/DO                | -    |

Set DI functions corresponding to hardware DI\_1. Refer to the following table for the functions corresponding to the set value:

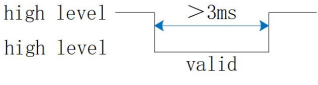
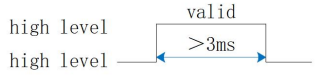
| Setting value | DI channel function             | Setting value | DI channel function     |
|---------------|---------------------------------|---------------|-------------------------|
| 0             | OFF (not used)                  | 8             | E-STOP (Emergency stop) |
| 1             | SON (servo enabled)             | 10            | GAIN-SEL switch         |
| 2             | A-CLR (Fault and warning clear) | 18            | Probe 1                 |
| 3             | POT (Forward drive prohibition) | 19            | Probe 2                 |
| 4             | NOT (Reverse drive prohibition) | 26            | HOMEORG (origin signal) |
| 6             | CL (deviation counter cleared)  | Remaining     | None                    |

If P06-02 is set to a value other than that in the preceding table, the DI port function is not require

The same DI channel function could not be allocated to multiple DI ports, otherwise servo drive will occur A-89 (duplicate DI port configuration)

| P06-03<br>2006-03 | Parameter name                            | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_1 channel logic selection<br>Di1LogSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

## DI port input logic validity function selection

| Setting value | Content                                                | Specification                                                                      |
|---------------|--------------------------------------------------------|------------------------------------------------------------------------------------|
| 0             | Normally open input. Active low level (switch on);     |  |
| 1             | Normally closed input. Active high level (switch off); |  |

| P06-04<br>2006-04 | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_1 input source selection<br>Di1SrcSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

Select the enabled DI\_1 port type

| Setting value | Port category                |
|---------------|------------------------------|
| 0             | Hardware DI_1 input terminal |
| 1             | Virtual VDI_1 input terminal |

| P06-05<br>2006-05 | Parameter name                               | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | DI_2 channel function selection<br>Di2FunSel | Operation setting | Power-on again | 2       | 0~32      | DI/DO                | -    |

| P06-06<br>2006-06 | Parameter name                            | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_2 channel logic selection<br>Di2LogSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-07<br>2006-07 | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_2 input source selection<br>Di2SrcSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-08<br>2006-08 | Parameter name                  | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|-------------------|---------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | DI_3 channel function selection | Operation setting | Power-on again | 3       | 0~32      | DI/DO                | -    |

|  |           |  |  |  |  |  |  |
|--|-----------|--|--|--|--|--|--|
|  | Di3FunSel |  |  |  |  |  |  |
|--|-----------|--|--|--|--|--|--|

| P06-09<br>2006-09 | Parameter name                            | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_3 channel logic selection<br>Di3LogSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-10<br>2006-0A | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_3 input source selection<br>Di3SrcSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-11<br>2006-0B | Parameter name                               | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
|                   | DI_4 channel function selection<br>Di4FunSel | Operation setting | Power-on again | 4       | 0~32      | DI/DO                | -    |

| P06-12<br>2006-0C | Parameter name                            | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_4 channel logic selection<br>Di4LogSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-13<br>2006-0D | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_4 input source selection<br>Di4SrcSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-13<br>2006-0E | Parameter name                           | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DI_5 input source selection<br>Di5SrcSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P06-26<br>2006-1A | Parameter name                               | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DO_1 channel function selection<br>Do1FunSel | Operation setting | Valid immediately | 132     | 128 ~ 148 | DI/DO                | -    |

Use to set DO functions corresponding to hardware DO\_1. Refer to the following table for the functions corresponding to the set

value:

| Setting value | DI channel function            |
|---------------|--------------------------------|
| 128           | OFF (not used)                 |
| 129           | RDY (Servo ready)              |
| 130           | ALM (fault signal)             |
| 131           | WARN (warning signal)          |
| 132           | TGON (rotation detection)      |
| 133           | ZSP (zero speed signal)        |
| 134           | P-COIN (positioning completed) |
| 137           | V-NEAR (speed approach)        |
| 138           | T-COIN (torque arrival)        |

| Setting value | DI channel function                  |
|---------------|--------------------------------------|
| 139           | T-LIMIT (Torque limit)               |
| 140           | V-LIMIT (speed limited)              |
| 141           | BRK-OFF (brake output)               |
| 142           | SRV-ST (Servo on state output)       |
| 145           | COM_VDO1 (communication VDO1 output) |
| 146           | COM_VDO1 (communication VDO1 output) |
| 147           | COM_VDO1 (communication VDO1 output) |
| Others        | None                                 |
|               |                                      |

**Note:** To use the BRK-OFF (brake output) function code, power must be turned on again to take effect.

If P06-26 is set to a value other than that in the preceding table, the DO port function is not required

The same DO channel function could not be allocated to multiple DO ports, otherwise servo drive will occur A-90 (duplicate DO port configuration)

| P06-27<br>2006-1B | Parameter name                            | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DO_1 channel logic selection<br>Do1LogSel | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

DO Port input logic validity function selection.

| Setting value | Content                                                                                                    |
|---------------|------------------------------------------------------------------------------------------------------------|
| 0             | Output transistor is on when the output is valid, and output transistor is off when the output is invalid. |
| 1             | Output transistor is off when the output is valid, and output transistor is on when the output is invalid. |

| P06-28<br>2006-1C | Parameter name                               | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|----------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | DO_2 channel function selection<br>Do2FunSel | Operation setting | Valid immediately | 130     | 128 ~ 148 | DI/DO                | -    |

| P06-29 | Parameter name | Setting method | Valid time | Default | Set range | Application category | Unit |
|--------|----------------|----------------|------------|---------|-----------|----------------------|------|
|--------|----------------|----------------|------------|---------|-----------|----------------------|------|

|                |                              |                   |                   |   |        |       |   |
|----------------|------------------------------|-------------------|-------------------|---|--------|-------|---|
| <b>2006-1D</b> | DO_2 channel logic selection | Operation setting | Valid immediately | 0 | 0 to 1 | DI/DO | - |
|                | Do2LogSel                    |                   |                   |   |        |       |   |

|                           |                                              |                       |                   |                |                  |                             |             |
|---------------------------|----------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P06-30<br/>2006-1E</b> | <b>Parameter name</b>                        | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | DO_3 channel function selection<br>Do3FunSel | Operation setting     | Valid immediately | 129            | 128 ~ 148        | DI/DO                       | -           |

|                           |                                           |                       |                   |                |                  |                             |             |
|---------------------------|-------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P06-31<br/>2006-1F</b> | <b>Parameter name</b>                     | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | DO_3 channel logic selection<br>Do3LogSel | Operation setting     | Valid immediately | 0              | 0 to 1           | DI/DO                       | -           |

|                           |                                                     |                       |                   |                |                  |                             |             |
|---------------------------|-----------------------------------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P06-34<br/>2006-20</b> | <b>Parameter name</b>                               | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | ECAT forces DO to output state<br>CompDoOutputStatu | Operation setting     | Valid immediately | 0              | 0 to 1           | Auxiliary function          | -           |

When the master station changes from online to offline, the DO output state changes (when the DO forced output enable of 60FE-02h is not turned on, it is not affected by this function code)

0: Keep the current state;

1: Initialize state.

### Group 200Ah: Auxiliary Function

|                           |                        |                       |                   |                |                  |                             |             |
|---------------------------|------------------------|-----------------------|-------------------|----------------|------------------|-----------------------------|-------------|
| <b>P10-01<br/>200A-01</b> | <b>Parameter name</b>  | <b>Setting method</b> | <b>Valid time</b> | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                           | JOG speed<br>SpdRefJOG | Operation setting     | Valid immediately | 100            | 0~3000           | Auxiliary function          | rpm         |
| Used to set JOG speed     |                        |                       |                   |                |                  |                             |             |

|                                                             |                                       |                       |                            |                |                  |                             |             |
|-------------------------------------------------------------|---------------------------------------|-----------------------|----------------------------|----------------|------------------|-----------------------------|-------------|
| <b>P10-02<br/>200A-02</b>                                   | <b>Parameter name</b>                 | <b>Setting method</b> | <b>Valid time</b>          | <b>Default</b> | <b>Set range</b> | <b>Application category</b> | <b>Unit</b> |
|                                                             | Factory value resetting<br>RstFuncFac | Shutdown setting      | Valid immediately          | 0              | 0 to 65535       | Auxiliary function          | -           |
| Used to restore function code parameters to factory values. |                                       |                       |                            |                |                  |                             |             |
|                                                             |                                       | <b>Setting value</b>  | <b>Operational meaning</b> |                |                  |                             |             |

|  |   |                               |  |
|--|---|-------------------------------|--|
|  | 0 | No operation                  |  |
|  | 1 | Restore factory setting value |  |

| P10-03  | Parameter name                  | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|---------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 200A-03 | Fault clearing<br>ServoErrClear | Operation setting | Valid immediately | 0       | 0 to 1    | Auxiliary function   | -    |

Fault reset operation selection

| Setting value | Function       | Remark                                                                                                                                                                     |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | No operation   | -                                                                                                                                                                          |
| 1             | Fault clearing | For clearable faults, after the cause of fault is removed, and write 1 to the function code, the drive will stop the fault display and enter the Rdy (or RUN) state again. |

 **Note:** If the servo S-ON is valid, when the fault is removed and cleared, the servo will directly enter the Run state. When performing fault clearing actions, be sure to stop sending control instructions such as pulses to ensure personal safety.

| P10-04  | Parameter name                                             | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|---------|------------------------------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| 200A-04 | Motor overload protection time factor<br>MotOLProtect_Coef | Operation setting | Valid immediately | 100     | 1 to 800  | Accessibility        | %    |

This function code represents the heat dissipation capacity of the motor surface.

The larger the value, the stronger the heat dissipation capacity of the motor, and the less likely it is to report motor overload warnings and faults under the same load conditions.

| P10-05  | Parameter name            | Setting method    | Valid time     | Default | Set range | Application category | Unit |
|---------|---------------------------|-------------------|----------------|---------|-----------|----------------------|------|
| 200A-05 | Motor type<br>MotoTypeSel | Operation setting | Power-on again | 0       | 0-65535   | Accessibility        | -    |

The motor type is used together with P10-7 to manually set the motor code. When P10-7 is set to 1, the motorcode uses the P10-5 setting value. When P10-7 is set to 0, query U0-53 to obtain the current motor type.

 **Note:** The motor must be connected first, and then the drive is powered on. Otherwise, the servo drive will report Er.27 (encoder disconnection fault).

| P10-06  | Parameter name                    | Setting method   | Valid time        | Default | Set range | Application category | Unit |
|---------|-----------------------------------|------------------|-------------------|---------|-----------|----------------------|------|
| 200A-06 | Multi-turn absolute encoder reset | Shutdown setting | Valid immediately | 0       | 0 to 1    | Accessibility        | -    |



|                                                                                                                                                                                                                                              | AbsEncRst                                                                |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|---------------|----------|---|--------------|---|--------------------------------------------------------------------------|
| Used to clear the rotation number of multi-turn absolute encoder (U0-56), current position (U0-56) or clear the encoder fault alarms                                                                                                         |                                                                          |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
|                                                                                                                                                                                                                                              |                                                                          | <table><tr><th>Setting value</th><th>Function</th></tr><tr><td>0</td><td>No operation</td></tr><tr><td>1</td><td>Clear multi-turn data, encoder current position and encoder fault alarms</td></tr></table> |  |  |  |  |  | Setting value | Function | 0 | No operation | 1 | Clear multi-turn data, encoder current position and encoder fault alarms |
| Setting value                                                                                                                                                                                                                                | Function                                                                 |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
| 0                                                                                                                                                                                                                                            | No operation                                                             |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
| 1                                                                                                                                                                                                                                            | Clear multi-turn data, encoder current position and encoder fault alarms |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
|                                                                                                                                                                                                                                              |                                                                          |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |
|  <b>Note:</b> After reset (P10-06 is set to 1), the absolute position of the encoder will change suddenly, and the mechanical homing operation is required. |                                                                          |                                                                                                                                                                                                             |  |  |  |  |  |               |          |   |              |   |                                                                          |

| P10-07                                                                                                                                                                | Parameter name                                 | Setting method    | Effective time | Default | Set range | Application category | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------|----------------|---------|-----------|----------------------|------|
| 200A-07                                                                                                                                                               | Manual setting motor code<br>ManualSetMotoCode | Operation setting | Power-on again | 0       | 0 to 1    | Auxiliary function   | -    |
| Used to modify the Motor Code of the servo drive. When it is set to 0, Motor Code is read from motor. When it is set to 1, Motor code is read from P10-5 motor model. |                                                |                   |                |         |           |                      |      |
| <b>Note:</b> Do not modify it casually, otherwise it will cause motor damage.                                                                                         |                                                |                   |                |         |           |                      |      |

|         |                   |                   |                   |         |           |                      |      |
|---------|-------------------|-------------------|-------------------|---------|-----------|----------------------|------|
| P10-11  | Parameter name    | Setting method    | Valid time        | Default | Set range | Application category | Unit |
| 200A-0B | ManualSetMotoCode | Operation setting | Valid immediately | 0       | 0 to 1    | Auxiliary function   | -    |

Used to turn on and off the motor stall overtemperature detection function..

| Setting value | VDI_1 input level                                                                                                                        |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | Enable motor stall overtemperature detection. When the motor stalls, the drive reports [ER.45] motor stall overtemperature protection;   |
| 1             | Shielded motor stall overtemperature detection. (After stall detection, the torque is automatically reduced to 70.7% of the rated value) |

【Note】After executing the shielded motor stall overtemperature detection operation (P10-11 is set to 1), the motor may burn out when it stalls and overheats!

#### Group 200Dh Communication Input and Output Terminal

| P13-01                                                                           | Parameter name                         | Setting method       | Valid time               | Default | Set range | Application category | Unit |
|----------------------------------------------------------------------------------|----------------------------------------|----------------------|--------------------------|---------|-----------|----------------------|------|
| 200D-01                                                                          | Virtual VDI_1 input value<br>CommVdi_1 | Operation setting    | Valid immediately        | 0       | 0 to 1    | DI/DO                | -    |
| When P06-04 is set to 1, DI_1 channel logic is controlled by this function code. |                                        |                      |                          |         |           |                      |      |
|                                                                                  |                                        | <b>Setting value</b> | <b>VDI_1 input level</b> |         |           |                      |      |
|                                                                                  |                                        | 0                    | Low level                |         |           |                      |      |

|  |   |            |  |
|--|---|------------|--|
|  | 1 | High level |  |
|--|---|------------|--|

| P13-02<br>200D-02                                                                | Parameter name                         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|----------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                                  | Virtual VDI_2 input value<br>CommVdi_2 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |
| When P06-07 is set to 1, DI_2 channel logic is controlled by this function code. |                                        |                   |                   |         |           |                      |      |

| P13-03<br>200D-03                                                             | Parameter name                         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                               | Virtual VDI_3 input value<br>CommVdi_3 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |
| When P06-10 is set to 1, DI_3 channel logic is control by this function code. |                                        |                   |                   |         |           |                      |      |

| P13-04<br>200D-04                                                             | Parameter name                         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                               | Virtual VDI_4 input value<br>CommVdi_4 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |
| When P06-13 is set to 1, DI_4 channel logic is control by this function code. |                                        |                   |                   |         |           |                      |      |

| P13-05<br>200D-05                                                             | Parameter name                         | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                               | Virtual VDI_5 input value<br>CommVdi_5 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |
| When P06-13 is set to 1, DI_5 channel logic is control by this function code. |                                        |                   |                   |         |           |                      |      |

| P13-11<br>200D-0B                                                                   | Parameter name                          | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------------------------------------------------------------------------|-----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                                                                                     | Virtual VDO_1 output value<br>CommVdo_1 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |
| Used to set the input level logic when the DO function selected by VDO_1 is active. |                                         |                   |                   |         |           |                      |      |
|                                                                                     |                                         | Setting value     | VDO_1 input level |         |           |                      |      |
|                                                                                     |                                         | 0                 | Low level         |         |           |                      |      |
|                                                                                     |                                         | 1                 | High level        |         |           |                      |      |

| P13-12<br>200D-0C | Parameter name                          | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Virtual VDO_2 output value<br>CommVdo_2 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

| P13-13<br>200D-0D | Parameter name                          | Setting method    | Valid time        | Default | Set range | Application category | Unit |
|-------------------|-----------------------------------------|-------------------|-------------------|---------|-----------|----------------------|------|
|                   | Virtual VDO_3 output value<br>CommVdo_3 | Operation setting | Valid immediately | 0       | 0 to 1    | DI/DO                | -    |

## Group 201Eh Universal Monitoring

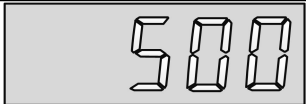
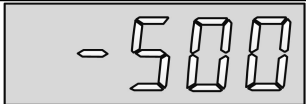
| U0-01   | Monitoring name           | Range | Category  | Panel display | Unit | Data type |
|---------|---------------------------|-------|-----------|---------------|------|-----------|
| 201E-01 | Servo status<br>SrvStatus | 0 ~8  | Universal | Decimal       | -    | 16 Bit    |

Display the status of servo drive.

| Display value | Status                 | Display value | Status               |
|---------------|------------------------|---------------|----------------------|
| 0             | Power-on               | 5             | Servo operation      |
| 1             | Initialization         | 6             | Quick shutdown       |
| 2             | Failure-free (nF)      | 7             | Malfunction shutdown |
| 3             | Servo ready (Ry)       | 8             | Fault                |
| 4             | Wait for servo enabled |               |                      |

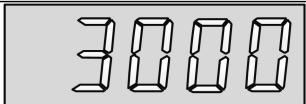
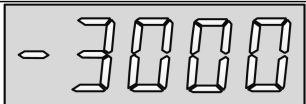
| U0-02   | Monitoring name               | Range      | Category  | Panel display | Unit | Data type |
|---------|-------------------------------|------------|-----------|---------------|------|-----------|
| 201E-02 | Servo motor speed<br>SpeedDis | -5000~5000 | Universal | Decimal       | rpm  | 16 Bit    |

Display the actual speed of servo drive. The accuracy is 1 rpm. The display of servo drive panel is as below.

| 500rpm display                                                                      | -500rpm display                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |

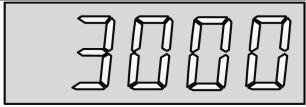
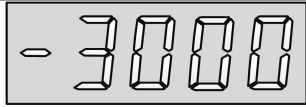
| U0-03   | Monitoring name                   | Range      | Category  | Panel display | Unit | Data type |
|---------|-----------------------------------|------------|-----------|---------------|------|-----------|
| 201E-03 | Input speed instruction<br>SpdCmd | -6000~6000 | Universal | Decimal       | rpm  | 16 Bit    |

Display servo input speed instruction. The accuracy is 1 rpm. The display of servo drive panel is as below.

| 3000rpm display                                                                     | -3000rpm display                                                                     |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |

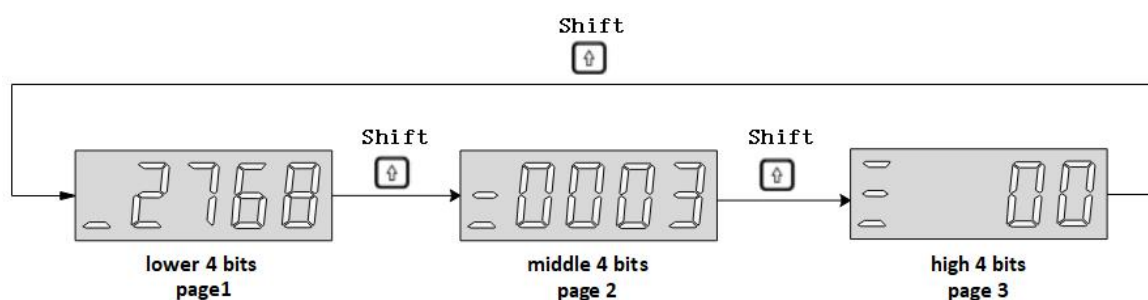
| U0-04   | Monitoring name                                        | Range      | Category  | Panel display | Unit | Data type |
|---------|--------------------------------------------------------|------------|-----------|---------------|------|-----------|
| 201E-04 | Corresponding speed of position command<br>PosCmdToSpd | -5000~5000 | Universal | Decimal       | rpm  | 16 Bit    |

Display the current speed instruction value of servo drive in position mode. The accuracy is 1 rpm. The display of servo drive panel is as below.

| 3000rpm display                                                                   | -3000rpm display                                                                   |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  |  |

| U0-05   | Monitoring name            | Range                 | Category  | Panel display | Unit                       | Data type |
|---------|----------------------------|-----------------------|-----------|---------------|----------------------------|-----------|
| 201E-05 | Pulse deviation<br>PulsErr | $-2^{31} \sim 2^{31}$ | Universal | Decimal       | Equivalent pulse deviation | 32 Bit    |

Display pulse deviation. If U0-05 is 32768, the display of the servo drive panel is:

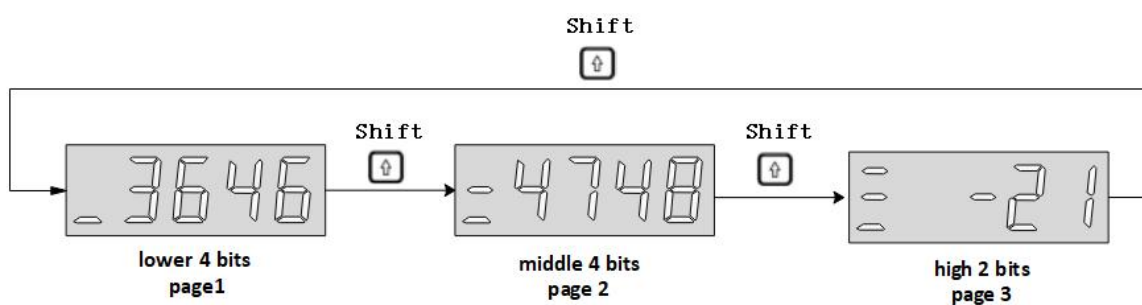


| U0-07   | Monitoring name                                      | Range   | Category  | Panel display | Unit | Data type |
|---------|------------------------------------------------------|---------|-----------|---------------|------|-----------|
| 201E-0F | Encoder communication error count<br>Encoder Err Cnt | 0~65536 | Universal | Decimal       |      | 16 Bit    |

Displays the number of drive and encoder communication errors from power on to the current drive

| U0-09   | Monitoring name                             | Range                 | Category  | Panel display | Unit             | Data type |
|---------|---------------------------------------------|-----------------------|-----------|---------------|------------------|-----------|
| 201E-09 | Input instruction pulse number<br>PulsTotal | $-2^{31} \sim 2^{31}$ | Universal | Decimal       | Instruction unit | 32 Bit    |

Display instruction pulse number that input the servo drive. If U0-09 is set to -2147483646, the panel of servo drive is displayed as below.



|                                | Monitoring name                   | Range                 | Category  | Panel display | Unit         | Data type |
|--------------------------------|-----------------------------------|-----------------------|-----------|---------------|--------------|-----------|
| <b>U0-13</b><br><b>201E-0D</b> | Encoder cumulative position       | $-2^{31} \sim 2^{31}$ | Universal | Decimal       | Encoder unit | 32 Bit    |
|                                | (Low 32 bits)<br>EncTotal_LowWord |                       |           |               |              |           |

|                                | Monitoring name                     | Range                 | Category  | Panel display | Unit         | Data type |
|--------------------------------|-------------------------------------|-----------------------|-----------|---------------|--------------|-----------|
| <b>U0-15</b><br><b>201E-0F</b> | Encoder cumulative position         | $-2^{31} \sim 2^{31}$ | Universal | Decimal       | Encoder unit | 32 Bit    |
|                                | (High 32 bits)<br>EncTotal_HighWord |                       |           |               |              |           |

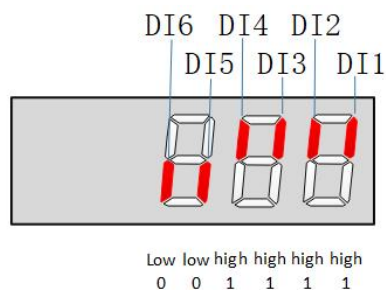
Display the cumulative data of encoder position. It is used with U0-13 cooperatively.

|                                | Monitoring name        | Range     | Category  | Panel display | Unit         | Data type |
|--------------------------------|------------------------|-----------|-----------|---------------|--------------|-----------|
| <b>U0-17</b><br><b>201E-11</b> | DI input signal status | 00000000~ | Universal | Binary        | Encoder unit | 16 Bit    |
|                                | DiData1                | 11111111  |           |               |              |           |

Displays the current level status of 6 DI terminals.

Display mode: The upper part of the digital tube of the servo drive panel is bright to indicate high level (represented by "1"); The lower light indicates low level (denoted by "0").

Take the DI1~DI4 terminal as the high level and DI5~DI6 as the low level as the example: the corresponding binary code is "001111", and Wecon servo control device debugging platform U0-17 displays the 0b0000 1111. The panel of servo drive is displayed as below:

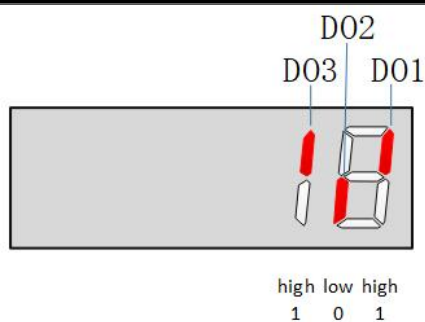


|                                | Monitoring name         | Range     | Category  | Panel display | Unit         | Data type |
|--------------------------------|-------------------------|-----------|-----------|---------------|--------------|-----------|
| <b>U0-19</b><br><b>201E-13</b> | DO output signal status | 00000000~ | Universal | Binary        | Encoder unit | 16 Bit    |
|                                | DoData1                 | 00001111  |           |               |              |           |

Displays the current level status of 3 DO terminals.

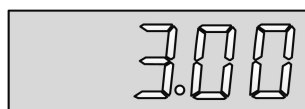
Display mode: The upper part of the digital tube of the servo drive panel is bright to indicate high level (represented by "1"); The lower light indicates low level (denoted by "0").

Take the DO1, DO2 and DO3 terminals as the high level and DO2 as the low level as an example. The corresponding binary code is "101", and Wecon servo upper computer debugging platform U0-17 displays the current binary value is 0b0000 0101. The panel of servo drive is displayed as below.



|                  | Monitoring name              | Range | Category  | Panel display | Unit | Data type |
|------------------|------------------------------|-------|-----------|---------------|------|-----------|
| U0-20<br>201E-14 | Real-time load inertia ratio | -     | Universal | Decimal       | %    | 16 Bit    |
|                  | InerRatioReal                |       |           |               |      |           |

Displays the current load inertia ratio. If the load inertia ratio is 3 times (300%) , the panel of servo drive is displayed as below.

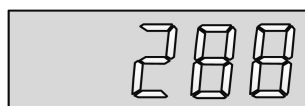


|                  | Monitoring name     | Range | Category  | Panel display | Unit | Data type |
|------------------|---------------------|-------|-----------|---------------|------|-----------|
| U0-23<br>201E-17 | Vibration Frequency | -     | Universal | Decimal       | Hz   | 16 Bit    |
|                  | DisVibFreq          |       |           |               |      |           |

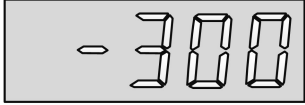
|                  | Monitoring name     | Range | Category  | Panel display | Unit | Data type |
|------------------|---------------------|-------|-----------|---------------|------|-----------|
| U0-24<br>201E-18 | Vibration Amplitude | -     | Universal | Decimal       | rpm  | 16 Bit    |
|                  | DisVibMag           |       |           |               |      |           |

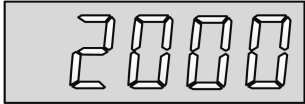
|                  | Monitoring name            | Range | Category  | Panel display | Unit | Data type |
|------------------|----------------------------|-------|-----------|---------------|------|-----------|
| U0-25<br>201E-19 | Forward torque limit value | 0~300 | Universal | Decimal       | %    | 16 Bit    |
|                  | PToqLimitDis               |       |           |               |      |           |

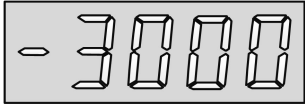
Display the set value of P01-15 (forward torque limit) of servo drive. If U0-25 is 288%, the panel of servo drive is displayed as below.



|                  | Monitoring name            | Range  | Category  | Panel display | Unit | Data type |
|------------------|----------------------------|--------|-----------|---------------|------|-----------|
| U0-26<br>201E-1A | Reverse torque limit value | -300~0 | Universal | Decimal       | %    | 16 Bit    |
|                  |                            |        |           |               |      |           |

|                                                                                                                                          |              |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------|--|--|--|--|--|
|                                                                                                                                          | NToqLimitDis |  |  |  |  |  |
| Display the set value of P01-16 (reverse torque limit) of servo drive. If U0-26 is 300%, the panel of servo drive is displayed as below. |              |  |  |  |  |  |
|                                                         |              |  |  |  |  |  |

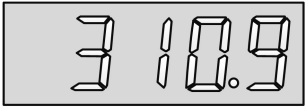
|                                                                                                                                                     | Monitoring name           | Range  | Category  | Panel display | Unit | Data type |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------|-----------|---------------|------|-----------|
| U0-27<br>201E-1B                                                                                                                                    | Forward speed limit value | 0~5000 | Universal | Decimal       | rpm  | 16 Bit    |
|                                                                                                                                                     | PSpdLimitDis              |        |           |               |      |           |
| Display the set value of P01-12 (forward speed threshold) of servo drive. If P01-12 is set to 2000, the panel of servo drive is displayed as below. |                           |        |           |               |      |           |
|                                                                    |                           |        |           |               |      |           |

|                                                                                                                                                     | Monitoring name           | Range   | Category  | Panel display | Unit | Data type |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------|-----------|---------------|------|-----------|
| U0-28<br>201E-1C                                                                                                                                    | Reverse speed limit value | -5000~0 | Universal | Decimal       | rpm  | 16 Bit    |
|                                                                                                                                                     | NSpdLimitDis              |         |           |               |      |           |
| Display the set value of P01-13 (reverse speed threshold) of servo drive. If P01-13 is set to 3000, the panel of servo drive is displayed as below. |                           |         |           |               |      |           |
|                                                                  |                           |         |           |               |      |           |

|                                                                                             | Monitoring name  | Range | Category  | Panel display | Unit | Data type |
|---------------------------------------------------------------------------------------------|------------------|-------|-----------|---------------|------|-----------|
| U0-29<br>201E-1D                                                                            | Mechanical angle | 0~359 | Universal | Decimal       | °    | 16 Bit    |
|                                                                                             | MachineAngle     |       |           |               |      |           |
| Display current mechanical angle of motor. 0 corresponds to a mechanical angle of 0 degree. |                  |       |           |               |      |           |

|                                                                                                                                  | Monitoring name  | Range | Category  | Panel display | Unit | Data type |
|----------------------------------------------------------------------------------------------------------------------------------|------------------|-------|-----------|---------------|------|-----------|
| U0-30<br>201E-1E                                                                                                                 | Electrical angle | 0~359 | Universal | Decimal       | °    | 16 Bit    |
|                                                                                                                                  | ElecAngle        |       |           |               |      |           |
| Display current electrical angle of motor. The accuracy is 1°. When the motor rotates, the electrical angle range is 360°.       |                  |       |           |               |      |           |
| When the motor is 4 poles, every time the motor is rotated one turn, it undergoes a change process of 0° to 359° for four times. |                  |       |           |               |      |           |



| U0-31<br>201E-1F                                                                                                                                                                                                                                                                                                                  | Monitoring name              | Range | Category  | Panel display | Unit | Data type |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------|-----------|---------------|------|-----------|
|                                                                                                                                                                                                                                                                                                                                   | Bus voltage<br>DcBusVoltDisp | -     | Universal | Decimal       | V    | 16 Bit    |
| Display the DC bus voltage of the main circuit input voltage of servo drive after rectification.<br><br>If the bus voltage is 310.9, the panel of servo drive is displayed as below. <div style="text-align: center; margin-top: 10px;">  </div> |                              |       |           |               |      |           |

| U0-32<br>201E-20 | Monitoring name                         | Range | Category  | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Radiator temperature<br>Temperature_IPM | -     | Universal | Decimal       | °C   | 16 Bit    |

| U0-33<br>201E-21 | Monitoring name                               | Range | Category  | Panel display | Unit | Data type |
|------------------|-----------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Instantaneous output power<br>OutputPowerInst | -     | Universal | Decimal       | W    | 16 Bit    |

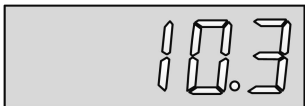
| U0-34<br>201E-22 | Monitoring name                            | Range | Category  | Panel display | Unit | Data type |
|------------------|--------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Average output power<br>OutputPowerAverage | -     | Universal | Decimal       | W    | 16 Bit    |

| U0-35<br>201E-23 | Monitoring name                             | Range | Category  | Panel display | Unit | Data type |
|------------------|---------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Total operation time (hour)<br>HourTotalRun | -     | Universal | Decimal       | h    | 16 Bit    |

| U0-37<br>201E-25 | Monitoring name                              | Range | Category  | Panel display | Unit | Data type |
|------------------|----------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Total operation time (minute)<br>MinTotalRun | -     | Universal | Decimal       | min  | 16 Bit    |

| U0-38<br>201E-26 | Monitoring name      | Range | Category  | Panel display | Unit | Data type |
|------------------|----------------------|-------|-----------|---------------|------|-----------|
|                  | Total operation time | -     | Universal | Decimal       | s    | 16 Bit    |

|  |             |  |  |  |  |  |
|--|-------------|--|--|--|--|--|
|  | (second)    |  |  |  |  |  |
|  | SecTotalRun |  |  |  |  |  |

| U0-39<br>201E-27                                                                                                                        | Monitoring name                      | Range | Category  | Panel display | Unit | Data type |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------|-----------|---------------|------|-----------|
|                                                                                                                                         | Load torque percentage<br>ToqOutRate | -     | Universal | Decimal       | %    | 16 Bit    |
| Display current load torque percentage. If the current load torque percentage is 10.3%, the panel of servo drive is displayed as below. |                                      |       |           |               |      |           |
|                                                        |                                      |       |           |               |      |           |

| U0-40<br>201E-28 | Monitoring name                                 | Range | Category  | Panel display | Unit | Data type |
|------------------|-------------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Current operation time (hour)<br>HourCurrentRun | -     | Universal | Decimal       | h    | 16 Bit    |

| U0-42<br>201E-2A | Monitoring name                                  | Range | Category  | Panel display | Unit | Data type |
|------------------|--------------------------------------------------|-------|-----------|---------------|------|-----------|
|                  | Current operation time (minute)<br>MinCurrentRun | -     | Universal | Decimal       | min  | 16 Bit    |

| U0-43<br>201E-2B | Monitoring name                                  | Range | Category | Panel display | Unit | Data type |
|------------------|--------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Current operation time (second)<br>SecCurrentRun | -     | General  | Decimal       | s    | 16 Bit    |

| U0-44<br>201E-2C | Monitoring name                                    | Range | Category | Panel display | Unit | Data type |
|------------------|----------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Instantaneous braking resistor power<br>DisPwrInst | -     | General  | Decimal       | W    | 16 Bit    |

| U0-46<br>201E-2E | Monitoring name                             | Range | Category | Panel display | Unit | Data type |
|------------------|---------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Average braking resistor power<br>DisPwrAvg | -     | General  | Decimal       | W    | 16 Bit    |

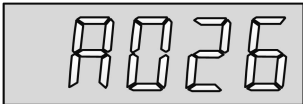
| U0-48<br>201E-30 | Monitoring name              | Range | Category | Panel display | Unit  | Data type |
|------------------|------------------------------|-------|----------|---------------|-------|-----------|
|                  | Power-on times<br>PwrUpCount | -     | General  | Decimal       | Times | 16 Bit    |

| U0-49<br>201E-31 | Monitoring name    | Range | Category | Panel display | Unit  | Data type |
|------------------|--------------------|-------|----------|---------------|-------|-----------|
|                  | MotorOverLoadCount | -     | General  | Decimal       | 0.01% | 16 Bit    |

| U0-50<br>201E-32                                                                                 | Monitoring name                                                          | Range               | Category  | Panel display | Unit   | Data type |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------|-----------|---------------|--------|-----------|
|                                                                                                  | Motor cumulative number of circles<br>(Low 32 bits)<br>MotoTotal_LowWord | $0 \sim (2^{32}-1)$ | Universal | Decimal       | Circle | 32 Bit    |
| Displays the cumulative number of revolutions of the motor. It is used with U0-51 cooperatively. |                                                                          |                     |           |               |        |           |

| U0-51<br>201E-33 | Monitoring name                                                            | Range               | Category  | Panel display | Unit   | Data type |
|------------------|----------------------------------------------------------------------------|---------------------|-----------|---------------|--------|-----------|
|                  | Motor cumulative number of circles<br>(High 32 bits)<br>MotoTotal_HighWord | $0 \sim (2^{32}-1)$ | Universal | Decimal       | Circle | 32 Bit    |

| U0-52<br>201E-34 | Monitoring name            | Range    | Category  | Panel display | Unit | Data type |
|------------------|----------------------------|----------|-----------|---------------|------|-----------|
|                  | Encoder bits<br>EncoderBit | 17 to 23 | Universal | Decimal       | Bit  | 16 Bit    |

| U0-53<br>201E-35                                                                                                                                               | Monitoring name               | Range | Category  | Panel display | Unit | Data type |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------|-----------|---------------|------|-----------|
|                                                                                                                                                                | Motor model code<br>MotoModel | -     | Universal | Hexadecimal   | -    | 16 Bit    |
| Displays the Motor Code of the current servo drive connected motor. Taking WD80M-07530S-A1F (A026) as an example, the description panel is displayed as below: |                               |       |           |               |      |           |
|                                                                             |                               |       |           |               |      |           |

|                                                                     | Monitoring name   | Range                  | Category  | Panel display | Unit         | Data type |
|---------------------------------------------------------------------|-------------------|------------------------|-----------|---------------|--------------|-----------|
| U0-54<br>201E-36                                                    | Absolute encoder  |                        |           |               |              |           |
|                                                                     | position in 1 lap | 0~(2 <sup>32</sup> -1) | Universal | Decimal       | Encoder unit | 32 Bit    |
|                                                                     | AbsEncln1Cycle    |                        |           |               |              |           |
| Display the single turn position feedback value of absolute encoder |                   |                        |           |               |              |           |

|                                               | Monitoring name   | Range      | Category  | Panel display | Unit   | Data type |
|-----------------------------------------------|-------------------|------------|-----------|---------------|--------|-----------|
| U0-55<br>201E-37                              | Absolute encoder  |            |           |               |        |           |
|                                               | number of circles | 0 to 65535 | Universal | Decimal       | Circle | 32 Bit    |
|                                               | AbsEncMultiTurn   |            |           |               |        |           |
| Circle numbers of multi-turn absolute encoder |                   |            |           |               |        |           |

|                                                                            | Monitoring name     | Range                  | Category  | Panel display | Unit | Data type |
|----------------------------------------------------------------------------|---------------------|------------------------|-----------|---------------|------|-----------|
| U0-58<br>201E-3A                                                           | Dynamic brake relay |                        |           |               |      |           |
|                                                                            | switching times     | 0~(2 <sup>32</sup> -1) | Universal | Decimal       | -    | 32-bit    |
|                                                                            | Bk Relay CtrlCnt    |                        |           |               |      |           |
| Record the number of times the dynamic brake relay is switched on and off. |                     |                        |           |               |      |           |
| Note: This function is currently only used on VD5E.                        |                     |                        |           |               |      |           |

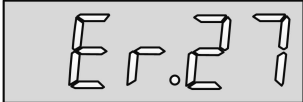
|                                                                                                                               | Monitoring name                                     | Range    | Category  | Panel display | Unit             | Data type |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------|-----------|---------------|------------------|-----------|
| U0-59<br>201E-41                                                                                                              | Current position of the multi-turn absolute encoder |          |           |               |                  |           |
|                                                                                                                               | (High 32 bits)                                      | -231~231 | Universal | Decimal       | Instruction unit | 32-bit    |
|                                                                                                                               | EncTotal_CmdUnit                                    |          |           |               |                  |           |
| Display the absolute position of the current motor (Instruction unit). It is only valid in multi-turn absolute encoder motor. |                                                     |          |           |               |                  |           |

|                                                                                                                               | Monitoring name                                     | Range    | Category  | Panel display | Unit             | Data type |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------|-----------|---------------|------------------|-----------|
| U0-60<br>201E-42                                                                                                              | Current position of the multi-turn absolute encoder |          |           |               |                  |           |
|                                                                                                                               | (High 32 bits)                                      | -231~231 | Universal | Decimal       | Instruction unit | 32-bit    |
|                                                                                                                               | EncTotal_CmdUnit                                    |          |           |               |                  |           |
| Display the absolute position of the current motor (Instruction unit). It is only valid in multi-turn absolute encoder motor. |                                                     |          |           |               |                  |           |

**201Fh Group: Warning Monitoring**

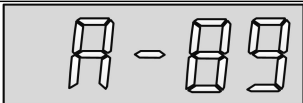
| U1-01<br>201F-01 | Monitoring name                    | Range | Category | Panel display | Unit | Data type |
|------------------|------------------------------------|-------|----------|---------------|------|-----------|
|                  | Current error code<br>NowErrorCode | -     | Warning  | -             | -    | 16 Bit    |

If there is fault in servo drive, it would display the corresponding fault. If not, the panel displays “---”, Taking the failure of “encoder disconnection” as an example, the panel of servo drive is displayed as below.

|                                                                                   |                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Servo drive has an fault “ encoder disconnection”                                 | Servo drive has no fault                                                           |
|  |  |

| U1-02<br>201F-02 | Monitoring name                     | Range | Category | Panel display | Unit | Data type |
|------------------|-------------------------------------|-------|----------|---------------|------|-----------|
|                  | Current warning code<br>NowWarmCode | -     | Warning  | -             | -    | 16 Bit    |

If there is warning in servo drive, it would display the corresponding warning. If not, the panel displays “---”. Taking the warning of “duplicate DI port configuration” as an example, the panel is displayed as below.

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Servo drive has an warning “duplicate DI port configuration”                        | Servo drive has no warning                                                           |
|  |  |

| U1-03<br>201F-03 | Monitoring name                                  | Range | Category | Panel display | Unit | Data type |
|------------------|--------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | U phase current when faults occur<br>IuWarmOccur | -     | Warning  | Decimal       | A    | 16 Bit    |

| U1-04<br>201F-04 | Monitoring name                                             | Range | Category | Panel display | Unit | Data type |
|------------------|-------------------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | V phase current when faults occurmalfunction<br>IvWarmOccur | -     | Warning  | Decimal       | A    | 16 Bit    |

| U1-05<br>201F-05 | Monitoring name                               | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Bus voltage when faults occur<br>UdcWarmOccur | -     | Warning  | Decimal       | V    | 16 Bit    |

| U1-06<br>201F-06 | Monitoring name                                      | Range | Category | Panel display | Unit | Data type |
|------------------|------------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | IGBT temperature when faults occur<br>T_IPMWarmOccur | -     | Warning  | Decimal       | °C   | 16 Bit    |

| U1-07<br>201F-07 | Monitoring name                                   | Range | Category | Panel display | Unit | Data type |
|------------------|---------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Torque component when faults occur<br>IqWarmOccur | -     | Warning  | Decimal       | %    | 16 Bit    |

| U1-08<br>201F-08 | Monitoring name                                       | Range | Category | Panel display | Unit | Data type |
|------------------|-------------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Excitation component when faults occur<br>IdWarmOccur | -     | Warning  | Decimal       | %    | 16 Bit    |

| U1-09<br>201F-09 | Monitoring name                                         | Range | Category | Panel display | Unit         | Data type |
|------------------|---------------------------------------------------------|-------|----------|---------------|--------------|-----------|
|                  | Position deviation when faults occur<br>PosErrWarmOccur | -     | Warning  | Decimal       | Encoder unit | 32 Bit    |

| U1-10<br>201F-0A | Monitoring name                               | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Speed value when faults occur<br>SpdWarmOccur | -     | Warning  | Decimal       | rpm  | 16 Bit    |

| U1-11<br>201F-0B | Monitoring name                                 | Range | Category | Panel display | Unit | Data type |
|------------------|-------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Time when the fault occurred<br>Time 1WarmOccur | -     | Warning  | Decimal       | s    | 16 Bit    |

| U1-12<br>201F-0C | Monitoring name                                           | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | Number of faults during current operation<br>ErrCntCurRun | -     | Warning  | Decimal       | -    | 16 Bit    |

| U1-13<br>201F-0D | Monitoring name                   | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------|-------|----------|---------------|------|-----------|
|                  | Number of warnings during current | -     | Warning  | Decimal       | -    | 16 Bit    |

|  |               |  |  |  |  |  |
|--|---------------|--|--|--|--|--|
|  | operation     |  |  |  |  |  |
|  | WarmCntCurRun |  |  |  |  |  |

|                  | Monitoring name                   | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------|-------|----------|---------------|------|-----------|
| U1-14<br>201F-0E | Total number of historical faults | -     | Warning  | Decimal       | -    | 16 Bit    |
|                  | ErrorTotalCnt                     |       |          |               |      |           |

|                  | Monitoring name                     | Range | Category | Panel display | Unit | Data type |
|------------------|-------------------------------------|-------|----------|---------------|------|-----------|
| U1-15<br>201F-0F | Total number of historical warnings | -     | Warning  | Decimal       | -    | 16 Bit    |
|                  | WarmTotalCnt                        |       |          |               |      |           |

|                                                              | Monitoring name       | Range | Category | Panel display | Unit | Data type |
|--------------------------------------------------------------|-----------------------|-------|----------|---------------|------|-----------|
| U1-16<br>201F-10                                             | Latest 1st fault code | -     | Warning  | -             | -    | 16 Bit    |
|                                                              | ErrCodeLast1st        |       |          |               |      |           |
| Display the 1st fault code of the most recent of servo drive |                       |       |          |               |      |           |

|                  | Monitoring name       | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------|-------|----------|---------------|------|-----------|
| U1-17<br>201F-11 | Latest 2nd fault code | -     | Warning  | -             | -    | 16 Bit    |
|                  | ErrCodeLast2nd        |       |          |               |      |           |

|                  | Monitoring name       | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------|-------|----------|---------------|------|-----------|
| U1-18<br>201F-12 | Latest 3rd fault code | -     | Warning  | -             | -    | 16 Bit    |
|                  | ErrCodeLast 3rd       |       |          |               |      |           |

|                  | Monitoring name       | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------|-------|----------|---------------|------|-----------|
| U1-19<br>201F-13 | Latest 4th fault code | -     | Warning  | -             | -    | 16 Bit    |
|                  | ErrCodeLast 4th       |       |          |               |      |           |

|                  | Monitoring name       | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------|-------|----------|---------------|------|-----------|
| U1-20<br>201F-14 | Latest 5th fault code | -     | Warning  | -             | -    | 16 Bit    |
|                  | ErrCodeLast 5th       |       |          |               |      |           |

|       | Monitoring name | Range | Category | Panel display | Unit | Data type |
|-------|-----------------|-------|----------|---------------|------|-----------|
| U1-21 |                 |       |          |               |      |           |

|                                                                |                         |   |         |   |   |        |
|----------------------------------------------------------------|-------------------------|---|---------|---|---|--------|
| <b>201F-15</b>                                                 | Latest 1st warning code | - | Warning | - | - | 16 Bit |
|                                                                | WarmCodeLast1st         |   |         |   |   |        |
| Display the 1st warning code of the most recent of servo drive |                         |   |         |   |   |        |

|                                | Monitoring name         | Range | Category | Panel display | Unit | Data type |
|--------------------------------|-------------------------|-------|----------|---------------|------|-----------|
| <b>U1-22</b><br><b>201F-16</b> | Latest 2nd warning code | -     | Warning  | -             | -    | 16 Bit    |
|                                | WarmCodeLast 2 nd       |       |          |               |      |           |

|                                | Monitoring name         | Range | Category | Panel display | Unit | Data type |
|--------------------------------|-------------------------|-------|----------|---------------|------|-----------|
| <b>U1-23</b><br><b>201F-17</b> | Latest 3rd warning code | -     | Warning  | -             | -    | 16 Bit    |
|                                | WarmCodeLast 3 rd       |       |          |               |      |           |

|                                | Monitoring name         | Range | Category | Panel display | Unit | Data type |
|--------------------------------|-------------------------|-------|----------|---------------|------|-----------|
| <b>U1-24</b><br><b>201F-18</b> | Latest 4th warning code | -     | Warning  | -             | -    | 16 Bit    |
|                                | WarmCodeLast 4 th       |       |          |               |      |           |

|                                | Monitoring name         | Range | Category | Panel display | Unit | Data type |
|--------------------------------|-------------------------|-------|----------|---------------|------|-----------|
| <b>U1-25</b><br><b>201F-18</b> | Latest 5th warning code | -     | Warning  | -             | -    | 16 Bit    |
|                                | WarmCodeLast 5 th       |       |          |               |      |           |



**2020h Group: Device Monitoring**

| U2-01<br>2020-01 | Monitoring name              | Range | Category | Panel display | Unit | Data type |
|------------------|------------------------------|-------|----------|---------------|------|-----------|
|                  | Product series<br>ProductSer | -     | Device   | Hexadecimal   | -    | 16 Bit    |

Display the product series code of servo drive.

The VD5L servo drive code is 0x354C. The panel is displayed as below:



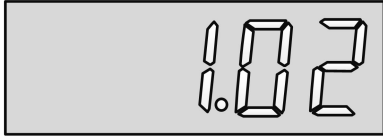
| U2-02<br>2020-02 | Monitoring name | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------|-------|----------|---------------|------|-----------|
|                  | Model<br>Model1 | -     | Device   | Hexadecimal   | -    | 16 Bit    |

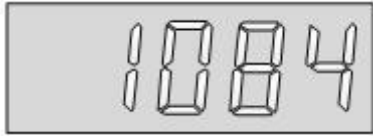
Display the servo drive model.

| U2-01 display | U2-02 display | Model        |
|---------------|---------------|--------------|
|               |               | VD5L-003SA1P |
|               |               | VD5L-010SA1P |
|               |               | VD5L-014SA1P |
|               |               | VD5L-015SA1P |

| U2-03<br>2020-03 | Monitoring name | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------|-------|----------|---------------|------|-----------|
|                  | Model<br>Model2 | -     | Device   | Hexadecimal   | -    | 16 Bit    |

| U2-04<br>2020-04 | Monitoring name  | Range | Category | Panel display | Unit | Data type |
|------------------|------------------|-------|----------|---------------|------|-----------|
|                  | Firmware version | -     | Device   | Decimal       | -    | 16 Bit    |

|                                                                                                                                                                                                                                                  |             |  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|--|--|--|--|
|                                                                                                                                                                                                                                                  | FirewareVer |  |  |  |  |  |
| <p>Display the firmware version.</p> <p>Display format: X.YY. For example, 1.02. The panel is displayed as below.</p> <div style="text-align: center;">  </div> |             |  |  |  |  |  |

| U2-05                                                                                                                                                                                                                                                                                                               | Monitoring name     | Range | Category | Panel display | Unit | Data type |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------|----------|---------------|------|-----------|
| 2020-05                                                                                                                                                                                                                                                                                                             | Cm Hardware version | -     | Device   | Decimal       | -    | 16 Bit    |
|                                                                                                                                                                                                                                                                                                                     | CM FireWare         | -     | Device   | Decimal       | -    | 16 Bit    |
| <p>Displays the servo cm firmware version number.</p> <p>Display format: X.YY, 2 decimal places, such as 1084 represents January 8, 2024, the servo drive panel displays as follows:</p> <div style="text-align: center;">  </div> |                     |       |          |               |      |           |

| U2-06   | Monitoring name      | Range | Category | Panel display | Unit | Data type |
|---------|----------------------|-------|----------|---------------|------|-----------|
| 2020-06 | Firmware time (year) | -     | Device   | Decimal       | Year | 16 Bit    |
|         | ExFactoryYear        | -     | Device   | Decimal       | Year | 16 Bit    |

| U2-07   | Monitoring name       | Range | Category | Panel display | Unit  | Data type |
|---------|-----------------------|-------|----------|---------------|-------|-----------|
| 2020-07 | Firmware time (month) | -     | Device   | Decimal       | Month | 16 Bit    |
|         | ExFactoryMonth        | -     | Device   | Decimal       | Month | 16 Bit    |

| U2-08   | Monitoring name     | Range | Category | Panel display | Unit | Data type |
|---------|---------------------|-------|----------|---------------|------|-----------|
| 2020-08 | Firmware Date (Day) | -     | Device   | Decimal       | Day  | 16 Bit    |
|         | ExFactoryDay        |       |          |               |      |           |

Display the production date of display firmware.

Taking the “VD5L-014SA1P\_V1. 03 firmware production date is January 10, 2022” as an example, the drive panel is displayed as below:

| U2-06                                                                               | U2-07                                                                               | U2-08                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

| U2-09<br>2020-09 | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 1<br>DeviceSerNum1 | -     | Device   | Decimal       | -    | 16 Bit    |

| U2-10<br>2020-0A | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 2<br>DeviceSerNum2 | -     | Device   | Decimal       | -    | 16 Bit    |

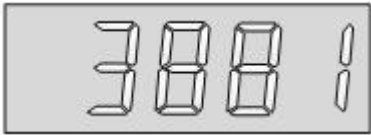
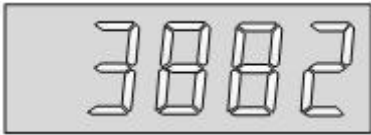
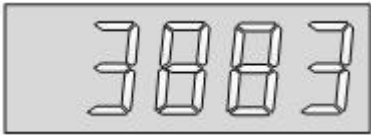
| U2-11<br>2020-0B | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 3<br>DeviceSerNum3 | -     | Device   | Decimal       | -    | 16 Bit    |

| U2-12<br>2020-0C | Monitoring name                | Range | Category | Panel display | Unit | Data type |
|------------------|--------------------------------|-------|----------|---------------|------|-----------|
|                  | EtherCAT XML<br>Version number | -     | Device   | Decimal       | -    | 16 Bit    |

| U2-13<br>2020-0D | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 5<br>DeviceSerNum5 | -     | Device   | Decimal       | -    | 16 Bit    |

| U2-14<br>2020-0E | Monitoring name                                               | Range | Category | Panel display | Unit | Data type |
|------------------|---------------------------------------------------------------|-------|----------|---------------|------|-----------|
|                  | PCB hardware version<br>Identification Number<br>PCB HardWare | -     | Device   | Decimal       | -    | 16 Bit    |

Used to display the servo hardware PCB version number. Currently supported PCB versions are 3881/3882/3883. Servo drive panel display:

| U2-14                                                                               | U2-14                                                                                | U2-14                                                                                 |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

| U2-15<br>2020-0F | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 7<br>DeviceSerNum7 | -     | Device   | Decimal       | -    | 16 Bit    |

| U2-16<br>2020-10 | Monitoring name                         | Range | Category | Panel display | Unit | Data type |
|------------------|-----------------------------------------|-------|----------|---------------|------|-----------|
|                  | Device serial number 8<br>DeviceSerNum8 | -     | Device   | Decimal       | -    | 16 Bit    |

## 8.4 Standard Equipment Sub-protocol Area (6000h to 6FFFh)

| 603F | Parameter name          | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|-------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Error Code (Error Code) | RO            | TPDO         | -                  | 0~65535            | -       | ALL              |

When the drive has an error described by DSP402 sub-protocol, 603F is consistent with DS402 protocol;

603F is 65280 when a user-specified exception occurs on the drive.

| 6040 | Parameter name              | Accessibility | Data mapping | Set to take effect                             | Data display range | Default | Correlation mode |
|------|-----------------------------|---------------|--------------|------------------------------------------------|--------------------|---------|------------------|
|      | Control Word (Control Word) | RW            | TPDO         | Set value takes effect at the time of shutdown | 0 ~65535           | 0       | ALL              |

Used to set control instructions. It is meaningless to assign each bit of a control word separately, and it must be combined with other bits to form a certain control instruction.

bit0 ~ bit3 have the same meaning in each control mode of servo drive, and commands must be sent in sequence before the servo drive can be switched according to CiA402 state machine.

| Bit   | Name                           | Description                                                                                                                        |
|-------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 0     | Servo operation can be started | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 1     | Turn on the main circuit       | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 2     | Quick shutdown                 | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 3     | Servo operation                | 0: Invalid                                                                                                                         |
|       |                                | 1: Valid                                                                                                                           |
| 4 ~ 6 | Operation mode                 | It is related to the operation mode of servo drive                                                                                 |
| 7     | Fault reset                    | Used to clear reset faults:<br>The rising edge of bit7 is valid;<br>bit7 is kept at 1, and other control instructions are invalid. |
| 8     | Pause                          | Please refer to the object dictionary 605D for the pause method in each mode.                                                      |
| 9     | Reserved                       | Undefined                                                                                                                          |
| 10    | Reserved                       | Undefined                                                                                                                          |
| 11-15 | Manufacturer customizaed       | Manufacture customizaed                                                                                                            |

|             |                           |                      |                     |                           |                           |                |                         |
|-------------|---------------------------|----------------------|---------------------|---------------------------|---------------------------|----------------|-------------------------|
| <b>6041</b> | <b>Parameter name</b>     | <b>Accessibility</b> | <b>Data mapping</b> | <b>Set to take effect</b> | <b>Data display range</b> | <b>Default</b> | <b>Correlation mode</b> |
|             | Status Word (Status Word) | RO                   | TPDO                | -                         | 0 ~65535                  | 0              | ALL                     |

Used to display servo drive status.

| Bit | Name                                  | Description |
|-----|---------------------------------------|-------------|
| 0   | Servo ready                           | 0: Invalid  |
|     |                                       | 1: Valid    |
| 1   | Servo operation can be started        | 0: Invalid  |
|     |                                       | 1: Valid    |
| 2   | Servo operation                       | 0: Invalid  |
|     |                                       | 1: Valid    |
| 3   | fault                                 | 0: Invalid  |
|     |                                       | 1: Valid    |
| 4   | Electrical connection of main circuit | 0: Invalid  |
|     |                                       | 1: Valid    |
| 5   | Quick shutdown                        | 0: Invalid  |
|     |                                       | 1: Valid    |
| 6   | Servo is not operational              | 0: Invalid  |
|     |                                       | 1: Valid    |
| 7   | Warning                               | 0: Invalid  |
|     |                                       | 1: Valid    |
| 8   | -                                     | -           |
| 9   | Remote control                        | 0: Invalid  |
|     |                                       | 1: Valid    |
| 10  | Target arrival                        | 0: Invalid  |
|     |                                       | 1: Valid    |

Bit 0 ~ bit 9 have the same meaning in all control modes of servo drive. After the control word 6040h sends commands in sequence, the servo feeds back the determined status.

| Setting value (binary number) | Description                |
|-------------------------------|----------------------------|
| xxxx xxxx x0xx 0000           | Servo is not ready         |
| xxxx xxxx x1xx 0000           | Startup failure            |
| xxxx xxxx x01x 0001           | Servo ready                |
| xxxx xxxx x01x 0011           | start up                   |
| xxxx xxxx x01x 0111           | Servo enable               |
| xxxx xxxx x00x 0111           | Malfunction shutdown valid |
| xxxx xxxx x0xx 1111           | Fault response valid       |
| xxxx xxxx x0xx 1000           | Fault                      |

|      | Parameter name                                          | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|---------------------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 605A | Quick stop option selection<br>(Quick-stop option code) | RW            | NO           | -                  | 0 ~7               | 2       | ALL              |

Used to set the quick stop mode.

| Setting value | Name                                                                                                                                                                                                                                                                                                                                                     |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | The drive enters the OFF state and coasts to a stop. The motor shaft remains in a free state.                                                                                                                                                                                                                                                            |
| 1             | After deceleration stop with 6084 (CSP&PP), the motor shaft remains in a free state.<br>After deceleration stop with 609A (HM), the motor shaft remains in a free state.<br>After deceleration stop with 6084 (CSV&PV), the motor shaft remains in a free state.<br>After deceleration stop with 6084 (CST&PT), the motor shaft remains in a free state. |
| 2             | After deceleration stop with 6085 (CSP&PP), the motor shaft remains in a free state.<br>After deceleration stop with 6085 (HM), the motor shaft remains in a free state.<br>After deceleration stop with 6085 (CSV&PV), the motor shaft remains in a free state.<br>After deceleration stop with 6085 (CST&PT), the motor shaft remains in a free state. |
| 3             | After deceleration stop with emergency torque, the motor shaft remains in a free state.                                                                                                                                                                                                                                                                  |
| 4             | Not supported                                                                                                                                                                                                                                                                                                                                            |
| 5             | After deceleration stop with 6084 (CSP&PP), the motor shaft remains locked.<br>After deceleration stop with 609A (HM), the motor shaft remains locked.<br>After deceleration stop with 6084 (CSV&PV), the motor shaft remains locked.<br>After deceleration stop with 6084 (CST&PT), the motor shaft remains locked.                                     |
| 6             | After deceleration stop with 6085 (CSP&PP), the motor shaft remains locked.<br>After deceleration stop with 6085 (HM), the motor shaft remains locked.<br>After deceleration stop with 6085 (CSV&PV), the motor shaft remains locked.<br>After deceleration stop with 6085 (CST&PT), the motor shaft remains locked.                                     |
| 7             | The machine is decelerated and stopped with emergency torque, and the motor shaft remains in a position-locked state.                                                                                                                                                                                                                                    |

|      | Parameter name       | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|----------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 605B | Shutdown Option Code | RW            | NO           | -                  | 0 ~1               | 0       | ALL              |

Used to set the quick stop mode.

| Setting value | Name                                                                                      |
|---------------|-------------------------------------------------------------------------------------------|
| 0             | The drive enters the OFF state and stops freely. The motor shaft remains in a free state. |
| 1             | 1 After stopping at 6084 deceleration, the motor shaft remains in a free state.           |

| 605C | Parameter name               | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Disale Operation Option Code | RW            | NO           | -                  | 0 ~1               | 0       | ALL              |

Used to set the quick stop mode.

| Setting value | Name                                                                                      |
|---------------|-------------------------------------------------------------------------------------------|
| 0             | The drive enters the OFF state and stops freely. The motor shaft remains in a free state. |
| 1             | 1 After stopping at 6084 deceleration, the motor shaft remains in a free state.           |

| 605D | Parameter name                         | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|----------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Halt option code<br>(Halt option code) | RW            | NO           | -                  | 1 ~3               | 1       | ALL              |

Used to set the quick stop mode.

| Setting value | Name                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | After deceleration stop with 6084 (CSP&PP), the motor shaft remains locked.<br>After deceleration stop with 609A (HM), the motor shaft remains locked.<br>After deceleration stop with 6084 (CSV&PV), the motor shaft remains locked.<br>After deceleration stop with 6087 (CST&PT), the motor shaft remains locked.<br>In other modes, the drive stops freely. The motor shaft remains locked.       |
| 2             | After deceleration stop with 6085 (CSP & PP), the motor shaft remains locked.<br>After deceleration stop with 6085 (HM), the motor shaft remains locked.<br>After deceleration stop with 6085 (CSV & PV), the motor shaft remains locked.<br>After deceleration stop with 6087 (CST & PT), the motor shaft remains locked.<br>In other modes, the drive stops freely. The motor shaft remains locked. |
| 3             | After deceleration stop with emergency torque (CSP & PP), the motor shaft remains locked.<br>After deceleration stop with emergency torque (HM), the motor shaft remains locked.<br>After deceleration stop with emergency torque (CSV & PV), the motor shaft remains locked.                                                                                                                         |



|  |       |                                                                                                                                                          |  |
|--|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |       | After deceleration stop with 6087 (CST & PT), the motor shaft remains locked.<br>In other modes, the drive stops freely. The motor shaft remains locked. |  |
|  | other | Reserved, not supported yet.                                                                                                                             |  |

| 605E | Parameter name             | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|----------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Fault Reaction Option Code | RW            | NO           | -                  | 0 ~ 3              | 0       | ALL              |

Used to set the quick stop mode.

| Setting value | Name                                                                                          |
|---------------|-----------------------------------------------------------------------------------------------|
| 0             | The drive enters the OFF state and coasts to a stop. The motor shaft remains in a free state. |
| 1             | After deceleration stop with 6084 (HM; 609A), the motor shaft remains in a free state.        |
| 2             | 2After deceleration stop with 6085 (HM; 609A), the motor shaft remains in a free state.       |
| 3             | After deceleration stop with emergency torque, the motor shaft remains in a free state.       |

| 6060 | Parameter name                               | Accessibility | Data mapping | Set to take effect                             | Data display range | Default | Correlation mode |
|------|----------------------------------------------|---------------|--------------|------------------------------------------------|--------------------|---------|------------------|
|      | Servo mode selection<br>(Modes of operation) | RW            | RPDO         | Set value takes effect at the time of shutdown | 0 ~ 10             | 0       | ALL              |

Used to set the operation mode of servo drive.

| Setting value | Name                             | Remarks                                                                  |
|---------------|----------------------------------|--------------------------------------------------------------------------|
| 1             | Profile position control mode    | -                                                                        |
| 3             | Profile velocity control mode    | -                                                                        |
| 4             | Profile torque control mode      | Please refer to "7.7 Profile Torque Mode" for details-                   |
| 6             | Homing mode                      | Please refer to "7.8 Homing Mode" for details                            |
| 7             | Interpolation mode               | -                                                                        |
| 8             | Cyclic Synchronous Position mode | Please refer to "7.4 Cyclic Synchronous Position mode (CSP)" for details |

|  |    |                                |                                                                          |  |
|--|----|--------------------------------|--------------------------------------------------------------------------|--|
|  | 9  | Cyclic synchronous speed mode  | Please refer to "7.5 Cyclic Synchronous Velocity mode (CSV)" for details |  |
|  | 10 | Cyclic synchronous torque mode | Please refer to "7.6 Cyclic Synchronous Torque mode (CSt)" for details   |  |

| 6061 | Parameter name                        | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|---------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Run mode display<br>(Modes operation) | RO            | TPDO         | -                  | 0 ~ 10             | 0       | ALL              |

Used to display the current operation mode of servo drive.

| Setting value | Name                             | Remarks                                                                  |
|---------------|----------------------------------|--------------------------------------------------------------------------|
| 1             | Profile position control mode    | -                                                                        |
| 3             | Profile speed control mode       | -                                                                        |
| 4             | Profile torque control mode      | Please refer to "7.7 Profile Torque Mode" for details-                   |
| 6             | Homing mode                      | Please refer to "7.8 Homing Mode" for details                            |
| 7             | Interpolation mode               | -                                                                        |
| 8             | Cyclic Synchronous Position mode | Please refer to "7.4 Cyclic Synchronous Position mode (CSP)" for details |
| 9             | Cyclic synchronous velocity mode | Please refer to "7.5 Cyclic Synchronous Velocity mode (CSV)" for details |
| 10            | Cyclic synchronous torque mode   | Please refer to "7.6 Cyclic Synchronous Torque mode (CSt)" for details   |

| 6062 | Parameter name                              | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|---------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | position command<br>(Position demand value) | RO            | TPDO         | -                  | -                  | 0       | CSP HM PP        |

It is used to reflect the position command (command unit) that has been input by the servo in the enabled state.

| 6063 | Parameter name                               | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|----------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Position feedback<br>(Position actual value) | RO            | TPDO         | -                  | -                  | 0       | ALL              |

Used to reflect the absolute position of motor.

| 6064 | Parameter name                               | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|----------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Position feedback<br>(Position actual value) | RO            | TPDO         | -                  | -                  | 0       | ALL              |

Used to reflect real-time absolute position.

"Position Feedback 6064h" \* "Gear Ratio 6091h" = "Position Feedback 6063h"

| 6065 | Parameter name                                                        | Accessibility | Data mapping | Set to take effect                             | Data display range       | Default                                                  | Correlation mode |
|------|-----------------------------------------------------------------------|---------------|--------------|------------------------------------------------|--------------------------|----------------------------------------------------------|------------------|
|      | Threshold of excessive position deviation<br>(Following error window) | RW            | RPDO         | Set value takes effect at the time of shutdown | 0 ~ (2 <sup>32</sup> -1) | 17 bit encoder:<br>524288<br>23 bit encoder:<br>25165824 | CSP HM PP        |

Used to set the position deviation excess threshold.

When the position deviation exceeds the set value of 6065h, Er.36 (excessive position deviation) will occur in servo.

| 6066 | Parameter name                                                         | Accessibility | Data mapping | Set to take effect                             | Data display range       | Default | Correlation mode |
|------|------------------------------------------------------------------------|---------------|--------------|------------------------------------------------|--------------------------|---------|------------------|
|      | Threshold of excessive position deviation<br>(Following Error TimeOut) | RW            | RPDO         | Set value takes effect at the time of shutdown | 0 ~ (2 <sup>32</sup> -1) | 0       | CSP HM PP        |

Used to set the position deviation excess threshold.

When the position deviation exceeds the set value of 6065h, Er.36 (excessive position deviation) will occur in servo.

| 6067 | Parameter name                                  | Accessibility | Data mapping | Set to take effect | Data display range       | Default | Correlation mode |
|------|-------------------------------------------------|---------------|--------------|--------------------|--------------------------|---------|------------------|
|      | Position arrival threshold<br>(Position window) | RW            | RPDO         | Set value takes    | 0 ~ (2 <sup>32</sup> -1) | 1000    | CSP HM PP        |

|                                                                                                                                                                                                                                                      |  |  |  |                                         |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|-----------------------------------------|--|--|--|
|                                                                                                                                                                                                                                                      |  |  |  | effect at<br>the time<br>of<br>shutdown |  |  |  |
| <p>Used to set the threshold value for position arrival.</p> <p>When the position deviation is within the set value of <math>\pm 6067h</math>, the position is determined to have arrived.</p> <p>In position mode, bit10=1 for status word 6041</p> |  |  |  |                                         |  |  |  |

|                                                                                  | Parameter name                                 | Accessibility | Data mapping | Set to take effect                                         | Data display range | Default | Correlation mode |
|----------------------------------------------------------------------------------|------------------------------------------------|---------------|--------------|------------------------------------------------------------|--------------------|---------|------------------|
| 6068                                                                             | Position window time<br>(Position window time) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | 0 ~65535           | 100     | PP IP CSP        |
| Used to set the position window time of the servo drive under the position mode. |                                                |               |              |                                                            |                    |         |                  |

|                                                               | Parameter name                             | Accessibility | Data mapping | Set to take effect | Data display range        | Default | Correlation mode |
|---------------------------------------------------------------|--------------------------------------------|---------------|--------------|--------------------|---------------------------|---------|------------------|
| 606C                                                          | Actual velocity<br>(Velocity actual value) | RO            | TPDO         | -                  | $-2^{31} \sim (2^{31}-1)$ | -       | ALL              |
| Used to display the actual rotating speed of the servo drive. |                                            |               |              |                    |                           |         |                  |

|                                                                                    | Parameter name                                  | Accessibility | Data mapping | Set to take effect                                         | Data display range | Default | Correlation mode |
|------------------------------------------------------------------------------------|-------------------------------------------------|---------------|--------------|------------------------------------------------------------|--------------------|---------|------------------|
| 606D                                                                               | Velocity arrival threshold<br>(Velocity window) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | 0 ~65535           | 30      | PV               |
| Used to set the velocity arrival threshold of servo drive under the velocity mode. |                                                 |               |              |                                                            |                    |         |                  |

|      | Parameter name                                 | Accessibility | Data mapping | Set to take effect                       | Data display range | Default | Correlation mode |
|------|------------------------------------------------|---------------|--------------|------------------------------------------|--------------------|---------|------------------|
| 606E | Velocity window time<br>(Velocity window time) | RW            | RPDO         | Set value<br>takes effect<br>at the time | 0 ~65535           | 100     | PV               |

|                                                                              |  |  |  |                |  |  |  |
|------------------------------------------------------------------------------|--|--|--|----------------|--|--|--|
|                                                                              |  |  |  | of<br>shutdown |  |  |  |
| Used to set the velocity window time of servo drive under the velocity mode. |  |  |  |                |  |  |  |

|                                                                                                                                                            | Parameter name                   | Accessibility | Data mapping | Set to take effect                                         | Data display range | Default | Correlation mode |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------|--------------|------------------------------------------------------------|--------------------|---------|------------------|
| 6071                                                                                                                                                       | Target torque<br>(Target torque) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | -3000~3000         | 0       | PT CST           |
| Used to set the servo target torque in profile torque mode and cycle synchronous torque mode. 100.0% corresponds to 1 times the rated torque of the motor. |                                  |               |              |                                                            |                    |         |                  |

|                                                                               | Parameter name                                | Accessibility | Data mapping | Setting in force                                     | Data display range | Default value | Correlation mode | Data type |
|-------------------------------------------------------------------------------|-----------------------------------------------|---------------|--------------|------------------------------------------------------|--------------------|---------------|------------------|-----------|
| 6072                                                                          | Maximum torque<br>Instruction<br>(Max torque) | RW            | RPDO         | Operation<br>setting<br><br>Effective<br>immediately | 0~3000             | 3000          | ALL              | 16-bit    |
| Used to set the maximum torque instruction of the servo drive in PT/CST mode. |                                               |               |              |                                                      |                    |               |                  |           |

|                                                                                                                                                                     | Parameter name                          | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 6074                                                                                                                                                                | Torque given by user<br>(Torque demand) | RO            | TPDO         | -                  | -3000~3000         | 0       | ALL              |
| It is used to reflect the torque command (command unit) that has been input when the servo is enabled. 100.0% corresponds to 1 times the rated torque of the motor. |                                         |               |              |                    |                    |         |                  |

|                                                                               | Parameter name                         | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|-------------------------------------------------------------------------------|----------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 6077                                                                          | Actual torque<br>(Torque actual value) | RO            | TPDO         | -                  | -3000~3000         | 0       | PT CST           |
| Used to display the actual torque value of servo drive under the torque mode. |                                        |               |              |                    |                    |         |                  |

| 607A | Parameter name | Accessibility | Data | Set to take | Data display | Default | Correlation |
|------|----------------|---------------|------|-------------|--------------|---------|-------------|
|------|----------------|---------------|------|-------------|--------------|---------|-------------|

|  |                                      |    | mapping | effect                                                     | range                       |   | mode      |
|--|--------------------------------------|----|---------|------------------------------------------------------------|-----------------------------|---|-----------|
|  | Target location<br>(target position) | RW | RPDO    | Set value<br>takes effect<br>at the time<br>of<br>shutdown | $(-2^{31}) \sim (2^{31}-1)$ | 0 | CSP HM PP |

Used to set the servo target position of the servo drive in the cyclic synchronous position mode (CSP).

|      | Parameter name               | Accessibility | Data mapping | Set to take effect                                         | Data display range          | Default | Correlation mode |
|------|------------------------------|---------------|--------------|------------------------------------------------------------|-----------------------------|---------|------------------|
| 607C | Home offset<br>(Home offset) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | $(-2^{31}) \sim (2^{31}-1)$ | 0       | HM               |

Used to set the physical position of the mechanical homing mode from the motor origin in homing mode. This object dictionary only takes effect when the servo is powered on, the homing operation is completed, and the status word 6041 is bit15=1.

|      | Parameter name                                     | Accessibility | Data mapping | Set to take effect                                         | Data display range  | Default | Correlation mode |
|------|----------------------------------------------------|---------------|--------------|------------------------------------------------------------|---------------------|---------|------------------|
| 607F | Maximum profile velocity<br>(Max profile velocity) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | $0 \sim (2^{32}-1)$ | 131072  | ALL              |

Set the maximum operating speed of user.

The set value takes effect when the velocity instruction of slave station changes.

|      | Parameter name                         | Accessibility | Data mapping | Set to take effect                                         | Data display range  | Default | Correlation mode |
|------|----------------------------------------|---------------|--------------|------------------------------------------------------------|---------------------|---------|------------------|
| 6081 | Profile velocity<br>(Profile velocity) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | $0 \sim (2^{32}-1)$ | 218453  | PP               |

Set the constant operating speed of the shift instruction under the profile position mode.

The set value takes effect after the slave station receives the shift instruction.

|      | Parameter name                                 | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode |
|------|------------------------------------------------|---------------|--------------|------------------------------------------------|---------------------|---------|------------------|
| 6083 | Profile acceleration<br>(Profile acceleration) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of | $0 \sim (2^{32}-1)$ | 131072  | PP PV            |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |          |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|----------|--|--|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  | shutdown |  |  |  |
| <p>Set the acceleration under the profile position mode and profile velocity mode.</p> <p>Under the profile position mode, the set value takes effect after the position command is triggered. The minimum value of the cyclic position command increment of each position loop is 1.</p> <p>Under the profile velocity mode, the operation takes effect.</p> <p>If the parameter value is set to be 0, it will be converted to 1 compulsorily.</p> |  |  |  |          |  |  |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Parameter name                                 | Accessibility | Data mapping | Set to take effect                             | Data display range       | Default | Correlation mode |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------|--------------|------------------------------------------------|--------------------------|---------|------------------|
| 6084                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Profile deceleration<br>(Profile deceleration) | RW            | RPDO         | Set value takes effect at the time of shutdown | 0 ~ (2 <sup>32</sup> -1) | 131072  | PP PV<br>CSP CSV |
| <p>Set the deceleration under the profile position mode and profile velocity mode.</p> <p>Under the profile position mode, the set value takes effect after the position command is triggered.</p> <p>Under the profile velocity mode, the operation takes effect.</p> <p>Under PP CSV PV mode, the quick-stop option code (605A) is equal to 1 or 5, the deceleration of slope shutdown takes effect when the quick-stop command is valid;</p> <p>Under PP CSV PV mode, the halt option code (605D) is equal to 1, the deceleration of slope shutdown takes effect when halt command is valid.</p> <p>Under PP CSV PV mode, when the pause mode selection (605D) is equal to 1, the deceleration during ramp stop when the pause command is valid;</p> <p>Under PP CSV PV mode, when the fault stop selection (605E) is equal to 1, the deceleration during ramp stop when the fault stop command is valid.</p> |                                                |               |              |                                                |                          |         |                  |

|      | Parameter name                                       | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode       |
|------|------------------------------------------------------|---------------|--------------|------------------------------------------------|---------------------|---------|------------------------|
| 6085 | Quick stop deceleration<br>(Quick stop deceleration) | RW            | RPDO         | Set value takes effect at the time of shutdown | $0 \sim (2^{32}-1)$ | 100     | PP PV<br>HM CSP<br>CSV |

Under PP CSV PV HM mode, the quick-stop option code (605A) is equal to 2 or 6, the deceleration of slope shutdown takes effect when the quick-stop command is valid.

Under PP CSV PV HM mode, the halt option code (605D) is equal to 2, the deceleration of slope shutdown takes effect when the halt command is valid.

Under PP CSV PV mode, when the fault stop selection (605E) is equal to 2 and the fault stop command is valid, the deceleration of the ramp stop.

|      | Parameter name                               | Accessibility | Data mapping | Set to take effect                             | Data display range        | Default | Correlation mode |
|------|----------------------------------------------|---------------|--------------|------------------------------------------------|---------------------------|---------|------------------|
| 6086 | Motion profile type<br>(Motion profile type) | RW            | RPDO         | Set value takes effect at the time of shutdown | $-2^{15} \sim (2^{15}-1)$ | 0       | --               |

Set the curve type of the motor position command or speed command. 0: Linear (Currently only supports mode 0.)

|      | Parameter name                 | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode |
|------|--------------------------------|---------------|--------------|------------------------------------------------|---------------------|---------|------------------|
| 6087 | Torque slope<br>(Torque slope) | RW            | RPDO         | Set value takes effect at the time of shutdown | $0 \sim (2^{32}-1)$ | 1000    | PT CST           |

Set the torque command acceleration under the profile torque mode, which means the torque command increment per second.



| 6091                                                                                                  | Parameter name                                         | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode    |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------|--------------|------------------------------------------------|---------------------|---------|---------------------|
|                                                                                                       | Gear Ratio                                             | -             | -            | -                                              | -                   | -       | CSP HM PP<br>PV CSV |
| Set range of electronic gear ratio: "0.001* encoder resolution/10000, 4000* encoder resolution/10000" |                                                        |               |              |                                                |                     |         |                     |
| Beyond this set range, Er.35 (electronic gear ratio overrun) will occur in servo drive.               |                                                        |               |              |                                                |                     |         |                     |
| 01h                                                                                                   | Parameter name                                         | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode    |
|                                                                                                       | Electronic gear ratio numerator<br>(Motor revolutions) | RW            | RPDO         | Set value takes effect at the time of shutdown | $1 \sim (2^{32}-1)$ | 1       | -                   |
| Used to set the motor resolution.                                                                     |                                                        |               |              |                                                |                     |         |                     |
| 02h                                                                                                   | Parameter name                                         | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode    |
|                                                                                                       | Electronic gear ratio denominator<br>(Shaft revision)  | RW            | RPDO         | Set value takes effect at the time of shutdown | $1 \sim (2^{32}-1)$ | 1       | -                   |
| Used to set the load shaft resolution.                                                                |                                                        |               |              |                                                |                     |         |                     |

| 6098 | Parameter name                 | Accessibility | Data mapping | Set to take effect                             | Data display range | Default | Correlation mode |
|------|--------------------------------|---------------|--------------|------------------------------------------------|--------------------|---------|------------------|
|      | Homing mode<br>(Homing method) | RW            | RPDO         | Set value takes effect at the time of shutdown | 1 ~ 35             | 1       | HM               |

Used to select homing method.

| method | Deceleration point        | Origin                    | method | Deceleration point | Origin           |
|--------|---------------------------|---------------------------|--------|--------------------|------------------|
| 1      | Reverse overtravel switch | Motor Z signal            | 19     | Origin switch      | Origin switch    |
| 2      | Forward overtravel switch | Motor Z signal            | 20     | Origin switch      | Origin switch    |
| 3      | Origin switch             | Motor Z signal            | 21     | Origin switch      | Origin switch    |
| 4      | Origin switch             | Motor Z signal            | 22     | Origin switch      | Origin switch    |
| 5      | Origin switch             | Motor Z signal            | 23     | Origin switch      | Origin switch    |
| 6      | Origin switch             | Motor Z signal            | 24     | Origin switch      | Origin switch    |
| 7      | Origin switch             | Motor Z signal            | 25     | Origin switch      | Origin switch    |
| 8      | Origin switch             | Motor Z signal            | 26     | Origin switch      | Origin switch    |
| 9      | Origin switch             | Motor Z signal            | 27     | Origin switch      | Origin switch    |
| 10     | Origin switch             | Motor Z signal            | 28     | Origin switch      | Origin switch    |
| 11     | Origin switch             | Motor Z signal            | 29     | Origin switch      | Origin switch    |
| 12     | Origin switch             | Motor Z signal            | 30     | Origin switch      | Origin switch    |
| 13     | Origin switch             | Motor Z signal            | 33     | None               | Motor Z signal   |
| 14     | Origin switch             | Motor Z signal            | 34     | None               | Motor Z signal   |
| 17     | Reverse overtravel switch | Reverse overtravel switch | 35     | -                  | Current position |
| 18     | Forward overtravel switch | Forward overtravel switch |        |                    |                  |

| 6099 | Parameter name                  | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|---------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Homing speed<br>(Homing speeds) | -             | -            | -                  | -                  | -       | HM               |

Used to set two speed values in homing mode

| 01 | Parameter name                                                  | Accessibility | Data mapping | Set to take effect                             | Data display range       | Default | Correlation mode |
|----|-----------------------------------------------------------------|---------------|--------------|------------------------------------------------|--------------------------|---------|------------------|
|    | Speed during search for switch (Speed during search for switch) | RW            | RPDO         | Set value takes effect at the time of shutdown | 0 ~ (2 <sup>32</sup> -1) | 432537  | HM               |

Used to set the speed of searching deceleration point signal. It is recommended to set the speed to a higher value to prevent Er.44 (back-to-original timeout fault) caused by too long homing time

| 02 | Parameter name          | Accessibility | Data mapping | Set to take effect | Data display range        | Default | Correlation mode |
|----|-------------------------|---------------|--------------|--------------------|---------------------------|---------|------------------|
|    | Speed during search for | RW            | RPDO         | Set value          | 10 ~ (2 <sup>32</sup> -1) | 218453  | HM               |

|                                                                                                                                                |                                    |  |  |                                      |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--|--|--------------------------------------|--|--|--|
|                                                                                                                                                | zero(Speed during search for zero) |  |  | takes effect at the time of shutdown |  |  |  |
| Used to set the speed of searching origin signal. It is recommended to be set to a lower value to prevent overshoot caused by high-speed stop. |                                    |  |  |                                      |  |  |  |

|                                                                                                                                                                                                            | Parameter name                           | Accessibility | Data mapping | Set to take effect                             | Data display range  | Default | Correlation mode |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------|--------------|------------------------------------------------|---------------------|---------|------------------|
| 609A                                                                                                                                                                                                       | Home acceleration<br>(Home acceleration) | RW            | RPDO         | Set value takes effect at the time of shutdown | $0 \sim (2^{32}-1)$ | 655360  | HM               |
| Used to set the acceleration in homing mode. When the homing operation is started, the set value takes effect.<br>Home acceleration refers to the increment of position command (command unit) per second. |                                          |               |              |                                                |                     |         |                  |

|                                                                                                                                                                                                                                                                 | Parameter name  | Accessibility | Data mapping | Set to take effect                             | Data display range          | Default | Correlation mode |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|--------------|------------------------------------------------|-----------------------------|---------|------------------|
| 60B0                                                                                                                                                                                                                                                            | Position offset | RW            | RPDO         | Set value takes effect at the time of shutdown | $(-2^{31}) \sim (2^{31}-1)$ | 0       | CSP/CSV          |
| Used to set the EtherCAT external velocity feedforward signal under the cyclic synchronization position mode. Used to set the servo torque command offset amount under the cyclic synchronization velocity mode; after offset, servo target torque=60FFh+60B1h. |                 |               |              |                                                |                             |         |                  |

|                                                                                                                                                                                                                                                                    | Parameter name                       | Accessibility | Data mapping | Set to take effect                             | Data display range          | Default | Correlation mode |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------|--------------|------------------------------------------------|-----------------------------|---------|------------------|
| 60B1                                                                                                                                                                                                                                                               | Velocity offset<br>(Velocity offset) | RW            | RPDO         | Set value takes effect at the time of shutdown | $(-2^{31}) \sim (2^{31}-1)$ | 0       | CSP/CSV          |
| Used to set the EtherCAT external velocity feedforward signal under the cyclic synchronization position mode.<br>Used to set the servo torque command offset amount under the cyclic synchronization velocity mode; after offset, servo target torque=60FFh+60B1h. |                                      |               |              |                                                |                             |         |                  |

|      | Parameter name | Accessibility | Data mapping | Set to take effect     | Data display range         | Default | Correlation mode |
|------|----------------|---------------|--------------|------------------------|----------------------------|---------|------------------|
| 60B2 | Torque offset  | RW            | RPDO         | Set value takes effect | -3000~ 3000<br>(unit 0.1%) | 0       | CSP/CSV/CST      |

|                                                                                                                                                   |                 |  |  |                               |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--|--|-------------------------------|--|--|--|
|                                                                                                                                                   | (Torque offset) |  |  | at the time<br>of<br>shutdown |  |  |  |
| Used to set the EtherCAT external velocity feedforward signal under the cyclic synchronization position mode and cyclic synchronization velocity; |                 |  |  |                               |  |  |  |
| Used to set the servo torque command offset amount under the cyclic synchronization torque mode; after offset, servo target torque=6071h+60B2h.   |                 |  |  |                               |  |  |  |

|                                                  | Parameter name                                 | Accessibility | Data mapping | Set to take effect                                         | Data display range | Default | Correlation mode |
|--------------------------------------------------|------------------------------------------------|---------------|--------------|------------------------------------------------------------|--------------------|---------|------------------|
| 60B8                                             | Touch probe function<br>(Touch probe function) | RW            | RPDO         | Set value<br>takes effect<br>at the time<br>of<br>shutdown | 0~65535            | 0       | -                |
| Used to set the function of probe 1 and probe 2. |                                                |               |              |                                                            |                    |         |                  |

|                                                 | Parameter name                             | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|-------------------------------------------------|--------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 60B9                                            | Touch probe status<br>(Touch probe status) | RO            | TPDO         | -                  | 0~65535            | 0       | -                |
| Used to read the status of probe 1 and probe 2. |                                            |               |              |                    |                    |         |                  |

|                                                                                       | Parameter name                                                            | Accessibility | Data mapping | Set to take effect | Data display range          | Default | Correlation mode |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------|--------------|--------------------|-----------------------------|---------|------------------|
| 60BA                                                                                  | Probe 1 rising edge<br>position value<br>(Touch Probe Pos1 Pos<br>Value)  | RO            | TPDO         | -                  | $(-2^{31}) \sim (2^{31}-1)$ | 0       | -                |
| Used to display the rising edge and position value of probe 1 signal (command unit).  |                                                                           |               |              |                    |                             |         |                  |
|                                                                                       | Parameter name                                                            | Accessibility | Data mapping | Set to take effect | Data display range          | Default | Correlation mode |
| 60BB                                                                                  | Probe 1 falling edge<br>position value<br>(Touch Probe Pos1 Neg<br>Value) | RO            | TPDO         | -                  | $(-2^{31}) \sim (2^{31}-1)$ | 0       | -                |
| Used to display the falling edge and position value of probe 1 signal (command unit). |                                                                           |               |              |                    |                             |         |                  |

| 60BC | Parameter name | Accessibility | Data | Set to take | Data display | Default | Correlation |
|------|----------------|---------------|------|-------------|--------------|---------|-------------|
|------|----------------|---------------|------|-------------|--------------|---------|-------------|

|                                                                                      |                                                                    |    | mapping | effect | range                       |   | mode |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------|----|---------|--------|-----------------------------|---|------|
|                                                                                      | Probe 2 rising edge position value<br>(Touch Probe Pos2 Pos Value) | RO | TPDO    | -      | $(-2^{31}) \sim (2^{31}-1)$ | 0 | -    |
| Used to display the rising edge and position value of probe 2 signal (command unit). |                                                                    |    |         |        |                             |   |      |

| 60BD                                                                                  | Parameter name                                                      | Accessibility | Data mapping | Set to take effect | Data display range          | Default | Correlation mode |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------|--------------|--------------------|-----------------------------|---------|------------------|
|                                                                                       | Probe 2 falling edge position value<br>(Touch Probe Pos2 Neg Value) | RO            | TPDO         | -                  | $(-2^{31}) \sim (2^{31}-1)$ | 0       | -                |
| Used to display the falling edge and position value of probe 2 signal (command unit). |                                                                     |               |              |                    |                             |         |                  |

| 60C5                                                                                  | Parameter name           | Accessibility | Data mapping | Set to take effect | Data display range  | Default | Correlation mode |
|---------------------------------------------------------------------------------------|--------------------------|---------------|--------------|--------------------|---------------------|---------|------------------|
|                                                                                       | Max profile acceleration | RW            | RPDO         | -                  | $0 \sim (2^{32}-1)$ | 0       | -                |
| Used to display the falling edge and position value of probe 2 signal (command unit). |                          |               |              |                    |                     |         |                  |

| 60C6                                                                                  | Parameter name           | Accessibility | Data mapping | Set to take effect | Data display range  | Default | Correlation mode |
|---------------------------------------------------------------------------------------|--------------------------|---------------|--------------|--------------------|---------------------|---------|------------------|
|                                                                                       | Max profile deceleration | RW            | RPDO         | -                  | $0 \sim (2^{32}-1)$ | 0       | -                |
| Used to display the falling edge and position value of probe 2 signal (command unit). |                          |               |              |                    |                     |         |                  |

| 60E0                                                | Parameter name                         | Accessibility | Data mapping | Setting in force                           | Data display range | Default value | Correlation mode | Data type |
|-----------------------------------------------------|----------------------------------------|---------------|--------------|--------------------------------------------|--------------------|---------------|------------------|-----------|
|                                                     | Forward direction maximum torque limit | RW            | RPDO         | Operation setting<br>Effective immediately | 0 to 3000          | 3000          | ALL              | 16-bit    |
| Set the positive maximum torque limit of the servo. |                                        |               |              |                                            |                    |               |                  |           |
| 🔧 Note: It takes effect when the parameter P1-14=2. |                                        |               |              |                                            |                    |               |                  |           |

| 60E1 | Parameter name                               | Accessibility | Data mapping | Setting in force               | Data display range | Default value | Correlation mode | Data type |
|------|----------------------------------------------|---------------|--------------|--------------------------------|--------------------|---------------|------------------|-----------|
|      | Reverse direction maximum torque limit value | RW            | RPDO         | Operation setting<br>Effective | 0 to 3000          | 3000          | ALL              | 16-bit    |

|                                                                                                                                            |  |  |  |             |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|-------------|--|--|--|--|
|                                                                                                                                            |  |  |  | immediately |  |  |  |  |
| Set the negative maximum torque limit of the servo.                                                                                        |  |  |  |             |  |  |  |  |
|  <b>Note:</b> It takes effect when the parameter P1-14=2. |  |  |  |             |  |  |  |  |

|                                                              | Parameter name                                       | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|--------------------------------------------------------------|------------------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 60F4                                                         | Position deviation<br>(Following error actual value) | RO            | TPDO         | -                  | -                  | -       | PP HM CSP        |
| Used to display following error actual value (command unit). |                                                      |               |              |                    |                    |         |                  |

|                                                                                                                                                                                    | Parameter name                                   | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
| 60FC                                                                                                                                                                               | Position demand value<br>(Position demand value) | RO            | TPDO         | -                  | -                  | -       | PP HM CSP        |
| Used to display the position demand value (encoder unit).                                                                                                                          |                                                  |               |              |                    |                    |         |                  |
| When the servo is enabled, if there is no warning, the relationship between the position demand value (encoder unit) and position demand value (command unit) is shown as follows: |                                                  |               |              |                    |                    |         |                  |
| Position demand value 60FCh (encoder unit)= position demand value 6062h (command unit)* gear ratio (6091h).                                                                        |                                                  |               |              |                    |                    |         |                  |

|                                                         | Parameter name                | Accessibility          | Data mapping       | Set to take effect | Data display range | Default | Correlation mode |
|---------------------------------------------------------|-------------------------------|------------------------|--------------------|--------------------|--------------------|---------|------------------|
| 60FD                                                    | Digital input (Digital Input) | RO                     | TPDO               | -                  | -                  | -       | ALL              |
| Used to reflect the current DI terminal logic of drive: |                               |                        |                    |                    |                    |         |                  |
| 0 -logic invalid;                                       |                               |                        |                    |                    |                    |         |                  |
| 1- logic valid.                                         |                               |                        |                    |                    |                    |         |                  |
| DI signals represented by each bit are as follows:      |                               |                        |                    |                    |                    |         |                  |
|                                                         | <b>Bit</b>                    | <b>Name</b>            | <b>Description</b> |                    |                    |         |                  |
|                                                         | 0                             | Reverse overrun switch | 0: Invalid         |                    |                    |         |                  |
|                                                         |                               |                        | 1: Valid           |                    |                    |         |                  |
|                                                         | 1                             | Forward overrun switch | 0: Invalid         |                    |                    |         |                  |
|                                                         |                               |                        | 1: Valid           |                    |                    |         |                  |
|                                                         | 2                             | Homing Switch          | 0: Invalid         |                    |                    |         |                  |
|                                                         |                               |                        | 1: Valid           |                    |                    |         |                  |
|                                                         | 3-15                          | N/A                    | 0: Invalid         |                    |                    |         |                  |

|          |    |            |            |  |
|----------|----|------------|------------|--|
|          |    |            | 1: Valid   |  |
|          | 16 | DI1        | 0: Invalid |  |
|          |    |            | 1: Valid   |  |
|          | 17 | DI2        | 0: Invalid |  |
|          |    |            | 1: Valid   |  |
|          | 18 | DI3        | 0: Invalid |  |
|          |    |            | 1: Valid   |  |
|          | 19 | DI4        | 0: Invalid |  |
|          |    |            | 1: Valid   |  |
|          | 22 | NA         | 0: Invalid |  |
| 1: Valid |    |            |            |  |
| 25-31    | NA | 0: Invalid |            |  |
|          |    | 1: Valid   |            |  |

| 60FE | Parameter name                               | Accessibility | Data mapping | Set to take effect                         | Data display range | Default | Correlation mode |
|------|----------------------------------------------|---------------|--------------|--------------------------------------------|--------------------|---------|------------------|
|      | Digital Output Dictionary<br>DigitalDoOutput | RW            | RPDO         | Operation setting<br>Effective immediately | 0~ 65535           | 0       | ALL              |

| 60EF-01 |         |                      | 60EF-02 |         |                      |
|---------|---------|----------------------|---------|---------|----------------------|
| bit     | name    | description          | bit     | name    | description          |
| 0-15    | reserve | -                    | 0-15    | reserve | -                    |
| 16      | DO_1    | 0: Forced output OFF | 16      | DO_1    | 0: Forced output OFF |
|         |         | 1: Forced output ON  |         |         | 1: Forced output ON  |
| 17      | DO_2    | 0: Forced output OFF | 17      | DO_2    | 0: Forced output OFF |
|         |         | 1: Forced output ON  |         |         | 1: Forced output ON  |
| 18      | DO_3    | 0: Forced output OFF | 18      | DO_3    | 0: Forced output OFF |
|         |         | 1: Forced output ON  |         |         | 1: Forced output ON  |
| 19-31   | reserve | -                    | 19-31   | reserve | -                    |

| 60FF                                                                                                            | Parameter name                         | Accessibility | Data mapping | Set to take effect | Data display range          | Default | Correlation mode |
|-----------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------|--------------|--------------------|-----------------------------|---------|------------------|
|                                                                                                                 | Profile velocity<br>(Profile velocity) | RW            | RPDO         | -                  | $(-2^{31}) \sim (2^{31}-1)$ | 0       | PV CSV           |
| Used to set the user velocity command under the profile velocity mode and cyclic synchronization velocity mode. |                                        |               |              |                    |                             |         |                  |

| 6502 | Parameter name        | Accessibility | Data mapping | Set to take effect | Data display range | Default | Correlation mode |
|------|-----------------------|---------------|--------------|--------------------|--------------------|---------|------------------|
|      | Supported drive modes | RO            | TPDO         | -                  | -                  | -       | -                |

Used to select homing method.

| Bit   | Description                     | Support or not<br>0-Not support<br>1-Support |
|-------|---------------------------------|----------------------------------------------|
| 0     | Profile position mode (PP)      | 1                                            |
| 1     | NA                              | 0                                            |
| 2     | Profile velocity mode (PV)      | 1                                            |
| 3     | Profile torque mode (PT)        | 1                                            |
| 4     | NA                              | 0                                            |
| 5     | Homing mode (HM)                | 1                                            |
| 6     | Interpolation mode              | 0                                            |
| 7     | Cycle Synchronous Position Mode | 1                                            |
| 8     | Cycle Synchronous Velocity Mode | 1                                            |
| 9     | Cycle Synchronous Torque Mode   | 1                                            |
| 10-31 | Factory customized              | Reserved                                     |



# Chapter 9 Adjustments

## 9.1 Overview

The servo drive needs to make the motor work without delay as much as possible in accordance with the instructions issued by the host controller. In order to make the motor run based on command as much as possible and maximize the mechanical performance, it is necessary to adjust the gain. The flow of gain adjustment is as shown in Figure 9-1.

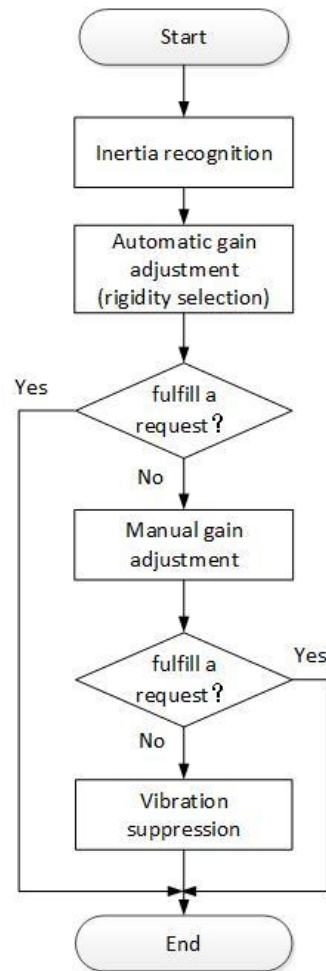


Figure 9-1 Gain adjustment process

The servo gain is composed of multiple sets of parameters such as position loop, speed loop, filter, load inertia ratio, etc., and they affect each other. In the process of setting the servo gain, the balance between the setting values of each parameter must be considered.



### Notice

Before adjusting the gain, it is recommended to carry out inching test run first! Ensure that the servo motor can operate normally!

The gain adjustment process description is shown in Table 9-1.

Table 9-1 Gain adjustment process description

| Gain adjustment process |                           |                      | Function                                                                                                                                   | Detailed chapter |
|-------------------------|---------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1                       | Inertia identification    |                      | Automatic load inertia ratio identification is carried out by using the upper computer debugging platform software matched with the drive. | 9.2              |
| 2                       | Automatic gain adjustment |                      | On the premise of setting the inertia ratio correctly, the drive automatically adjusts a set of matching gain parameters.                  | 9.3.1            |
| 3                       | Manual gain adjustment    | Basic gain           | On the basis of automatic gain adjustment, if the expected effect is not achieved, manually fine-tune the gain to optimize the effect.     | 9.3.2            |
|                         |                           | Feedforward gain     | The feedforward function is enabled to improve the followability.                                                                          | 9.3.3            |
| 4                       | Vibration suppression     | Mechanical resonance | The notch filter function is enabled to suppress mechanical resonance.                                                                     | 9.4.1            |

## 9.2 Inertia identification

Load inertia ratio "2003-01" refers to:

$$\text{Load inertia ratio} = \frac{\text{Total moment of inertia of mechanical load}}{\text{Moment of inertia of the motor}}$$

Load inertia ratio is an important parameter of servo system. Correct setting of load inertia ratio is helpful to complete debugging quickly.



### Notice

**Before performing oncable load inertia identification, the following conditions should be met:**

1. The maximum speed of the motor should be greater than 300rpm;
2. The actual load inertia ratio is 0.00~Between 100.00;
3. The load torque is relatively stable, and the load cannot change drastically during the measurement process;
4. The backlash of the load transmission mechanism is within a certain range;

**The motor's movable stroke should meet following two requirements:**

1. There is a movable stroke of more than 1 circle in both forward and reverse directions between the mechanical limit switches. Before performing oncable inertia identification, please make sure that the limit switch has been installed on the machine, and the motor has a movable stroke of more than 1 circle respectively in the forward and reverse directions to prevent overtravel during the inertia identification process, which may cause accidents.
2. Meet the requirements of inertia identification turns [2003-05]; make sure that the motor's movable stroke at the stop position is greater than the set value of the number of inertia identification circles [2003-05], otherwise the maximum speed of inertia identification [2003-06]

should be appropriately reduced.

**During the automatic load inertia identification process, if vibration occurs, the load inertia identification should be stopped immediately.**

Related function codes are shown in Table 9-2.

Table 9-2 Details of inertia identification related parameters

| Function code | Name                                           | Setting method    | Valid time        | Default | Range         | Definition                                                                                                                                                                                                                                       | Unit |
|---------------|------------------------------------------------|-------------------|-------------------|---------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2003-01       | Load inertia ratio                             | Operation Setting | Valid immediately | 300     | 100~1000<br>0 | Set load inertia ratio, 0.00~100.00 times                                                                                                                                                                                                        | 0.01 |
| 2003-05       | Inertia identification circles                 | Shutdown Setting  | Valid immediately | 2       | 1~20          | Offcable load inertia identification process, motor rotation number setting                                                                                                                                                                      | Turn |
| 2003-06       | Maximum speed of inertia identification        | Shutdown Setting  | Valid immediately | 1000    | 300~2000      | Set the allowable maximum motor speed instruction in offcable inertia identification mode.<br><br>The faster the speed during inertia identification is, the more accurate the identification result will be. Generally, keep the default value. | rpm  |
| 2003-07       | Parameter identification of rotation direction | Shutdown Setting  | Valid immediately | 0       | 0 to 2        | 0: Forward and reverse reciprocating rotation<br><br>1: Forward one-way rotation<br><br>2: Reverse one-way rotation                                                                                                                              | -    |

### 9.3 Gain Adjustment

In order to optimize the responsiveness of the servo drive, the gain set in the servo drive needs to be adjusted. Servo gain needs to set multiple parameter combinations, which will affect each other. Therefore, the adjustment of servo gain must consider the relationship between each parameter.

Under normal circumstances, high-rigidity machinery can improve the response performance by increasing the servo gain. But for machines with lower rigidity, when the servo gain is increased, vibration may occur, which will affect the increase in gain. Therefore, selecting appropriate servo gain parameters can achieve higher response and stable performance.

The servo supports automatic gain adjustment and manual gain adjustment. It is recommended to use automatic gain adjustment first.

### 9.3.1 Automatic Gain Adjustment

Automatic gain adjustment means that through the rigidity level selection function [2003-02], the servo drive will automatically generate a set of matching gain parameters to meet the requirements of rapidity and stability.

The rigidity of the servo refers to the ability of the motor rotor to resist load inertia, that is, the self-locking ability of the motor rotor. The stronger the servo rigidity is, the greater the corresponding position loop gain and speed loop gain can achieve, and the faster the response speed of the system will be.



#### Notice

Before adjusting the rigidity grade, set the appropriate load inertia ratio correctly[2003-01].

The value range of rigidity grade is between 0~31. The value range of the rigidity grade is between 0 and 31. Grade 0 corresponds to the weakest rigidity and minimum gain, and grade 31 corresponds to the strongest rigidity and maximum gain. According to different load types, Table 9-3 Empirical values can be used for reference.

Table 9-3 Experience reference of rigidity grade

| Rigidity grade | Load mechanism type                                                 |
|----------------|---------------------------------------------------------------------|
| Grade 4 to 8   | Some large machinery                                                |
| Grade 8 to 15  | Low rigidity applications such as belts                             |
| Grade 15 to 20 | High rigidity applications such as ball screw and direct connection |

When the function code [2003-03] is set to 0, the gain parameters are stored in the first gain by modifying the rigidity grade.

When debugging with the upper computer debugging software, automatic rigidity level measurement can be carried out, which is used to select a set of appropriate rigidity grades as operating parameters. The operation steps are as follows:

Step 1 Confirm that the servo is in the ready state, the panel displays "ry", and the communication cable is connected;

Step 2 Open the servo drive debugging software, enter the trial run interface, set the corresponding parameters, and click "Servo on";

Step 3 Click the "forward" or "reverse" button to confirm the travel range of the servo operation;

Step 4 After the "Start Identification" of inertia identification lights up, click "Start Identification" to start inertia identification to measure the load inertia.

Step 5 After the inertia identification test is completed, click "Save inertia value";

Step 6 Click "Next" at the bottom right to go to the parameter adjustment interface, click "Parameter Measurement" to start parameter measurement.

Step 7 After the parameter measurement is completed, the servo drive debugging software will pop up a confirmation window for parameter writing and saving.



#### Notice

There may be a short mechanical whistling sound during the test. Generally, the servo will automatically stop the test. If it does not stop automatically or in other abnormal situations, you can click the "Servo Off" button on the interface to turn off the servo, or power off the machine!

For the detailed operation of the upper computer debugging software, please refer to "Wecon SCTool Software User Manual".

Table 9-4 Self-tuning mode selection parameter details

| Index code | Name                       | Setting method    | Valid time        | Default | Range  | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Unit |
|------------|----------------------------|-------------------|-------------------|---------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2003-03    | Self-tuning mode selection | Operation setting | Valid immediately | 0       | 0 to 2 | <p>0: Rigidity grade self-adjusting mode. Position loop gain, speed loop gain, speed loop integral time constant, torque filter parameter settings are automatically adjusted according to the rigidity grade setting.</p> <p>1: Manual setting. Users need to manually set the position loop gain, speed loop gain, speed loop integral time constant, and torque filter parameter setting</p> <p>2: On cable automatic parameter self-adjusting mode (Not implemented yet)</p> | -    |

### 9.3.2 Manual Gain Adjustment

When the servo automatic gain adjustment fails to achieve the desired result, you can manually fine-tune the gain to achieve better results.

The servo system consists of three control loops, from the outside to the inside are the position loop, the speed loop and the current loop. The basic control block diagram is shown as below.

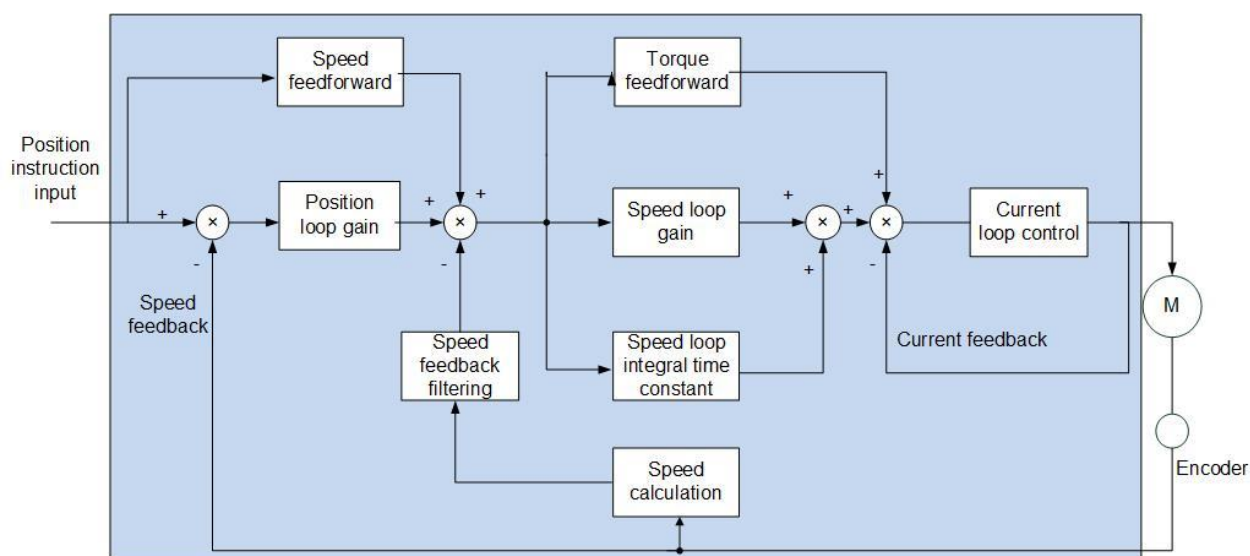


Figure 9-2 Basic block diagram of servo loop gain

The more the inner loop is, the higher the responsiveness is required. Failure to comply with this principle may lead to system instability!

The default current loop gain of the servo drive has ensured sufficient responsiveness, generally no adjustment is required, only the position loop gain, speed loop gain and other auxiliary gains need to be adjusted.

#### (1) Speed loop gain

The speed loop gain determines the highest frequency of the changing speed instruction that the speed loop can follow.

In the case of no vibration or noise in the mechanical system, the larger the speed loop gain setting value is, the better the response of servo system and the better the speed followability can achieve. When noise occurs in the system, reduce the speed loop gain. Related function codes are shown in Table 9-5.

Table 9-5 Details of speed loop gain parameters

| Index code | Name                | Setting method    | Valid time        | Default | Range   | Definition                                                                              | Unit  |
|------------|---------------------|-------------------|-------------------|---------|---------|-----------------------------------------------------------------------------------------|-------|
| 2002-02    | 1st speed loop gain | Operation setting | Valid immediately | 250     | 0~35000 | Set the speed loop proportional gain to determine the responsiveness of the speed loop. | 0.1Hz |

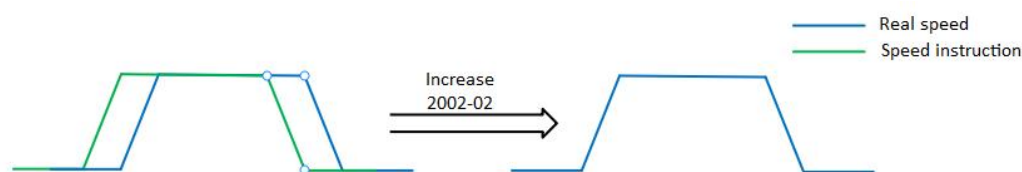


Figure 9-3 Effect schematic diagram of velocity loop gain

## (2) Speed loop integral time constant

The speed loop integral time constant is used to eliminate the speed loop deviation. Decreasing the integral time constant of the speed loop can increase the speed of the speed following. If the set value is too small, it will easily cause speed overshoot or vibration. When the setting value of time constant is too large, the integral action will be weakened, resulting in a deviation of the speed loop. Related function codes are shown in Table 9-6.

Table 9-6 Details of speed loop integral time constant parameters

| Index code | Name                         | Setting method   | Valid time        | Default | Range    | Definition                                                                                                    | Unit  |
|------------|------------------------------|------------------|-------------------|---------|----------|---------------------------------------------------------------------------------------------------------------|-------|
| 2002-03    | speed loop 1st integral time | OperationSetting | Valid immediately | 230     | 10~65535 | Set the speed loop integral constant. The smaller the set value is, the stronger the integral effect will be. | 0.1ms |

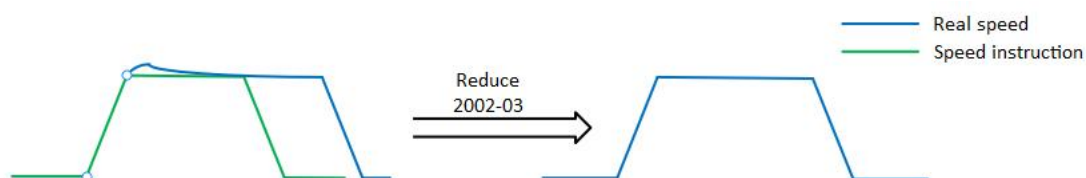


Figure 9-4 Sketch for the effect of integrating time constant of velocity loop

## (3) Position loop gain

Determine the highest frequency of the position command that the position loop can follow the change. Increasing this parameter can speed up the positioning time and improve the ability of the motor to resist external disturbances when the motor is stationary. However, if the setting value is too large, the system may be unstable and disrupted. Related function codes are shown in Table 9-7.

Table 9-7 Details of position loop gain parameters

| Index code | Name                   | Setting method   | Valid time        | Default | Range  | Definition                                                                                              | Unit  |
|------------|------------------------|------------------|-------------------|---------|--------|---------------------------------------------------------------------------------------------------------|-------|
| 2002-01    | 1st position loop gain | OperationSetting | Valid immediately | 449     | 0~6200 | Set the position loop proportional gain to determine the responsiveness of the position control system. | 0.1Hz |

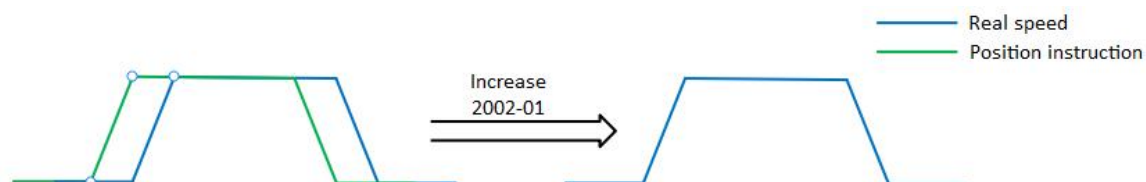


Figure 9-5 Gain effect schematic diagram of position loop

#### (4) Torque instruction filter time

Selecting an appropriate torque filter time constant could suppress mechanical resonance. The larger the value of this parameter, the stronger the suppression ability. If the setting value is too large, it will decrease the current loop response frequency and cause needle movement. Related function codes are shown in Table 9-8.

Table 9-8 Details of torque filter time constant parameters

| Index code | Name                           | Setting method    | Valid time        | Default | Range  | Definition                                                                              | Unit   |
|------------|--------------------------------|-------------------|-------------------|---------|--------|-----------------------------------------------------------------------------------------|--------|
| 2004-04    | Torque filtering time constant | Operation Setting | Valid immediately | 95      | 7~2500 | This parameter is automatically set when "Self-tuning Mode Selection" is selected as 0. | 0.01ms |

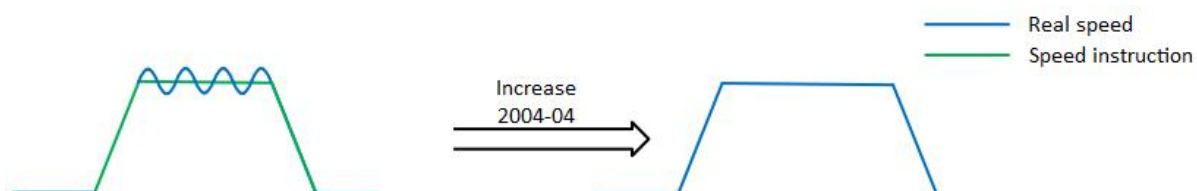


Figure 9-6 Time Constant Effect Schematic Diagram of Torque Filtering

#### 9.3.3 Feedforward Gain

Speed feedforward could be used in position control mode and full closed-loop function. It could improve the response to the speed instruction and reduce the position deviation with fixed speed. Speed feedforward parameters are shown in Table 9-9. See Table 9-10 for details of torque feedforward parameters.

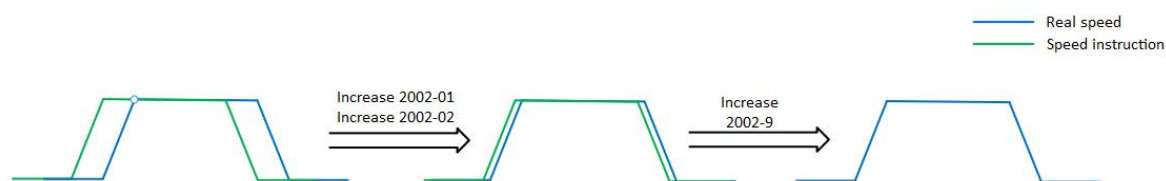


Figure 9-7 Effect schematic of speed feedforward parameters

Table 9-9 Speed feedforward parameters

| Index code | Name | Adjustment description |
|------------|------|------------------------|
|------------|------|------------------------|

|         |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2002-09 | Speed feedforward gain                    | When the speed feedforward filter is set to 50 (0.5 ms), gradually increase the speed feedforward gain, and the speed feedforward will take effect. The position deviation during operation at a constant speed becomes smaller according to the value of the speed feedforward gain as shown in the following formula.<br><br>Position deviation (pulse instruction) = instruction speed[instruction unit/s]÷position loop gain [1/s]×(100—speed feedforward gain [%])/100 |
| 2002-0A | Speed feedforward filtering time constant |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

Torque feedforward can improve torque command response and reduce position deviation during fixed acceleration and deceleration.

Table 9-10 Torque feedforward parameters

| Index code | Name                                    | Adjustment description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2002-0B    | Torque feedforward gain                 | Increase the torque feedforward gain, because the position deviation during certain acceleration and deceleration can be close to 0, so under the ideal condition that the torque does not act when the external disturbance occurs, when driving under the trapezoidal speed model, the position deviation can be made in the entire action range close to 0.<br><br>In fact, there must be external disturbance torque, so the position deviation cannot be 0. In addition, like the speed feedforward, the larger the constant of the torque feedforward filter is, the smaller the action will be, with greater positional deviation of the acceleration change point. |
| 2002-0C    | Torque feedforward filter time constant |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### 9.3.4 Model tracking control function

Model tracking control is applicable to the position control mode, which adds a model loop outside the three loops. In the model loop, new control quantities such as position instructions, speed feedforward and torque feedforward are generated based on the user's response requirements for the system and the ideal motor control model. Applying these control variables to the actual control loop can significantly improve the response performance and positioning performance of position control. The design block diagram is as follows.

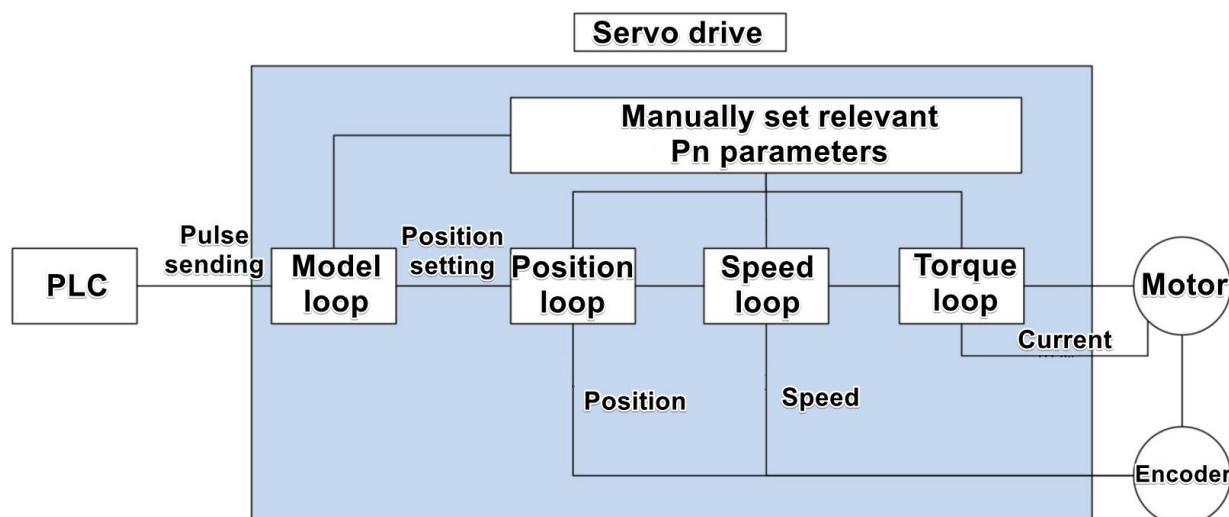


Figure 9-8 Model tracking control design block diagram

Use methods and conditions of model tracking control:



- ① Correctly set the inertia ratio P3-1 of the system, which can be obtained by monitoring the real-time load inertia ratio U0-20;
- ② Set the load rigidity level P3-2, set suitable values, do not need to set high rigidity levels (recommended values under rigid loads 17~21);
- ③ Setting P2-20=1, turn on the function of model tracking control;
- ④ Adjust the tracking control gain of P2-21 model from small to large, which can be gradually increased according to the step amount of 1000 until the responsiveness of the system meets the actual demand. The responsiveness of the system is mainly determined by this parameter;
- ⑤ After the responsiveness meets the requirements, appropriate adjustments can be made to improve the load rigidity level P3-2.

 Note: Model tracing control is only available in position mode and not available in other modes.

| Index code | Name                                                  | Setting method    | Effective time        | Default | Range     | Definition                                                                                                                                                                                                                                                                                      | Unit  |
|------------|-------------------------------------------------------|-------------------|-----------------------|---------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2002-14    | Model tracking control enabled                        | Stop setting      | Effective immediately | 0       | 0~1       | Set 1 to enable model tracking control features                                                                                                                                                                                                                                                 | -     |
| 2002-15    | Model tracking control gain                           | Stop setting      | Effective immediately | 1000    | 200~20000 | Increasing the model tracking control gain can improve the position response performance of the model loop. High gain may cause overshoot behavior. Gain compensation affects the damping ratio of the model loop, and the damping ratio becomes larger with the increase of gain compensation. | 0.1/s |
| 2002-16    | Model tracking control gain compensation              | Stop setting      | Effective immediately | 1000    | 500~2000  |                                                                                                                                                                                                                                                                                                 | 0.10% |
| 2002-17    | Model tracking control forward direction offset       | Operation setting | Effective immediately | 1000    | 0~10000   | Magnitude of torque feedforward in forward and reverse directions under model tracking control                                                                                                                                                                                                  | 0.10% |
| 2002-18    | Model tracking control reverse direction offset       | Operation setting | Effective immediately | 1000    | 0~10000   |                                                                                                                                                                                                                                                                                                 | 0.10% |
| 2002-19    | Model tracking control speed feedforward compensation | Operation setting | Effective immediately | 1000    | 0~10000   | Velocity feedforward magnitude under model tracking control                                                                                                                                                                                                                                     | 0.10% |

Please refer to the following table for examples of steps for adjusting servo gain.

| Step | Content                                                                                                                                                                                                                                                                                                                                               |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Please try to set the correct load inertia ratio parameter P3-1.                                                                                                                                                                                                                                                                                      |
| 2    | If the automatic adjustment mode is adopted (P3-3 is set to 0), please set the basic rigidity level parameter P3-2;<br><br>If you manually adjust the mode(P3-3set1), please set the gain related to the position loop and speed loop P2-1~P2-3 and torque filtering time constant P4-4. The setting principle is mainly non-vibration and overshoot. |
| 3    | Turn on the model tracking function P2-20 and set it to 1.                                                                                                                                                                                                                                                                                            |

|   |                                                                                                                                                                                                                                                                                               |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | In the range where overshoot and vibration do not occur, improve the model tracking gain P2-21.                                                                                                                                                                                               |
| 5 | If the rigidity level of step 2 is relatively low, the rigidity level P3-2 can be appropriately increased.                                                                                                                                                                                    |
| 6 | When overshoot occurs, or when the responses of forward and reverse are different, fine-tuning is performed by model tracking control forward direction offset P2-23, model tracking control reverse direction offset P2-24, and model tracking control speed feedforward compensation P2-25. |

### 9.3.5 Gain switching

Gain switching function:

- ① It can be switched to a lower gain when the motor is stationary (servo enabled) to suppress vibration;
- ② It can be switched to higher gain when the motor is stationary to shorten the positioning time;
- ③ It can be switched to higher gain in the running state of the motor to obtain better instruction tracking performance;
- ④ Different gain settings can be switched through external signals according to load equipment conditions, etc.

#### (1) Gain switching parameter setting

##### ① When P02-07=0

Fixed to the first gain (i.e. using P02-01~P02-03), by DI function 10(GAIN-SEL, gain switching) can be achieved P/PI(proportion/Proportional-integral) control switching.

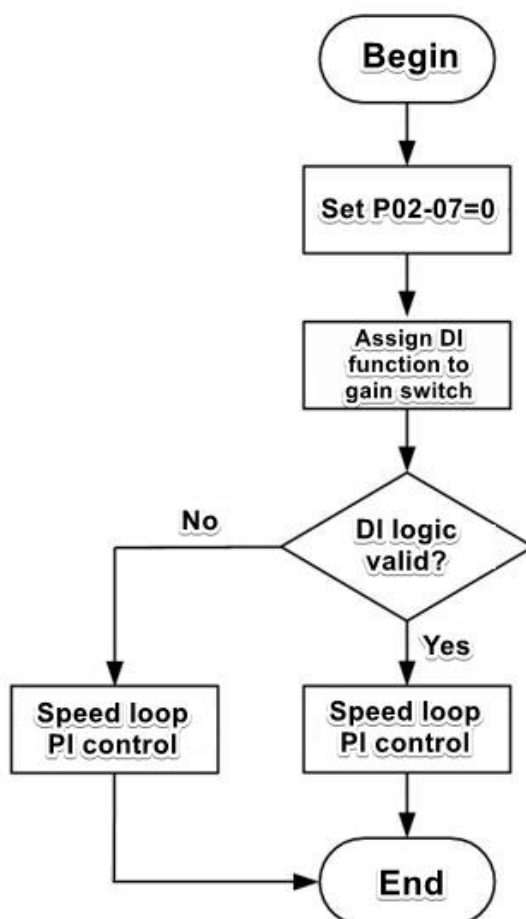


Figure 9-9 P02-07=0 Gain switch flowchart

## ② When P02-07=1

Achieve the first gain (P02-01~P02-03) and second gain (P02-04~P02-06), the switching condition can be set by parameter P02-08.

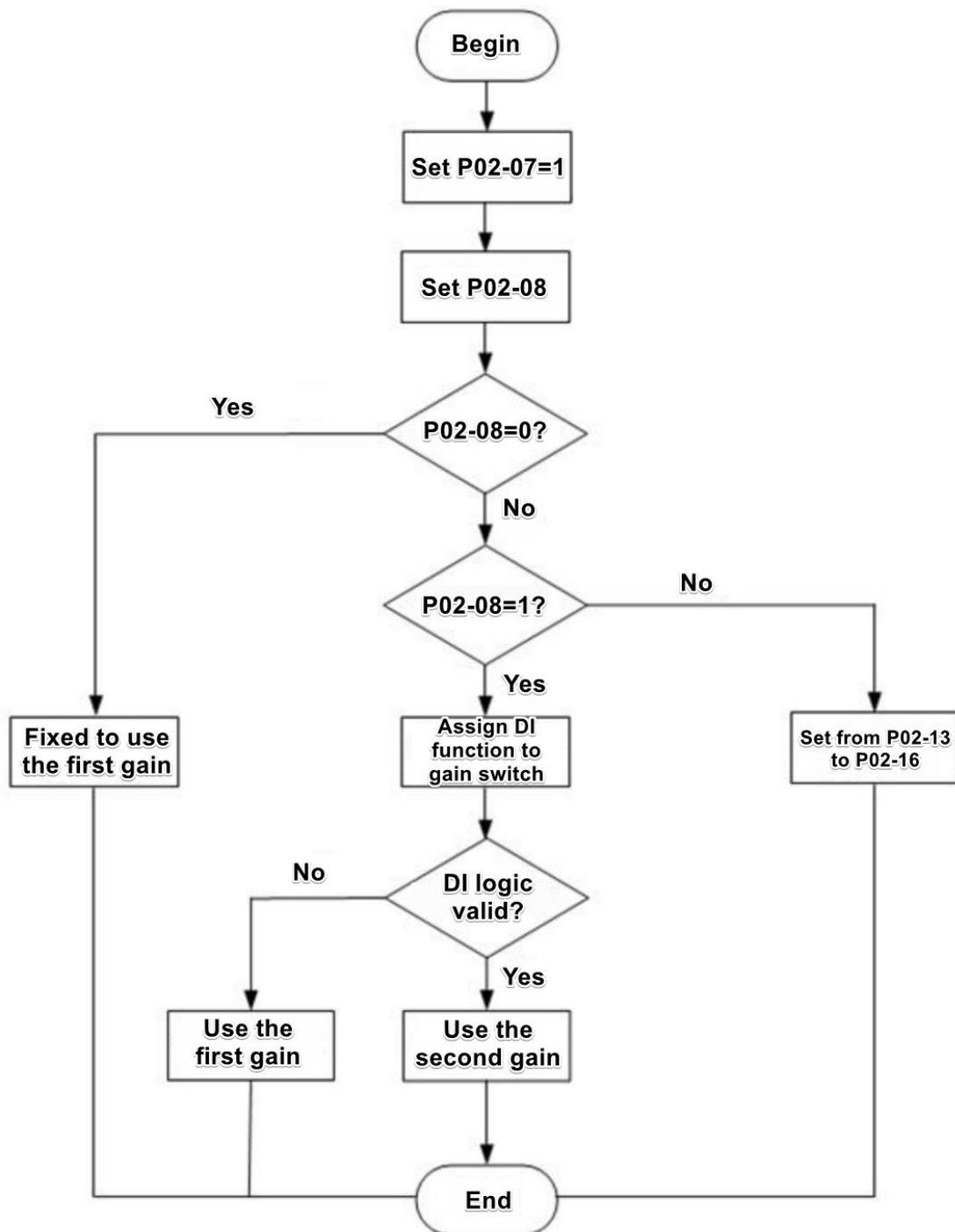
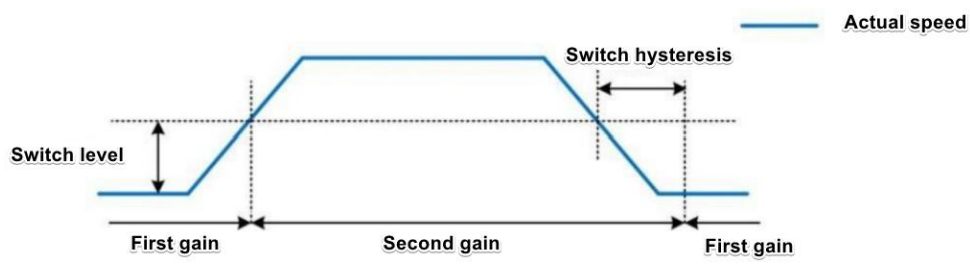
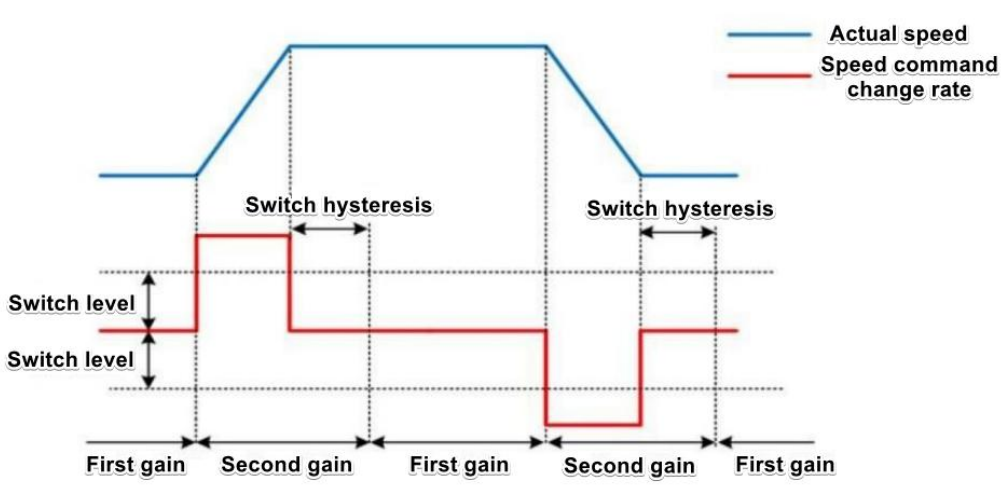
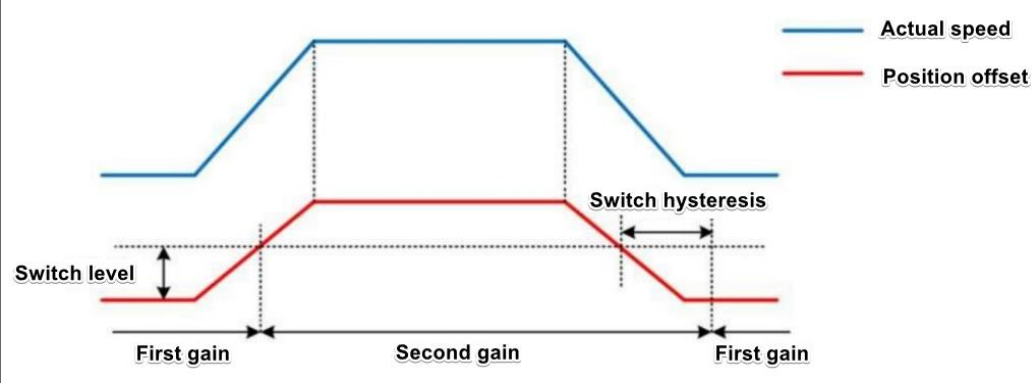


Figure 9-10 When P02-07=1, gain switching flowchart

| P02-08 | Content                           | Schematic diagram |
|--------|-----------------------------------|-------------------|
| 0      | Fixedly used first gain           | -                 |
| 1      | Switching with DI                 | -                 |
| 2      | When torque instruction is larger |                   |
| 3      | When actual torque is larger      |                   |
| 4      | When velocity torque is larger    |                   |
| 5      | When actual speed is larger       |                   |

|   |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                               |  <p>This graph illustrates the relationship between actual speed and time during a speed change. The blue line represents the 'Actual speed'. It starts at a low level, rises through a 'First gain' phase, enters a 'Second gain' phase where it levels off, and then falls through another 'First gain' phase. A 'Switch level' is indicated by a horizontal dashed line. The 'Switch hysteresis' is shown as the horizontal distance between the rising and falling edges of the speed curve at the switch level.</p>                                              |
| 6 | When speed instruction change rate is larger. |  <p>This graph shows the effect of a larger speed instruction change rate. The blue line is 'Actual speed' and the red line is 'Speed command change rate'. The red line shows sharp, step-like transitions between levels. The 'Actual speed' curve follows these steps with a delay and smoothing. The 'First gain' and 'Second gain' phases are labeled for both the rising and falling portions of the speed curve. 'Switch level' is marked with horizontal dashed lines, and 'Switch hysteresis' is indicated for both the rising and falling transitions.</p> |
| 7 | When position deviation is larger             |  <p>This graph shows the effect of a larger position deviation. The blue line is 'Actual speed' and the red line is 'Position offset'. The red line shows a step-like increase in position offset. The 'Actual speed' curve shows a corresponding rise and fall. The 'First gain' and 'Second gain' phases are labeled. 'Switch level' is marked with horizontal dashed lines, and 'Switch hysteresis' is indicated for the falling transition.</p>                                                                                                                 |

| P02-08 | Content                                | Schematic diagram                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8      | There is a position instruction        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 9      | Positioning completed                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 10     | With position instruction+actual speed | <p>The description is made with reference to figure 7-10.</p> <p>In the previous first gain, if the position Instruction is not 0, switching to the second gain;</p> <p>In the previous second gain, if the status in which the position instruction is 0 continues during the delay time, maintaining the second gain; When the delay time reaches, if the absolute value of the current actual speed is less than (level), the speed integration time constant is fixed at the second integration time constant, and the rest are returned to the first gain. If the absolute value of the actual speed is less than (level-lag), all are returned to the first gain.</p> |

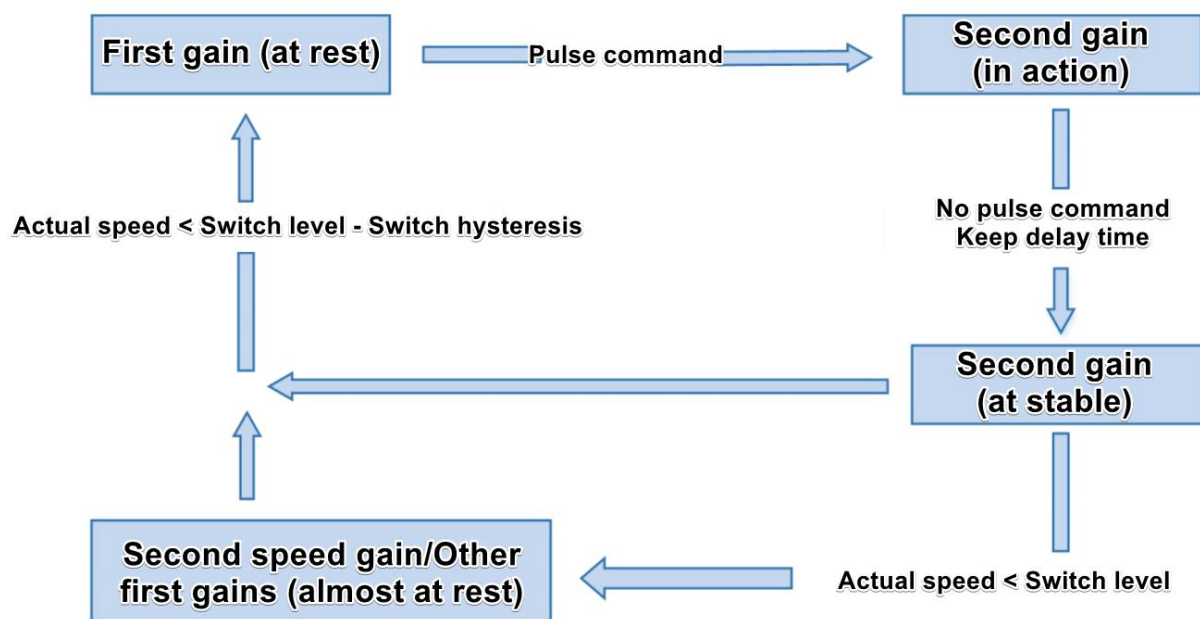


Figure 9-11 P02-08=10 position instruction+actual speed gain description

**(2) Relevant parameter description**

| 2002-07 | Parameter name          | Setting method    | Effective time        | Default | Range  | Application category | Unit |
|---------|-------------------------|-------------------|-----------------------|---------|--------|----------------------|------|
|         | 2nd gain switching mode | Operation setting | Effective immediately | 1       | 0 to 1 | Gain control         |      |

The switching mode of the second gain is set.

| Setting value | Function                                                                                                                                  |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | First gain fixed Using DI function 10(GAIN-SEL, gain switching) to switch:<br>DI logic invalid: PI control;<br>DI logic valid: P Control. |
| 1             | The first gain and the second gain are switched by the set value of P02-08.                                                               |

| 2002-08 | Parameter name                     | Setting method    | Effective time        | Default | Range   | Application category | Unit |
|---------|------------------------------------|-------------------|-----------------------|---------|---------|----------------------|------|
|         | Gain switching condition selection | Operation setting | Effective immediately | 0       | 0 to 10 | Gain control         |      |

Set the conditions for gain switching.

| Setting value | Gain switching condition                      | Details                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0             | First gain fixed                              | Fixed as a first gain                                                                                                                                                                                                                                                                                                                                                      |
| 1             | Switch by DI terminal                         | Using DI function 10(GAIN-SEL, gain switching).<br>DI logic invalid: First gain (P02-01-P02-03);<br>DI logic valid: Second gain (P02-04-P02-06).                                                                                                                                                                                                                           |
| 2             | When torque instruction is larger             | In the previous first gain, when the absolute value of the torque instruction exceeds (level+Hysteresis),<br>Switching to second gain;<br>In the previous second gain, when a status in which the absolute value of the torque instruction is less than (level-hysteresis) continues during the delay time, the second gain is returned to the first gain.                 |
| 3             | When actual torque is larger                  | In the previous first gain, when the absolute value of the actual torque exceeds (level+hysteresis), switching to the second gain;<br>In the second gain of the previous time, when a state in which the absolute value of the actual torque is less than (level-hysteresis) continues during the delay time, the second gain is returned to the first gain.               |
| 4             | When velocity torque is larger                | In the previous first gain, when the absolute value of the speed instruction exceeds (level+hysteresis), switching to the second gain;<br>When the status where the absolute value of the speed instruction is less than (level-hysteresis) in the previous second gain continues during the delay time, the gain returns to the first gain.                               |
| 5             | When actual speed is larger                   | In the previous first gain, when the absolute value of the actual speed exceeds (level+hysteresis), switching to the second gain;<br>In the second gain of the previous time, when a status in which the absolute value of the actual speed is less than (level-hysteresis) continues during the delay time, the first gain is returned to the first gain.                 |
| 6             | When speed instruction change rate is larger. | In the previous first gain, when the absolute value of the speed instruction change rate exceeds (level+hysteresis), switching to the second gain;<br>In the previous second gain, when a status in which the absolute value of the speed instruction change rate is less than (level-hysteresis) continues during the delay time, the gain is returned to the first gain. |
| 7             | When position deviation is larger             | In the previous first gain, when the absolute value of the position deviation exceeds (level+hysteresis), switching to the second gain;<br>In the previous second gain, when a status in which the absolute value of the position deviation is less than (level-hysteresis) continues during the delay time, the gain is returned to the first gain. II .                  |
| 8             | There is a position instruction               | In the previous first gain, if the position Instruction is not 0, switching to the second gain;<br>If the status where the position instruction is 0 continues during the delay time in the previous second gain, the gain returns to the first gain.                                                                                                                      |

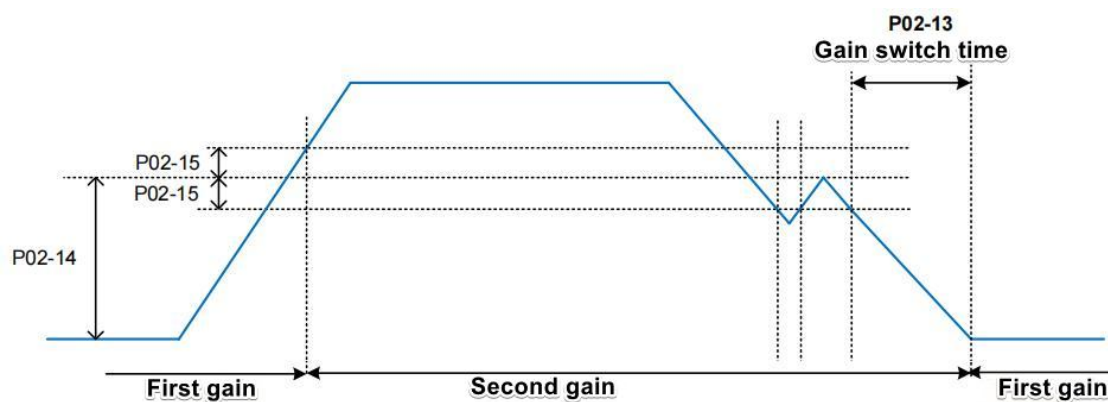


## Chapter 9 Adjustments

|  |    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--|----|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | 9  | Positioning completed                  | <p>In the previous first gain, if the positioning does not complete, switching to the second gain;</p> <p>In the second gain of the previous time, if the positioning incomplete status persists during the delay time, the first gain is returned.</p>                                                                                                                                                                                                                                                                                                                                                       |
|  | 10 | With position instruction+actual speed | <p>In the previous first gain, if the position Instruction is not 0, switching to the second gain;</p> <p>In the previous second gain, if the status in which the position instruction is 0 continues during the delay time, maintaining the second gain; When the delay time reaches, if the absolute value of the current actual speed is less than (level), the speed integration time constant is fixed at the second integration time constant, and the rest are returned to the first gain. If the absolute value of the actual speed is less than (level-lag), all are returned to the first gain.</p> |

| 2002-0D | Parameter name            | Setting method    | Effective time        | Default | Range      | Application category | Unit  |
|---------|---------------------------|-------------------|-----------------------|---------|------------|----------------------|-------|
|         | Gain switching delay time | Operation setting | Effective immediately | 20      | 0 to 10000 | Gain control         | 0.1ms |

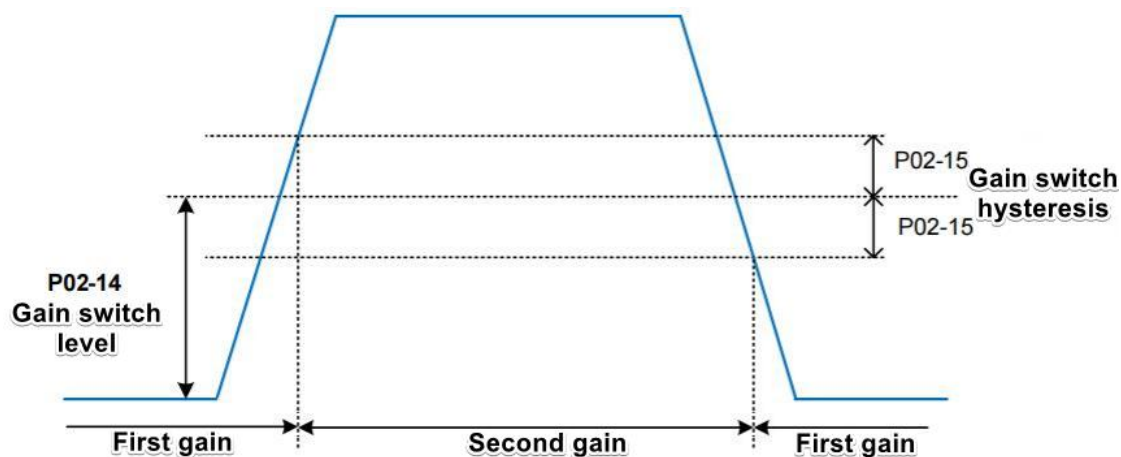
When the second gain is set to switch back to the first gain, the time switching condition needs to last.



**Note:** This parameter is valid only when the second gain is switched back to the first gain.

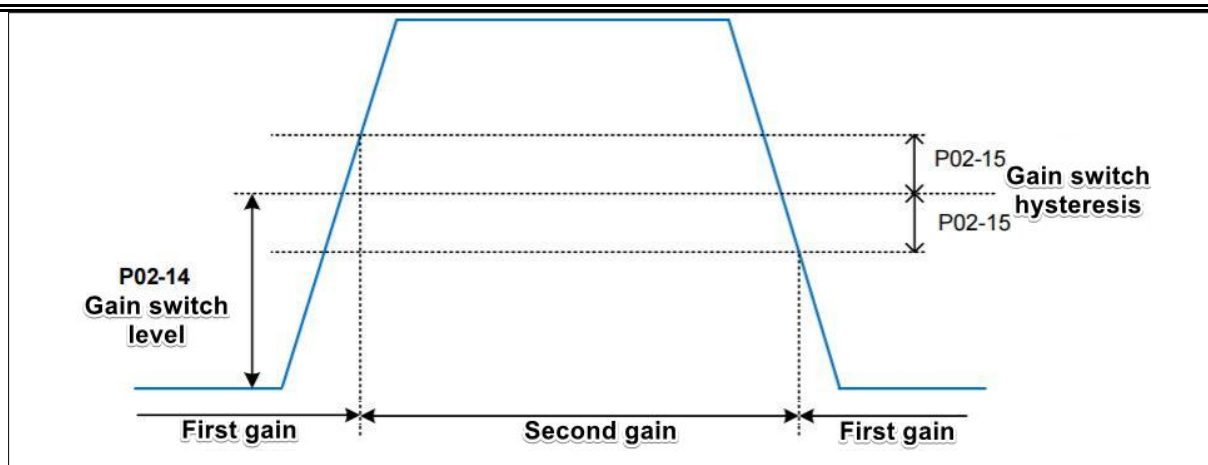
| 2002-0E | Parameter name       | Setting method    | Effective time        | Default | Range      | Application category | Unit                                 |
|---------|----------------------|-------------------|-----------------------|---------|------------|----------------------|--------------------------------------|
|         | Gain switching level | Operation setting | Effective immediately | 50      | 0 to 20000 | Gain control         | According to the switching condition |

Set the level of the gain condition. The actual switching action is affected by two conditions: level and hysteresis.



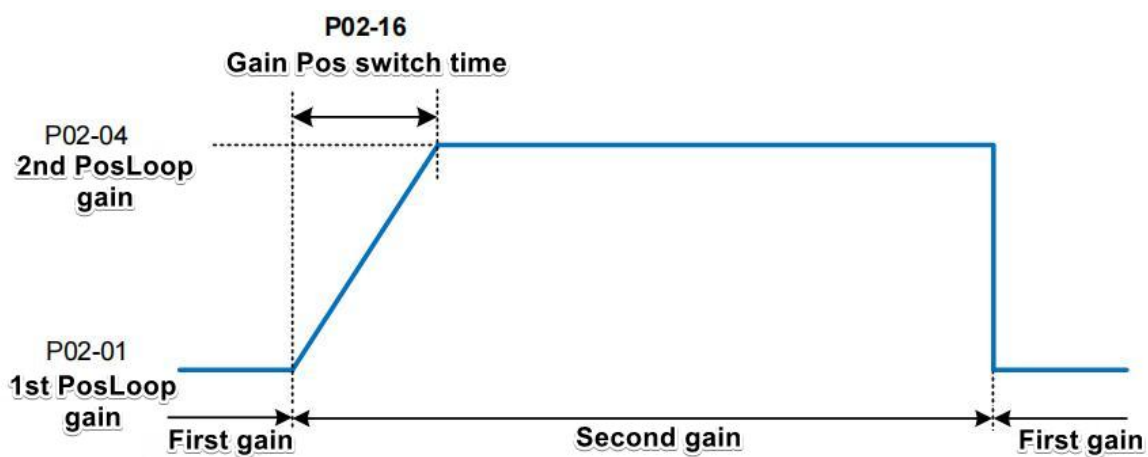
| 2002-0F | Parameter name            | Setting method    | Effective time        | Default | Range      | Application category | Unit                                 |
|---------|---------------------------|-------------------|-----------------------|---------|------------|----------------------|--------------------------------------|
|         | Gain switching hysteresis | Operation setting | Effective immediately | 20      | 0 to 20000 | Gain control         | According to the switching condition |

Set the hysteresis that satisfies the gain switching condition.



| 2002-10 | Parameter name               | Setting method    | Effective time        | Default | Range      | Application category | Unit  |
|---------|------------------------------|-------------------|-----------------------|---------|------------|----------------------|-------|
|         | Position gain switching time | Operation setting | Effective immediately | 30      | 0 to 10000 | Gain control         | 0.1ms |

The time is set at which the first position loop (P02-01) is switched to the second position loop (P02-04) in the position control mode.



If  $P02-04 \leq P02-01$ , this parameter is invalid and immediately switches to the second gain.

## 9.4 Mechanical Resonance Suppression

### 9.4.1 Mechanical Resonance Suppression Methods

When the mechanical rigidity is low, vibration and noise may occur due to resonance caused by shaft twisting, and it may not be possible to increase the gain setting. In this case, by using a notch filter to reduce the gain at a specific frequency, the servo gain can continue to increase after the resonance is validly suppressed. There are 2 methods to suppress mechanical resonance.

#### (1) Torque instruction filter

By setting the filter time constant, the torque instruction is attenuated in the high frequency range above the cutoff frequency, so as to achieve the expectation of suppressing mechanical resonance. The cut-off frequency of the torque instruction filter could be calculated by the following formula:

$$\text{Filter cutoff frequency } f_c(\text{Hz}) = \frac{1}{2\pi * \text{Set parameter value} * 0.001}$$

#### (2) Notch filter

The notch filter can achieve the expectation of suppressing mechanical resonance by reducing the gain at a specific frequency. When setting the notch filter correctly, the vibration can be validly suppressed. You can try to increase the servo gain. The principle of notch filter is shown in Figure Figure 9-8.

### 9.4.2 Notch Filter

VD5L Ethernet servo drive have 2 sets of notch filters, each of which has 3 parameters, namely notch frequency, width grade and depth grade.

#### (1) Width grade of notch filter

The notch width grade is used to express the ratio of the notch width to the center frequency of the notch:

$$\text{Notch filter width grade} = \frac{f_H - f_L}{f_T} \quad (9-1)$$

In formula (9-1),  $f_T$  It is the center frequency of notch filter, that is, the mechanical resonance frequency;  $f_H - f_L$  is the width of notch filter, which represents the frequency bandwidth with an amplitude attenuation rate of -3dB relative to the center frequency of notch filter.

#### (2) Depth grade of notch filter

The depth grade of notch filter represents the ratio relationship between input and output at center frequency. When the depth level of notch filter is 0, the input is completely suppressed at the center frequency; When the notch filter depth level is 100, the input is completely passable at the center frequency. Therefore, the smaller the the notch filter depth grade is set, the deeper the the notch filter depth will be, and the stronger the

suppression of mechanical resonance can achieve, but it may lead to system instability, so attention should be paid when using it. Specific relationships are shown in Figure 9-9.

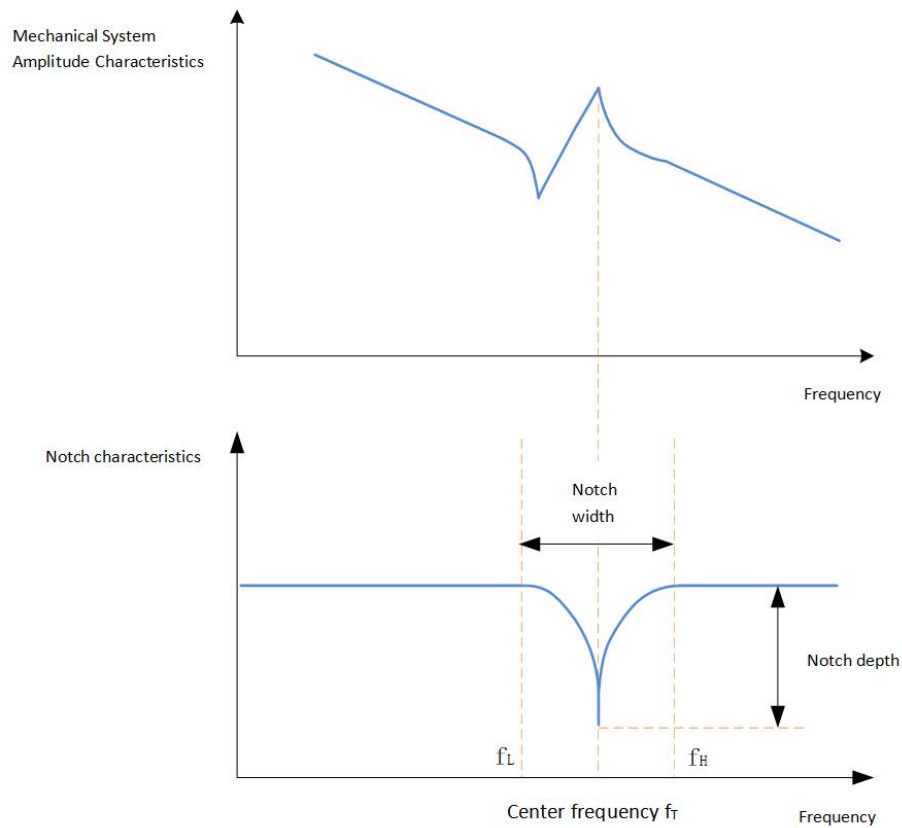


Figure 9-8 Notch characteristics, notch width and notch depth

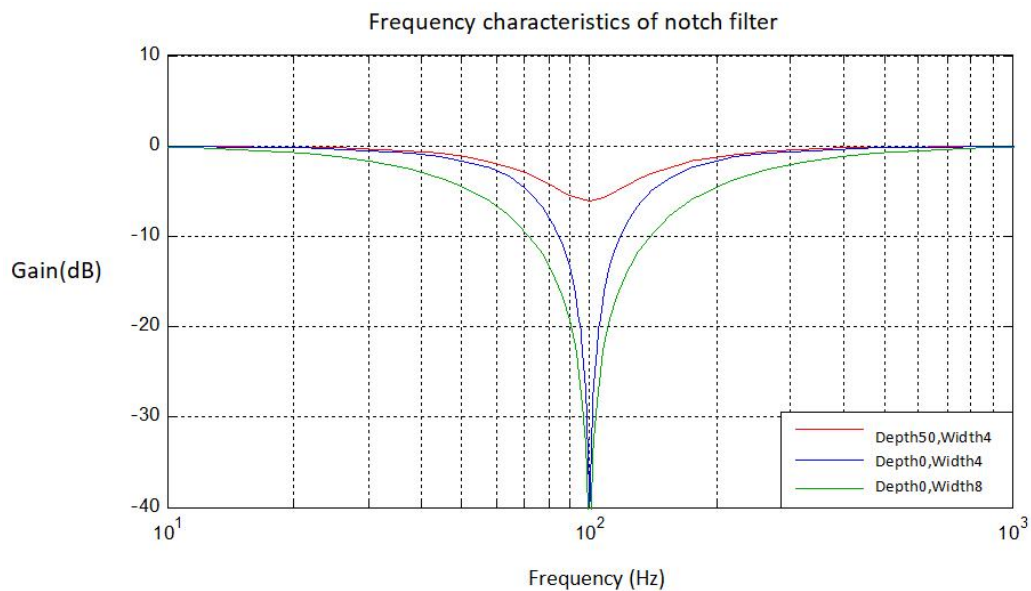


Figure 9-9 Frequency characteristics of notch filter

Table 9-11 Details of notch filter function code parameters

| Index code | Name                       | Setting method    | Valid time        | Default | Range    | Definition                                                                                                                        | Unit |
|------------|----------------------------|-------------------|-------------------|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------|------|
| 2004-05    | 1st notch filter frequency | Operation Setting | Valid immediately | 300     | 250~5000 | Set the center frequency of the 1st notch filter.<br><br>When the set value is 5000, the function of the notch filter is invalid. | Hz   |
| 2004-06    | 1st notch filter depth     | Operation Setting | Valid immediately | 100     | 0~100    | 0: all truncated<br>100: All passed                                                                                               | -    |
| 2004-07    | 1st notch filter width     | Operation Setting | Valid immediately | 4       | 0~12     | 0: 0.5 times the bandwidth<br>4: 1 times the bandwidth<br>8: 2 times the bandwidth<br>12: 4 times the bandwidth                   | -    |
| 2004-08    | 2nd notch filter frequency | Operation Setting | Valid immediately | 500     | 250~5000 | Set the center frequency of the 2nd notch filter.<br><br>When the set value is 5000, the function of the notch filter is invalid. | Hz   |
| 2004-09    | 2nd notch filter depth     | Operation Setting | Valid immediately | 100     | 0~100    | 0: all truncated<br>100: All passed                                                                                               | -    |
| 2004-0A    | 2nd notch filter width     | Operation Setting | Valid immediately | 4       | 0~12     | 0: 0.5 times the bandwidth<br>4: 1 times the bandwidth<br>8: 2 times the bandwidth<br>12: 4 times the bandwidth                   | -    |

## Chapter 10 Malfunctions

### 10.1 Faults and Warnings Handling at Startup

| Boot process          | Fault phenomenon                                                | Reason                                                                                          | Confirmation method            |
|-----------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------|
| Power supply (L1, L3) | ① Digital tube is not bright                                    | ① The power terminal is disconnected                                                            | ☆Rewiring                      |
|                       | ② Not display "ry"                                              | ② Servo drive failure                                                                           | ☆Contact technician for repair |
|                       | Panel display "Er.xx"                                           | Refer to"10.2 Faults and warnings handling during operation" to find the cause and troubleshoot |                                |
|                       | After troubleshooting, the servo drive panel should display"ry" |                                                                                                 |                                |

### 10.2 Faults and Warnings Handling During Operation

#### 10.2.1 Overview

The faults and warnings of Wecon VD5L series servo drives are graded according to their severity, which can be divided into four grades: Category 1, Category 2, Category 3, Category 4.

Severity level: Category 1 > Category 2 > Category 3 > Category 4. The specific types are as follows:

Category 1: non-clearable faults;

Category 2: clearable faults;

Category 3: clearable faults;

Category 4: clearable warning.

Among them, "clearable" means that the panel stops the fault display state by giving a "clear signal". The specific operations are as follows:

- ① Set the parameters 200A-03=1 (fault clearing) or use DI function 02 (02-A-CLR, fault and warning clearing) and set it to logic valid, which can stop the fault display on the panel.
- ② The clearing method of category 2 and category 3 clearable faults: first turn off the servo enable signal (set S-ON to OFF), then set P10-03=1 or use DI function 2.
- ③ The clearing method of category 4 of clearable warnings: set 200A-03=1 or use DI function 2.



#### Notice

For some faults and warnings, please change the settings to eliminate the causes before they can be cleared, but

clearing does not mean that the changes take effect. For the changes that need the device to be re-powered to take effect, the device must be re-powered; for the changes that need to stop the device to take effect, the servo must be disabled. After the changes take effect, the servo drive is running normally.

Associated function code:

| Function code | Name           | Setting method    | Valid time        | Default | Range  | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|----------------|-------------------|-------------------|---------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 200A-03=1     | Fault clearing | Operation setting | Valid immediately | 0       | 0 to 1 | <p>0: No operation</p> <p>1: For clearable faults, after the cause of fault is removed, and write 1 to the function code, the drive will stop the fault display and enter the Rdy (or RUN) state again.</p> <p> <b>Note:</b> If the servo S-ON is valid, when the fault is removed and cleared, the servo will directly enter the Run state. When performing fault clearing actions, be sure to stop sending control instructions such as pulses to ensure personal safety.</p> |

Associated function number:

| Number | Name  | Function name           | Function                                                                        |
|--------|-------|-------------------------|---------------------------------------------------------------------------------|
| 2      | A-CLR | Fault and warning clear | Invalid, does not reset faults and warnings<br>valid, reset faults and warnings |

Wecon VD5L series bus servo drives have a fault recording function, which could record the latest 5 faults and the latest 5 warning names and the status parameters of servo drive when the fault or warning occurs. After the fault or warning is cleared, the fault record will still save the fault and warning.

The current fault code could be viewed through the monitoring parameter U1-01, and the current warning code could be viewed through U1-02. The monitoring U1-16 to U1-25 could display the latest 5 fault codes and warning codes. Please refer to "[201Fh Group: warning monitoring](#)".



## 10.2.2 Fault and Warning Code Table

| Category   | Fault/warning name                           | Fault code | Can it be cleared |
|------------|----------------------------------------------|------------|-------------------|
| Category 1 | Parameter damage                             | Er.01      | No                |
| Category 1 | Parameter storage error                      | Er.02      | No                |
| Category 1 | ADC reference source error                   | Er.03      | No                |
| Category 1 | AD current sampling conversion error         | Er.04      | No                |
| Category 1 | Abnormal FPGA communication                  | Er.05      | No                |
| Category 1 | Wrong FPGA program version                   | Er.06      | No                |
| Category 1 | Clock abnormality                            | Er.07      | No                |
| Category 1 | Overcurrent                                  | Er.19      | Yes               |
| Category 1 | Overcurrent                                  | Er.20      | No                |
| Category 1 | The braking resistor is turned on abnormally | Er.24      | No                |
| Category 1 | Encoder is disconnected                      | Er.27      | No                |
| Category 1 | Wrong motor model                            | Er.26      | No                |
| Category 1 | Encoder Z pulse is lost                      | Er.28      | No                |
| Category   | Encoder UVW signal                           | Er.30      | No                |

| Category   | Fault/warning name                        | Fault code | Can it be cleared |
|------------|-------------------------------------------|------------|-------------------|
| Category 3 | Synchronization period error is too large | Er.14      | Yes               |
| Category 3 | Main power supply is undervoltage         | Er.21      | Yes               |
| Category 3 | Braking resistor is not connected         | Er.23      | Yes               |
| Category 3 | Wrong motor model                         | Er.25      | Yes               |
| Category 3 | Power module is over temperature          | Er.33      | Yes               |
| Category 3 | Motor overload protection                 | Er.34      | Yes               |
| Category 3 | Electronic gear ratio exceeds limit       | Er.35      | Yes               |
| Category 3 | Position deviation is too large           | Er.36      | Yes               |
| Category 3 | Abnormal torque saturation                | Er.37      | Yes               |
| Category 3 | Main circuit electrical phase loss        | Er.38      | Yes               |
| Category 3 | Emergency stop                            | Er.39      | Yes               |
| Category 3 | Encoder battery failure                   | Er.40      | Yes               |
| Category 3 | Motor (encoder) over temperature          | Er.41      | Yes               |
| Category 3 | Encoder write                             | Er.42      | Yes               |

| 1          | error                             |       |     |  | failure    |                                                                    |              |
|------------|-----------------------------------|-------|-----|--|------------|--------------------------------------------------------------------|--------------|
| Category 1 | Exceeding motor maximum speed     | Er.32 | No  |  | Category 3 | Back to original timeout fault                                     | Er.44<br>Yes |
| Category 1 | ADC conversion is not completed   | Er.60 | No  |  | Category 3 | Drive stall over-temperature protection                            | Er.45<br>Yes |
| Category 1 | Internal software fault           | Er.61 | No  |  | Category 4 | Over speed alarm                                                   | A-81<br>Yes  |
| Category 1 | Internal software fault           | Er.62 | No  |  | Category 4 | Overload                                                           | A-82<br>Yes  |
| Category 1 | Internal software fault           | Er.63 | No  |  | Category 4 | Braking resistor is over temperature or overload                   | A-83<br>Yes  |
| Category 1 | Internal software fault           | Er.64 | No  |  | Category 4 | Parameter modification that needs to be powered on again           | A-84<br>Yes  |
| Category 1 | Internal software fault           | Er.65 | No  |  | Category 4 | Main circuit instantaneous power failure                           | A-88<br>Yes  |
| Category 2 | Main power supply overvoltage     | Er.11 | Yes |  | Category 4 | Duplicate DI port configuration                                    | A-89<br>Yes  |
| Category 2 | Main power supply overvoltage     | Er.22 | Yes |  | Category 4 | Duplicate DO port configuration                                    | A-90<br>Yes  |
| Category 2 | Power cable disconnection         | Er.31 | Yes |  | Category 4 | Parameter modification is too frequent                             | A-91<br>Yes  |
| Category 2 | Abnormal network status switching | Er.09 | Yes |  | Category 4 | Encoder battery voltage low warning                                | A-92<br>Yes  |
| Category 2 | Loss of synchronization           | Er.10 | Yes |  | Category 4 | Encoder read and write check is abnormal and frequency is too high | A-93<br>Yes  |

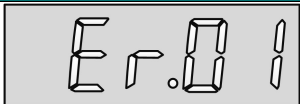
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|               |                                         |       |     |  |  |  |  |
|---------------|-----------------------------------------|-------|-----|--|--|--|--|
| Category<br>2 | Network<br>initialization failed        | Er.12 | Yes |  |  |  |  |
| Category<br>2 | Synchronization<br>period setting error | Er.13 | Yes |  |  |  |  |

### 10.2.3 Troubleshooting

#### Er.01 Parameter damage

##### (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name       |
|-----------------------------------------------------------------------------------|------------------|
|  | Parameter damage |

##### (2) Troubleshooting methods

| Reason                               | Troubleshooting methods                                                                                                         | Handling                                                           |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| EEPROM could not be read and written | Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty. | ■ Contact the manufacturer's technician personnel for maintenance. |

#### Er.02 Parameter storage error

##### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Parameter storage error |

Reason: The total number of function codes or content transmission changes. It usually occur after firmware upgrade.

##### (2) Troubleshooting methods

| Reason                              | Troubleshooting methods                                                                                                           | Handling                                                                                                                                      |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Firmware upgraded                   | ●Check whether the program has been upgraded.                                                                                     | ■Repower the servo drive.                                                                                                                     |
| Parameter read and write exceptions | ●After a parameter is changed, power it on again and check whether the parameter is saved                                         | ■If the parameters are not saved and the problem persists after multiple power-on, contact the manufacturer's technical personnel for repair. |
|                                     | ●Restore factory setting [200A-02=1] and power on again..If the servo drive still alarms after multiple operations, it is faulty. | ■ Contact the manufacturer's technician personnel for maintenance.                                                                            |

**Er.03 ADC reference source error**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                 |
|-----------------------------------------------------------------------------------|----------------------------|
|  | ADC reference source error |

## (2) Troubleshooting methods

| Reason                                                            | Troubleshooting methods                                                                                                         | Handling                                                                                                            |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| The internal analog reference source of the drive is not accurate | Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty. | ■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance. |

**Er.04 AD current sampling conversion error**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                           |
|-------------------------------------------------------------------------------------|--------------------------------------|
|  | AD current sampling conversion error |

## (2) Troubleshooting methods

| Reason                   | Troubleshooting methods                                                                                                         | Handling                                                                                                            |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Current sampling timeout | Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty. | ■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance. |
| Current sensor error     |                                                                                                                                 |                                                                                                                     |

**Er.05 Abnormal FPGA communication**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                  |
|-------------------------------------------------------------------------------------|-----------------------------|
|  | Abnormal FPGA communication |

## (2) Troubleshooting methods

| Reason                      | Troubleshooting methods                                                                                                 | Handling                                                                                               |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Abnormal FPGA communication | Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is | ■If servo still have alarm after powering on several times, contact the manufacturer's technicians for |

|  |         |              |
|--|---------|--------------|
|  | faulty. | maintenance. |
|--|---------|--------------|

**Er.06 Wrong FPGA program version**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                        |
|-----------------------------------------------------------------------------------|-----------------------------------|
|  | FPGA program version is not right |

## (2) Troubleshooting methods

| Reason                                                   | Troubleshooting methods                                                                                                                                                                                    | Handling                                                                                                                                                             |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The FPGA program version does not match firmware version | <ul style="list-style-type: none"> <li>Check whether the servo drive monitoring quantities 2020-04 (firmware version) and 2020-05 (hardware version) conform to the corresponding relationship.</li> </ul> | <ul style="list-style-type: none"> <li>Contact the manufacturer's technician to upgrade FPGA (hardware version).</li> </ul>                                          |
| Servo drive fault                                        | <ul style="list-style-type: none"> <li>Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.</li> </ul>                          | <ul style="list-style-type: none"> <li>If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**Er.07 Clock abnormality**

## (1) Fault phenomenon

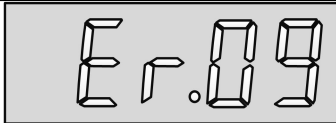
| Servo drive panel display                                                           | Fault name        |
|-------------------------------------------------------------------------------------|-------------------|
|  | Clock abnormality |

## (2) Troubleshooting methods

| Reason                | Troubleshooting methods                                                                                                                                                           | Handling                                                                                                                                                                                                        |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External interference | <ul style="list-style-type: none"> <li>Check whether there are strong magnetic fields nearby</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>Eliminate the interference of strong magnetic field nearby.</li> </ul>                                                                                                   |
|                       | <ul style="list-style-type: none"> <li>Check whether there are sources of interference such as power supply inverter equipment nearby</li> </ul>                                  | <ul style="list-style-type: none"> <li>Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.</li> </ul> |
| Servo drive fault     | <ul style="list-style-type: none"> <li>Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul>                                            |

**Er.09 Abnormal network status switching**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                        |
|-----------------------------------------------------------------------------------|-----------------------------------|
|  | Abnormal network status switching |

## (2) Troubleshooting methods

| Reason                               | Troubleshooting methods                                                                                                                           | Handling                                                                                                  |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Master station operation error       | <ul style="list-style-type: none"> <li>● Check whether the master station switches the network status when the servo drive is enabled.</li> </ul> | <ul style="list-style-type: none"> <li>■ Correct the upper computer network switching program.</li> </ul> |
| Communication cable connection error | <ul style="list-style-type: none"> <li>● Check whether the communication cable is properly connected.</li> </ul>                                  | <ul style="list-style-type: none"> <li>■ Correctly connect the communication cable.</li> </ul>            |

**Er.10 Loss of synchronization**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Loss of synchronization |

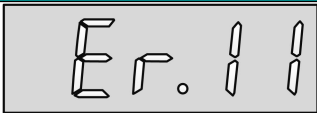
## (2) Troubleshooting methods

| Reason                             | Troubleshooting methods                                                                                                                                                                 | Handling                                                                                                                                                                                            |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communication is disturbed         | <ul style="list-style-type: none"> <li>● Check whether the servo drive network port is damaged. (Displayed by the first digital tube from the left of the servo drive panel)</li> </ul> | <ul style="list-style-type: none"> <li>■ If damaged, contact the manufacturer's technician for repair.</li> </ul>                                                                                   |
|                                    | <ul style="list-style-type: none"> <li>● Check whether the communication cable is damaged.</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>■ If damaged, replace a reliable communication cable, it is recommended to use twisted-pair shielded cable with shielding function.</li> </ul>               |
|                                    | <ul style="list-style-type: none"> <li>● Check whether the servo drive is well grounded.</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>■ The servo drive is well grounded.</li> </ul>                                                                                                               |
| Communication wiring error         | <ul style="list-style-type: none"> <li>● Check whether the communication connection follows the sequence of CN5 port in and CN6 port out to connect each slave station.</li> </ul>      | <ul style="list-style-type: none"> <li>■ Correctly connect the communication cable.</li> </ul>                                                                                                      |
| Master station configuration error | <ul style="list-style-type: none"> <li>● Cross-verification, using normal PLC for comparative test.</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>■ If it is determined that the configuration of the master station is wrong, correct the relevant procedures of the master station configuration.</li> </ul> |

|                                                       |                                                                                                             |                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The upper computer is shut down or stuck              | <ul style="list-style-type: none"> <li>● Check whether the upper computer is shut down or stuck.</li> </ul> | <ul style="list-style-type: none"> <li>■ Restart the upper computer.</li> </ul>                                                                                                                                                                                                         |
| Upper computer synchronization clock is not in effect | <ul style="list-style-type: none"> <li>● Measure the synchronization period by oscilloscope.</li> </ul>     | <ul style="list-style-type: none"> <li>■ If the synchronization period is 0, first check whether the communication cable connection mode is correct, and then restart the network.</li> <li>■ If the synchronization period is not 0, contact the manufacturer's technician.</li> </ul> |
| Servo drive fault                                     | <ul style="list-style-type: none"> <li>● None of the above methods can solve the fault.</li> </ul>          | <ul style="list-style-type: none"> <li>■ If damaged, contact the manufacturer's technician for repair.</li> </ul>                                                                                                                                                                       |

### Er.11 Unburned XML configuration file

#### (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                      |
|-----------------------------------------------------------------------------------|---------------------------------|
|  | Unburned XML configuration file |

#### (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                                            | Handling                                                                                                             |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Unburned device configuration file (XML file) | <ul style="list-style-type: none"> <li>● After the upper computer scans the slave station, check whether the slave station ID is empty.</li> </ul> | Contact the manufacturer's technician to burn the device file.                                                       |
| Servo drive fault                             | <ul style="list-style-type: none"> <li>● After burning the configuration file, the fault still not be solved.</li> </ul>                           | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician personnel for maintenance.</li> </ul> |

### Er.12 Network initialization failed

#### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                    |
|-------------------------------------------------------------------------------------|-------------------------------|
|  | Network initialization failed |

#### (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                                            | Handling                                                                                                             |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Unburned device configuration file (XML file) | <ul style="list-style-type: none"> <li>● After the upper computer scans the slave station, check whether the slave station ID is empty.</li> </ul> | Contact the manufacturer's technician to burn the device file.                                                       |
| Servo drive fault                             | <ul style="list-style-type: none"> <li>● After burning the configuration file, the fault still not be solved.</li> </ul>                           | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician personnel for maintenance.</li> </ul> |

### Er.13 Synchronization period setting error



## (1) Fault phenomenon

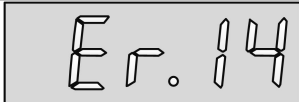
| Servo drive panel display                                                         | Fault name                           |
|-----------------------------------------------------------------------------------|--------------------------------------|
|  | Synchronization period setting error |

## (2) Troubleshooting methods

| Reason                                                                  | Troubleshooting methods                             | Handling                                                                     |
|-------------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------------------------|
| The synchronization period is not an integer multiple of 125us or 250us | ●Check the setting value of synchronization period. | ■Modify the synchronization period to an integer multiple of 125us or 250us. |

**Er.14 Synchronization period error is too large**

## (1) Fault phenomenon

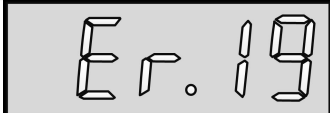
| Servo drive panel display                                                         | Fault name                                |
|-----------------------------------------------------------------------------------|-------------------------------------------|
|  | Synchronization period error is too large |

## (2) Troubleshooting methods

| Reason                                                      | Troubleshooting methods                                                         | Handling                                                                                                                              |
|-------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Device profile mismatch                                     | ●Check whether this fault occurs every time, the device profile does not match. | ■Contact the manufacturer technician to update the device configuration file (XML file) inside the servo drive to the latest version. |
| The synchronization period error of the controller is large | ●Check whether this fault is accidental.                                        | ■Check the upper computer.                                                                                                            |

**Er.19 Software overcurrent**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name           |
|-------------------------------------------------------------------------------------|----------------------|
|  | Software overcurrent |

## (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                      | Handling                                                                |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Motor power cable UVW phase sequence is wrong | ●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other. | ■According to the drive side UVW, connect the motor side UVW correctly. |

|                                               |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                             |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable short circuit               | <ul style="list-style-type: none"> <li>● Check whether power cable UVW is short-circuited to PE</li> </ul>                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>■ Replace the power cable.</li> </ul>                                                                                                                                                                                                |
| Poor connection of motor power cable terminal | <ul style="list-style-type: none"> <li>● Check whether the motor power cable connection port is connected reliably</li> </ul>                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>■ Tighten the fixing screws at the connection port of the motor power wire.</li> </ul>                                                                                                                                               |
| Abnormal braking resistance                   | <ul style="list-style-type: none"> <li>● Internal brake resistance wiring error: check whether C, D are connected to the shorting cap and the contact is normal</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>■ Ensure reliable connection between C and D shorting cap or short wiring.</li> </ul>                                                                                                                                                |
|                                               | <ul style="list-style-type: none"> <li>● External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.</li> </ul>                                                                                                                                                               | <ul style="list-style-type: none"> <li>■ The external braking resistor is reliably connecting between P + and C.</li> </ul>                                                                                                                                                 |
|                                               | <ul style="list-style-type: none"> <li>● Short-circuit of the built-in brake resistance: Check whether the built-in brake resistance is short-circuit.</li> </ul>                                                                                                                                                                     | <ul style="list-style-type: none"> <li>■ Remove the shorting cap between C and D, and connect the external braking resistors with equal resistance between P + and C.</li> <li>■ Contact the manufacturer's technician to replace the internal braking resistor.</li> </ul> |
|                                               | <ul style="list-style-type: none"> <li>● The resistance value of the external braking resistor is too small: Test the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too small</li> </ul> | <ul style="list-style-type: none"> <li>■ Select the appropriate external braking resistor.</li> </ul>                                                                                                                                                                       |
| Encoder wiring error; loose plug              | <ul style="list-style-type: none"> <li>● Check whether the cable port (CN2) of the encoder is properly connected</li> </ul>                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>■ Tighten the fixing screws for CN2 port.</li> </ul>                                                                                                                                                                                 |
|                                               | <ul style="list-style-type: none"> <li>● Check whether the servo drive CN2 port jack is deformed</li> </ul>                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>■ Replace the cable or cable port if deformed.</li> </ul>                                                                                                                                                                            |
|                                               | <ul style="list-style-type: none"> <li>● Check whether both ends of the rectangular connector are reliably connected</li> </ul>                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>■ Ensure reliable connection at both ends of rectangular connection port;</li> <li>■ Replace with an encoder cable with higher connection reliability.</li> </ul>                                                                    |
| Improper parameter setting                    | <ul style="list-style-type: none"> <li>● Check whether 2003-02 (load rigidity level) is set properly</li> </ul>                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>■ Appropriately increase the setting value of 2003-02 (load rigidity level).</li> </ul>                                                                                                                                              |
|                                               | <ul style="list-style-type: none"> <li>● Check whether the gain parameters are set properly, resulting in overshoot</li> </ul>                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>■ Reasonably adjust the gain parameters.</li> </ul>                                                                                                                                                                                  |
| Frequent acceleration and deceleration        | <ul style="list-style-type: none"> <li>● Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.</li> </ul>                                                                                                                                               | <ul style="list-style-type: none"> <li>■ Appropriately extend the acceleration and deceleration time.</li> </ul>                                                                                                                                                            |
| Internal servo drive fault                    | <ul style="list-style-type: none"> <li>● Cross-verification. Use the normal motor, encoder cable to connect to the servo drive, only connect the encoder cable. If the servo drive still alarm, it is</li> </ul>                                                                                                                      | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician personnel for maintenance.</li> </ul>                                                                                                                                                        |

|  |          |  |
|--|----------|--|
|  | failure. |  |
|--|----------|--|

**Er.20 Overcurrent**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name  |
|-----------------------------------------------------------------------------------|-------------|
|  | Overcurrent |

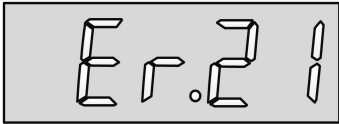
## (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                                                                                                                                                                                                                               | Handling                                                                                                                                                                                                                                                                    |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable UVW phase sequence is wrong | <ul style="list-style-type: none"> <li>● Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.</li> </ul>                                                                                                                                                       | <ul style="list-style-type: none"> <li>■ According to the drive side UVW, connect the motor side UVW correctly.</li> </ul>                                                                                                                                                  |
| Motor power cable short circuit               | <ul style="list-style-type: none"> <li>● Check whether power cable UVW is short-circuited to PE</li> </ul>                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>■ Replace the power cable.</li> </ul>                                                                                                                                                                                                |
| Poor connection of motor power cable terminal | <ul style="list-style-type: none"> <li>● Check whether the motor power cable connection port is connected reliably</li> </ul>                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>■ Tighten the fixing screws at the connection port of the motor power wire.</li> </ul>                                                                                                                                               |
| Abnormal braking resistance                   | <ul style="list-style-type: none"> <li>● Internal brake resistance wiring error: check whether C, D are connected to the shorting cap and the contact is normal</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>■ Ensure reliable connection between C and D shorting cap or short wiring.</li> </ul>                                                                                                                                                |
|                                               | <ul style="list-style-type: none"> <li>● External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.</li> </ul>                                                                                                                                                               | <ul style="list-style-type: none"> <li>■ The external braking resistor is reliably connecting between P + and C.</li> </ul>                                                                                                                                                 |
|                                               | <ul style="list-style-type: none"> <li>● Short-circuit of the built-in brake resistance: Check whether the built-in brake resistance is short-circuit.</li> </ul>                                                                                                                                                                     | <ul style="list-style-type: none"> <li>■ Remove the shorting cap between C and D, and connect the external braking resistors with equal resistance between P + and C.</li> <li>■ Contact the manufacturer's technician to replace the internal braking resistor.</li> </ul> |
|                                               | <ul style="list-style-type: none"> <li>● The resistance value of the external braking resistor is too small: Test the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too small</li> </ul> | <ul style="list-style-type: none"> <li>■ Select the appropriate external braking resistor.</li> </ul>                                                                                                                                                                       |
| Encoder wiring error; loose plug              | <ul style="list-style-type: none"> <li>● Check whether the cable port (CN2) of the encoder is properly connected</li> </ul>                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>■ Tighten the fixing screws for CN2 port.</li> </ul>                                                                                                                                                                                 |

|                                        |                                                                                                                                                                                                                           |                                                                                                                                                                                                          |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | <ul style="list-style-type: none"> <li>● Check whether the servo drive CN2 port jack is deformed</li> </ul>                                                                                                               | <ul style="list-style-type: none"> <li>■ Replace the cable or cable port if deformed.</li> </ul>                                                                                                         |
|                                        | <ul style="list-style-type: none"> <li>● Check whether both ends of the rectangular connector are reliably connected</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>■ Ensure reliable connection at both ends of rectangular connection port;</li> <li>■ Replace with an encoder cable with higher connection reliability.</li> </ul> |
| Improper parameter setting             | <ul style="list-style-type: none"> <li>● Check whether 2003-02 (load rigidity level) is set properly</li> </ul>                                                                                                           | <ul style="list-style-type: none"> <li>■ Appropriately increase the setting value of 2003-02 (load rigidity level).</li> </ul>                                                                           |
|                                        | <ul style="list-style-type: none"> <li>● Check whether the gain parameters are set properly, resulting in overshoot</li> </ul>                                                                                            | <ul style="list-style-type: none"> <li>■ Reasonably adjust the gain parameters.</li> </ul>                                                                                                               |
| Frequent acceleration and deceleration | <ul style="list-style-type: none"> <li>● Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.</li> </ul>                                   | <ul style="list-style-type: none"> <li>■ Appropriately extend the acceleration and deceleration time.</li> </ul>                                                                                         |
| Internal servo drive fault             | <ul style="list-style-type: none"> <li>● Cross-verification. Use the normal motor, encoder cable to connect to the servo drive, only connect the encoder cable. If the servo drive still alarm, it is failure.</li> </ul> | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician personnel for maintenance.</li> </ul>                                                                                     |

## Er.21 Main power supply undervoltage

### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                        |
|-------------------------------------------------------------------------------------|-----------------------------------|
|  | Main power supply is undervoltage |

Reason: DC bus voltage is lower than the fault value.

○220V drive: The normal value of DC bus voltage is 310V, and the fault value of DC bus voltage is 200V;

○380V drive: The normal value of DC bus voltage is 540V, and the fault value of DC bus voltage is 420V.

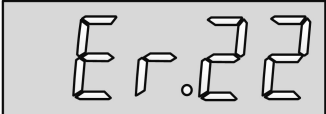
### (2) Troubleshooting methods

| Reason                               | Troubleshooting methods                                                                                                                                                                                        | Handling                                                                                                                                                                                     |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power-off when VD5L drive is enabled | <ul style="list-style-type: none"> <li>● Check whether the servo drive is power off when logic is valid and the S-ON function is enabled in the 2006 Group "DIDO Function configuration parameter".</li> </ul> | <ul style="list-style-type: none"> <li>■ It is servo internal software logic, and the alarm will be automatically released after the indicator light of servo drive panel is off.</li> </ul> |
| The power supply is unstable or off  | <ul style="list-style-type: none"> <li>● Observe whether the monitoring quantity 201E-1f (bus voltage) is in the following range:<br/><br/>220V drive: 201E-1F less than 200V;</li> </ul>                      | <ul style="list-style-type: none"> <li>■ Run servo after the power supply is stable;</li> <li>■ Increase power capacity.</li> </ul>                                                          |

|                                                                 |                                                                                                                                                                                                                                                                                |                                                                                                                                                                     |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                 | 380V drive: 201E-1F less than 420V.                                                                                                                                                                                                                                            |                                                                                                                                                                     |
| The voltage drops during operation of the servo drive           | <ul style="list-style-type: none"> <li>● Check whether the servo drive shares the same power supply with other high loads</li> </ul>                                                                                                                                           | <ul style="list-style-type: none"> <li>■ Turn off other loads of the same main circuit power supply;</li> <li>■ Servo drive uses a separate power supply</li> </ul> |
| Phase loss (three phase power is running on single phase power) | <ul style="list-style-type: none"> <li>● Check if the main circuit wiring is correct</li> </ul> <p>VD5L A: single-phase 220V input connected to L1, L3;</p> <p>VD5L B: single-phase 220V input connected to L1, L3;</p> <p>three-phase 220V input connected to L1, L2, L3.</p> | <ul style="list-style-type: none"> <li>■ Correctly connect the main circuit wiring.</li> </ul>                                                                      |

## Er.22 Main power supply overvoltage

### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                       |
|-------------------------------------------------------------------------------------|----------------------------------|
|  | Main power supply is overvoltage |

Reason: DC bus voltage is higher than the fault value.

○220V drive: The normal value of DC bus voltage is 310V, and the fault value of DC bus voltage is 390V;

○380V drive: The normal value of DC bus voltage is 540V, and the fault value of DC bus voltage is 670V.

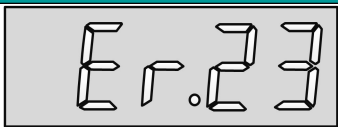
### (2) Troubleshooting methods

| Reason                                                | Troubleshooting methods                                                                                                                                                                                                 | Handling                                                                                                                                                                                                                                |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The input voltage is too high                         | <ul style="list-style-type: none"> <li>● Check that the drive input power specifications meet the specifications:</li> </ul> <p>220V drive: valid value: 198V ~ 242V;</p> <p>380V drive: valid values: 342V ~ 418V.</p> | <ul style="list-style-type: none"> <li>■ Change or adjust the power supply.</li> </ul>                                                                                                                                                  |
| The power supply is not stable or struck by lightning | <ul style="list-style-type: none"> <li>● Check whether the input power supply of the servo drive meets the specifications and monitor whether it has been struck by lightning.</li> </ul>                               | <ul style="list-style-type: none"> <li>■ Run servo after the power supply is stable;</li> <li>■ Connect the surge suppressor, please contact the technical personnel of the manufacturer for the specific connection method.</li> </ul> |
| Abnormal braking resistance                           | <ul style="list-style-type: none"> <li>● Internal braking resistor wiring error: check whether C, D are connected to the shorting cap and the connection is</li> </ul>                                                  | <ul style="list-style-type: none"> <li>■ Reliable connection between C and D shorting cap or short wiring.</li> </ul>                                                                                                                   |

|                                                                       |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                       | normal                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                      |
|                                                                       | <ul style="list-style-type: none"> <li>●External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>■ The external braking resistor is reliably connected between P + and C.</li> </ul>                                                                                                                                                           |
|                                                                       | <ul style="list-style-type: none"> <li>●Short-circuit of the built-in braking resistor: Check whether the built-in braking resistor suffers from short-circuit.</li> </ul>                                                                                                                                                             | <ul style="list-style-type: none"> <li>■ Remove the shorting cap between C and D, and reliably connect the external braking resistors with equal resistance between P + and C.</li> <li>■ Contact the manufacturer's technician to replace the internal braking resistor.</li> </ul> |
|                                                                       | <ul style="list-style-type: none"> <li>●The resistance value of the external braking resistor is too large: Check the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too large.</li> </ul> | <ul style="list-style-type: none"> <li>■ Select the appropriate external braking resistor.</li> </ul>                                                                                                                                                                                |
| The motor is in a state of rapid acceleration and deceleration motion | <ul style="list-style-type: none"> <li>●Monitor the servo drive monitoring quantity 201E-1F (bus voltage) to confirm whether the voltage exceeds the fault value when the motor is in the deceleration section.</li> </ul>                                                                                                             | <ul style="list-style-type: none"> <li>■ Ensure that the input voltage is within the specification range and increase the acceleration and deceleration time.</li> </ul>                                                                                                             |
| Internal servo drive fault                                            | <ul style="list-style-type: none"> <li>●The servo drive is still faulty after power on again</li> </ul>                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>■ Servo drive may be damaged, contact the manufacturer's technician for repair.</li> </ul>                                                                                                                                                    |

### Er.23 Braking resistor is not connected

#### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                        |
|-------------------------------------------------------------------------------------|-----------------------------------|
|  | Braking resistor is not connected |

#### (2) Troubleshooting methods

| Reason                                 | Troubleshooting methods                                                                                                              | Handling                                                                                                                                                                      |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal braking resistor wiring error | <ul style="list-style-type: none"> <li>●Check whether C, D are connected to the shorting cap and the connection is normal</li> </ul> | <ul style="list-style-type: none"> <li>■ When internal braking resistors are used, ensure the shorting caps or short wires are reliably connected between C and D.</li> </ul> |
| External braking resistor wiring error | <ul style="list-style-type: none"> <li>●Check whether the external resistor is connected reliably between P+ and C.</li> </ul>       | <ul style="list-style-type: none"> <li>■ When external braking resistors are used, ensure the external resistors are reliably strung between P + and C.</li> </ul>            |

|                                   |                                                                                                                                                            |                                                                                                                                                                                                                                                                 |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal braking resistor damaged | <ul style="list-style-type: none"> <li>●The servo drive is powered off. Detect whether the resistance between P+ and D is <math>50\Omega</math></li> </ul> | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to replace the internal braking resistor.</li> <li>■ Use the external braking resistor and change the relevant parameters in servo drive 2000 group "basic settings".</li> </ul> |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Er.24 Braking resistor turns on abnormally**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                                   |
|-----------------------------------------------------------------------------------|----------------------------------------------|
|  | The braking resistor is turned on abnormally |

## (2) Troubleshooting methods

| Reason                                   | Troubleshooting methods                                                                                 | Handling                                                                                                   |
|------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Internal hardware of servo drive damaged | <ul style="list-style-type: none"> <li>●The servo drive is still faulty after power on again</li> </ul> | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician for maintenance.</li> </ul> |

**Er.25 Braking resistor resistance is too large**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                               |
|-------------------------------------------------------------------------------------|------------------------------------------|
|  | Braking resistor resistance is too large |

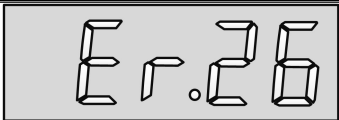
## (2) Troubleshooting methods

| Reason                                                         | Troubleshooting methods                                                                                                                                                                                                                                            | Handling                                                                                                                               |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| The resistance value of the external braking resistor is large | <ul style="list-style-type: none"> <li>●Check the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too large.</li> </ul> | <ul style="list-style-type: none"> <li>■ Use an appropriate external braking resistor.</li> </ul>                                      |
| Improper parameter setting                                     | <ul style="list-style-type: none"> <li>●Check whether the value of servo drive 2000-0A (external brake resistance) is set too high</li> </ul>                                                                                                                      | <ul style="list-style-type: none"> <li>■ Reasonably set the parameter value of 2000-0A (external braking resistance value).</li> </ul> |

**Er.26 Wrong motor model**

## (1) Fault phenomenon

| Servo drive panel display | Fault name |
|---------------------------|------------|
|---------------------------|------------|

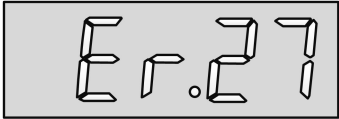
|                                                                                   |                   |
|-----------------------------------------------------------------------------------|-------------------|
|  | Wrong motor model |
|-----------------------------------------------------------------------------------|-------------------|

## (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                              | Handling                                                                                             |
|-----------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| The motor is not supported by the servo drive | ●Check whether the servo drive model supports the motor              | ■ Contact the manufacturer's technician to obtain the appropriate servo drive model and motor model. |
| Wrong motor model                             | ●Check whether the Motor Code is consistent with the motor nameplate | ■ Contact technician to record the motor Motor Code                                                  |

**Er.27 Encoder disconnection**

## (1) Fault phenomenon

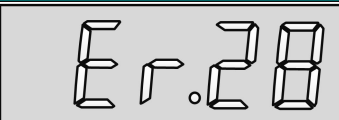
| Servo drive panel display                                                         | Fault name              |
|-----------------------------------------------------------------------------------|-------------------------|
|  | Encoder is disconnected |

## (2) Troubleshooting methods

| Reason                                                      | Troubleshooting methods                                                      | Handling                                                                                                                                         |
|-------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Poor contact on CN2 port                                    | ●Check whether the cable port (CN2) of the encoder is properly connected     | ■ Tighten the fixing screws for CN2 port.                                                                                                        |
|                                                             | ●Check whether the servo drive CN2 port jack is deformed                     | ■ Replace the cable or cable port if deformed.                                                                                                   |
| Poor contact on adapter port (Rectangular connection cable) | ●Check whether both ends of the rectangular connector are reliably connected | ■ Ensure reliable connection at both ends of rectangular connection port;<br>■ Replace with an encoder cable with higher connection reliability. |
| Wrong encoder cable wiring                                  | ●Check whether the both ends of the encoder cable are correctly connected    | ■ Adjust the wiring according to the corresponding relationship of pins;<br>■ Preferably use the standard encoder cable of the manufacturer.     |

**Er.28 Encoder Z pulse lost**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Encoder Z pulse is lost |



## (2) Troubleshooting methods

| Reason                | Troubleshooting methods                                                                                                                                                                                 | Handling                                                                                                                                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wrong motor model     | <ul style="list-style-type: none"> <li>● Check whether the servo drive model supports the motor</li> </ul>                                                                                              | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to obtain the appropriate servo drive model and motor model.</li> </ul>                                                               |
| External interference | <ul style="list-style-type: none"> <li>● Check whether there are strong magnetic fields nearby</li> </ul>                                                                                               | <ul style="list-style-type: none"> <li>■ Eliminate the interference of strong magnetic field nearby.</li> </ul>                                                                                                      |
|                       | <ul style="list-style-type: none"> <li>● Check whether there are sources of interference such as power supply inverter equipment nearby</li> </ul>                                                      | <ul style="list-style-type: none"> <li>■ Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.</li> </ul>    |
| Encoder fault         | <ul style="list-style-type: none"> <li>● Manually rotate the motor shaft counterclockwise or clockwise to observe whether the monitoring quantity U0-30 (electrical angle) changes regularly</li> </ul> | <ul style="list-style-type: none"> <li>■ If the value of U0-30 (electric angle) changes abruptly or does not change, there may be a problem with the encoder itself. Please replace the motor or encoder.</li> </ul> |

**Er.30 Encoder UVW signal error**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name               |
|-------------------------------------------------------------------------------------|--------------------------|
|  | Encoder UVW signal error |

## (2) Troubleshooting methods

| Reason                | Troubleshooting methods                                                                                                                    | Handling                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| External interference | <ul style="list-style-type: none"> <li>● Check that the motor and servo drive are well grounded</li> </ul>                                 | <ul style="list-style-type: none"> <li>■ Ensure the motor and servo drive are well grounded.</li> </ul>               |
| Encoder cable fault   | <ul style="list-style-type: none"> <li>● Cross-verification. Use the normal motor, encoder cable to connect to the servo drive.</li> </ul> | <ul style="list-style-type: none"> <li>■ Replace with an encoder cable with higher connection reliability.</li> </ul> |
| Servo drive fault     | <ul style="list-style-type: none"> <li>● The servo drive is still faulty after power on again</li> </ul>                                   | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician for maintenance.</li> </ul>            |

**Er.31 Power cable disconnection**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                |
|-------------------------------------------------------------------------------------|---------------------------|
|  | Power cable disconnection |

## (2) Troubleshooting methods

| Reason                                                      | Troubleshooting methods                                                      | Handling                                                                                                                                    |
|-------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Poor contact of motor power wiring port                     | ●Check whether the motor power wiring port is connected reliably             | ■Tighten the fixing screws at the wiring port of the motor power wire.                                                                      |
| Power cable disconnection                                   | ●Check whether both ends of the power cable are disconnected                 | ■Replace the power cable and repower                                                                                                        |
| Poor contact on adapter port (rectangular connection cable) | ●Check whether both ends of the rectangular connector are reliably connected | ■Ensure reliable connection at both ends of rectangular connection port;<br>■Replace with a power cable with higher connection reliability. |

**Er.32 Exceeding motor maximum speed**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                    |
|-----------------------------------------------------------------------------------|-------------------------------|
|  | Exceeding motor maximum speed |

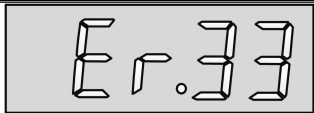
## (2) Troubleshooting methods

| Reason                                     | Troubleshooting methods                                                                                                                                                                                                                                                    | Handling                                                                        |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Motor power cable UVW phase sequence error | ●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.                                                                                                                                               | ■ According to the drive side UVW, the motor side UVW is connected correctly.   |
| 2001-0A parameter setting is not proper    | ●Check that the parameter value of 2001-0A (maximum speed threshold) is less than the maximum speed required for the actual operation of the motor<br>●Check whether the motor rotating speed corresponding to the input command exceeds 2001-0A (maximum speed threshold) | ■ Reset 2001-0A (maximum speed threshold) according to mechanical requirements. |
| Motor speed overshoot                      | ●Check whether the gain parameters are set properly, resulting in overshoot                                                                                                                                                                                                | ■Reasonably adjust the gain parameters.                                         |
| Servo drive fault                          | ●The servo drive is still faulty after power on again                                                                                                                                                                                                                      | ■ Servo drive may be damaged, replace servo drive.                              |

**Er.33 Power module over temperature**

## (1) Fault phenomenon

| Servo drive panel display | Fault name |
|---------------------------|------------|
|---------------------------|------------|

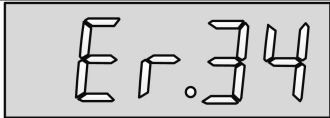
|                                                                                   |                                  |
|-----------------------------------------------------------------------------------|----------------------------------|
|  | Power module is over temperature |
|-----------------------------------------------------------------------------------|----------------------------------|

## (2) Troubleshooting methods

| Reason                                                                                                            | Troubleshooting methods                                                                                                       | Handling                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient temperature is too high                                                                                   | <ul style="list-style-type: none"> <li>● Measure the ambient temperature.</li> </ul>                                          | <ul style="list-style-type: none"> <li>■ Reduce the ambient temperature of the servo drive.</li> </ul>                                     |
| Servo drive fan failure                                                                                           | <ul style="list-style-type: none"> <li>● Check whether the servo drive fan is blocked or damaged</li> </ul>                   | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to repair or replace the fan.</li> </ul>                    |
| The servo drive is mounted in an unreasonable orientation or the spacing between the servo drives is unreasonable | <ul style="list-style-type: none"> <li>● Check whether the servo drive installation is reasonable</li> </ul>                  | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to obtain the servo drive installation standard.</li> </ul> |
| Servo drive fault                                                                                                 | <ul style="list-style-type: none"> <li>● Fault is still reported when restarting after ten minutes of power cutoff</li> </ul> | <ul style="list-style-type: none"> <li>■ Servo drive may be damaged, contact the manufacturer's technician for repair.</li> </ul>          |

**Er.34 Motor overload protection**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                |
|-------------------------------------------------------------------------------------|---------------------------|
|  | Motor overload protection |

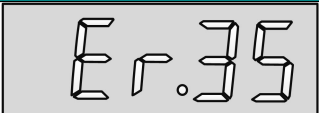
## (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                                                                                 | Handling                                                                                                                                                                                               |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable, encoder cable wiring error | <ul style="list-style-type: none"> <li>● Check whether the motor power cable and encoder cable wiring are correct.</li> </ul>                                                           | <ul style="list-style-type: none"> <li>■ Connect according to the correct connection method;</li> <li>■ Preferably use the motor power cables and encoder cables standard by manufacturers.</li> </ul> |
| The load is too large                         | <ul style="list-style-type: none"> <li>● Check overload characteristics of motor or servo drive</li> </ul>                                                                              | <ul style="list-style-type: none"> <li>■ Reduce the load;</li> <li>■ Contact the manufacturer's technician to obtain the drive and motor model with appropriate capacity.</li> </ul>                   |
| Frequent acceleration and deceleration        | <ul style="list-style-type: none"> <li>● Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.</li> </ul> | <ul style="list-style-type: none"> <li>■ Appropriately extend the acceleration and deceleration time.</li> </ul>                                                                                       |
| Motor model and servo drive do not match      | <ul style="list-style-type: none"> <li>● Check the monitoring quantity 201E-35 (motor model code).</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to obtain the matching motor model.</li> </ul>                                                                          |

|                         |                                                                                                                                                    |                                                                                                                                                                       |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unreasonable parameters | <ul style="list-style-type: none"> <li>●Use Wecon SCTools to obtain the actual torque waveform and observe whether overshoot is obvious</li> </ul> | <ul style="list-style-type: none"> <li>■ Set the appropriate loop gain parameters.</li> </ul>                                                                         |
|                         | <ul style="list-style-type: none"> <li>●Observe whether the motor vibrates during operation</li> </ul>                                             | <ul style="list-style-type: none"> <li>■Set the appropriate rigidity level.</li> </ul>                                                                                |
|                         | <ul style="list-style-type: none"> <li>●Check whether 200A-04 (motor overload protection time coefficient) parameter is reasonable</li> </ul>      | <ul style="list-style-type: none"> <li>■ Increase 200A-04 (motor overload protection time coefficient) under the premise that the motor will not burn out.</li> </ul> |
| The motor is locked     | <ul style="list-style-type: none"> <li>●Check whether the brake output function is enabled by mistake, resulting in the motor locking.</li> </ul>  | <ul style="list-style-type: none"> <li>■Disable the brake output function.</li> </ul>                                                                                 |
| Servo drive fault       | <ul style="list-style-type: none"> <li>●The servo drive is still faulty after power on again</li> </ul>                                            | <ul style="list-style-type: none"> <li>■ Servo drive may be damaged, contact the manufacturer's technician for repair.</li> </ul>                                     |

### Er.35 Electronic gear ratio exceeds limit

#### (1) Fault phenomenon

| Servo drive panel display                                                          | Fault name                          |
|------------------------------------------------------------------------------------|-------------------------------------|
|  | Electronic gear ratio exceeds limit |

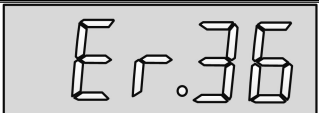
#### (2) Troubleshooting methods

| Reason                                                               | Troubleshooting methods                                                                                                                                                                                                                                                                                     | Handling                                                                                                                                                               |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The electronic gear ratio setting is greater than the settable range | Check whether the ratio of object dictionaries 6091: 01 to 6091: 02 is within the following range: <ul style="list-style-type: none"> <li>●The upper limit of 17bit absolute value encoder can be set to 52428;</li> <li>●The upper limit of 23bit absolute value encoder can be set to 3355443.</li> </ul> | <ul style="list-style-type: none"> <li>■ After modifying the corresponding function code according to the settable range, set 200A-03 (fault clearing) to 1</li> </ul> |
| The electronic gear ratio setting is less than the settable range    | Check whether the ratio of object dictionaries 6091: 01 to 6091: 02 is within the following range: <ul style="list-style-type: none"> <li>●The lower limit of 17bit absolute value encoder can be set to 0.01;</li> <li>●The lower limit of 23bit absolute value encoder can be set to 0.83.</li> </ul>     |                                                                                                                                                                        |

### Er.36 Position deviation is too large

#### (1) Fault phenomenon

| Servo drive panel display | Fault name |
|---------------------------|------------|
|---------------------------|------------|

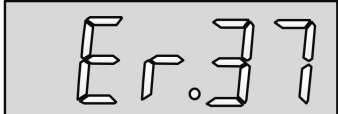
|                                                                                   |                                 |
|-----------------------------------------------------------------------------------|---------------------------------|
|  | Position deviation is too large |
|-----------------------------------------------------------------------------------|---------------------------------|

## (2) Troubleshooting methods

| Reason                                                | Troubleshooting methods                                                                                                                              | Handling                                                                                                                                       |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable problem                                         | ●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.                         | ■ According to the drive side UVW, connect the motor side UVW correctly.                                                                       |
|                                                       | ●Check whether both ends of power cable are disconnected                                                                                             | ■ Replace the power cable and repower                                                                                                          |
| Improper parameter setting                            | ●Check whether 2003-02 (load rigidity level) is set properly                                                                                         | ■ Appropriately increase the setting value of 2003-02 (load rigidity level).                                                                   |
|                                                       | ●Check whether the gain parameters are set properly; if not, it may result in overshoot                                                              | ■ Reasonably adjust the gain parameters.                                                                                                       |
|                                                       | ●Check whether 6065 (position deviation threshold) is set properly                                                                                   | ■ Appropriately increase the setting value of 6065 (excessive position deviation threshold)                                                    |
|                                                       | ●Use Wecon SCTools to obtain the equivalent speed of the position command and check whether the speed is greater than the motor rotating speed limit | ■ Increase the setting values of 2001-0C (forward speed threshold) and 2001-0D (reverse speed threshold) according to mechanical requirements. |
| Motor is locked                                       | ●Check whether motor is locked due to mechanical jamming                                                                                             | ■ Solve the problem of mechanical jamming.                                                                                                     |
| Brake is not opened                                   | ●Check whether the brake device is opened normally, and check whether the output voltage of the brake is 24V                                         | ■ Check the logic of brake power supply or brake output signal.                                                                                |
| Position command equivalent speed changes too quickly | ●Check whether the position command equivalent speed changes too quickly                                                                             | ■ Properly increase the acceleration and deceleration time and reduce the change rate of the rotating speed.                                   |

**Er.37 Abnormal torque saturation**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                 |
|-------------------------------------------------------------------------------------|----------------------------|
|  | Abnormal torque saturation |

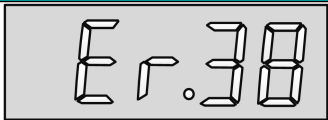
## (2) Troubleshooting methods

| Reason | Troubleshooting methods | Handling |
|--------|-------------------------|----------|
|--------|-------------------------|----------|

|                                              |                                                                                                                                                                                |                                                                                                                                                                      |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable UVW phase sequence error   | <ul style="list-style-type: none"> <li>●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.</li> </ul> | <ul style="list-style-type: none"> <li>■ According to the drive side UVW, connect the motor side UVW correctly.</li> </ul>                                           |
| Improper parameter setting                   | <ul style="list-style-type: none"> <li>●Check whether 2001-13 (torque saturation timeout) is set properly</li> </ul>                                                           | <ul style="list-style-type: none"> <li>■ Appropriately increase the setting value of 2001-13 (torque saturation timeout time).</li> </ul>                            |
|                                              | Check whether 2001-0F (forward torque limit) and 2001-10 (reverse torque limit) are set reasonably                                                                             | <ul style="list-style-type: none"> <li>■ Appropriately increase the setting values of 2001-0F (positive torque limit) and 2001-10 (reverse torque limit).</li> </ul> |
|                                              | <ul style="list-style-type: none"> <li>●Check whether the gain parameters are set properly</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>■ Reasonably adjust the gain parameters.</li> </ul>                                                                           |
|                                              | <ul style="list-style-type: none"> <li>●Check whether the acceleration and deceleration time are set properly</li> </ul>                                                       | <ul style="list-style-type: none"> <li>■ Appropriately increase the acceleration and deceleration time.</li> </ul>                                                   |
| The load is too large                        | <ul style="list-style-type: none"> <li>●Check whether the load is too large</li> </ul>                                                                                         | <ul style="list-style-type: none"> <li>■ Reduce the load.</li> </ul>                                                                                                 |
| Motor is locked                              | <ul style="list-style-type: none"> <li>●Check whether the motor is locked due to mechanical jamming of the load.</li> </ul>                                                    | <ul style="list-style-type: none"> <li>■ Solve the problem of mechanical jamming.</li> </ul>                                                                         |
| Limit switches are mounted beyond the travel | <ul style="list-style-type: none"> <li>●Check whether the limit switch is installed beyond the travel</li> </ul>                                                               | <ul style="list-style-type: none"> <li>■ Adjust the installation position of the limit switch.</li> </ul>                                                            |
| The brake is not opened                      | <ul style="list-style-type: none"> <li>●Check whether the brake device is opened normally, and check whether the output voltage of the brake is 24V</li> </ul>                 | <ul style="list-style-type: none"> <li>■ Check the logic of brake power supply or brake output signal.</li> </ul>                                                    |

### Er.38 Main circuit electrical phase loss

#### (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                         |
|-------------------------------------------------------------------------------------|------------------------------------|
|  | Main circuit electrical phase loss |

#### (2) Troubleshooting methods

| Reason                                                              | Troubleshooting methods                                                                                                     | Handling                                                                                                                                  |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Cable problem                                                       | <ul style="list-style-type: none"> <li>●Check whether the motor power wiring port is connected reliably</li> </ul>          | <ul style="list-style-type: none"> <li>■ Tighten the fixing screws at the wiring port of the motor power wire.</li> </ul>                 |
|                                                                     | <ul style="list-style-type: none"> <li>●Check whether both ends of the power cable are disconnected</li> </ul>              | <ul style="list-style-type: none"> <li>■ Replace the power cable and repower</li> </ul>                                                   |
| Three-phase specification drives run on single-phase power supplies | <ul style="list-style-type: none"> <li>●Check whether the three-phase drive has a single-phase power supply</li> </ul>      | <ul style="list-style-type: none"> <li>■ Re-connect the three-phase power supply according to the power supply specifications.</li> </ul> |
| The power supply is unstable or off                                 | <ul style="list-style-type: none"> <li>●Check that the drive input power specifications meet the specifications:</li> </ul> | <ul style="list-style-type: none"> <li>■ Run servo after the power supply is stable.</li> </ul>                                           |

|                   |                                                                                                         |                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                   | 220V drive: valid value : 198V ~ 242V;;<br>380V drive: valid values : 342V ~ 418V.                      |                                                                                                                                   |
| Servo drive fault | <ul style="list-style-type: none"> <li>●The servo drive is still faulty after power on again</li> </ul> | <ul style="list-style-type: none"> <li>■ Servo drive may be damaged, contact the manufacturer's technician for repair.</li> </ul> |

### Er.39 Emergency stop

#### (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name     |
|-----------------------------------------------------------------------------------|----------------|
|  | Emergency stop |

#### (2) Troubleshooting methods

| Reason                                           | Troubleshooting methods                                                                                                                                                                                                                                                                                                            | Handling                                                                         |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Servo drive receives emergency stop instructions | <ul style="list-style-type: none"> <li>●Check whether emergency stop protection is triggered manually</li> </ul>                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>■ Repower the servo drive.</li> </ul>     |
|                                                  | <ul style="list-style-type: none"> <li>●Check whether the servo drive has mistakenly triggered the emergency stop signal.</li> </ul> <p>Check whether function 08 (E-STOP) is configured in "DI "port function selection" of the 2006 group "DIDO configuration" function code group and whether the DI port wiring is normal.</p> | <ul style="list-style-type: none"> <li>■ Reasonably wire the DI port.</li> </ul> |

### Er.40 Encoder battery failure

#### (1) Fault phenomenon

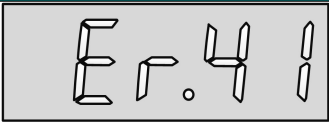
| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Encoder battery failure |

#### (2) Troubleshooting methods

| Reason                                                                                        | Troubleshooting methods                                                                                                               | Handling                                                                                                                      |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Multi-turn absolute encoder is not connected to the battery when the servo drive is power off | <ul style="list-style-type: none"> <li>●Check if the encoder is connected to the battery during the power off of the servo</li> </ul> | <ul style="list-style-type: none"> <li>■ Set 200A-03 (fault clearing) to 1.</li> </ul>                                        |
| The voltage of multi-turn absolute encoder battery is low                                     | <ul style="list-style-type: none"> <li>●Measure battery voltage</li> </ul>                                                            | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to replace the new encoder battery.</li> </ul> |

**Er.41 Motor (encoder) over temperature**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                       |
|-----------------------------------------------------------------------------------|----------------------------------|
|  | Motor (encoder) over temperature |

## (2) Troubleshooting methods

| Reason                  | Troubleshooting methods                                                                 | Handling                                                                                                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The motor is overloaded | <ul style="list-style-type: none"> <li>Check whether the motor is overloaded</li> </ul> | <ul style="list-style-type: none"> <li>Reduce the load, or stop the motor. After the motor temperature returns to normal, use the [P10-3] to clear the fault.</li> </ul> |

**Er.42 Encoder write fault**

## (1) Fault phenomenon

| Servo drive panel display                                                          | Fault name          |
|------------------------------------------------------------------------------------|---------------------|
|  | Encoder write fault |

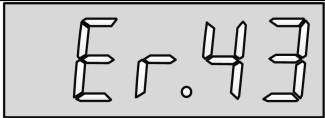
## (2) Troubleshooting methods

| Reason                                                      | Troubleshooting methods                                                                                                                          | Handling                                                                                                                                                                                                        |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Poor contact on CN1 port                                    | <ul style="list-style-type: none"> <li>Check whether the cable port (CN1) of the encoder is properly connected</li> </ul>                        | <ul style="list-style-type: none"> <li>Tighten the fixing screws for CN1 port.</li> </ul>                                                                                                                       |
|                                                             | <ul style="list-style-type: none"> <li>Check whether the servo drive CN1 port jack is deformed</li> </ul>                                        | <ul style="list-style-type: none"> <li>Replace the cable or cable port if deformed.</li> </ul>                                                                                                                  |
| Poor contact on adapter port (rectangular connection cable) | <ul style="list-style-type: none"> <li>Check whether both ends of the rectangular connector are reliably connected</li> </ul>                    | <ul style="list-style-type: none"> <li>Ensure reliable connection at both ends of rectangular connection port;</li> <li>Replace with an encoder cable with higher connection reliability.</li> </ul>            |
| External interference                                       | <ul style="list-style-type: none"> <li>Check whether there are strong magnetic fields nearby</li> </ul>                                          | <ul style="list-style-type: none"> <li>Eliminate the interference of strong magnetic field nearby.</li> </ul>                                                                                                   |
|                                                             | <ul style="list-style-type: none"> <li>Check whether there are sources of interference such as power supply inverter equipment nearby</li> </ul> | <ul style="list-style-type: none"> <li>Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.</li> </ul> |
| Servo drive fault                                           | <ul style="list-style-type: none"> <li>The servo drive is still faulty after power on again</li> </ul>                                           | <ul style="list-style-type: none"> <li>Servo drive may be damaged, contact the manufacturer's technician for repair.</li> </ul>                                                                                 |

**Er.43 Drive overload fault**



## (1) Fault phenomenon

| Servo drive panel                                                                 | Fault name           |
|-----------------------------------------------------------------------------------|----------------------|
|  | Drive overload fault |

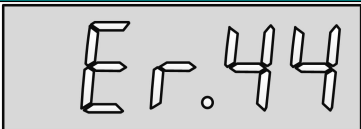
## (2) Troubleshooting methods

| Reason                                                                                              | Troubleshooting                                                                                                                                                                     | Handling                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The average output power of U0-34 exceeds the limit power (110% overload) for more than 20 minutes. | <ul style="list-style-type: none"> <li>Whether the average output power of U0-34 often exceeds the limit (110% overload) Check whether the drive meets the requirements.</li> </ul> | <ul style="list-style-type: none"> <li>It can be observed whether the U0-34 is often greater than the servo limit power (110% overload) when servo is running. When ER.43 alarm is found in the process of machine adjustment, please check whether the servo power is suitable. It is recommended to replace the drive model with higher power.</li> </ul> |
| Servo drive fault                                                                                   | <ul style="list-style-type: none"> <li>The servo drive is still fault after power on again</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>Servo drive may be damaged. Please contact the manufacturer's technician for repair.</li> </ul>                                                                                                                                                                                                                      |

| Servo drive model | Rated power /W | Limited power/W (110% overload) |
|-------------------|----------------|---------------------------------|
| VD5L-003SA1P      | 100            | 110                             |
| VD5L-010SA1P      | 400            | 440                             |
| VD5L-014SA1P      | 750            | 825                             |
| VD5L-015SA1P      | 750            | 825                             |

**Er.44 Homing timeout fault**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name           |
|-------------------------------------------------------------------------------------|----------------------|
|  | Homing timeout fault |

## (2) Troubleshooting methods

| Reason                 | Troubleshooting methods             | Handling                                                                                   |
|------------------------|-------------------------------------|--------------------------------------------------------------------------------------------|
| Fault of homing switch | Check whether homing is always in a | <ul style="list-style-type: none"> <li>First confirm whether the DI function 26</li> </ul> |

|                                                                          |                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                          | <p>high-speed search instead of a low-speed search.</p> <p>Check whether homing high-speed search has been in the reverse low-speed search process.</p>                                                                  | <p>is set in group 2006, and then check the connection of the DI terminal. When manually changing the logic of the DI terminal, check whether the servo drive receives the corresponding DI level signal through 201E-11. If not, it means that the DI wiring is wrong, please wire correctly.</p> <p>■ Manually make DI terminal logic change, if received level signal, indicating the homing operation is wrong, please operate correctly.</p> |
| The speed of searching the home switch signal at high speed is too small | <p>● Check whether the 6099: 01h setting value is too small.</p>                                                                                                                                                         | <p>■ Increase the 6099: 01h setting value.</p>                                                                                                                                                                                                                                                                                                                                                                                                    |
| Hardware switch setting is unreasonable                                  | <p>● Confirm whether the limit switch signals on both sides are valid at the same time.</p> <p>● Confirm whether a limit switch signal and the deceleration point signal or origin signal are valid at the same time</p> | <p>■ Set the hardware switch position reasonably.</p>                                                                                                                                                                                                                                                                                                                                                                                             |

#### Er.44 Homing timeout fault

##### (1) Fault phenomenon

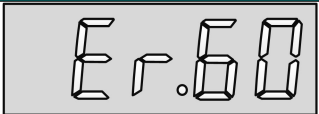
| Servo drive panel display                                                           | Fault name                               |
|-------------------------------------------------------------------------------------|------------------------------------------|
|  | Drive install overtemperature protection |

##### (2) Troubleshooting methods

| Reason                                                                                                                                                                                                                                                                                                                                                                                                               | Troubleshooting methods                                                                                                                                                                                                | Handling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Controlled by parameter P10-11 motor stall and over-temperature function.</p> <p>When P10-11=0, the motor is stalled, the actual speed of the motor is less than 10rpm, the torque instruction exceeds the rated torque of the motor, and the duration reaches the motor overheating protection time at the corresponding torque, ER.45 fault will be reported and the machine will be shut down immediately.</p> | <p>Check the waveform of the oscilloscope. The actual speed of the motor is less than 10rpm, and the torque instruction exceeds the rated torque of the motor. Observe whether the mechanical structure is jammed.</p> | <p>View oscilloscope waveforms. The actual speed of the motor is less than 10rpm, and the torque instruction exceeds the rated torque of the motor. Observe whether the motor is stuck by the mechanical structure. A temporary solution. P10-11=1 When the motor is stalled, the torque will become 70% of the rated torque.</p> <p>(Not recommended)</p> <p><b>Note: The shielded drive stall and over-temperature protection function is likely to cause motor and mechanical failure. Please use it carefully!</b></p> |

**Er.60 ADC conversion is not completed**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name                      |
|-----------------------------------------------------------------------------------|---------------------------------|
|  | ADC conversion is not completed |

## (2) Troubleshooting methods

| Reason                | Troubleshooting methods                                                                                                                                                              | Handling                                                                                                                                                                                                          |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External interference | <ul style="list-style-type: none"> <li>● Check whether there are strong magnetic fields nearby</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>■ Eliminate the interference of strong magnetic field nearby.</li> </ul>                                                                                                   |
|                       | <ul style="list-style-type: none"> <li>● Check whether there are sources of interference such as power supply inverter equipment nearby</li> </ul>                                   | <ul style="list-style-type: none"> <li>■ Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.</li> </ul> |
| Servo drive fault     | <ul style="list-style-type: none"> <li>● Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul>                                            |

**Er.61 Internal software fault**

## (1) Fault phenomenon

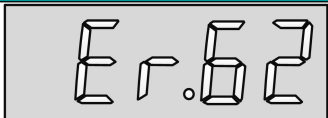
| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Internal software fault |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                              | Handling                                                                                                                                                               |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo drive fault | <ul style="list-style-type: none"> <li>● Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**Er.62 Internal software fault**

## (1) Fault phenomenon

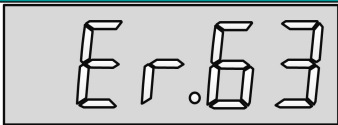
| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Internal software fault |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                             | Handling                                                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo drive fault | <ul style="list-style-type: none"> <li>●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**Er.63 Internal software fault**

## (1) Fault phenomenon

| Servo drive panel display                                                         | Fault name              |
|-----------------------------------------------------------------------------------|-------------------------|
|  | Internal software fault |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                             | Handling                                                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo drive fault | <ul style="list-style-type: none"> <li>●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**Er.64 Internal software fault**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Internal software fault |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                             | Handling                                                                                                                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo drive fault | <ul style="list-style-type: none"> <li>●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**Er.65 Internal software fault**

## (1) Fault phenomenon

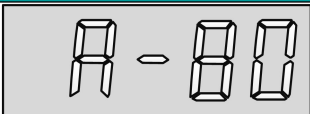
| Servo drive panel display                                                           | Fault name              |
|-------------------------------------------------------------------------------------|-------------------------|
|  | Internal software fault |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                              | Handling                                                                                                                                                               |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo drive fault | <ul style="list-style-type: none"> <li>● Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.</li> </ul> | <ul style="list-style-type: none"> <li>■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.</li> </ul> |

**A-80 power limit alarm**

## (1) Fault phenomenon

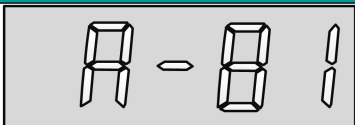
| Servo drive panel                                                                 | Alarm name               |
|-----------------------------------------------------------------------------------|--------------------------|
|  | Drive overpower alarming |

## (2) Troubleshooting methods

| Reason                                                                                                                                                  | Troubleshooting                                                                                                                                                | Handling                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| When the average output power of U0-34 exceeds the limit power of the drive (110% overload) for more than 5 seconds, there is drive overpower alarming. | <ul style="list-style-type: none"> <li>■ Check whether the average output power of U0-34 exceeds the limit (110% overload) for more than 5 seconds.</li> </ul> | <ul style="list-style-type: none"> <li>■ Check whether the power of U0-34 exceeds 110% of the rated power of the drive. When A80 alarm is reported in the adjustment process, please check whether the servo power is suitable.</li> </ul> |

**A-81 Overspeed alarm**

## (1) Fault phenomenon

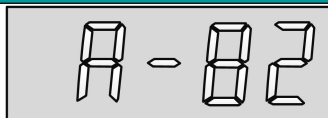
| Servo drive panel display                                                         | Warning name    |
|-----------------------------------------------------------------------------------|-----------------|
|  | Overspeed alarm |

## (2) Troubleshooting methods

| Reason                                     | Troubleshooting methods                                                                                                                                                       | Handling                                                                                                                                                                                 |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable UVW phase sequence error | <ul style="list-style-type: none"> <li>Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.</li> </ul> | <ul style="list-style-type: none"> <li>According to the drive side UVW, connect the motor side UVW correctly.</li> </ul>                                                                 |
| 2001-0B parameter setting is not proper    | <ul style="list-style-type: none"> <li>Check whether the value of 2001-0B (warning speed threshold) is less than the max speed required for the operation of motor</li> </ul> | <ul style="list-style-type: none"> <li>Reset 2001-0B (warning speed threshold) according to mechanical requirements.</li> </ul>                                                          |
| Input speed instruction is too high        | <ul style="list-style-type: none"> <li>Check whether the motor speed corresponding to the input command exceeds 2001-0B (warning speed threshold)</li> </ul>                  | <ul style="list-style-type: none"> <li>Reduce the input speed command while ensuring mechanical requirements;</li> <li>Reasonably increase 2001-0B (warning speed threshold).</li> </ul> |

**A-82 Overload**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Warning name |
|-------------------------------------------------------------------------------------|--------------|
|  | Overload     |

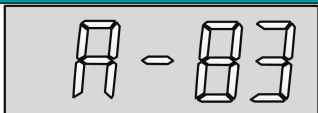
## (2) Troubleshooting methods

| Reason                                        | Troubleshooting methods                                                                                                     | Handling                                                                                                                                                                                                        |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor power cable, encoder cable wiring error | <ul style="list-style-type: none"> <li>Check whether the motor power cable and encoder cable wiring are correct.</li> </ul> | <ul style="list-style-type: none"> <li>Complete wiring according to the correct wiring method;</li> <li>Preferably use the standard motor power cables and encoder cables provided by manufacturers.</li> </ul> |
| The load is too large                         | <ul style="list-style-type: none"> <li>Perform inertia identification and check the inertia ratio.</li> </ul>               | <ul style="list-style-type: none"> <li>Reduce the load;</li> <li>Contact the manufacturer's technician to obtain the drive and motor model with appropriate capacity.</li> </ul>                                |

|                                          |                                                                                                                                                                                         |                                                                                                                               |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Frequent acceleration and deceleration   | <ul style="list-style-type: none"> <li>● Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.</li> </ul> | <ul style="list-style-type: none"> <li>■ Appropriately extend the acceleration and deceleration time.</li> </ul>              |
| Motor model and servo drive do not match | <ul style="list-style-type: none"> <li>● Check the monitoring quantity 201E-35 (motor model code).</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to obtain the matching motor model.</li> </ul> |
| Unreasonable parameters                  | <ul style="list-style-type: none"> <li>● Use Wecon SCTools to obtain the actual torque waveform and observe whether overshoot is obvious</li> </ul>                                     | <ul style="list-style-type: none"> <li>■ Set the appropriate loop gain parameters.</li> </ul>                                 |
|                                          | <ul style="list-style-type: none"> <li>● Observe whether the motor vibrates during operation</li> </ul>                                                                                 | <ul style="list-style-type: none"> <li>■ Set the appropriate rigidity level.</li> </ul>                                       |

### A-83 Braking resistor is over temperature or overloaded

#### (1) Fault phenomenon

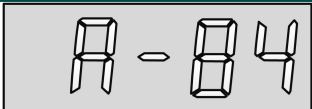
| Servo drive panel display                                                         | Warning name                                       |
|-----------------------------------------------------------------------------------|----------------------------------------------------|
|  | Braking resistor is over temperature or overloaded |

#### (2) Troubleshooting methods

| Reason                                                             | Troubleshooting methods                                                                                                                                                                                                                              | Handling                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improper wiring of internal braking resistor                       | <ul style="list-style-type: none"> <li>● Check whether C, D are connected to the shorting cap and the contact is normal</li> </ul>                                                                                                                   | <ul style="list-style-type: none"> <li>■ When internal braking resistors are used, ensure the shorting caps or short wires are reliably connected between C and D.</li> </ul>                                                                                                                                                                                                                                        |
| Improper wiring of external braking resistor                       | <ul style="list-style-type: none"> <li>● Remove the external braking resistor and measure whether the resistance value is "<math>\infty</math>" (Infinity).</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>■ Replace with a new external braking resistor, after ensuring that the resistance value of the resistor is consistent with the nominal value, connect it in series between P+ and C.</li> </ul>                                                                                                                                                                              |
| The resistance value of the external braking resistor is too large | <ul style="list-style-type: none"> <li>● Test the actual external braking resistor resistance and compare it with the recommended braking resistor to make sure the actual resistance is not too large.</li> </ul>                                   | <ul style="list-style-type: none"> <li>■ Use an appropriate external braking resistor.</li> </ul>                                                                                                                                                                                                                                                                                                                    |
| Improper parameter setting                                         | <p>When using an external braking resistor, check the following parameters.</p> <p>Whether the value of 2000-09 (brake setting) is reasonable</p> <p>Whether the value of 2000-10 (resistance value of external braking resistor) is reasonable.</p> | <ul style="list-style-type: none"> <li>■ Reasonably set the parameter value of 2000-09 (brake setting setting):<br/> 2000-09=1 (external braking resistor is used, natural cooling)<br/> 2000-09=3 (no braking resistor is used, and all are absorbed by capacitance)</li> <li>■ The parameter value of 2000-0A (external braking resistor) should be the same as the actual external braking resistance.</li> </ul> |

**A-84 Parameter modification that needs device to be powered on again**

## (1) Fault phenomenon

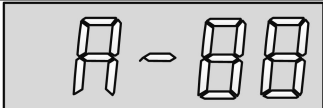
| Servo drive panel display                                                         | Warning name                                                    |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|
|  | Parameter modification that needs device to be powered on again |

## (2) Troubleshooting methods

| Reason                                                   | Troubleshooting methods                                                                                                                        | Handling                                                               |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Modified the valid timing parameter to "power on again". | <ul style="list-style-type: none"> <li>● Check whether the servo drive has modified the valid timing parameter to "power on again".</li> </ul> | <ul style="list-style-type: none"> <li>■ Power it on again.</li> </ul> |

**A-88 Main circuit instantaneous power failure**

## (1) Fault phenomenon

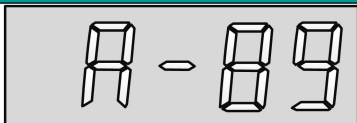
| Servo drive panel display                                                          | Warning name                             |
|------------------------------------------------------------------------------------|------------------------------------------|
|  | Main circuit instantaneous power failure |

## (2) Troubleshooting methods

| Reason            | Troubleshooting methods                                                                                                                                                                                              | Handling                                                                                                                                                 |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power failure     | <ul style="list-style-type: none"> <li>● Check that the drive input power specifications meet the specifications:<br/>220V drive: valid value : 198V ~ 242V;;<br/>380V drive: valid values : 342V ~ 418V.</li> </ul> | <ul style="list-style-type: none"> <li>■ If the mains input has no voltage or is unstable, wait for the power supply to stabilize before use.</li> </ul> |
| Servo drive fault | When the mains power is confirmed to be normal, the servo drive is still faulty after power on again                                                                                                                 | <ul style="list-style-type: none"> <li>■ Servo drive may be damaged, please contact the manufacturer's technician.</li> </ul>                            |

**A-89 Duplicate DI port configuration**

## (1) Fault phenomenon

| Servo drive panel display                                                           | Fault name                      |
|-------------------------------------------------------------------------------------|---------------------------------|
|  | Duplicate DI port configuration |

## (2) Troubleshooting methods

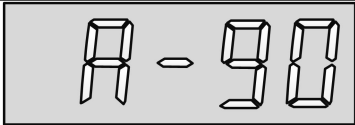
| Reason | Troubleshooting methods | Handling |
|--------|-------------------------|----------|
|--------|-------------------------|----------|



|                                                                |                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The same non-zero DI function is assigned to multiple DI ports | Check whether the "DI port function selection" of the "DIDO Configuration" function code group of the 2006 group is configured with the same DI function | <ul style="list-style-type: none"> <li>■ Set different DI functions for different DI port, and repower the servo;</li> <li>■ Configure the function of unnecessary DI port to 0 (off), and repower servo;</li> <li>■ Restore parameters to factory settings through setting 200A-02 as 1, and power it on again.</li> </ul> |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### A-90 Duplicate DO port configuration

#### (1) Fault phenomenon

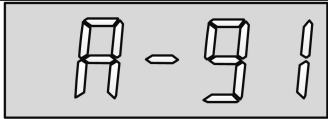
| Servo drive panel display                                                         | Fault name                      |
|-----------------------------------------------------------------------------------|---------------------------------|
|  | Duplicate DO port configuration |

#### (2) Troubleshooting methods

| Reason                                                         | Troubleshooting methods                                                                                                                                   | Handling                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The same non-zero DO function is assigned to multiple DO ports | Check whether the "DO port function selection" of the "DIDO Configuration" function code group of the 2006 group is configured with the same DO function. | <ul style="list-style-type: none"> <li>■ Set different DO functions for different DO port;</li> <li>■ Configure the function of unnecessary DO port to 128 (off);</li> <li>■ Restore parameters to factory settings through setting 200A-02 as 1, and power it on again.</li> </ul> |

### A-91 parameter modification is too frequent.

#### (1) Fault

| Servo drive panel                                                                   | Fault name                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Parameter modification is too frequent<br/>(Allowable modification frequency of the function code): 150 times/ 4 hours</p> <p> <b>Note: 32-bit function code is recorded as 2 times)</b></p> |

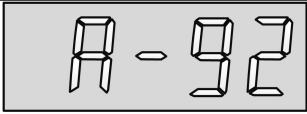
#### (2) Troubleshooting

| Reason                                 | Troubleshooting                                                                                                                                                              | Handling                                                                                                |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Parameter modification is too frequent | <ul style="list-style-type: none"> <li>● Check whether the host computer modifies the writing parameters frequently;<br/>(Allowable modification frequency of the</li> </ul> | (1) During the adjustment, A91 alarming (150 times/4 hours) caused by frequently manual modification of |

|  |                                                                                                 |                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | function code): 150 times/ 4 hours)<br><b>Note: 32-bit function code is recorded as 2 times</b> | function codes can be cleared through P10-03. In other cases, please check the PLC program;<br><br>(2) If A91 alarming appears in the normal working mode of the machine, please check whether the PLC program frequently modifies the function code. |
|--|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**A-92 Low encoder battery voltage warning**

## (1) Fault phenomenon

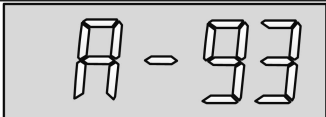
| Servo drive panel display                                                         | Fault name                          |
|-----------------------------------------------------------------------------------|-------------------------------------|
|  | Low encoder battery voltage warning |

## (2) Troubleshooting methods

| Reason                                    | Troubleshooting methods                                                             | Handling                                                                                                                      |
|-------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Encoder battery voltage is less than 3.1V | <ul style="list-style-type: none"> <li>● Measure encoder battery voltage</li> </ul> | <ul style="list-style-type: none"> <li>■ Contact the manufacturer's technician to replace the new encoder battery.</li> </ul> |

**A-93 encoder read-write verification exception is too frequent.**

## (1) Fault phenomenon

| Servo drive panel                                                                   | Fault name                                                 |
|-------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | Encoder read-write verification exception is too frequent. |

## (2) Troubleshooting methods

| Reason                | Troubleshooting                                                                                                                                    | Handling                                                                                                                                                                                                                   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External interference | <ul style="list-style-type: none"> <li>■ Check for strong magnetic fields nearby</li> </ul>                                                        | <ul style="list-style-type: none"> <li>■ Eliminate the interference of strong magnetic field nearby.</li> </ul>                                                                                                            |
|                       | <ul style="list-style-type: none"> <li>■ Check whether there are sources of interference such as power supply inverter equipment nearby</li> </ul> | <ul style="list-style-type: none"> <li>■ Try to separate the strong and weak currents in the wiring. Make sure the motor and drive are well grounded and keep away from the power cables.</li> </ul>                       |
|                       | <ul style="list-style-type: none"> <li>■ Increase P0-31: Encoder read-write verification exception threshold setting</li> </ul>                    | <ul style="list-style-type: none"> <li>■ Eliminate the A93 alarming by increasing the exception threshold is regarded as a temporary solution. The disadvantage is that the motor may run in an unstable state.</li> </ul> |
| Encoder fault         | <ul style="list-style-type: none"> <li>■ Manually rotate the motor axis counterclockwise or clockwise to observe</li> </ul>                        | <ul style="list-style-type: none"> <li>■ If the value of 201E-1E (electric angle) changes abruptly or does not</li> </ul>                                                                                                  |

|                   |                                                                                                                                                                 |                                                                                              |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
|                   | whether the monitoring value 201E-1E (electrical angle) changes regularly                                                                                       | change, there may be a problem with the encoder itself. Please replace the motor or encoder. |
| Servo drive fault | <p>■ Cross-verification: Use the normal motor and encoder cables to connect to the servo drive. If the servo drive still alarms, it is a servo drive fault.</p> | <p>■ Servo drive may be damaged, please contact the manufacturer's technician.</p>           |

If P6-14 and P6-17 are set to other functions, such as instruction reversal or other DI functions, the use of touch probe function will not be affected. That is, when DI5 or DI6 is enabled, the touch probe function and the corresponding function code function will take effect together and do not affect each other.

## Chapter 11 Appendix

### 11.1 Object Dictionary List

#### Group 1000

| Object dictionary (Hex) | Name                              | Accessibility | Data mapping | Default     | Data range | Unit | Data Type |
|-------------------------|-----------------------------------|---------------|--------------|-------------|------------|------|-----------|
| 1000                    | Device type                       | RO            | No           | 0x00020192  | -          | -    | UDINT     |
| 1001                    | Error record                      | RO            | No           | 0x00        | -          | -    | USINT     |
| 1008                    | Device name                       | RO            | No           | -           | -          | -    | STRING    |
| 1009                    | Manufacturer's hardware equipment | RO            | No           | -           | -          | -    | STRING    |
| 100A                    | Manufacturer software version     | RO            | No           | -           | -          | -    | STRING    |
| 1018: 01                | Vendor ID                         | RO            | No           | 0x000000EFF | -          | -    | UDINT     |
| 1018: 02                | Product code                      | RO            | No           | 0x10003101  | -          | -    | UDINT     |
| 1018: 03                | Revision number                   | RO            | No           | 0x00000001  | -          | -    | UDINT     |
| 1018: 04                | Serial number                     | RO            | No           | 0x00001419  | -          | -    | UDINT     |
| 1600: 01                | First mapping object              | RW            | RPDO         | 0x60400010  | -          | -    | UDINT     |
| 1600: 02                | Second mapping object             | RW            | RPDO         | 0x607A0020  | -          | -    | UDINT     |
| 1600: 03                | Third mapping object              | RW            | RPDO         | 0x60B80010  | -          | -    | UDINT     |
| 1600: 04                | Fourth mapping object             | RW            | RPDO         | 0x60600008  |            |      | UDINT     |
| 1701: 01                | First mapping object              | RW            | RPDO         | 0x60400010  | -          | -    | UDINT     |
| 1701: 02                | Second mapping object             | RW            | RPDO         | 0x607A0020  | -          | -    | UDINT     |
| 1701: 03                | Third mapping object              | RW            | RPDO         | 0x60B80010  | -          | -    | UDINT     |
| 1701: 04                | Fourth mapping object             | RW            | RPDO         | 0x60600008  | -          | -    | UDINT     |
| 1702: 01                | First mapping object              | RW            | RPDO         | 0x60400010  | -          | -    | UDINT     |
| 1702: 02                | Second mapping object             | RW            | RPDO         | 0x607A0020  | -          | -    | UDINT     |
| 1702: 03                | Third mapping object              | RW            | RPDO         | 0x60FF0020  | -          | -    | UDINT     |
| 1702: 04                | Fourth mapping object             | RW            | RPDO         | 0x60710010  | -          | -    | UDINT     |
| 1702: 05                | Fifth mapping object              | RW            | RPDO         | 0x60600008  | -          | -    | UDINT     |
| 1702: 06                | Sixth mapping object              | RW            | RPDO         | 0x60B80010  | -          | -    | UDINT     |
| 1702: 07                | Seventh mapping object            | RW            | RPDO         | 0x607F0020  | -          | -    | UDINT     |

|          |                                    |    |      |            |   |   |       |
|----------|------------------------------------|----|------|------------|---|---|-------|
| 1A00: 01 | First mapping object               | RW | TPDO | 0x60410010 | - | - | UDINT |
| 1A00: 02 | Second mapping object              | RW | TPDO | 0x60640020 | - | - | UDINT |
| 1A00: 03 | Third mapping object               | RW | TPDO | 0x60B90010 | - | - | UDINT |
| 1A00: 04 | Fourth mapping object              | RW | TPDO | 0x60BA0020 | - | - | UDINT |
| 1A00: 05 | Fifth mapping object               | RW | TPDO | 0x60BC0020 | - | - | UDINT |
| 1A00: 06 | Sixth mapping object               | RW | TPDO | 0x603F0010 | - | - | UDINT |
| 1A00: 07 | Seventh mapping object             | RW | TPDO | 0x60610008 | - | - | UDINT |
| 1B01: 01 | First mapping object               | RO | TPDO | 0x603F0010 | - | - | UDINT |
| 1B01: 02 | Second mapping object              | RO | TPDO | 0x60410010 | - | - | UDINT |
| 1B01: 03 | Third mapping object               | RO | TPDO | 0x60640020 | - | - | UDINT |
| 1B01: 04 | Fourth mapping object              | RO | TPDO | 0x60770010 | - | - | UDINT |
| 1B01: 05 | Fifth mapping object               | RO | TPDO | 0x60F40020 | - | - | UDINT |
| 1B01: 06 | Sixth mapping object               | RO | TPDO | 0x60610008 | - | - | UDINT |
| 1C12: 01 | Index of objects allocated by RPDO | RW | RPDO | 0x1701     | - | - | UINT  |
| 1C13: 01 | Index of objects assigned by TPDO  | RW | No   | 0x0001     | - | - | UINT  |
| 1C32: 01 | Synchronization type               | RW | No   | 0x0002     | - | - | UINT  |
| 1C32: 04 | Synchronization types supported    | RO | No   | 0x0005     | - | - | UDINT |
| 1C32: 05 | Minimum cycle time                 | RO | No   | 0x0001E848 | - | - | UINT  |
| 1C33: 01 | Synchronization type               | RW | No   | 0x0002     | - | - | UINT  |
| 1C33: 04 | Synchronization types supported    | RO | No   | 0x0005     | - | - | UDINT |
| 1C33: 05 | Minimum cycle time                 | RO | No   | 0x0001E848 | - | - | UINT  |

**Group 2000**

| Object dictionary (Hex) |           | Function code (Dec) | Name                                             | Setting method    | Valid time        | Default | Range    | Unit | Data type |
|-------------------------|-----------|---------------------|--------------------------------------------------|-------------------|-------------------|---------|----------|------|-----------|
| Index                   | Sub-index |                     |                                                  |                   |                   |         |          |      |           |
| 2000                    | 04        | P00-04              | Rotation direction                               | Shutdown setting  | Valid immediately | 0       | 0 to 1   | -    | 16 Bit    |
| 2000                    | 09        | P00-09              | Braking resistance setting                       | Operation setting | Valid immediately | 0       | 0 to 3   | -    | 16 Bit    |
| 2000                    | 0A        | P00-10              | External braking resistor resistance             | Operation setting | Valid immediately | 50      | 0~65535  | Ω    | 16 Bit    |
| 2000                    | 0B        | P00-11              | External braking resistor power                  | Operation setting | Valid immediately | 100     | 0~65535  | W    | 16 Bit    |
| 2000                    | 17        | P00-23              | Z pulse output OZ polarity                       | Operation setting | Power-on again    | 0       | 0~1      | -    | 16 Bit    |
| 2000                    | 18        | P00-24              | Z pulse output width                             | Operation setting | Power-on again    | 3       | 1~200    | ms   | 16 Bit    |
| 2000                    | 1D        | P00-29              | Number of equivalent position units              | Shutdown setting  | Valid immediately | 10000   | 0~131072 | -    | 32 Bit    |
| 2000                    | 1E        | P00-30              | Shield multi-turn absolute encoder battery fault | Operation setting | Power-on again    | 0       | 0 to 1   | -    | 16 Bit    |
| 2000                    | 1F        | P00-31              | Encoder R/W check                                | Operation setting | Valid immediately | 20      | 0 to 100 | -    | 16 bit    |
| 2000                    | 20        | P00-32              | Communication tolerance setting                  | Operation setting | Valid immediately | 2       | 2 to 14  | -    | 16 bit    |

**Group 2001**

| Object dictionary (Hex) |           | Function code (Dec) | Name                     | Setting method    | Valid time        | Default | Range  | Unit | Data type |
|-------------------------|-----------|---------------------|--------------------------|-------------------|-------------------|---------|--------|------|-----------|
| Index                   | Sub-index |                     |                          |                   |                   |         |        |      |           |
| 2001                    | 09        | P01-09              | Torque Mode Speed Source | Shutdown setting  | Valid immediately | 0       | 0~2    | -    | 16 Bit    |
| 2001                    | 0A        | P01-10              | MaxSpeedLimit            | Operation setting | Valid immediately | 3600    | 0~8000 | rpm  | 16 Bit    |
| 2001                    | 0B        | P01-11              | WarmSpeedTh              | Operation setting | Valid immediately | 3300    | 0~5000 | rpm  | 16 Bit    |

|      |    |        |                                                                                          |                   |                   |      |         |      |        |
|------|----|--------|------------------------------------------------------------------------------------------|-------------------|-------------------|------|---------|------|--------|
| 2001 | 0C | P01-12 | PosSpeedTh                                                                               | Operation setting | Valid immediately | 3000 | 0~8000  | rpm  | 16 Bit |
| 2001 | 0D | P01-13 | NegSpeedTh                                                                               | Operation setting | Valid immediately | 3000 | 0~6000  | rpm  | 16 Bit |
| 2001 | 0E | P01-14 | ToqLimitSrc                                                                              | Shutdown setting  | Valid immediately | 0    | 0 to 2  | -    | 16 Bit |
| 2001 | 0F | P01-15 | PToqLim                                                                                  | Operation setting | Valid immediately | 3000 | 0~3000  | 0.1% | 16 Bit |
| 2001 | 10 | P01-16 | NToqLim                                                                                  | Operation setting | Valid immediately | 3000 | 0~3000  | 0.1% | 16 Bit |
| 2001 | 11 | P01-17 | Torque Mode PSpd Limit                                                                   | Operation setting | Valid immediately | 3000 | 0~6000  | rpm  | 16 Bit |
| 2001 | 12 | P01-18 | Torque Mode NSpd Limit                                                                   | Operation setting | Valid immediately | 3000 | 0~6000  | rpm  | 16 Bit |
| 2001 | 13 | P01-19 | ToqLimTime                                                                               | Operation setting | Valid immediately | 1000 | 0~65535 | ms   | 16 Bit |
| 2001 | 14 | P01-20 | SoftOverCurrentDt                                                                        | Operation setting | Valid immediately | 8    | 0~65535 | -    | 16 Bit |
| 2001 | 1E | P01-30 | Delay from brake output ON to instruction reception                                      | Operation setting | Valid immediately | 250  | 0~500   | ms   | 16 Bit |
| 2001 | 1F | P01-31 | In the static state, delay from the "brake output is OFF to the motor is not energized". | Operation setting | Valid immediately | 150  | 1~1000  | ms   | 16 Bit |
| 2001 | 20 | P01-32 | Rotation status, when the brake output is OFF, the speed threshold.                      | Operation setting | Valid immediately | 30   | 0~3000  | rpm  | 16 Bit |
| 2001 | 21 | P01-33 | Rotation status, delay from servo enable OFF to brake output OFF                         | Operation setting | Valid immediately | 500  | 1~2000  | ms   | 16 Bit |
| 2001 | 22 | P01-37 | SpdRefJOGAccTime                                                                         | Operation setting | Valid immediately | 500  | 1~5000  | ms   | 16 Bit |
| 2001 | 23 | P01-38 | SpdRefJOGDecTime                                                                         | Operation setting | Valid immediately | 500  | 1~5000  | ms   | 16 Bit |

**Group 2002**

| Object dictionary (Hex) | Function code | Name | Setting | Valid time | Default | Range | Unit | Data | Page number |
|-------------------------|---------------|------|---------|------------|---------|-------|------|------|-------------|
|-------------------------|---------------|------|---------|------------|---------|-------|------|------|-------------|

| Index | Sub-index | (Dec)  |                         | method            |                   |     |          |        | type   | range |
|-------|-----------|--------|-------------------------|-------------------|-------------------|-----|----------|--------|--------|-------|
| 2002  | 01        | P02-01 | PosLoop1stGain          | Operation setting | Valid immediately | 449 | 0~6200   | 0.1Hz  | 16 Bit | 120   |
| 2002  | 02        | P02-02 | SpdLoop1stGain          | Operation setting | Valid immediately | 250 | 0~35000  | 0.1Hz  | 16 Bit | 120   |
| 2002  | 03        | P02-03 | SpdLoop1stIntgTime      | Operation setting | Valid immediately | 230 | 10~65535 | 0.1ms  | 16 Bit | 120   |
| 2002  | 04        | P02-04 | PosLoop2stGain          | Operation setting | Valid immediately | 300 | 0~6200   | 0.1Hz  | 16 Bit |       |
| 2002  | 05        | P02-05 | SpdLoop2stGain          | Operation setting | Valid immediately | 160 | 0~35000  | 0.1Hz  | 16 Bit |       |
| 2002  | 06        | P02-06 | SpdLoop2stIntgTime      | Operation setting | Valid immediately | 350 | 10~65535 | 0.1ms  | 16 Bit |       |
| 2002  | 07        | P02-07 | Second Gain Switch Mode | Operation setting | Valid immediately | 1   | 0~1      | -      | 16 Bit |       |
| 2002  | 08        | P02-08 | Second Gain Fun Select  | Operation setting | Valid immediately | 0   | 0~10     | -      | 16 Bit |       |
| 2002  | 09        | P02-09 | SpdFeedForwardGain      | Operation setting | Valid immediately | 0   | 0~1000   | 0.1%   | 16 Bit | 120   |
| 2002  | 0A        | P02-10 | SpdFeedForwardFilter    | Operation setting | Valid immediately | 3   | 0~500    | 1ms    | 16 Bit | 120   |
| 2002  | 0B        | P02-11 | ToqFeedForwardGain      | Operation setting | Valid immediately | 0   | 0~2000   | 0.1%   | 16 Bit | 120   |
| 2002  | 0C        | P02-12 | ToqFeedForwardFilter    | Operation setting | Valid immediately | 50  | 0~10000  | 0.01ms | 16 Bit | 120   |
| 2002  | 0D        | P02-13 | SecondGainSwTime        | Operation setting | Valid immediately | 20  | 0~10000  | 0.1ms  | 16 Bit |       |
| 2002  | 0E        | P02-14 | SecondGainSwLevel       | Operation setting | Valid immediately | 50  | 0~20000  | -      | 16 Bit |       |
| 2002  | 0F        | P02-15 | SecondGainHysteresis    | Operation setting | Valid immediately | 20  | 0~20000  | -      | 16 Bit |       |
| 2002  | 10        | P02-16 | Second Gain Pos         | Operation         | Valid immediately | 30  | 0~10000  | 0.1ms  | 16     |       |



Chapter 11 Appendix

|      |    |        | Switch Time                                                 | n setting             | ly                       |      |               |       | Bit       |  |
|------|----|--------|-------------------------------------------------------------|-----------------------|--------------------------|------|---------------|-------|-----------|--|
| 2002 | 14 | P02-20 | Model Ctrl Enable                                           | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 0    | 0~1           | -     | 16<br>Bit |  |
| 2002 | 15 | P02-21 | Model Ctrl Gain                                             | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 1000 | 200~2000<br>0 | 0.1/s | 16<br>Bit |  |
| 2002 | 16 | P02-22 | Model Ctrl Gain<br>Compensation                             | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 1000 | 500~2000      | 0.1%  | 16<br>Bit |  |
| 2002 | 17 | P02-23 | Model Ctrl Positive<br>dir Offset                           | Operatio<br>n setting | Valid<br>immediate<br>ly | 1000 | 0~10000       | 0.1%  | 16<br>Bit |  |
| 2002 | 18 | P02-24 | Model Ctrl<br>Negative dir Offset                           | Operatio<br>n setting | Valid<br>immediate<br>ly | 1000 | 0~10000       | 0.1%  | 16<br>Bit |  |
| 2002 | 19 | P02-25 | Model Ctrl Speed<br>Forward<br>Compensation                 | Operatio<br>n setting | Valid<br>immediate<br>ly | 1000 | 0~10000       | 0.1%  | 16<br>Bit |  |
| 2002 | 1A | P02-26 | Model Ctrl Gain                                             | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 1000 | 200~2000<br>0 | 0.1/s | 16<br>Bit |  |
| 2002 | 1B | P02-27 | Model Ctrl Gain<br>Compensation                             | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 1000 | 500~2000      | 0.1%  | 16<br>Bit |  |
| 2002 | 1C | P02-28 | Model Tracking<br>Vibration<br>Suppression 1<br>Frequency A | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 500  | 10~2500       | 0.1Hz | 16<br>Bit |  |
| 2002 | 1D | P02-29 | Model Tracking<br>Vibration<br>Suppression 1<br>Frequency B | Shutdow<br>n setting  | Valid<br>immediate<br>ly | 700  | 10~2500       | 0.1Hz | 16<br>Bit |  |

Group 2003

| Object<br>dictionary (Hex) |           | Function<br>code<br>(Dec) | Name               | Setting<br>method     | Valid time               | Default | Range         | Unit | Data<br>type | Page<br>number |
|----------------------------|-----------|---------------------------|--------------------|-----------------------|--------------------------|---------|---------------|------|--------------|----------------|
| Index                      | Sub-index |                           |                    |                       |                          |         |               |      |              |                |
| 2003                       | 01        | P03-01                    | Load InerRatio     | Operatio<br>n setting | Valid<br>immediatel<br>y | 300     | 100~1000<br>0 | 0.01 | 16<br>Bit    |                |
| 2003                       | 02        | P03-02                    | RigiditySel        | Operatio<br>n setting | Valid<br>immediatel<br>y | 14      | 0~31          | -    | 16<br>Bit    |                |
| 2003                       | 03        | P03-03                    | SelfAdjustMo<br>de | Operatio<br>n setting | Valid<br>immediatel      | 0       | 0 to 2        | -    | 16<br>Bit    |                |

|      |    |        |                    |                       | y                        |      |                 |            |           |  |
|------|----|--------|--------------------|-----------------------|--------------------------|------|-----------------|------------|-----------|--|
| 2003 | 04 | P03-04 | InerIdOncable      | Operatio<br>n setting | Valid<br>immediatel<br>y | 0    | 0 to 2          | -          | 16<br>Bit |  |
| 2003 | 05 | P03-05 | InerIdCircle       | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 2    | 1 to 20         | Circl<br>e | 16<br>Bit |  |
| 2003 | 06 | P03-06 | InerIdMaxSpd       | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 1000 | 300 to<br>2000  | rpm        | 16<br>Bit |  |
| 2003 | 07 | P03-07 | InerIdRollMod<br>e | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 0    | 0 to 2          | -          | 16<br>Bit |  |
| 2003 | 08 | P03-08 | InerIdWaitTim<br>e | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 1000 | 300 to<br>10000 | ms         | 16<br>Bit |  |

**Group 2004**

| Object dictionary<br>(Hex) |               | Functio<br>n code<br>(Dec) | Name                    | Setting<br>method     | Valid time               | Defaul<br>t | Range          | Unit       | Dat<br>a<br>typ<br>e | Page<br>numbe<br>r |
|----------------------------|---------------|----------------------------|-------------------------|-----------------------|--------------------------|-------------|----------------|------------|----------------------|--------------------|
| Inde<br>x                  | Sub-inde<br>x |                            |                         |                       |                          |             |                |            |                      |                    |
| 2004                       | 01            | P04-01                     | PulseFilterType         | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 0           | 0 to 1         | -          | 16<br>Bit            |                    |
| 2004                       | 02            | P04-02                     | LowpassFilterTime       | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 0           | 0~100<br>0     | ms         | 16<br>Bit            |                    |
| 2004                       | 03            | P04-03                     | AveragingFilterTim<br>e | Shutdow<br>n setting  | Valid<br>immediatel<br>y | 0           | 0 to<br>128    | ms         | 16<br>Bit            |                    |
| 2004                       | 04            | P04-04                     | TogFilterTime           | Operatio<br>n setting | Valid<br>immediatel<br>y | 95          | 7~250<br>0     | 0.01m<br>s | 16<br>Bit            |                    |
| 2004                       | 05            | P04-05                     | NotchFilter1_Freq       | Operatio<br>n setting | Valid<br>immediatel<br>y | 300         | 250 to<br>5000 | Hz         | 16<br>Bit            |                    |
| 2004                       | 06            | P04-06                     | NotchFilter1_Deep       | Operatio<br>n setting | valid<br>immediatel<br>y | 100         | 0 to<br>100    | -          | 16<br>Bit            |                    |
| 2004                       | 07            | P04-07                     | NotchFilter1_Band       | Operatio<br>n setting | Valid<br>immediatel<br>y | 4           | 0 to 12        | -          | 16<br>Bit            |                    |
| 2004                       | 08            | P04-08                     | NotchFilter2_Freq       | Operatio<br>n setting | Valid<br>immediatel<br>y | 500         | 250 to<br>5000 | Hz         | 16<br>Bit            |                    |

|      |    |        |                   |                   |                   |     |          |        |        |  |
|------|----|--------|-------------------|-------------------|-------------------|-----|----------|--------|--------|--|
| 2004 | 09 | P04-09 | NotchFilter2_Deep | Operation setting | Valid immediately | 100 | 0 to 100 | -      | 16 Bit |  |
| 2004 | 0A | P04-10 | NorthFilter2_Band | Operation setting | Valid immediately | 4   | 0 to 12  | -      | 16 Bit |  |
| 2004 | 12 | P04-18 | SpdFdbFilterTime  | Operation setting | Valid immediately | 10  | 1~1000   | 0.01ms | 16 Bit |  |

**Group 2005**

| Object dictionary (Hex) |           | Function code (Dec) | Name                 | Setting method    | Valid time        | Default | Range  | Unit | Data type | Page number |
|-------------------------|-----------|---------------------|----------------------|-------------------|-------------------|---------|--------|------|-----------|-------------|
| Index                   | Sub-index |                     |                      |                   |                   |         |        |      |           |             |
| 2005                    | 10        | P05-16              | RotateSpdDtTh        | Operation setting | Valid immediately | 20      | 0~1000 | rpm  | 16 Bit    |             |
| 2005                    | 13        | P05-19              | SpdZeroOutTh         | Operation setting | Valid immediately | 10      | 0~6000 | rpm  | 16 Bit    |             |
| 2005                    | 14        | P05-20              | TRQ Arrive Threshold | Operation setting | Valid immediately | 100     | 0~300  | %    | 16 Bit    |             |
| 2005                    | 15        | P05-21              | TRQ ArriveHysteresis | Operation setting | Valid immediately | 10      | 0~20   | %    | 16 Bit    |             |

**Group 2006**

| Object dictionary (Hex) |           | Function code (Dec) | Name      | Setting method    | Valid time        | Default | Range  | Unit | Data type | Page number |
|-------------------------|-----------|---------------------|-----------|-------------------|-------------------|---------|--------|------|-----------|-------------|
| Index                   | Sub-index |                     |           |                   |                   |         |        |      |           |             |
| 2006                    | 02        | P06-02              | Di1FunSel | Operation setting | Power-on again    | 0       | 0~32   | -    | 16 Bit    |             |
| 2006                    | 03        | P06-03              | Di1LogSel | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 2006                    | 04        | P06-04              | Di1SrcSel | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 2006                    | 05        | P06-05              | Di2FunSel | Operation setting | Power-on again    | 2       | 0~32   | -    | 16 Bit    |             |
| 2006                    | 06        | P06-06              | Di2LogSel | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 2006                    | 07        | P06-07              | Di2SrcSel | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 2006                    | 08        | P06-08              | Di3FunSel | Operation         | Power-on          | 3       | 0~32   | -    | 16        |             |

Chapter 11 Appendix

|      |    |        |                       | n setting             | again                    |     |              |   | Bit       |  |
|------|----|--------|-----------------------|-----------------------|--------------------------|-----|--------------|---|-----------|--|
| 2006 | 09 | P06-09 | Di3LogSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 0A | P06-10 | Di3SrcSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 0B | P06-11 | Di4FunSel             | Operatio<br>n setting | Power-on<br>again        | 4   | 0~32         | - | 16<br>Bit |  |
| 2006 | 0C | P06-12 | Di4LogSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 0D | P06-13 | Di4SrcSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 1A | P06-26 | Do1FunSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 132 | 128 ~<br>148 | - | 16<br>Bit |  |
| 2006 | 1B | P06-27 | Do1LogSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 1C | P06-28 | Do2FunSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 130 | 128 ~<br>148 | - | 16<br>Bit |  |
| 2006 | 1D | P06-29 | Do2LogSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 1E | P06-30 | Do3FunSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 129 | 128 ~<br>148 | - | 16<br>Bit |  |
| 2006 | 1F | P06-31 | Do3LogSel             | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |
| 2006 | 20 | P06-34 | CompDoOutputStat<br>u | Operatio<br>n setting | Valid<br>immediatel<br>y | 0   | 0 to 1       | - | 16<br>Bit |  |

**Group 200A**

| Object dictionary (Hex) |           | Function code (Dec) | Name                         | Setting method    | Valid time        | Default | Range      | Unit | Data type | Page number |
|-------------------------|-----------|---------------------|------------------------------|-------------------|-------------------|---------|------------|------|-----------|-------------|
| Index                   | Sub-index |                     |                              |                   |                   |         |            |      |           |             |
| 200A                    | 01        | P10-01              | SpdRefJOG                    | Operation setting | Valid immediately | 100     | 0~3000     | rpm  | 16 Bit    |             |
| 200A                    | 02        | P10-02              | RstFuncFac                   | Shutdown setting  | Valid immediately | 0       | 0 to 65535 | -    | 16 Bit    |             |
| 200A                    | 03        | P10-03              | ServoErrClear                | Operation setting | Valid immediately | 0       | 0 to 1     | -    | 16 Bit    |             |
| 200A                    | 04        | P10-04              | MotOLProtect_Coef            | Operation setting | Valid immediately | 100     | 0 to 800   | %    | 16 Bit    |             |
| 200A                    | 05        | P10-05              | MotoTypeSel                  | Operation setting | Power-on again    | 0       | 0 to 65535 | -    | 16 Bit    |             |
| 200A                    | 06        | P10-06              | AbsEncRst                    | Shutdown setting  | Valid immediately | 0       | 0 to 1     | -    | 16 Bit    |             |
| 200A                    | 07        | P10-07              | ManualSetMotoCode            | Operation setting | Power-on again    | 0       | 0 to 1     | -    | 16 Bit    |             |
| 200A                    | 0B        | P10-11              | Motor Stuck Over Temp Enable | Operation setting | Valid immediately | 0       | 0 to 1     | -    | 16 Bit    |             |

**Group 200D**

| Object dictionary (Hex) |           | Function code (Dec) | Name      | Setting method    | Valid time        | Default | Range  | Unit | Data type | Page number |
|-------------------------|-----------|---------------------|-----------|-------------------|-------------------|---------|--------|------|-----------|-------------|
| Index                   | Sub-index |                     |           |                   |                   |         |        |      |           |             |
| 200D                    | 01        | P13-01              | CommVdi_1 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 200D                    | 02        | P13-02              | CommVdi_2 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 200D                    | 03        | P13-03              | CommVdi_3 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 200D                    | 04        | P13-04              | CommVdi_4 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 200D                    | 05        | P13-05              | CommVdi_5 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |
| 200D                    | 06        | P13-06              | CommVdi_6 | Operation setting | Valid immediately | 0       | 0 to 1 | -    | 16 Bit    |             |

## Chapter 11 Appendix

|      |    |        |           |                      |                      |   |        |   |           |  |
|------|----|--------|-----------|----------------------|----------------------|---|--------|---|-----------|--|
| 200D | 0B | P13-11 | CommVdo_1 | Operation<br>setting | Valid<br>immediately | 0 | 0 to 1 | - | 16<br>Bit |  |
| 200D | 0C | P13-12 | CommVdo_2 | Operation<br>setting | Valid<br>immediately | 0 | 0 to 1 | - | 16<br>Bit |  |
| 200D | 0D | P13-13 | CommVdo_3 | Operation<br>setting | Valid<br>immediately | 0 | 0 to 1 | - | 16<br>Bit |  |

**DI/DO channel function definition**

| DI channel function definition |             |                           |                                                                                                                      |        |
|--------------------------------|-------------|---------------------------|----------------------------------------------------------------------------------------------------------------------|--------|
| Channel function code          | Name        | Function name             | Description                                                                                                          | Remark |
| 0                              | -           | OFF (not used)            | -                                                                                                                    | -      |
| 1                              | S-ON        | Servo enabled             | Invalid: Servo motor enabled function prohibited;<br>Valid: Servo motor power-on enabled.                            | -      |
| 2                              | A-CLR       | Fault and warning cleared | Invalid: Do not reset faults or warnings<br>Valid: Reset fault or warning.                                           | -      |
| 3                              | POT         | Forward drive prohibited  | Invalid: Forward drive allowed;<br>Valid: Forward drive prohibited.                                                  | -      |
| 4                              | NOT         | Reverse drive prohibited  | Invalid: Reverse drive allowed;<br>Valid: Reverse drive prohibited.                                                  | -      |
| 6                              | CL          | Clear deviation counter   | Invalid: The position deviation is not cleared;<br>Valid: Position deviation is cleared.                             | -      |
| 8                              | E-STOP      | Emergency stop            | Invalid: Position lock after zero speed stop;<br>Valid: Do not affect the current running state.                     | -      |
| 10                             | GAIN-SEL    | Gain switch               | Invalid: Gain switch enable stop;<br>Valid: Gain switch.                                                             |        |
| 18                             | TouchProbe1 | Probe 1                   | Invalid: Probe 1 function enable stop;<br>Valid: Probe position capture function.                                    |        |
| 19                             | TouchProbe2 | Probe 2                   | Invalid: Probe 2 function enable stop;<br>Valid: Probe position capture function.                                    |        |
| 26                             | HOMEORG     | Origin signal             | Invalid: Do not affect the current operation of servo motor<br>Valid: Servo motor implements origin regression mode. | -      |

| DO channel function definition |      |                |             |        |
|--------------------------------|------|----------------|-------------|--------|
| Channel function code          | Name | Function name  | Description | Remark |
| 128                            | -    | OFF (not used) | -           | -      |

|     |         |                             |                                                                                                                                                                                                       |                                                        |
|-----|---------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 129 | RDY     | Servo ready                 | Servo is ready, and could receive S-ON signal.<br>Invalid: Servo is not ready<br>Valid: Servo is ready                                                                                                | -                                                      |
| 130 | ALM     | Fault signal                | Valid when the fault is detected                                                                                                                                                                      | -                                                      |
| 131 | WARN    | Warning signal              | Valid when warning signals are output                                                                                                                                                                 | -                                                      |
| 132 | TGON    | Rotation detection          | When the absolute value of servo motor speed is higher than 2005-10 set value:<br>Invalid: The motor rotation detection signal is invalid<br>Valid: The motor rotation detection signal is valid      | -                                                      |
| 133 | ZSP     | Zero speed signal           | The signal output by the servo motor when it stops:<br>Invalid: Motor zero speed signal is invalid<br>Valid: Motor zero speed signal is valid                                                         | -                                                      |
| 134 | P-COIN  | Positioning completed       | In the position control mode, the absolute value of the position deviation meets the setting conditions of the object dictionary 6067h and 6068h, indicating that the servo positioning is completed. | -                                                      |
| 137 | V-NEAR  | Speed approach              | -                                                                                                                                                                                                     | -                                                      |
| 138 | T-COIN  | Torque arrival              | Invalid: The absolute value of torque command is less than the set value<br>Valid: The absolute value of torque command reaches the set value                                                         | -                                                      |
| 139 | T-LIMIT | Torque limit                | The confirmation signal of torque limit.<br>Invalid: Motor torque is not limited<br>Valid: Motor torque is limited                                                                                    | -                                                      |
| 140 | V-LIMIT | Speed limited               | The confirmation signal of speed limit in torque mode.<br>Invalid: Motor speed is not limited<br>Valid: Motor speed is limited                                                                        | -                                                      |
| 141 | BRK-OFF | Brake output                | Outputting this signal indicates that the brake of the servo motor is released.                                                                                                                       | To use this DO function, you need to power it on again |
| 142 | SRV-ST  | Servo start state<br>Output | Invalid: servo drive is in non-running mode<br>Valid: servo drive in running mode                                                                                                                     | -                                                      |



|     |          |                              |                       |   |
|-----|----------|------------------------------|-----------------------|---|
| 145 | COM_VDO1 | Communication<br>VDO1 output | Use communication VDO | - |
| 146 | COM_VDO2 | Communication<br>VDO2 output | Use communication VDO |   |
| 147 | COM_VDO3 | Communication<br>VDO3 output | Use communication VDO |   |

**Group 201E**

| Object dictionary<br>(Hex) |           | Monitoring<br>Quantity<br>(Dec) | Monitoring name                     | Category  | Unit                     | Data type | Page<br>number |
|----------------------------|-----------|---------------------------------|-------------------------------------|-----------|--------------------------|-----------|----------------|
| Index                      | Sub-index |                                 |                                     |           |                          |           |                |
| 201E                       | 01        | U0-01                           | SrvStatus                           | Universal | -                        | 16 Bit    |                |
| 201E                       | 02        | U0-02                           | SpeedDis                            | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 03        | U0-03                           | SpdCmd                              | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 04        | U0-04                           | PosCmdToSpd                         | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 05        | U0-05                           | PulsErr                             | Universal | Equivalent<br>pulse unit | 32 Bit    |                |
| 201E                       | 07        | U0-07                           | Encoder Err Cnt                     | Universal | -                        | 16 Bit    |                |
| 201E                       | 09        | U0-09                           | PulsTotal                           | Universal | Instruction<br>unit      | 32 Bit    |                |
| 201E                       | 0D        | U0-13                           | EncTotal_LowWord (Low 32 bits)      | Universal | Encoder unit             | 32 Bit    |                |
| 201E                       | 0F        | U0-15                           | EncTotal_HighWord (High 32<br>bits) | Universal | Encoder unit             | 32 Bit    |                |
| 201E                       | 11        | U0-17                           | DiData1                             | Universal | -                        | 16 Bit    |                |
| 201E                       | 13        | U0-19                           | DoData1                             | Universal | -                        | 16 Bit    |                |
| 201E                       | 14        | U0-20                           | InerRatioReal                       | Universal | %                        | 16 Bit    |                |
| 201E                       | 17        | U0-23                           | DisVibFreq                          | Universal | Hz                       | 16 Bit    |                |
| 201E                       | 18        | U0-24                           | DisVibMag                           | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 19        | U0-25                           | PToqLimitDis                        | Universal | %                        | 16 Bit    |                |
| 201E                       | 1A        | U0-26                           | NToqLimitDis                        | Universal | %                        | 16 Bit    |                |
| 201E                       | 1B        | U0-27                           | PSpdLimitDis                        | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 1C        | U0-28                           | NSpdLimitDis                        | Universal | rpm                      | 16 Bit    |                |
| 201E                       | 1D        | U0-29                           | MachineAngle                        | Universal | °                        | 16 Bit    |                |
| 201E                       | 1E        | U0-30                           | ElecAngle                           | Universal | °                        | 16 Bit    |                |
| 201E                       | 1F        | U0-31                           | DcBusVoltDisp                       | Universal | V                        | 16 Bit    |                |
| 201E                       | 20        | U0-32                           | Temperature_IPM                     | Universal | °C                       | 16 Bit    |                |
| 201E                       | 21        | U0-33                           | OutputPowerInst                     | Universal | W                        | 16 Bit    |                |
| 201E                       | 22        | U0-34                           | OutputPowerAverage                  | Universal | W                        | 16 Bit    |                |

Chapter 11 Appendix

|      |    |       |                                   |           |              |        |  |
|------|----|-------|-----------------------------------|-----------|--------------|--------|--|
| 201E | 23 | U0-35 | HourTotalRun                      | Universal | h            | 16 Bit |  |
| 201E | 25 | U0-37 | MinTotalRun                       | Universal | min          | 16 Bit |  |
| 201E | 26 | U0-38 | SecTotalRun                       | Universal | s            | 16 Bit |  |
| 201E | 27 | U0-39 | ToqOutRate                        | Universal | %            | 16 Bit |  |
| 201E | 28 | U0-40 | HourCurrentRun                    | Universal | h            | 16 Bit |  |
| 201E | 2A | U0-42 | MinCurrentRun                     | Universal | min          | 16 Bit |  |
| 201E | 2B | U0-43 | SecCurrentRun                     | Universal | s            | 16 Bit |  |
| 201E | 2C | U0-44 | DisPwrInst                        | Universal | W            | 16 Bit |  |
| 201E | 2E | U0-46 | DisPwrAvg                         | Universal | W            | 16 Bit |  |
| 201E | 30 | U0-48 | PwrUpCount                        | Universal | Times        | 16 Bit |  |
| 201E | 31 | U0-49 | MotorOverLoadCount                | Universal | 0.01%        | 16 Bit |  |
| 201E | 32 | U0-50 | MotoTotal_LowWord (lower 32 bits) | Universal | Circle       | 32 Bit |  |
| 201E | 33 | U0-51 | MotoTotal_HighWord (high 32 bits) | Universal | Circle       | 32 Bit |  |
| 201E | 34 | U0-52 | Encoder resolution                | Universal | bit          | 16 Bit |  |
| 201E | 35 | U0-53 | MotoModel                         | Universal | -            | 16 Bit |  |
| 201E | 36 | U0-54 | AbsEncIn1Cycle                    | Universal | Encoder unit | 32 Bit |  |
| 201E | 37 | U0-55 | AbsEncMultiTurn                   | Universal | Circle       | 32 Bit |  |
| 201E | 3A | U0-58 | Bk Relay CtrlCnt                  | Universal | -            | 32 Bit |  |
| 201E | 3B | U0-59 | HistoryVbusMax                    | Universal | V            | 16 Bit |  |
| 201E | 3C | U0-60 | HistoryPowerMax                   | Universal | W            | 16 Bit |  |

**Group 201F**

| Object dictionary<br>(Hex) |           | Monitoring<br>Quantity<br>(Dec) | Monitoring name | Category | Unit             | Data type | Page<br>number |
|----------------------------|-----------|---------------------------------|-----------------|----------|------------------|-----------|----------------|
| Index                      | Sub-index |                                 |                 |          |                  |           |                |
| 201F                       | 01        | U1-01                           | NowErrorCode    | Warning  | -                | 16 Bit    |                |
| 201F                       | 02        | U1-02                           | NowWarmCode     | Warning  | -                | 16 Bit    |                |
| 201F                       | 03        | U1-03                           | IuWarmOccur     | Warning  | A                | 16 Bit    |                |
| 201F                       | 04        | U1-04                           | IvWarmOccur     | Warning  | A                | 16 Bit    |                |
| 201F                       | 05        | U1-05                           | UdcWarmOccur    | Warning  | V                | 16 Bit    |                |
| 201F                       | 06        | U1-06                           | T_IPMWarmOccur  | Warning  | °C               | 16 Bit    |                |
| 201F                       | 07        | U1-07                           | IqWarmOccur     | Warning  | %                | 16 Bit    |                |
| 201F                       | 08        | U1-08                           | IdWarmOccur     | Warning  | %                | 16 Bit    |                |
| 201F                       | 09        | U1-09                           | PosErrWarmOccur | Warning  | Encoder<br>Units | 32 Bit    |                |
| 201F                       | 0A        | U1-10                           | SpdWarmOccur    | Warning  | rpm              | 16 Bit    |                |
| 201F                       | 0B        | U1-11                           | Time1WarmOccur  | Warning  | s                | 16 Bit    |                |
| 201F                       | 0C        | U1-12                           | ErrCntCurRun    | Warning  | -                | 16 Bit    |                |
| 201F                       | 0D        | U1-13                           | WarmCntCurRun   | Warning  | -                | 16 Bit    |                |
| 201F                       | 0E        | U1-14                           | ErrorTotalCnt   | Warning  | -                | 16 Bit    |                |
| 201F                       | 0F        | U1-15                           | WarmTotalCnt    | Warning  | -                | 16 Bit    |                |
| 201F                       | 10        | U1-16                           | ErrCodeLast1st  | Warning  | -                | 16 Bit    |                |
| 201F                       | 11        | U1-17                           | ErrCodeLast2nd  | Warning  | -                | 16 Bit    |                |
| 201F                       | 12        | U1-18                           | ErrCodeLast3rd  | Warning  | -                | 16 Bit    |                |
| 201F                       | 13        | U1-19                           | ErrCodeLast4th  | Warning  | -                | 16 Bit    |                |
| 201F                       | 14        | U1-20                           | ErrCodeLast5th  | Warning  | -                | 16 Bit    |                |

|      |    |       |                 |         |   |        |  |
|------|----|-------|-----------------|---------|---|--------|--|
| 201F | 15 | U1-21 | WarmCodeLast1st | Warning | - | 16 Bit |  |
| 201F | 16 | U1-22 | WarmCodeLast2nd | Warning | - | 16 Bit |  |
| 201F | 17 | U1-23 | WarmCodeLast3rd | Warning | - | 16 Bit |  |
| 201F | 18 | U1-24 | WarmCodeLast4th | Warning | - | 16 Bit |  |
| 201F | 19 | U1-25 | WarmCodeLast5th | Warning | - | 16 Bit |  |

**Group 2020**

| Object dictionary<br>(Hex) |           | Monitoring<br>Quantity<br>(Dec) | Monitoring name                | Category | Unit  | Data type | Page<br>number |
|----------------------------|-----------|---------------------------------|--------------------------------|----------|-------|-----------|----------------|
| Index                      | Sub-index |                                 |                                |          |       |           |                |
| 2020                       | 01        | U2-01                           | ProductSer                     | Device   | -     | 16 Bit    |                |
| 2020                       | 02        | U2-02                           | Model1                         | Device   | -     | 16 Bit    |                |
| 2020                       | 03        | U2-03                           | Model2                         | Device   | -     | 16 Bit    |                |
| 2020                       | 04        | U2-04                           | FirewareVer                    | Device   | -     | 16 Bit    |                |
| 2020                       | 05        | U2-05                           | HardwareVer                    | Device   | -     | 16 Bit    |                |
| 2020                       | 06        | U2-06                           | ExFactoryYear                  | Device   | Year  | 16 Bit    |                |
| 2020                       | 07        | U2-07                           | ExFactoryMonth                 | Device   | Month | 16 Bit    |                |
| 2020                       | 08        | U2-08                           | ExFactoryDay                   | Device   | Day   | 16 Bit    |                |
| 2020                       | 09        | U2-09                           | DeviceSerNum1                  | Device   | -     | 16 Bit    |                |
| 2020                       | 0A        | U2-10                           | DeviceSerNum2                  | Device   | -     | 16 Bit    |                |
| 2020                       | 0B        | U2-11                           | DeviceSerNum3                  | Device   | -     | 16 Bit    |                |
| 2020                       | 0C        | U2-12                           | EtherCAT XML version<br>number | Device   | -     | 16 Bit    |                |
| 2020                       | 0D        | U2-13                           | DeviceSerNum5                  | Device   | -     | 16 Bit    |                |
| 2020                       | 0E        | U2-14                           | DeviceSerNum6                  | Device   | -     | 16 Bit    |                |
| 2020                       | 0F        | U2-15                           | DeviceSerNum7                  | Device   | -     | 16 Bit    |                |

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|      |    |       |               |        |   |        |  |
|------|----|-------|---------------|--------|---|--------|--|
| 2020 | 10 | U2-16 | DeviceSerNum8 | Device | - | 16 Bit |  |
|------|----|-------|---------------|--------|---|--------|--|

**Group 6000**

| Object dictionary (Hex) | Name                          | Accessibility | Data mapping | Default | Data range                  | Unit               | Data type | Page number |
|-------------------------|-------------------------------|---------------|--------------|---------|-----------------------------|--------------------|-----------|-------------|
| 603F                    | Error code                    | RO            | TPDO         | 0       | 0~65535                     | -                  | 16 Bit    | 142         |
| 6040                    | Control word                  | RW            | TPDO         | 0       | 0~65535                     | -                  | 16 Bit    | 142         |
| 6041                    | Status word                   | RO            | TPDO         | 0       | 0~65535                     | -                  | 16 Bit    | 143         |
| 605A                    | Quick-stop option code        | RW            | No           | 2       | 0 to 7                      | -                  | 16 Bit    | 143         |
| 605B                    | Shutdown Option Code          | RW            | No           | 0       | 0 ~ 1                       |                    | 16 Bit    |             |
| 605C                    | Disable Operation Option Code | RW            | No           | 0       | 0 ~ 1                       | -                  | 16 Bit    |             |
| 605E                    | Fault ReactionOption Code     | RW            | No           | 1       | 0 ~ 3                       | -                  | 16 Bit    |             |
| 605D                    | Halt option code              | RW            | No           | 1       | 1 to 3                      | -                  | 16 Bit    | 143         |
| 6060                    | Modes of servo operation      | RW            | RPDO         | 0       | 0 ~ 10                      | -                  | 8 bit     | 144         |
| 6061                    | Modes operation               | RO            | TPDO         | 0       | 0 ~ 10                      | -                  | 8 bit     | 144         |
| 6062                    | Position demand value         | RO            | TPDO         | 0       | -                           | Instruction unit   | 32 Bit    | 144         |
| 6063                    | Position actual value         | RO            | TPDO         | 0       | -                           | Encoder Units      | 32 Bit    | 144         |
| 6064                    | Position actual value         | RO            | TPDO         | 0       | -                           | Instruction unit   | 32 Bit    | 144         |
| 6065                    | Following error window        | RW            | RPDO         | 524288  | 0 to ( $2^{32}-1$ )         | Instruction unit   | 32 Bit    | 145         |
| 6066                    | Following error time window   | RW            | RPDO         | 0       | 0 to ( $2^{32}-1$ )         | ms                 | 32 Bit    |             |
| 6067                    | Position window               | RW            | RPDO         | 0       | 0 to $2^{32}$               | Encoder Units      | 32 Bit    | 145         |
| 6068                    | Position window time          | RW            | RPDO         | 0       | 0~65535                     | 1ms                | 16 Bit    | 145         |
| 606C                    | Velocity actual value         | RW            | TPDO         | 0       | $-2^{31}$ to ( $2^{31}-1$ ) | Instruction unit/s | 32 Bit    | 145         |
| 606D                    | Velocity window               | RW            | RPDO         | 30      | 0~65535                     | rpm                | 16 Bit    | 145         |
| 606E                    | Velocity window time          | RW            | RPDO         | 100     | 0~65535                     | ms                 | 16 Bit    | 145         |
| 6071                    | Target torque                 | RW            | RPDO         | 0       | -3000 to 3000               | 0.1%               | 16 Bit    | 145         |
| 6072                    | Max torque                    | RW            | RPDO         | 3000    | 0~3000                      | 0.1%               | 16 Bit    | 145         |
| 6074                    | Torque command                | RO            | TPDO         | 0       | -3000to 3000                | 0.1%               | 16 Bit    | 146         |
| 6077                    | Torque actual value           | RO            | TPDO         | 0       | -3000 to 3000               | 0.1%               | 16 Bit    | 146         |

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|      |                 |    |      |   |                           |                  |        |     |
|------|-----------------|----|------|---|---------------------------|------------------|--------|-----|
| 607A | Target position | RW | RPDO | 0 | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit | 32 Bit | 146 |
| 607C | Home offset     | RW | RPDO | 0 | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit | 32 Bit | 146 |



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|          |                                      |    |      |          |                           |                                 |        |     |
|----------|--------------------------------------|----|------|----------|---------------------------|---------------------------------|--------|-----|
| 607F     | Max velocity                         | RW | RPDO | 13107200 | 0 to $(2^{32}-1)$         | Instruction unit/s              | 32 Bit | 147 |
| 6081     | Profile velocity                     | RW | RPDO | 218453   | 0 to $(2^{32}-1)$         | User position speed unit        | 32 Bit | 147 |
| 6083     | Profile acceleration                 | RW | RPDO | 13107200 | 0 to $(2^{32}-1)$         | Instruction unit/s <sup>2</sup> | 32 Bit | 147 |
| 6084     | Profile deceleration                 | RW | RPDO | 13107200 | 0 to $(2^{32}-1)$         | Instruction unit/s <sup>2</sup> | 32 Bit | 147 |
| 6085     | Quick stop deceleration              | RW | RPDO | 100      | 0 to $(2^{32}-1)$         | User acceleration unit          | 32 Bit | 148 |
| 6086     | Motion profile type                  | RW | RPDO | 0        | $-2^{15}$ to $(2^{15}-1)$ | -                               | 16 Bit | 148 |
| 6087     | Torque slope                         | RW | RPDO | 1000     | 0 to $(2^{32}-1)$         | 0.1%/s                          | 32 Bit | 148 |
| 6091: 01 | Gear ratio                           | RW | RPDO | 1        | 1 to $(2^{32}-1)$         | -                               | 32 Bit | 148 |
| 6091: 02 | Motor revolutions                    | RW | RPDO | 1        | 1 to $(2^{32}-1)$         | -                               | 32 Bit | 148 |
| 6098     | Homing method                        | RW | RPDO | 1        | 1 to 35                   | -                               | 8 bit  | 149 |
| 6099: 01 | Speed during search for switch       | RW | RPDO | 432537   | 0 to $(2^{32}-1)$         | Instruction unit/s              | 32 Bit | 149 |
| 6099: 02 | Speed during search for zero         | RW | RPDO | 218453   | 0 to $(2^{32}-1)$         | Instruction unit/s              | 32 Bit | 149 |
| 609A     | Home acceleration                    | RW | RPDO | 655360   | 0 to $(2^{32}-1)$         | Instruction unit/s <sup>2</sup> | 32 Bit | 149 |
| 60B0     | Position offset                      | RW | RPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit                | 32 Bit | 149 |
| 60B1     | Velocity offset                      | RW | RPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit/s              | 32 Bit | 150 |
| 60B2     | Torque offset                        | RW | RPDO | 0        | -5000~5000                | 0.1%                            | 16 Bit | 150 |
| 60B8     | Touch probe function                 | RW | RPDO | 0        | 0~65535                   | -                               | 16 Bit | 150 |
| 60B9     | Touch probe status                   | RO | TPDO | 0        | 0~65535                   | -                               | 16 Bit | 150 |
| 60BA     | Touch probe Pos1 Pos Value           | RO | TPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit                | 32 Bit | 150 |
| 60BB     | Touch Probe Pos1 Neg Value           | RO | TPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit                | 32 Bit | 150 |
| 60BC     | Touch Probe Pos2 Pos Value           | RO | TPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit                | 32 Bit | 150 |
| 60BD     | Touch Probe Pos2 Neg Value           | RO | TPDO | 0        | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit                | 32 Bit | 150 |
| 60C5     | Max profile acceleration             | RW | RPDO | 0        | 0 to $(2^{32}-1)$         | Instruction unit/s <sup>2</sup> | 32 Bit |     |
| 60C6     | Max profile deceleration             | RW | RPDO | 0        | 0 to $(2^{32}-1)$         | Instruction unit/s <sup>2</sup> | 32 Bit |     |
| 60E0     | Forward direction torque limit value | RW | RPDO | 3000     | 0~5000                    | 0.1%                            | 16 Bit | 150 |
| 60E1     | Reverse Direction torque limit value | RW | RPDO | 3000     | 0~5000                    | 0.1%                            | 16 Bit | 151 |

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|         |                                  |    |      |   |                           |                    |        |     |
|---------|----------------------------------|----|------|---|---------------------------|--------------------|--------|-----|
| 60F4    | Following error actual value     | RO | RPDO | - | -                         | Instruction unit   | 32 Bit | 151 |
| 60FC    | Position demand value            | RO | TPDO | - | -                         | Encoder units      | 32 Bit | 151 |
| 60FD    | Digital input                    | RO | PDO  | 0 | -                         | -                  | 32 Bit | 151 |
| 60FE-01 | Digital Output Object Dictionary | RW | RPDO | 0 | 0~65535                   | -                  | 32 Bit |     |
| 60FE-02 | Digital Output Object Dictionary | RW | RPDO | 0 | 0~65535                   | -                  | 32 Bit |     |
| 60FF    | Profile velocity                 | RW | RPDO | 0 | $-2^{31}$ to $(2^{31}-1)$ | Instruction unit/s | 32 Bit | 151 |
| 6502    | Supported drive modes            | RO | TPDO | - | -                         | -                  | 32 Bit |     |

## 11.2 List of Fault and Warning Codes

Clearable: the panel can stop the fault display state by giving a "clear signal".

Stop immediately: The control action state stops immediately.

| Code  | Content                              | Cleanable | Immediately Stop | Code  | Content                             | Cleanable | Immediately Stop |
|-------|--------------------------------------|-----------|------------------|-------|-------------------------------------|-----------|------------------|
| Er.01 | Parameter damage                     |           | ○                | Er.34 | Motor overload protection           | ✓         | ○                |
| Er.02 | Parameter storage error              |           | ○                | Er.35 | Electronic gear ratio exceeds limit | ✓         | ○                |
| Er.03 | ADC reference source error           |           | ○                | Er.36 | Position deviation is too large     | ✓         | ○                |
| Er.04 | AD current sampling conversion error |           | ○                | Er.37 | Abnormal torque saturation          | ✓         | ○                |
| Er.05 | Abnormal FPGA communication          |           | ○                | Er.38 | Main circuit electrical phase loss  | ✓         | ○                |
| Er.06 | Wrong FPGA program version           |           | ○                | Er.39 | Emergency stop                      | ✓         | ○                |
| Er.07 | Clock exception                      |           | ○                | Er.40 | Encoder battery failure             | ✓         | ○                |
| Er.09 | Abnormal network status switching    | ✓         | ○                | Er.41 | Motor (encoder) over temperature    | ✓         | ○                |
| Er.10 | Loss of synchronization              | ✓         | ○                | Er.42 | Encoder write failure               | ✓         | ○                |
| Er.11 | Unburned XML configuration file      | ✓         | ○                | Er.43 |                                     | ✓         | ○                |
| Er.12 | Network initialization failed        | ✓         | ○                | Er.44 | Back to original timeout fault      | ✓         | ○                |
| Er.13 | Synchronization period setting error | ✓         | ○                | Er.45 |                                     | ✓         | ○                |
| Er.14 | Synchronization period error is too  | ✓         |                  | Er.60 | ADC conversion is                   |           | ○                |

|       |                                              |   |   |       |                                                          |   |   |
|-------|----------------------------------------------|---|---|-------|----------------------------------------------------------|---|---|
|       | large                                        |   |   |       | not completed                                            |   |   |
| Er.20 | Overcurrent                                  |   | ○ | Er.61 | Internal software fault                                  |   | ○ |
| Er.21 | Main power supply is undervoltage            | ✓ | ○ | Er.62 | Internal software fault                                  |   | ○ |
| Er.22 | Main power supply is overvoltage             | ✓ | ○ | Er.63 | Internal software fault                                  |   | ○ |
| Er.23 | Braking resistor is not connected            | ✓ | ○ | Er.64 | Internal software fault                                  |   | ○ |
| Er.24 | The braking resistor is turned on abnormally |   | ○ | Er.65 | Internal software fault                                  |   | ○ |
| Er.25 | Wrong motor model                            | ✓ | ○ | A-80  |                                                          | ✓ |   |
| Er.26 | Wrong motor model                            |   | ○ | A-81  | Over speed alarm                                         | ✓ |   |
| Er.27 | Encoder is disconnected                      | ✓ | ○ | A-82  | Overload                                                 | ✓ |   |
| Er.28 | Encoder Z pulse is lost                      |   | ○ | A-83  | Braking resistor is over temperature or overload         | ✓ |   |
| Er.30 | Encoder UVW signal error                     |   | ○ | A-84  | Parameter modification that needs to be powered on again | ✓ |   |
| Er.31 | Power cable disconnection                    | ✓ | ○ | A-88  | Main circuit instantaneous power failure                 | ✓ |   |
| Er.32 | Exceeding motor maximum speed                |   | ○ | A-89  | Duplicate DI port configuration                          | ✓ |   |
| Er.33 | Power module is over temperature             | ✓ | ○ | A-90  | Duplicate DO port configuration                          | ✓ |   |
|       |                                              |   |   | A-91  | Parameter modification is too                            | ✓ |   |

## Chapter 11 Appendix

|  |  |  |  |      |                                                                                |   |  |
|--|--|--|--|------|--------------------------------------------------------------------------------|---|--|
|  |  |  |  |      | frequent                                                                       |   |  |
|  |  |  |  | A-92 | Encoder battery<br>voltage low warning                                         | ✓ |  |
|  |  |  |  | A-93 | Encoder read and<br>write check is<br>abnormal and<br>frequency is too<br>high | ✓ |  |

### 11.3 Wire

Table 11-1 Appearance of servo motor power cable

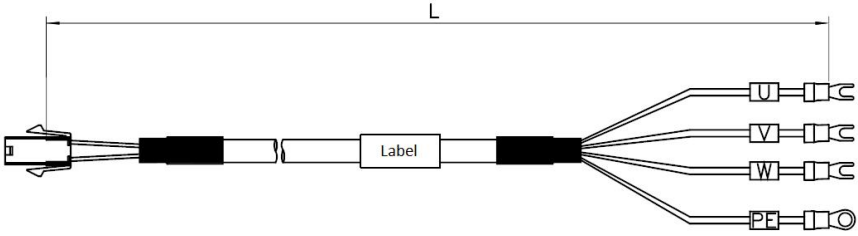
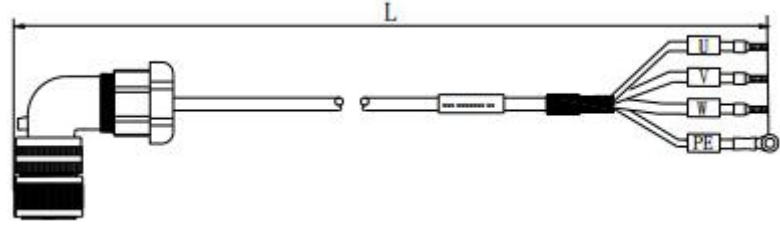
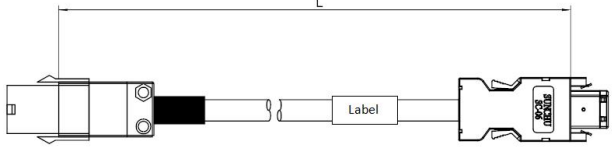
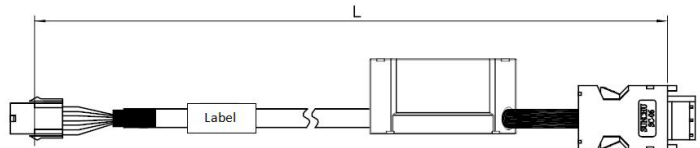
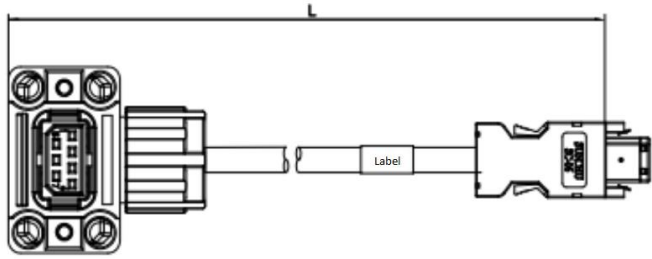
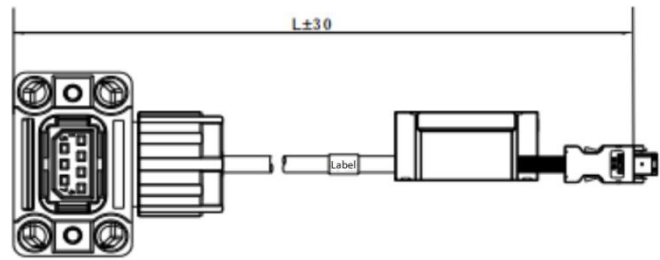
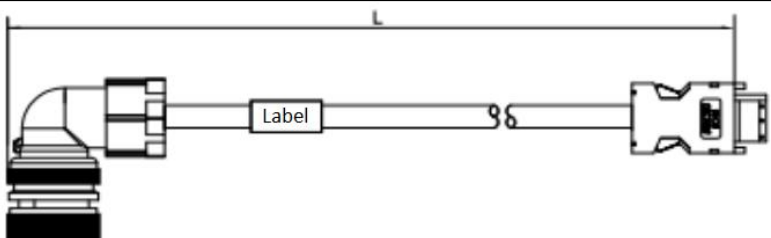
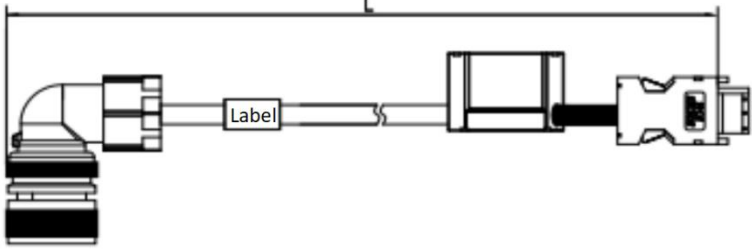
| Wire type           | Cable length L | Appearance drawing of cable                                                                                                                                                    |
|---------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P-Z3O1-R4M-3MX4     | 3 meters       |  <p>Suitable for [VD5L type A drive], which can connect [60/80 flange conductor motor]</p>   |
| P-Z3O1-R4M-5MX4     | 5 meters       |                                                                                                                                                                                |
| P-Z3O1-R4M-10MX4    | 10 meters      |                                                                                                                                                                                |
| P-Z3O1-H28J4M-3MX4  | 3 meters       |  <p>Suitable for [VD5L type A drive], which can connect [110 flange conductor motor]</p>    |
| P-Z3O1-H28J4M-5MX4  | 5 meters       |                                                                                                                                                                                |
| P-Z3O1-H28J4M-10MX4 | 10 meters      |                                                                                                                                                                                |
| P-Z3O1-MC4S-3MX4    | 3 meters       |  <p>Suitable for [VD5L type A drive], which can connect [60/80 flange conductor motor]</p> |
| P-Z3O1-MC4S-5MX4    | 5 meters       |                                                                                                                                                                                |
| P-Z3O1-MC4S-10MX4   | 10 meters      |                                                                                                                                                                                |

Table 11-2 Appearance diagram of servo encoder cable

| Wire type             | Cable length L | Appearance drawing of cable                                                          |
|-----------------------|----------------|--------------------------------------------------------------------------------------|
| E-J1394-R9M-3MX5-A    | 3 meters       |    |
| E-J1394-R9M-5MX5-A    | 5 meters       |                                                                                      |
| E-J1394-R9M-10MX5-A   | 10 meters      |                                                                                      |
| E-J1394-R9M-3MX7-A1   | 3 meters       |    |
| E-J1394-R9M-5MX7-A1   | 5 meters       |                                                                                      |
| E-J1394-R9M-10MX7-A1  | 10 meters      |                                                                                      |
| E-J1394-MC7S-3MX5-A   | 3 meters       |  |
| E-J1394-MC7S-5MX5-A   | 5 meters       |                                                                                      |
| E-J1394-MC7S-10MX5-A  | 10 meters      |                                                                                      |
| E-J1394-MC7S-3MX7-A1  | 3 meters       |  |
| E-J1394-MC7S-5MX7-A1  | 5 meters       |                                                                                      |
| E-J1394-MC7S-10MX7-A1 | 10 meters      |                                                                                      |
| E-J1394-H28K7M-3MX5-A | 3 meters       |  |
| E-J1394-H28K7M-5MX5-A | 5 meters       |                                                                                      |

|                             |           |                                                                                                 |
|-----------------------------|-----------|-------------------------------------------------------------------------------------------------|
| E-J1394-H28K7M-10MX<br>5-A  | 10 meters | Suitable for [VD5L series drive], which can connect [110 flange motor<br>(single-turn encoder)] |
| E-J1394-H28K7M-3MX7<br>-A1  | 3 meters  |               |
| E-J1394-H28K7M-5MX7<br>-A1  | 5 meters  |                                                                                                 |
| E-J1394-H28K7M-10MX<br>7-A1 | 10 meters |                                                                                                 |

Suitable for [VD5L series drive], which can connect [110 flange motor  
(multi-turn encoder)]



## 11.4 Correspondence of International Standards

The products meet the requirements of EMC standards:

Certification information

| Certification name | Certification symbol                                                              | Instruction Name |            | Standards                  |                  |
|--------------------|-----------------------------------------------------------------------------------|------------------|------------|----------------------------|------------------|
| CE certification   |  | EMC Directive    | 2014/30/EU | Servo drive<br>Servo motor | EN 61800-3<br>C2 |

The VD5L series drives comply with European EMC Directive 2014/30/EU and meet the requirements of EN 61800-3 C2 under the following conditions.

The recommended external EMC filter should be installed at the input terminal of the drive, and the shielded wire should be selected at the output terminal. Ensure the reliable grounding of the filter and 360° overlapping grounding of output cable shielding. For the selection of EMC filters, check "11.4.1 Hardware Requirements (1) EMC Filter Recommendations" below Table 11-3 Recommended Manufacturers and Models of EMC Input Filters";

The input terminal needs to be equipped with AC inductors that meet the requirements;

Shielded cable shall be used for driving cable between drive and motor. Please refer to below for cable selection and installation: "11.4.1 Hardware Requirements" 【 (3) Cable requirements and wiring 】 ";

Install the drive and wiring according to the recommended cable wiring method as below: "11.4.1 Hardware Requirements" 【 (3) Cable requirements and wiring 】 ";

Install a common mode filter if necessary.

### 11.4.1 Hardware requirements

#### (1) EMC filter recommendation

Recommended model: SCHAFFNER models are recommended as shown in the following table:

**Table 11-3 Recommended manufacturers and models of EMC input filters**

| Series               | Drive model  | Rated input current | Filter model  |
|----------------------|--------------|---------------------|---------------|
|                      |              | IN                  | SCHAFFNER     |
| VD5L-0xxSA1G         |              |                     |               |
| Single-phase<br>220V | VD5L-003SA1G | 0.9                 | FN 2090-1-06  |
|                      | VD5L-010SA1G | 3.6                 | FN 2090-4-06  |
|                      | VD5L-014SA1G | 6.7                 | FN 2090-8-06  |
|                      | VD5L-015SA1G | 6.7                 | FN 2090-16-06 |
| VD5L-0xxSA1G         |              |                     |               |
| Single-phase<br>220V | VD5E-003SA1G | 0.9                 | FN 2090-1-06  |
|                      | VD5E-010SA1G | 3.6                 | FN 2090-4-06  |
|                      | VD5E-014SA1G | 6.7                 | FN 2090-8-06  |

Applicable to European EMC directives.

Servo drives and motors cannot be used in ordinary families or connected to low-voltage public communication circuits. The drive may send radio frequency if the similar loops above is connected.

For its application to EMC directives, please use noise filters and surge absorbers and ferrite magnetic rings. As for the EMC Directive's applies on machinery and equipment, and the final mechanical equipment for assembling drives and motors must be confirmed.

### **(2) Requirements for AC input inductors**

The AC input inductor is mainly used to reduce the filtering in the input current. As an optional accessory, it should be external connect when the application environment has high harmonic requirements.

### **(3) Cable requirements and wiring**

#### **① Cable requirements**

In order to meet the EMC requirements of CE marking, shielding cables with shielding layer must be used. Shielding cable has three phase conductors and four phase conductors. If the conductivity of the shielding cable layer cannot meet the requirements, a separate PE wire needs to be added. Or shielding cable with four phase conductors, one of which is PE wire. In order to effectively suppress the emission and conduction of radio frequency interference, the shielding layer of shielding wire is composed of coaxial copper braided tape. In order to increase shielding effectiveness and electrical conductivity, the braiding density of shielding layer should be greater than 90%.

#### **② Wiring requirements**

Motor cables and their PE shielded wire (twister shield) should be as short as possible to reduce electromagnetic radiation and stray current and capacitive current outside the cable. If the length of motor cable exceeds 100m, it is required to install output filter or dv/dt inductor. It is recommended that all control cables should be shielding cables. Motor cable wiring must be far away from other cable wiring. Motor cables of several drives can be wired side by side. It is recommended to put the motor cable, input power cables and control cables respectively distributed in different troughs. In order to avoid electromagnetic interference caused by rapid changes in the output voltage of the drive, long-distance side-by-side routing of motor cables and other cables should be avoided.

When the control cable must pass through the power cable, ensure that the included angle between the two cables is kept at 90 degrees as much as possible. Do not put other cables through the drive. The power input and output cables of the drive and weak current signal cables (such as control cables) should not be arranged in parallel as far as possible, but vertically when conditions permit. Cable troughs must be well connected and well grounded. Aluminum trough can be used to improve equipotential. Filters, drives and motors should be well overlapped with the system (machinery or device), and spraying protection should be done in the installation part, and conductive metals should be fully contacted.

### **(4) Leakage current suppression**

Because the output of the drive is a high-speed pulse voltage, high-frequency leakage current will be generated. Drive equipment will generate DC leakage current in protective conductor, and B-type (delay type) leakage

protection circuit breaker must be used. If it's necessary to install multiple drives, each drive shall be provided with a leakage protection circuit breaker.

#### 11.4.2 Recommendations for common EMC issues

Drive products belong to strong interference equipment. When there are problems in wiring and grounding during use, interference may still occur. When interference with other equipment occurs, the following methods can be adopted for rectification.

**Table 11-4 Common EMC interference problems and rectification methods**

| Interference states                               | Rectification method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switch trip of leakage protection circuit breaker | <ul style="list-style-type: none"> <li>◆ Reduce the carrier frequency without affecting the performance;</li> <li>◆ Reduce the length of driving cable;</li> <li>◆ Add a magnet ring to the input drive;</li> <li>◆ If the power-on trips instantly, it is necessary to disconnect the large ground current at the input terminal; (Disconnect the ground of the external or internal filter and the ground terminal of the input port to the ground y capacitor)</li> <li>◆ In case of running or enabling trip, leakage current suppression measures should be installed at the input terminal. (Leakage current filter, safety capacitor and magnet ring, magnet ring)</li> </ul> |
| Interference caused by drive running              | <ul style="list-style-type: none"> <li>◆ The motor shell is connected to the PE end of the drive;</li> <li>◆ The PE terminal of the drive is connected to the power grid PE;</li> <li>◆ Add a magnet ring to input power;</li> <li>◆ Power supply or magnet ring is added to the interfered signal port;</li> <li>◆ Add additional common ground connection between devices.</li> </ul>                                                                                                                                                                                                                                                                                              |
| Communication interference                        | <ul style="list-style-type: none"> <li>◆ Connect the motor shell to the PE end of the drive;</li> <li>◆ Connect the PE terminal of the drive to the power grid PE;</li> <li>◆ Add a magnet ring to input power cable;</li> <li>◆ Add matching resistors to the communication cable source and load terminal;</li> <li>◆ Differential cable of communication cable adds external communication common ground cable;</li> <li>◆ Shielded wires for communication cables, and the shielding layer is</li> </ul>                                                                                                                                                                         |

|                  |                                                                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <p>connected to the communication common place;</p> <p>◆ Multi-node communication wiring needs daisy chain, and the length of branch cable is less than 30cm.</p>                                                                             |
| I/O interference | <p>◆ Low-speed DI increases capacitance filtering, and the maximum value is recommended to 0.1 <math>\mu\text{F}</math>;</p> <p>◆ AI increases capacitance filtering, and the recommended maximum value is 0.22 <math>\mu\text{F}</math>.</p> |



## Notice

- ◆ This series of products should strictly comply with EMC-related electrical installation requirements in the manual to meet EMC certification standards;
- ◆ When the CE marking is attached to the equipment or device with this series of products, please confirm whether the final equipment or device meets the European unified standard, and the relevant responsibility shall be borne by the customer of the final assembled product;
- ◆ For more product certification information, please consult our agent or sales person in charge.