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# Chapter 1 Product Information

## 1.1 About servo driver

### Description on drivermodel

TDS – R1 – P A 2R8 – B00

Servo driver code

| Mark | Serial number |
|---|---|
| TDS | Servo driver |

Series specifications

| Mark | Product series |
|---|---|
| R0 | Rotary R0 series |
| R1 | Rotary R1 series |
| L1 | Linear L1 series |

Type specification

| Mark | Model classification |
|---|---|
| P | Pulse type |
| N | ECAT bus type |
| C | CAN bus type |

Power supply voltage specification

| Mark | Input voltage and number of phases |
|---|---|
| A | 220V 1 phase |
| C | 220V 3 phase |
| T | 380V 3 phase |

Output current specification

| Mark | Rated output current |
|---|---|
| R70 | 0.7A |
| R90 | 0.9A |
| 1R6 | 1.6A |
| 2R8 | 2.8A |
| 3R8 | 3.8A |
| 5R5 | 5.5A |
| 7R6 | 7.6A |
| 012 | 12A |
| 017 | 17A |
| 020 | 20A |

Hardware non-standard number

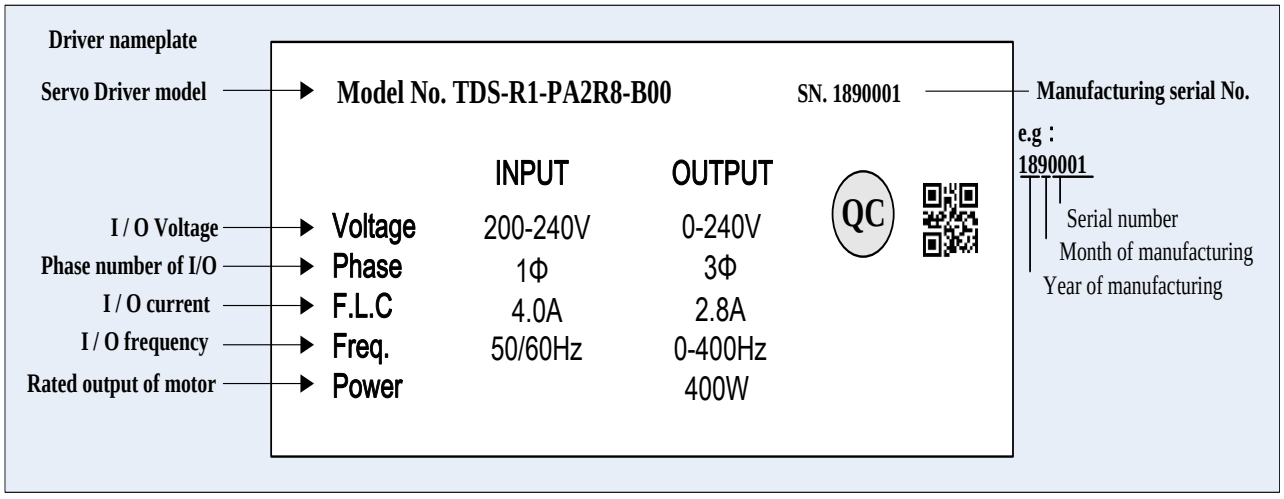
| Mark | Internal model |
|---|---|
| A | Standard unit hardware |
| B | B# Non-standard hardware |
| … | … |

Software non-standard number

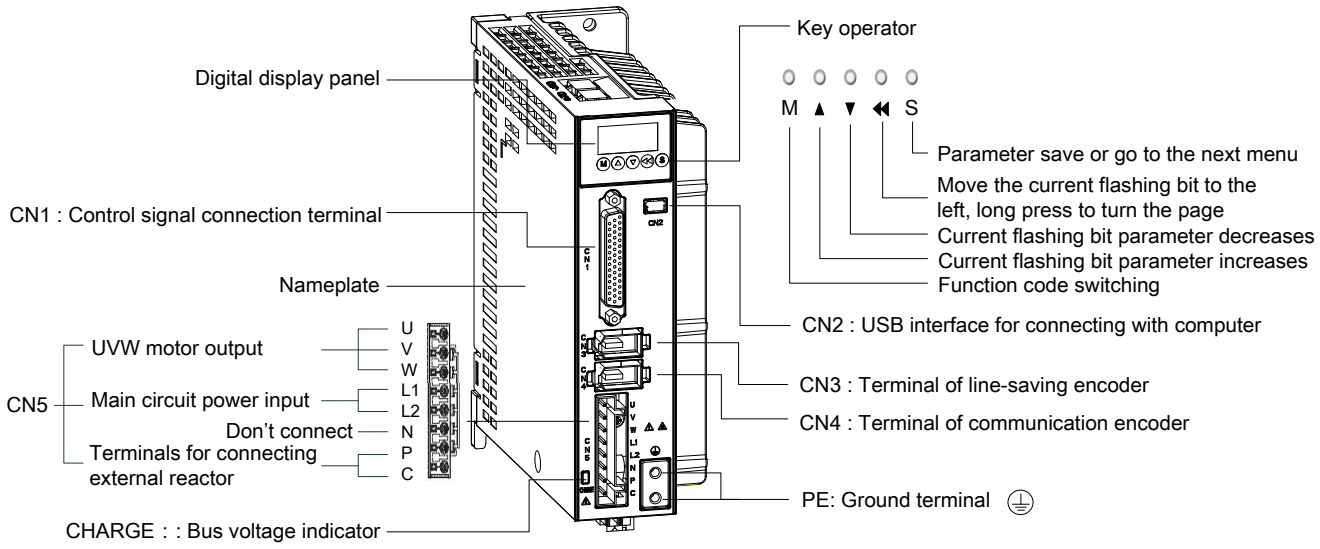
| Mark | Internal model |
|---|---|
| 00 | Standard unit software |
| 01 | 01# Non-standard software |
| … | … |

Note: A driver model with A00 or a default suffix is a standard unit.

### Description on driver nameplate



## Composition of servo driver




## Specifications for servo driver

### Electrical specification

| Item | Type SIZE-A | | | | Type SIZE-B | | |
|---|---|---|---|---|---|---|---|
| Driver model TDS-R*-PA** | R70 | R90 | 1R6 | 2R8 | 3R8 | 5R5 | 7R6 |
| Continuous output current (A) | 0.7 | 0.9 | 1.6 | 2.8 | 3.8 | 5.5 | 7.6 |
| Maximum output current(A) | 2.1 | 3.2 | 5.9 | 9.3 | 11 | 16.9 | 17 |
| Voltage specification of input power supply | Single-phase AC200V-240V , +10~-15% , 50/60HZ | | | | | | |
| Current specification of input power supply (A) | 0.8 | 1.6 | 2.4 | 5 | 6.3 | 8.7 | 10 |
| Brake handling function | External brake resistance | | | | Built-in brake resistance | | |
| Resistance value of built-in braking resistance(Ω) | — | — | — | — | 50 | 50 | 50 |
| Capacity of built-in brake resistor(W) | — | — | — | — | 50 | 50 | 50 |
| Minimum resistance value of external braking resistance(Ω) | 40 | 40 | 40 | 40 | 40 | 40 | 40 |

## Basic specifications

| Item | | | Descriptions |
|---|---|---|---|
| **Basic specifications** | Control mode | | IGBT PWM control, sine wave current driver mode. |
| | Encoder feedback | Rotary motor | R0 Series: Incremental line saving Encoder:2500 line incremental encoder<br>R1 Series: Bus type serial encoder: 17bit (absolute/incremental encoder)<br>23bit (absolute/incremental encoder) |
| | | Linear motor | Absolute linear encoder (signal resolution varies with absolute linear encoder)<br>Incremental linear encoder (signal resolution varies with incremental linear encoder and serial conversion unit) |
| | Control signal | Digital input signal | General 8 input<br>General input function is selected by parameters |
| | | Digital output signal | General 5 output<br>General output function is selected by parameters |
| | Analog signal | Input | 1 channel of 12bit A/D input |
| | Communication function | USB | Connect with computer, etc |
| | | RS485 | Possible for 1: n communication with maximum 247 shaft |
| | | Axes address setting | Based on user settings |
| | Dynamic brake | | Built-in |

| Item | | | Descriptions |
|---|---|---|---|
| | Control model | | Velocity mode, torque mode, position mode, position/velocity mode, position/torquemode, velocity-torque mode, full closed loop mode<br>The above 7 control modes can be switched by parameters |
| **Performance** | Velocity variation rate *1 | Load variation rate | Less than ± 0.1% of rated velocity (load fluctuation: 0~100%) |
| | | Voltage variation rate | 0% of rated velocity (voltage fluctuation: ±10%) |
| | | Temperature variation rate | Less than 0.1% of rated velocity (temperature fluctuation: 25 ± 25℃) |
| | Velocity control range | | 1:6000 |
| | Frequency characteristics of velocity loop | | 3.0KHZ |
| | Torque control accuracy | | ±1% |
| **Velocity control mode** | Soft start time setting | | 0~60s( Acceleration and deceleration can be set respectively) |
| | Control input | | Change to enable switch, over-travel switch, command disable switch, internal mode selector switch, internal command selector switch, etc. |
| | Control output | | Servo ready, positioning OK brake output, velocity reach, torque reach, etc |
| | Analog command input | Command voltage | Maximum input voltage: ±12V<br>maximum (motor rotates positive in case of a positive voltage command)<br>The rotating velocity at DC10V is 3000rpm(*mm/s), and the corresponding rotating velocity can be set as required. |

| Item | | | Descriptions | |
|---|---|---|---|---|
| | Analog command input | Input impedance | Appr 9kΩ | |
| | | Circuit time parameters | Appr 47μs | |
| **Torque control mode** | Analog command input | Command voltage | Maximum input voltage: ±12V<br>maximum (net torque output of motor in case of a positive voltage command)<br>The torque is 100% at dc10v, and the corresponding torque can be set freely | |
| | | Input impedance | Appr 9kΩ | |
| | | Circuit time parameters | Appr 47μs | |
| **Position control mode** | Filtering setting | | Smooth filtering, low-pass filtering, low-frequency jittering-suppression and other command processing | |
| | Feed-positive compensation | | 0 ~ 100.0% | |
| | Output signal positioning width setting OK | | Command unit and encoder unit are settable, in an unit of 1 | |
| | Input signal | Impulse command | Input pulse shape | Choose any of the following:<br>"Direction + pulse", "90° phase orthogonal pulse", "CW + CCW pulse" |
| | | | Input shape | Differential input, open-circuited collector |

| Item | | | Descriptions | |
|---|---|---|---|---|
| **Position control mode** | Input signal | | Input pulse frequency | Differential input: 4mpps maximum, pulse width no less than 0.125us; open-circuited collector : 200kpps maximum , pulse width no less than 2.5us. |
| | | Electronic gear ratio | $\frac{\text{Encoding resolution}}{10^8} \le \frac{\text{Electronic gear ratio numertor}}{\text{Electronic gear ratio denominator}} \le \frac{\text{Encoding resolution}}{2.5}$ | |
| | | Power supply for built-in collector in case of open circuit * 2 | +24V( built in 2.4kΩ resistor) | |
| | | Clear signal | Position deviation clearing, supports linear drive and open-circuited collector | |
| | Encoder frequency division pulse output | Output shape | Phase A, phase B: differential output<br>Phase Z: Differential output or open-circuited collector output | |
| | | Frequency division ratio | Any frequency division | |

| Item | | | Descriptions |
|---|---|---|---|
| **I/O signal** | Digital input signal | Possible to make change in signal distribution | 8-channel DI<br>DI function: Servo enable, alarm reset, gain switch, zero position fixing function enable, position command disable, positive over-travel switch, negative over-travel switch, positive jogging, negative jogging, electronic gear selection, home switch, home reset enable, position deviation clearing, internal velocity limit selection, and pulse command disable. |
| | Digital output signal | Possible to make change in signal distribution | 5-channel DO<br>DO function:<br>Servo ready, motor rotating, zero-velocity signal, velocity consistent, positioning OK, torque limit, velocity limit, brake output, warning output, fault output, home reset OK, torque reach, and velocity reach. |
| **Built-in function** | Over-travel (OT) prevention function | | Stop immediately when P-OT and N-OT are triggered. |
| | Protection function | | Overcurrent, overvoltage, insufficient voltage, overload, main circuit detection abnormality, radiator overheating, power supply phase failure, overvelocity, encoder abnormality, CPU abnormality, parameter abnormality, and others |
| | LED display function | | Main power supply CHARGE, 5-bit LED display |

| Item | | Descriptions |
|---|---|---|
| | Analog quantity monitoring function for observation | Provided with built-in analog quantity monitoring connector for observing velocity, torque command signal, etc |
| | Vibration suppression | Compatible with 0-100Hz low frequency suppression<br>Compatible with 100-5000Hz medium-high frequency suppression |
| | Others | Gain adjustment, alarm recording, IOG operation |

Note *1: The velocity variation rate is defined by the following formula:

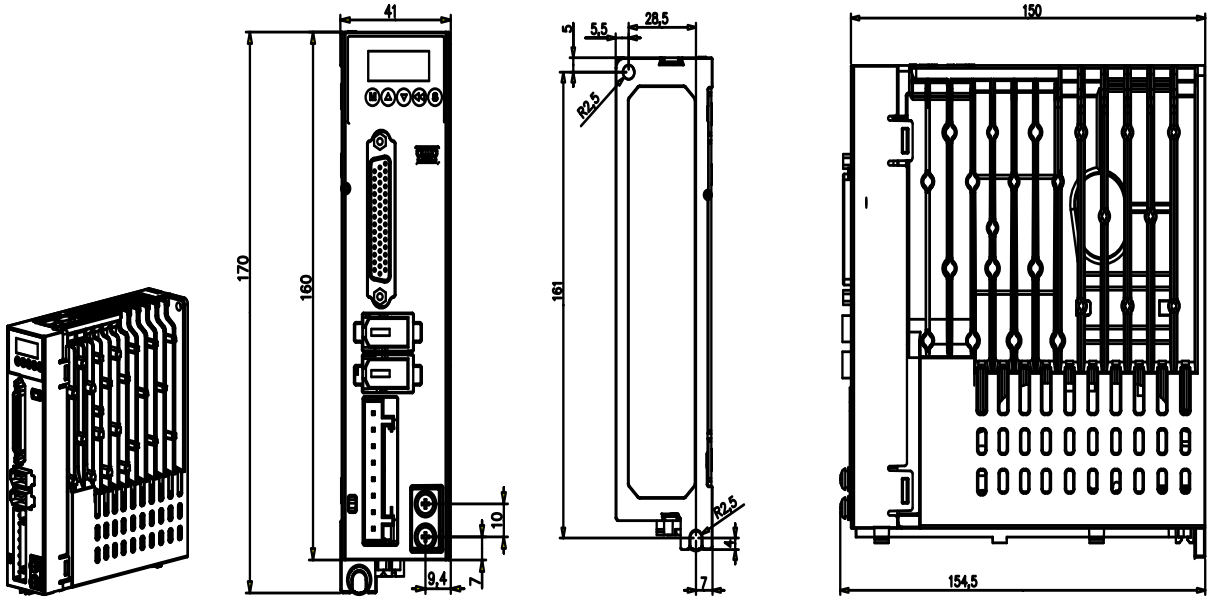
$$\text{Velocity variation rate} = \frac{\text{Noload velocity} - \text{Fullload velocity}}{\text{Rated velocity}} * 100\%$$

In fact, the variation of voltage and temperature will lead to the deviation of amplifier and the variation of hydrochloric acid resistance. Therefore, such variation will be shown by the variation of the rotational velocity. The variation rotational velocity is expressed by the ratio of the rated rotational velocity, which is the rate of variation of velocity caused by voltage variation and temperature variation respectively.

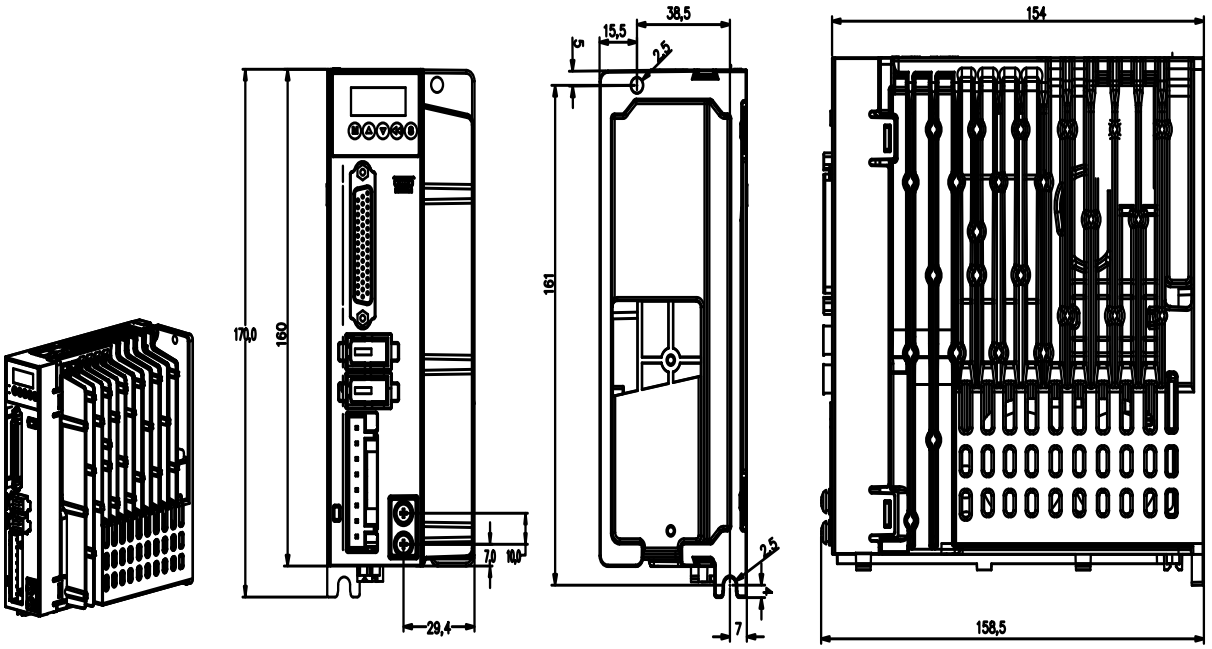
Note * 2: The power supply for the open-circuited built-in collector is not electrically isolated from the control circuit in the servo driver.

## Installation dimension of servo driver

SIZE-A installation dimension diagram (in: mm) :




SIZE-B installationdimension diagram (in: mm) :



## 1.2 About servo motor

### Description on model of EAM-S/T series servo motor

EAM – S F-0430A-U 3 0 – X X

| Mark | Serial No. |
|---|---|
| EAM | Servo motor |

| Mark | Motor series |
|---|---|
| S | S series |
| T | T series |
| ... | ... |

| Mark | Motor series |
|---|---|
| F | Low inertia |
| G | Middle inertia |
| H | High inertia |

| Mark | Rated power (W) |
|---|---|
| A5 | 50 |
| 01 | 100 |
| 02 | 200 |
| 04 | 400 |
| 06 | 600 |
| 08 | 750 |
| 09 | 850 |
| 10 | 1000 |
| 13 | 1300 |
| 15 | 1500 |
| 18 | 1800 |
| 20 | 2000 |
| 25 | 2500 |
| 29 | 2900 |
| 30 | 3000 |

| Mark | Rated velocity (rpm) |
|---|---|
| 15 | 1500 |
| 20 | 2000 |
| 25 | 2500 |
| 30 | 3000 |

| Mark | Voltage grade |
|---|---|
| A | AC 200V |
| T | AC 400V |
| D | DC 48V |

| Mark | Customer code |
|---|---|
| 01 | 1# non-standard |

| Mark | Brake, reducer, oil seal |
|---|---|
| 0 | Oil seal |
| 1 | No oil seal |
| 2 | Oil seal + brake |
| 4 | Brake |

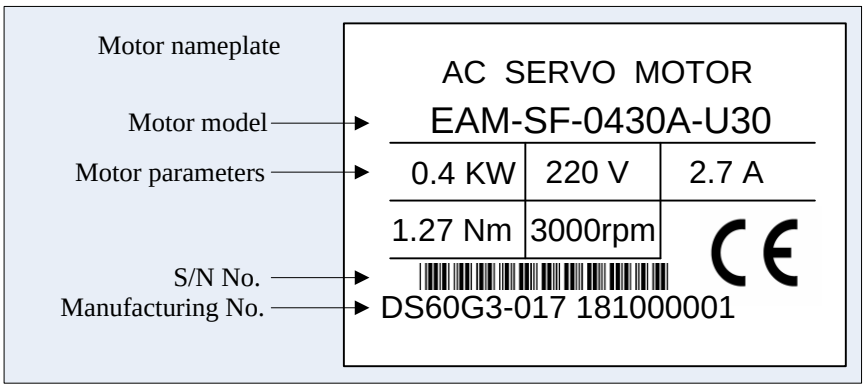
| Mark | Shaft connection mode |
|---|---|
| 1 | Optic shaft |
| 2 | Solid, keyed |
| 3 | Solid, keyed, with threaded hole |
| 4 | Solid, with threaded hole |

| Mark | Encoder type |
|---|---|
| 1 | 2500-wire line-saving incremental encoder |
| 2 | S-type 17-bit multi-ring absolute value encoder |
| 3 | S-type 17-bit single-ring absolute value encoder |
| 4 | R-type 17-bit multi-ring absolute value encoder |
| 5 | R-type 17-bit single-ring absolute value encoder |
| 6 | 1024-wire line-saving incremental encoder |
| D | 20-bit bus encoder |
| U | 23-bit multi-ring absolute value encoderbus encoder |

Note: A servo motor model with a default suffix is a standard unit.

## 1.2.1 Description on EAM-S series servo motor

### Description on nameplate of EAM-S series servo motor



## Specification for mechanical characteristic parameters of EAM-S series servo motor

| Item | Description |
|---|---|
| **Rated time** | Continuous |
| **Vibration level** | V15 |
| **Insulation** | DC500V , 10MΩand above |
| **Operating** | 0 ~ 40℃ |
| **Excitation mode** | Permanent magnet type |
| **Installation mode** | Flange type |
| **Heat resistance** | Level F |
| **Isolation voltage** | AC1500V 1min(200V level) |
| **Housing** | IP65 |
| **Operating** | 20 ~ 80%(no condensation) |
| **Connection mode** | Direct connection |
| **Rotation direction** | Counter clockwise (CC rotation) when viewed from load side |

## Specification for rating of EAM-S series servo motor

| Model | Base | Rated output (kW)*1 | Rated torque (N m) | Max torque (N m) | Rated current (A) | Max current (A) | Rated velocity (rpm) | Max velocity (rpm) | Torque parameter (N m/A) | Rotor inertia (10-4kg m2) | Voltage (V) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **EAM-SF-0130A-***** | 40 | 0.1 | 0.32 | 0.96 | 0.8 | 2.4 | 3000 | 5000 | 0.4 | 0.035 | 220V |
| **EAM-SF-0230A-***** | 60 | 0.2 | 0.64 | 1.92 | 1.1 | 3.3 | | | 0.58 | 0.264 | |
| **EAM-SF-0430A-***** | | 0.4 | 1.27 | 3.81 | 2.3 | 6.9 | | | 0.55 | 0.407 | |
| **EAM-SF-0630A-***** | | 0.6 | 1.91 | 5.7 | 3.8 | 11.4 | | | 0.5 | 0.526 | |
| **EAM-SF-0830A-***** | 80 | 0.75 | 2.39 | 7.2 | 4.2 | 12.6 | | | 0.6 | 0.924 | |
| **EAM-SF-1030A-***** | | 1.0 | 3.18 | 9.6 | 4.5 | 13.5 | | | 0.71 | 1.207 | |
| **EAM-SF-1230A-***** | 110 | 1.2 | 4 | 12 | 4.5 | 15 | | 3500 | 0.89 | 7.62 | |
| **EAM-SF-1530A-***** | | 1.5 | 5 | 15 | 5.5 | 18 | | | 0.91 | 9.45 | |
| **EAM-SF-1830A-***** | | 1.8 | 6 | 18 | 7 | 18 | | | 0.85 | 11.3 | |

Note: Please communicate with our technicians when selecting motor with base 110.

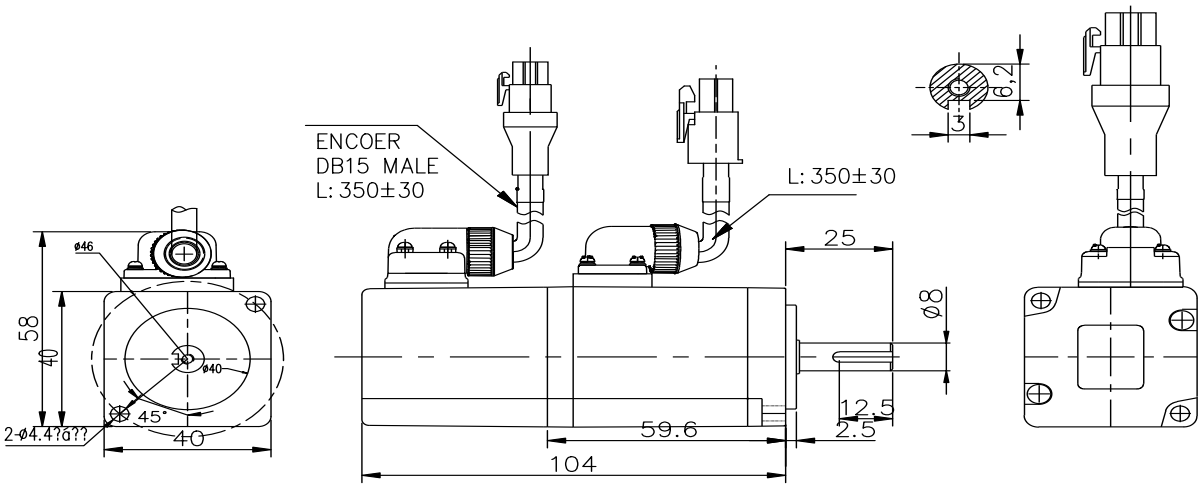
**Electrical specification for brake of EAM-S series brake motor**

| Motor model | Power supply voltage(V) ±10% | Out of time | In time (ms) | Rated power (w) | Brake holding torque ( N.m ) |
|---|---|---|---|---|---|
| **EAM-SF-A530A /0130A** | DC24 | 20 | 50 | 6.1 | ≥0.32 |
| **EAM-SF-0230A/0430A/0630A** | | 40 | 50 | 6.44 | ≥1.32 |
| **EAM-SF-0830A/1030A** | | 40 | 60 | 11.5 | ≥3.2 |
| **EAM-SF-1230A/1530A/1830A** | | 60 | 120 | 14.4 | ≥6 |

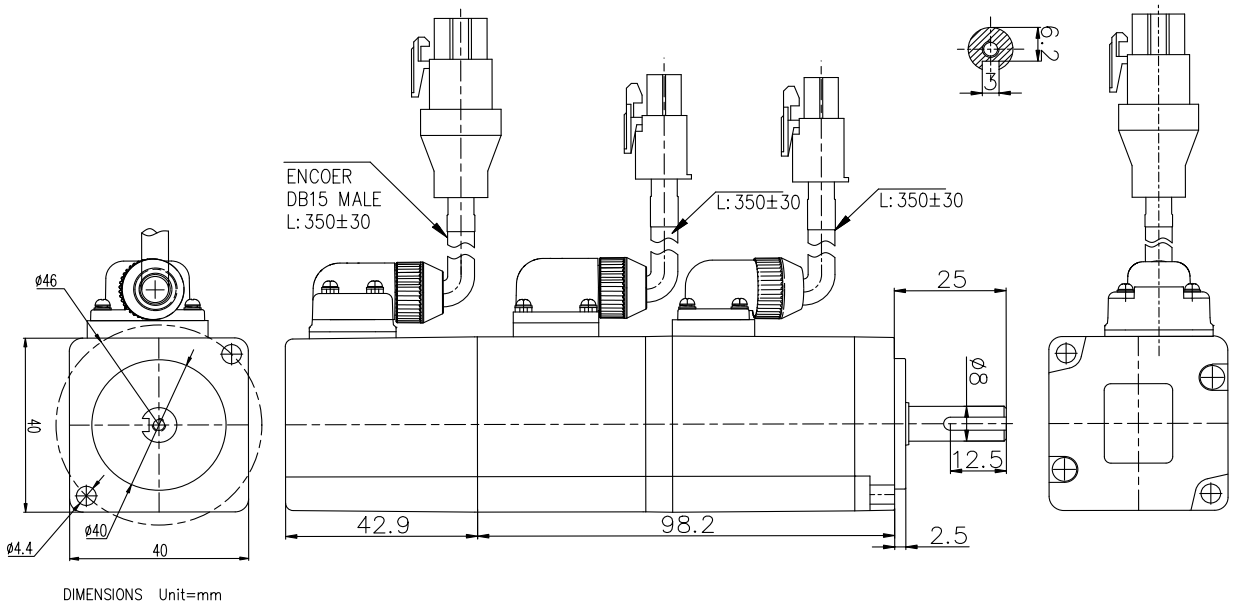
- The brake shall not share power supply with other electrical appliances to prevent the voltage or current from decreasing due to the operation of other electrical appliances, which will eventually cause the brake to malfunction.
- Cables with a specification of more than 0.5mm$^2$ will be recommend

## Installation dimensions of EAM-S series servo motor

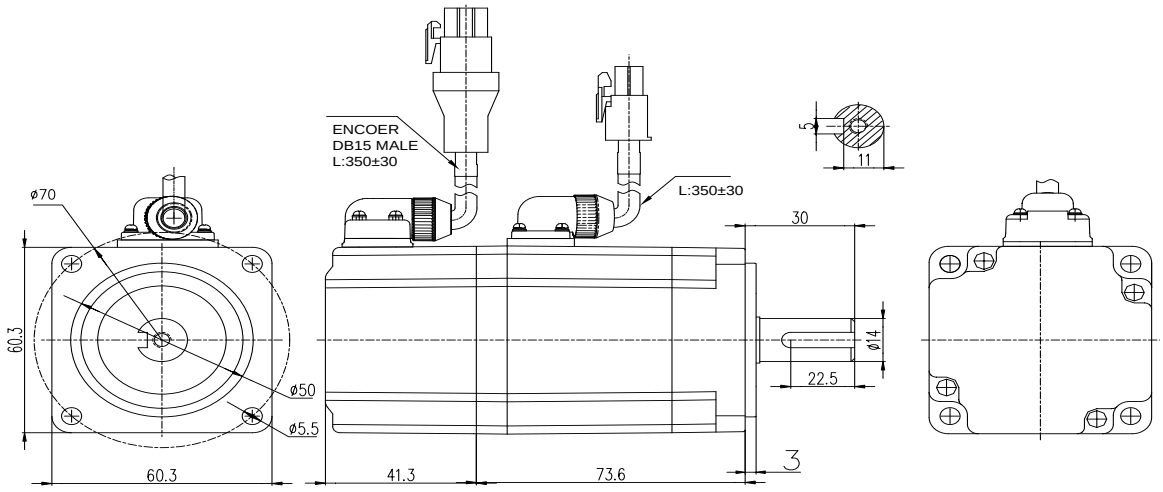
Installation dimension diagram for 100W servo motor without brake (in: mm):



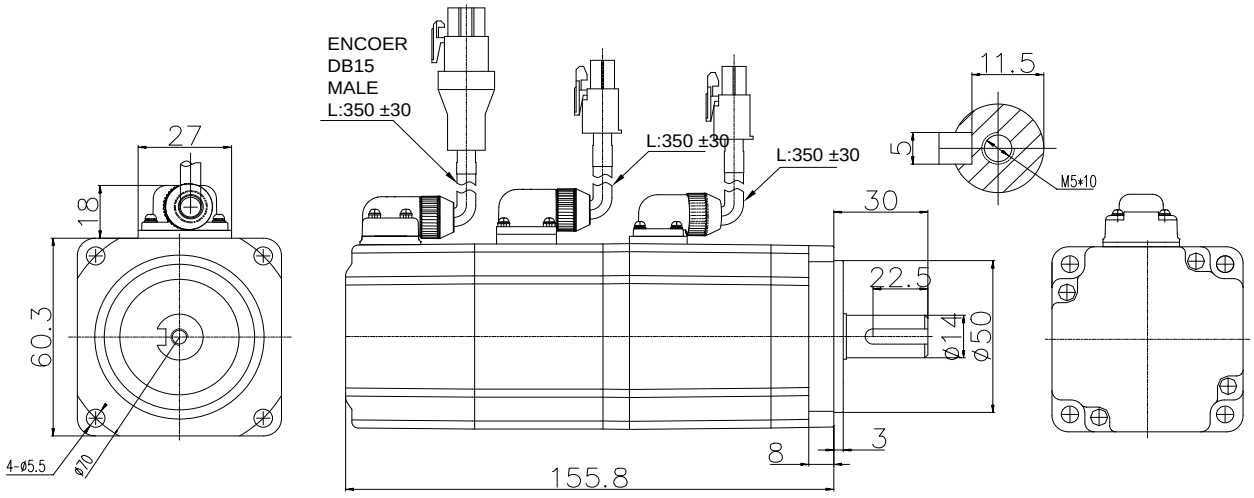

Installation dimension diagram for 100W servo motor with brake (in: mm):



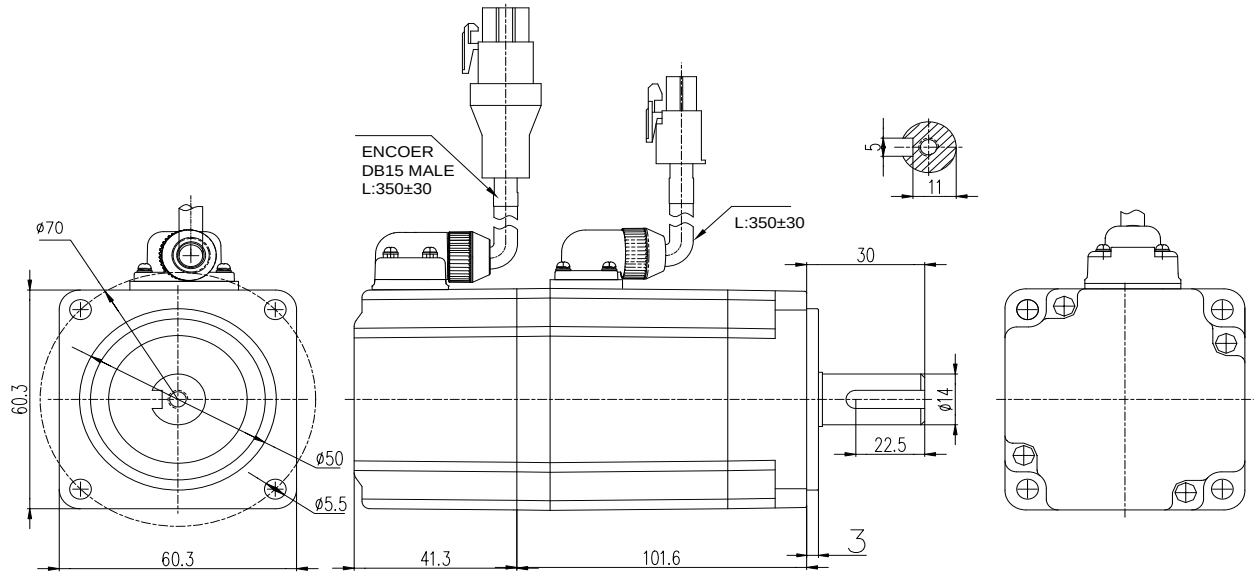

Installation dimension diagram for 200W servo motor without brake (in: mm):



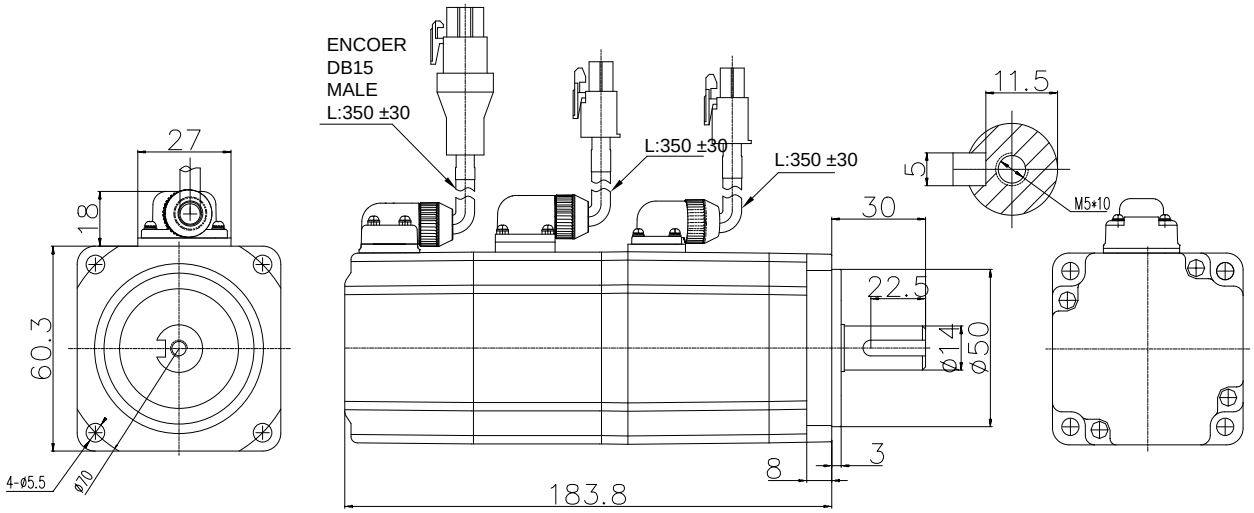
Installation dimension diagram for 200W servo motor with brake (in: mm):



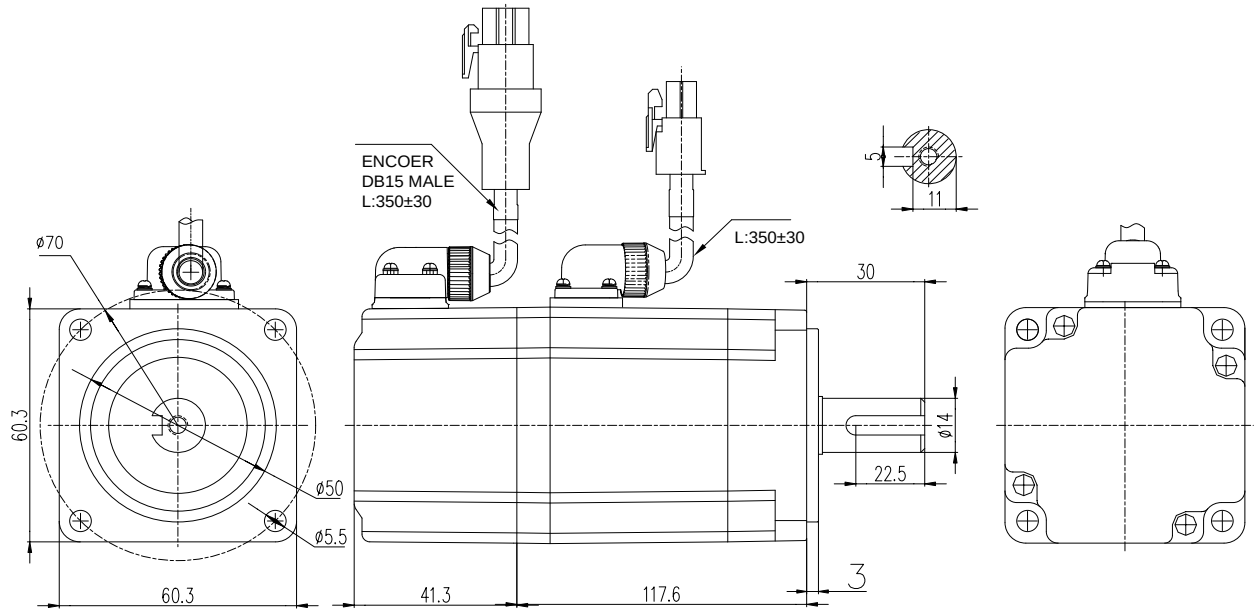

Installation dimension diagram for 400W servo motor without brake (in: mm):



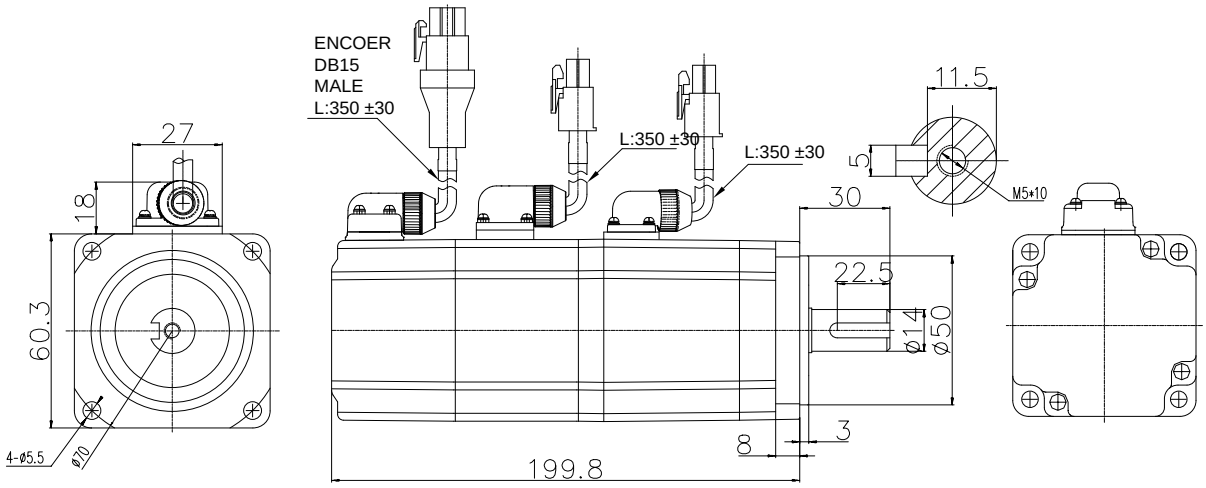

Installation dimension diagram for 400W servo motor with brake (in: mm):



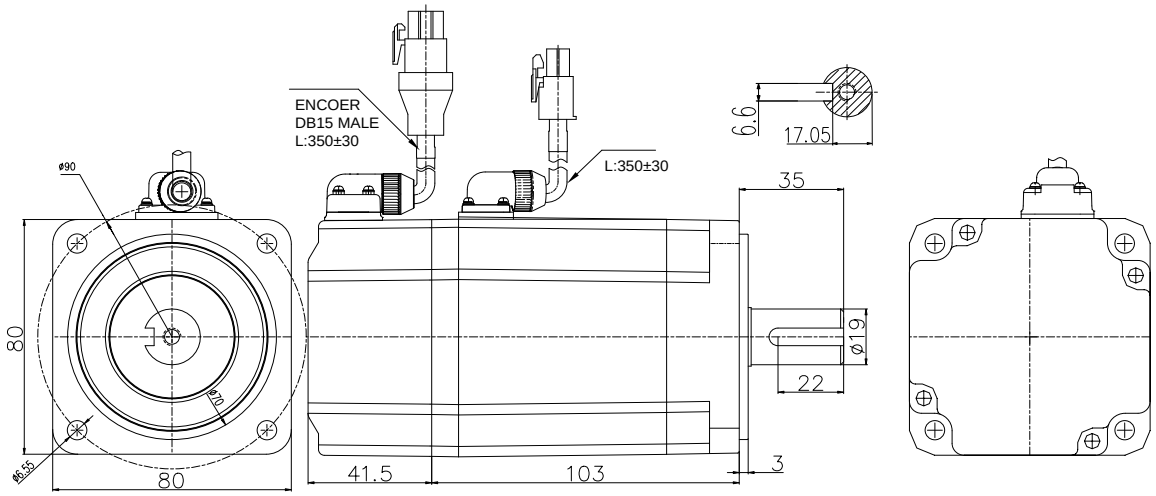
Installation dimension diagram for 600W servo motor without brake (in: mm):



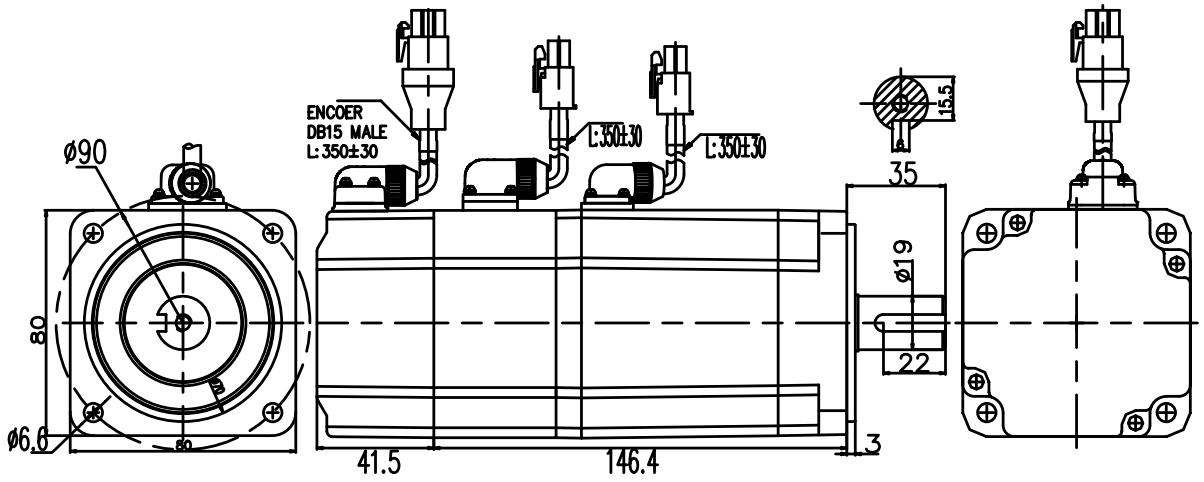

Installation dimension diagram for 600W servo motor with brake (in: mm):



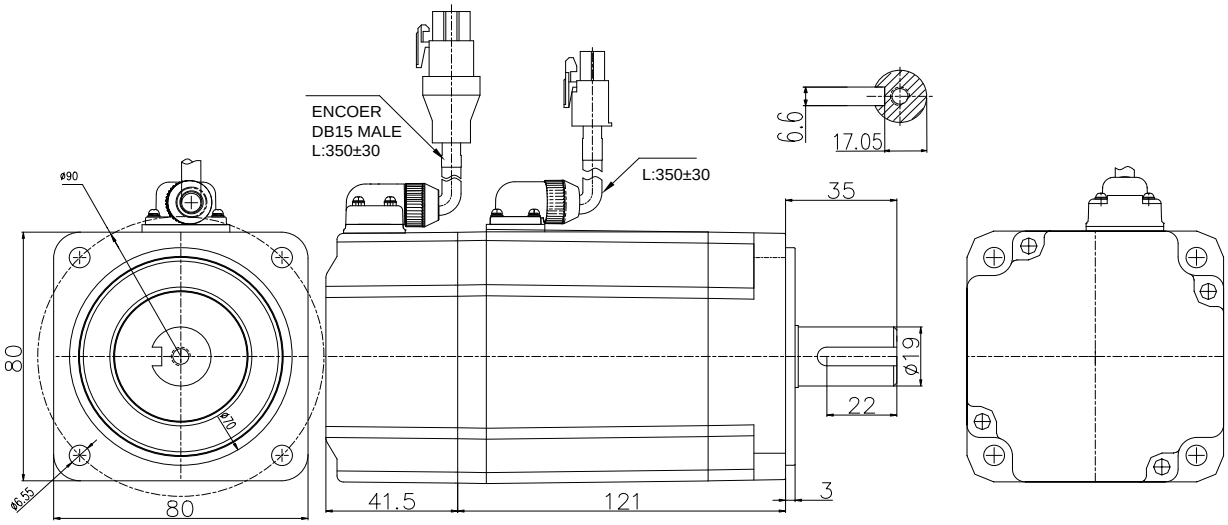

Installation dimension diagram for 750W servo motor without brake (in: mm):



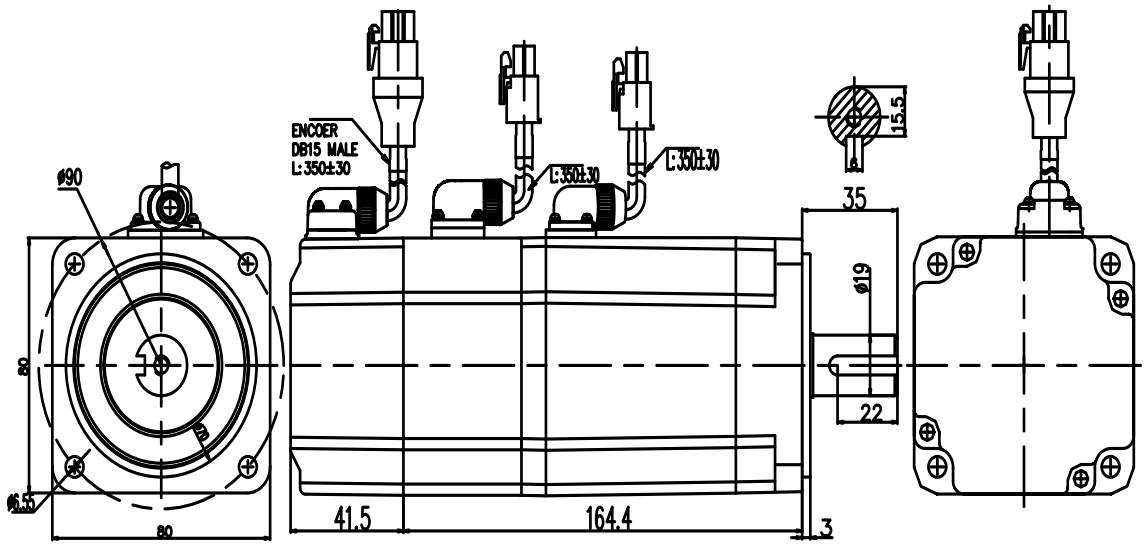
Installation dimension diagram for 750W servo motor without brake (in: mm):




Installation dimension diagram for 1000W servo motor without brake (in: mm):

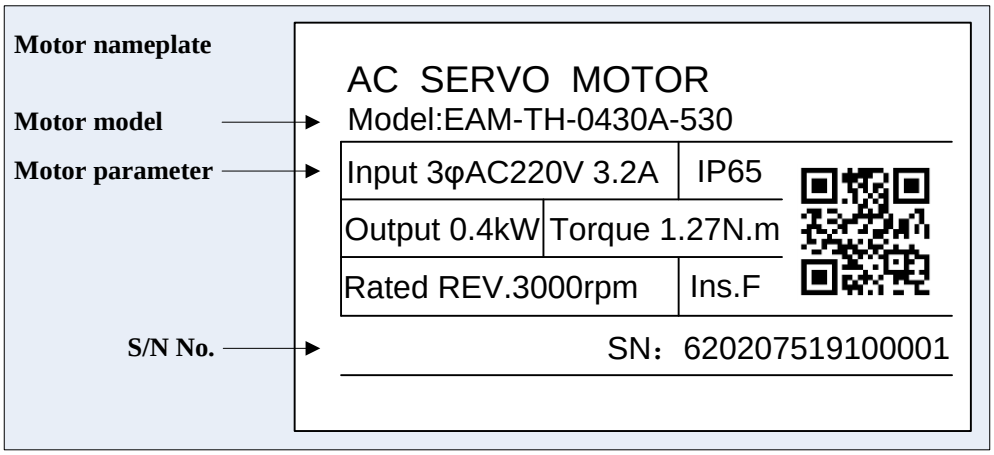



Installation dimension diagram for 1000W servo motor with brake (in: mm):



## 1.2.2 Description on EAM-T series motor

### Description on nameplate of EAM-T series motor




### Specification for mechanical characteristic parameters of motor

| Item | Description |
|---|---|
| **Rated time** | Continuous |
| **Vibration level** | V15 |
| **Insulation resistance** | DC500V，10MΩand above |
| **Operating ambient** | 0～40℃ |
| **Excitation mode** | Permanent magnet type |
| **Installation mode** | Flange type |
| **Heat resisting class** | F level |
| **Isolation voltage** | AC1500V 1min(200V level) |
| **Housing protection mode** | IP65 |
| **Operating ambient** | 20～80%(No condensation) |
| **Connection mode** | Direct connection |
| **Rotation direction** | Counter clockwiserotation (CCW) when viewed from load side under positive rotation command |

## Specification for rating of EAM-T series servo motor

| Model | Base | Rated output (kW)*1 | Rated torque (N.m) | Max torque (N.m) | Rated current (A) | Max current (A) | Rated velocity (rpm) | Max velocity (rpm) | Torque partmeter (N.m/A) | Rotor inertia (10-4kg.m2) | Voltage (V) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EAM-TH-0130A-53* | 40 | 0.1 | 0.32 | 0.96 | 1.1 | 3.3 | 3000 | 6000 | 0.306 | 0.048 (0.051) | 220 |
| EAM-TH-0230A-53* | | 0.2 | 0.64 | 2.23 | 1.9 | 6.6 | | 6500 | 0.33 | 0.29 (0.31) | |
| EAM-TH-0430A-53* | | 0.4 | 1.27 | 4.46 | 3.2 | 11.2 | | 6500 | 0.4 | 0.56 (0.58) | |
| EAM-TH-0830A-53* | | 0.75 | 2.39 | 8.36 | 5.1 | 17.8 | | 6500 | 0.465 | 1.56 (1.66) | |

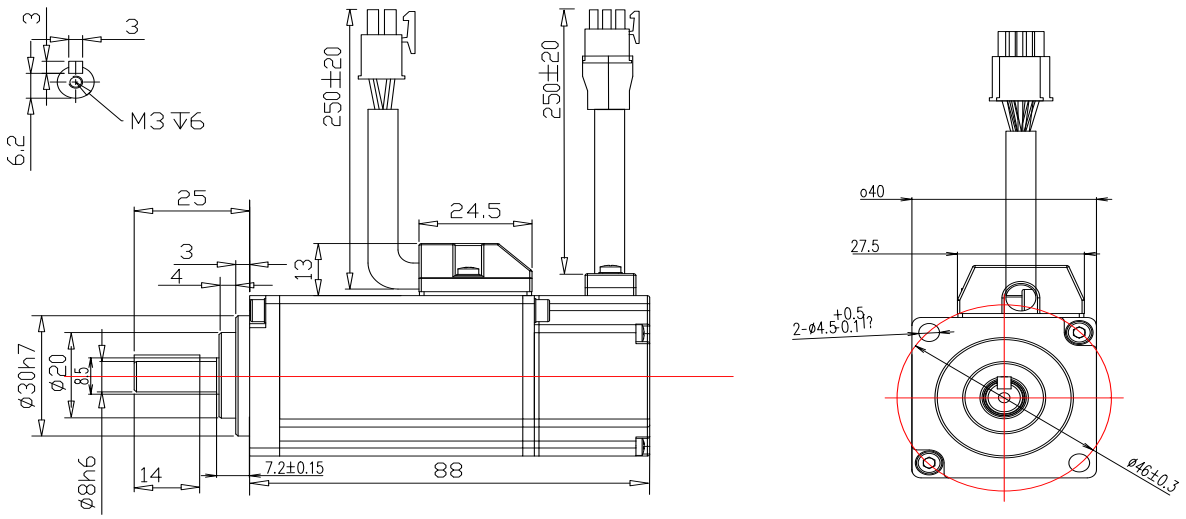
Note: The data in brackets refer to relevant parameters of the brake motor.

## Electrical specification for brake of EAM-T series brake motor:

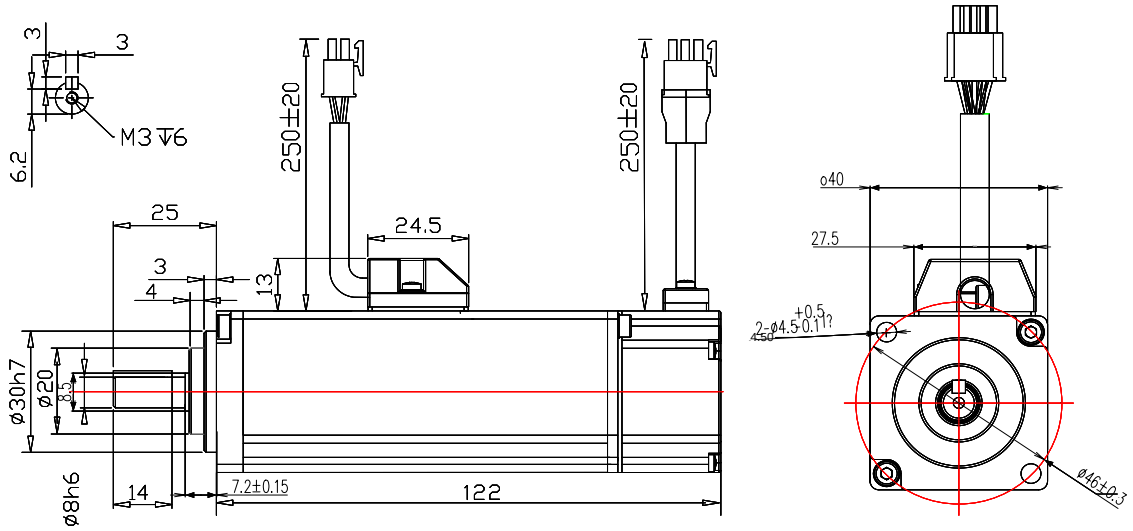
| Motor model | Power supply voltage (V) ±10% | Disengaging time (ms) | Engaging time(ms) | Rated power(W) | Brake holding torque(N.m) |
|---|---|---|---|---|---|
| EAM-TF-0130A-532 | DC24 | 20 | 60 | 6.1 | ≥0.32 |
| EAM-TH-0230A/0430A-532 | | 20 | 60 | 7.6 | ≥1.5 |
| EAM-TH-0830A-532 | | 20 | 60 | 8.5 | ≥2.5 |

## Installation dimension of EAM-T series servo motor

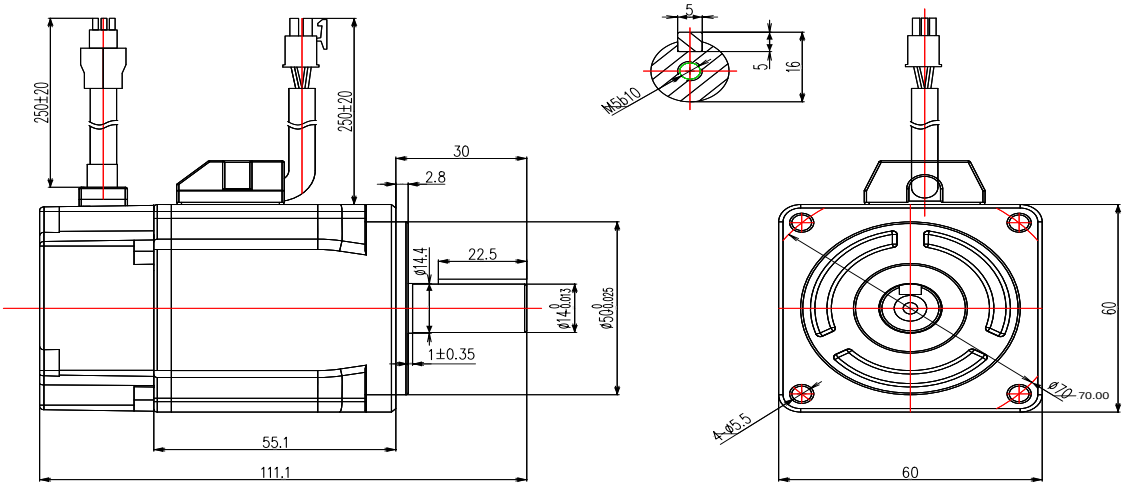
EAM-TF-0130A-530 Installation dimension diagram for 100W servo motor without brake



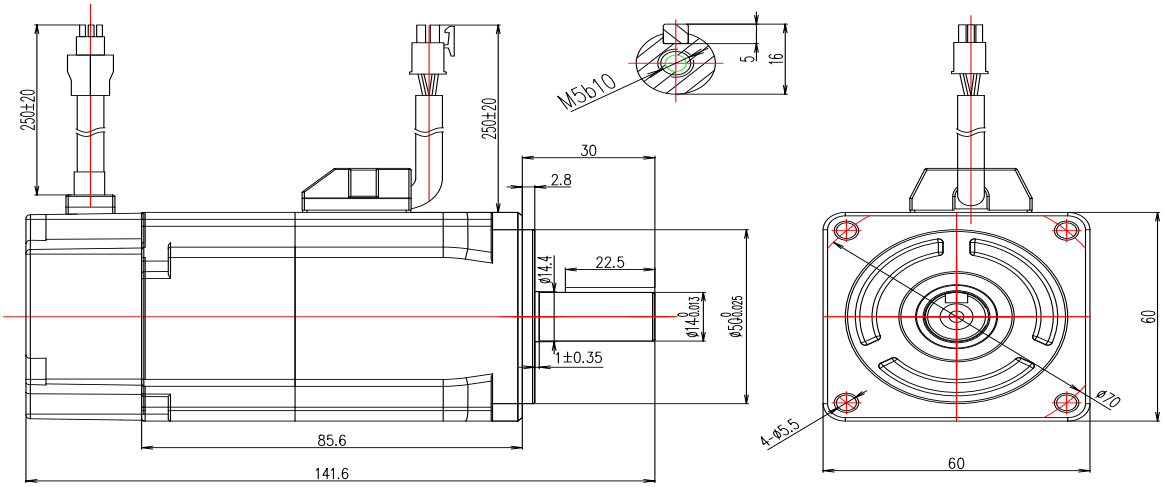
EAM-TF-0130A-532 Installation dimension diagram for 100W servo motor with brake



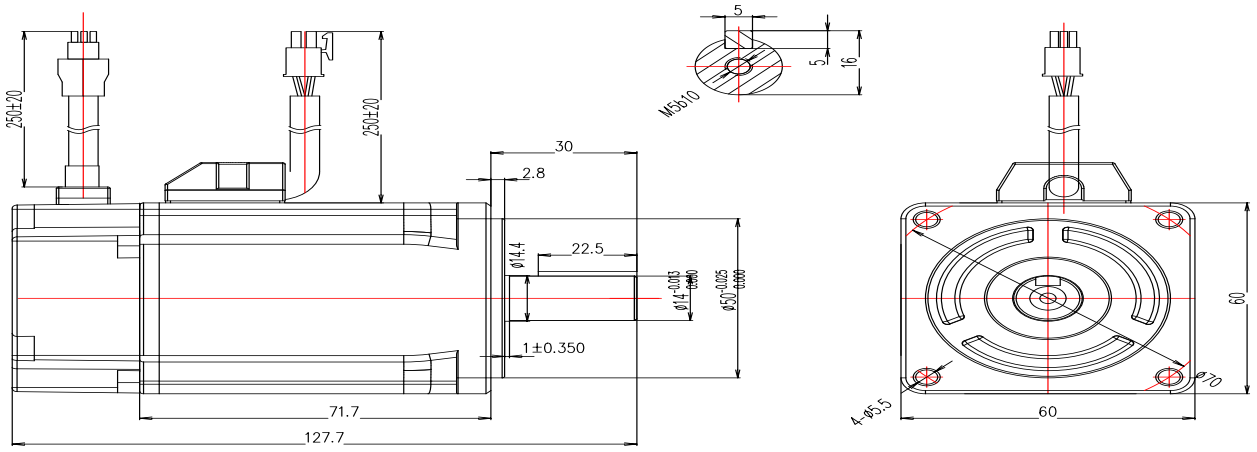

EAM-TH-0230A-530 Installation dimension diagram for 200W servo motor without brake:



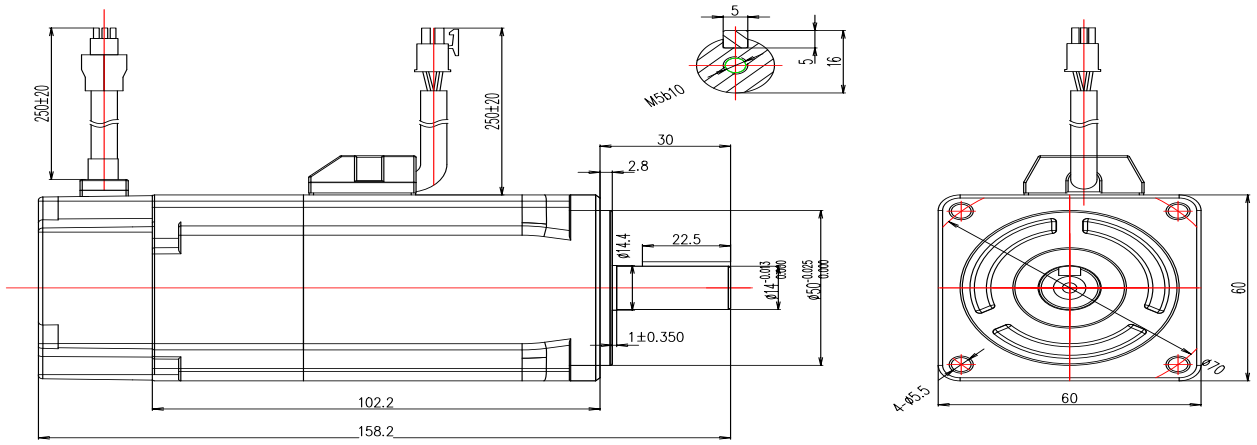

EAM-TH-0230A-532 Installation dimension diagram for 200W servo motor with brake:



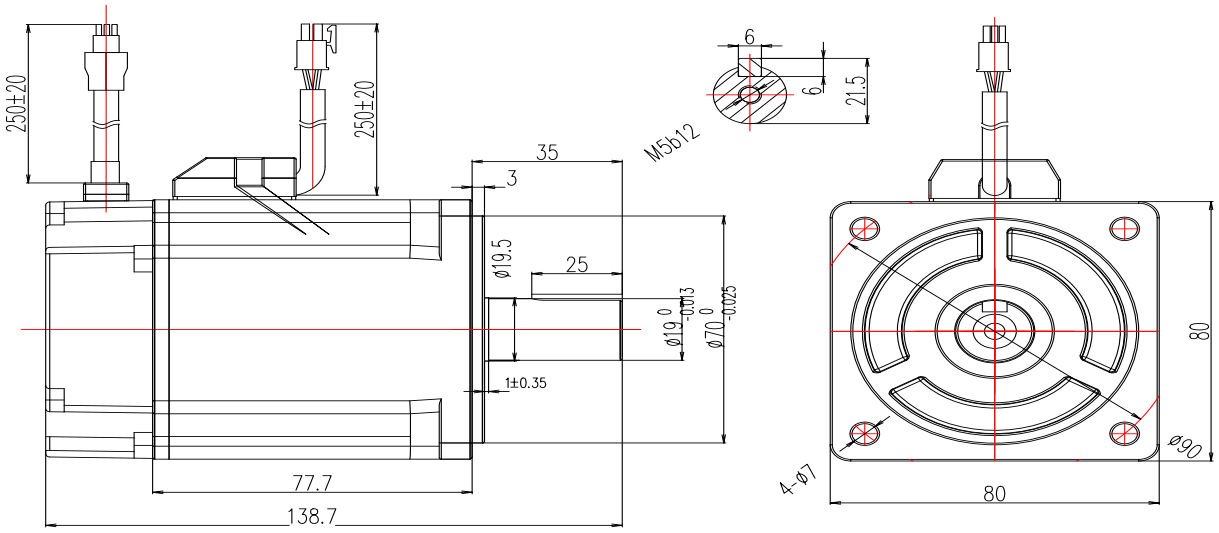
EAM-TH-0430A-530 Installation dimension diagram for 400W servo motor without brake



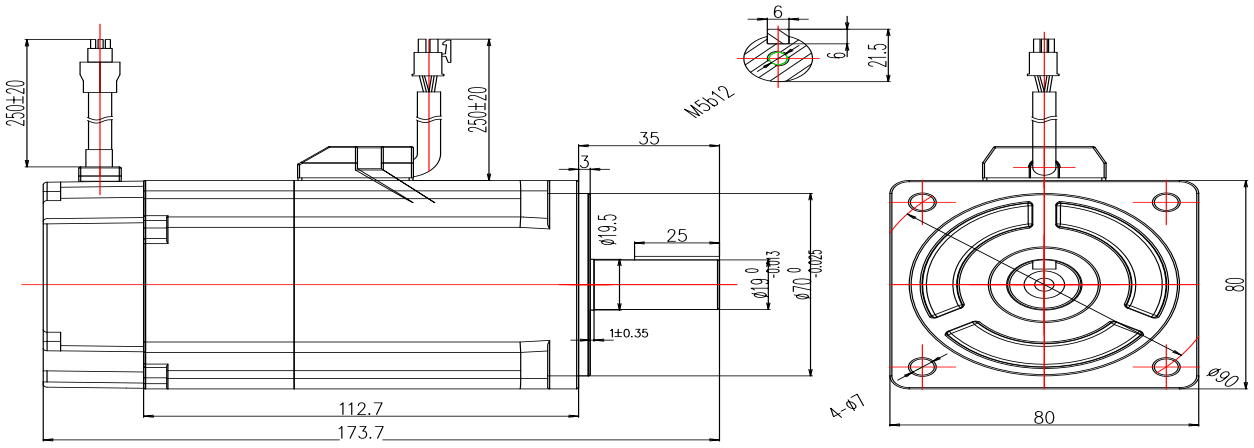

EAM-TH-0430A-532 Installation dimension diagram for 400W servo motor with brake




EAM-TH-0830A-530 Installation dimension diagram for 750W servo motor without brake (in mm):



EAM-TH-0830A-532 Installation dimension diagram for 750W servo motor without brake：




## 1.3 List of servo unit and servo motor combinations

| Servo motor model | | Power | Servo driver model | |
|---|---|---|---|---|
| EAM-SF<br>EAM-TF<br>EAM-TH | EAM-SF-A530A | 50W | TDS-R* | TDS-R*-PAR70 |
| | EAM-SF-0130A | 100W | | TDS-R*-PAR90 |
| | EAM-SF-0230A | 200W | | TDS-R*-PA1R6 |
| | EAM-SF-0430A | 400W | | TDS-R*-PA2R8 |
| | EAM-SF-0630A | 600W | | TDS-R*-PA3R8 |
| | EAM-SF-0830A | 750W | | TDS-R*-PA5R5 |
| | EAM-SF-1030A | 1000W | | TDS-R*-PA5R5 |
| | EAM-SF-1230A | 1200W | | TDS-R*-PA7R6 |
| | EAM-SF-1530A | 1500W | | TDS-R*-PA7R6 |
| | EAM-SF-1830A | 1800W | | TDS-R*-PA7R6 |

Note: Please communicate with our technicians when selecting a motor with base 110.

# Chapter 2 Installation Instruction

## 2.1 Installation of servo driver

### Installation site

- Install this product in a control panel within a room free from rain and direct sunlight, and without flammable materials placed around, as it is provided with no waterproof structure.
- Do not use this product in an environment with corrosive gas or liquid.
- Do not use this product in an environment with flammable gas or near combustible materials.
- Do not install this product in a place with high temperature, humidity, dust, cutting fluid, oil mist, metal dust, etc..
- Install this product in a well ventilated, dry and dust-free place.
- Install this product in a vibration-free place.
- Do not use gasoline, diluents, alcohol, acid and alkaline cleaning agent to avoid discoloration or damage of the housing.

### Environmental conditions

| Item | Conditions |
|---|---|
| **Altitude** | The altitude shall be less than 1000m,in case of an altitude of 1000m and above, the product should be derated in use ( to be de-rated by 10% for every 500m increase in altitude) |
| **Atmospheric** | 86kPa~106kPa |
| **Operating temperature** | 0 ~ +55℃ (in case of an ambient temperature of 40-55℃, the average load rate should not exceed 80%) (no condensation * 2) |
| **Save** | -20~85℃ ( no condensation*2 ) |
| **Humidity** | Less than 90%RH ( no condensatio*2 ) |
| **Vibration** | Less than10~60HZ 5.88 $m/s^2$ ( 0.6G ) , less than 20Hz 9.80665 $m/s^2$ ( 1G ) |
| **Impact** | 19.6$m/s^2$ |
| **IP grade** | IP20 |
| **Pollution level** | PD2 |

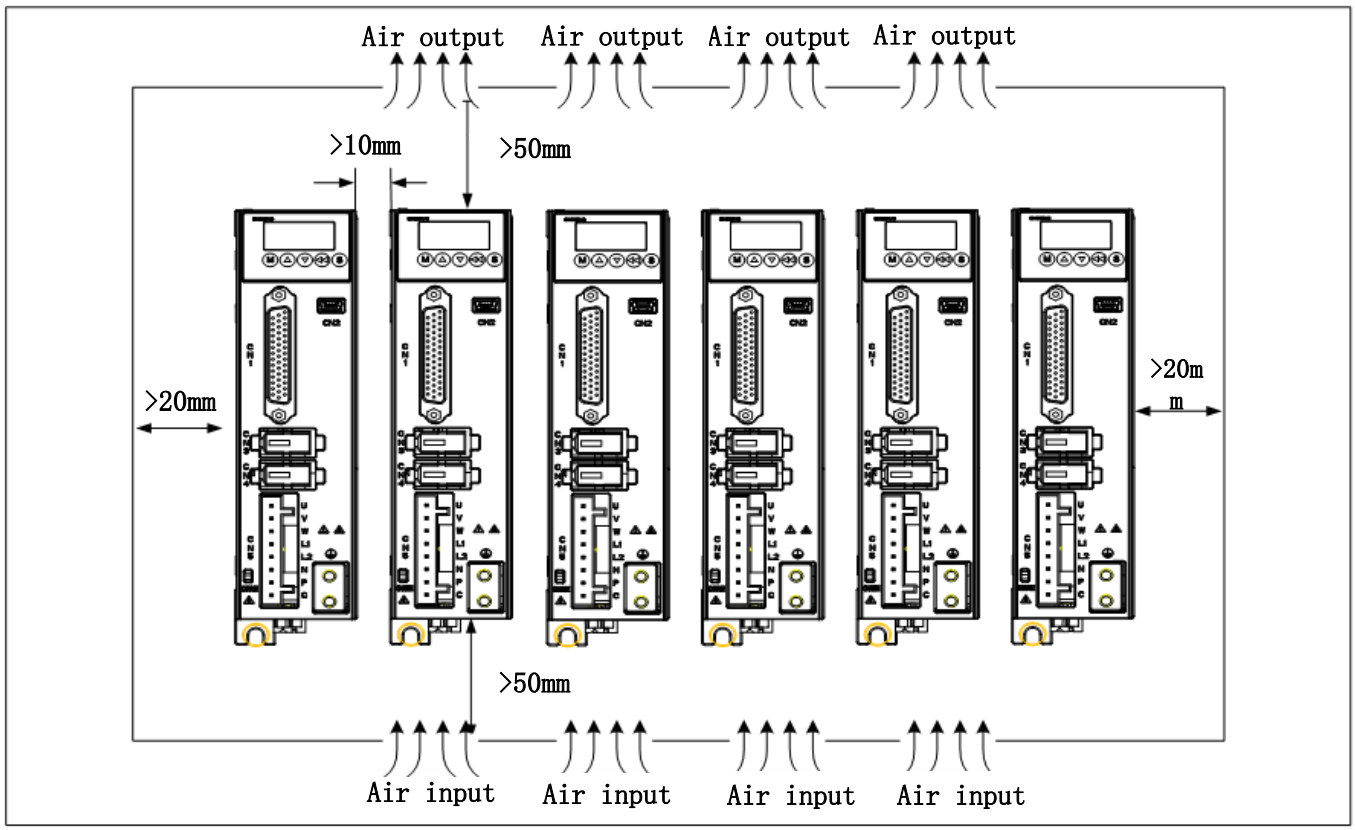
*1 Allowable temperature for a short time including transportation factors.

*2Please note that condensation is easy to occur when the temperature decreases and the humidity increases.

# Installation and precaution

## Installation direction

- This product is provided with a vertical structure; please ensure that the drive is installed vertically.。
- The driver shall be firmly fixed on the mounting surface through the mounting hole as shown in the diagram (by M4 mounting screws, with a recommended torque of 1.7~2N-m).




## Cooling

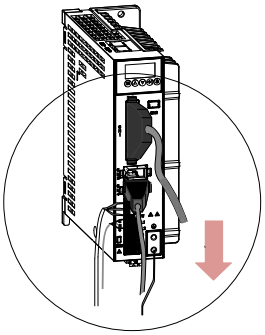
- Please leave enough space around the driver for effective cooling, with a spacing more than 50mm to be preserved above and below the driver, as shown in the above figure, and a lateral spacing of more than 10mm to be maintained in case of multiple drives installed side by side.
- Using the driver in the sealed control box will cause the temperature in the control box to rise abnormally. In order to meet the requirements for the operating temperature range around the driver, please consider configuring a cooling device.

## Grounding

- Be sure to ground the ground terminal. If the grounding is not sufficient, the driver will not only be unable to give full play to its own functions, but also may cause safety problems such as wrong actions due to electric shock or interference.
- When there is a coating on the installation part of the cabinet body corresponding to the driver, please scrape off the coating before installation, which will help prevent noise.

## Wiring

- Please confirm the correct wiring. Improper or wrong wiring will cause the motor to lose control or burn out. In addition, do not let conductive objects such as wire scraps fall into the driver during installation and wiring operations.
- When the wire is bundled and inserted into the metal tube for use, the allowable current of the wire will decrease due to temperature rise, thus causing burns. Please confirm the current reduction factor before selecting wires.
- When using stranded wires, please use insulated rod terminals or insulated round terminals totidy up the wires. If used inan uncluttered state, unexpected accidents or injuries such as electric shock or leakage may occur.
- When wiring the driver, please set the cable downward (asshown inthe right figure) to prevent liquid from flowinginto the driver along the cable, which may cause damage to the driver.



## Others

- Do not apply vibration or impact (more than 5.88 $m/s^2$) to the product, do not place the product in a place where dust, metal scraps, oil mist and other foreign matters accumulate, do not place the product in liquids such as water, oil, cutting fluid, etc., do not allow the product to get close to combustible materials or corrosive gasoline (H2S, SO2, NO2, Cl2, etc.), and avoid storing or using the product in flammable gas and other similar environments.
- The power supply for molded case circuit breaker (MCCB) must be set. In addition, the ground wire terminal or ground wire must be grounded.
- Due to possible wrong actions when turning on the power supply, please do not approach the motor and the machine driven by the driver.
- When running at high velocity, please set a stop time of about 10min when the dynamic brake is activated.
- Please make sure that the terminal bbrake screw and the ground wire screw have been fully tightened.

# 2.2 Installation of servo motor

## Installation site

- Please install the motor in a site that meets the following conditions as its service life will depend on the quality of the installation site.
- Install this motor within a room free from rain and direct sunlight.
- Do not use this product in an environment with corrosive gas or liquid.
- Do not use this product in an environment with flammable gas or near combustible materials.
- Do not install this product in a place with high temperature, humidity, dust, cutting fluid, oil mist, metal dust, etc.
- Please install this product in a place with good ventilation, free from moisture, oil or water intrusion, and away from heat sources.
- Please install this product in a place convenient for inspection and cleaning.
- Please install this product in a vibration-free place.

## Environmental condition

| Item | Conditions |
|---|---|
| **Altitude** | The altitude shall be less than 1000m,in case of an altitude of 1000m and above, the product should be derated in use |
| **Temperature** | 0℃~40℃(No condensation) |
| **Save temperature** | -20℃~60℃(Maximum temperature guarantee: no condensation at 80℃ for 72 hours) |
| **Humidity** | Less than 90%RH (no condensation) |
| **Vibration** | Less than 49m/s$^2$(5G) when rotating, less than 24.5m/s$^2$(2.5G) when stopping |
| **Impact** | Less than 98m/s$^2$(10G) |
| **IP grade** | IP67(The through part of the axes, except the connecting terminal partof the motor connectorr) |

* 1Ambient temperature refers to the temperature 5cm from the motor.
* 2 Allowable temperature for a short time including transportation factors.

## Installation precaution

### Installation direction

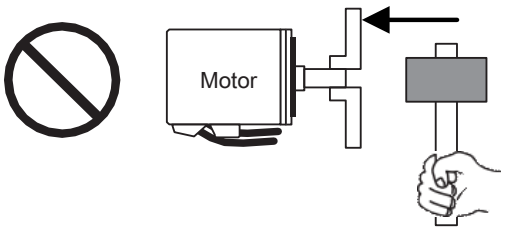
Itis acceptable to install the motor vertically or horizontally, subject to the following requirements.

① Horizontal installation

Turn the cable outlet downward to prevent oil and water from penetrating into the motor.

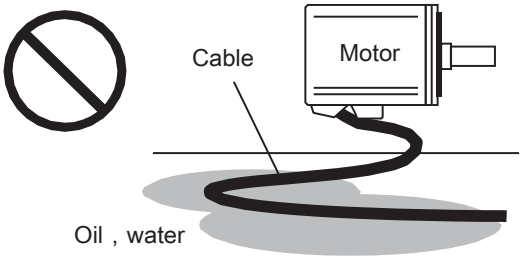
② Vertical installation

When a motor with reducer is installed axially, please use a motor with oil seal to prevent the reducer oil from penetrating into the motor.




## Mechanical coupling

- When installing or removing the coupling at the shaft end of the motor, do not directly strike the shaft end with a hammer(If installed at the shaft end on the negative load side, the encoder will be damaged).
- Sufficient coaxiality shall be required (otherwise vibration or damage to bearings and encoders may occur).
- When the motor shaft is running without grounding, depending on the condition of the motor and the installation environment, electrical corrosion and excessive bearing sound may occur on the motor bearing, which should be confirmed and checked.



## Oil and water protection

- Do not use cables in oil or water.
- Please set the cable outlet downward.
- Do not use in an environment where oil and water often splash down on the motor body.
- When used in combination with reducer, please use a motor with oil seal to prevent oil from penetrating into the motor from the extension of the shaft.

## Stress of cable

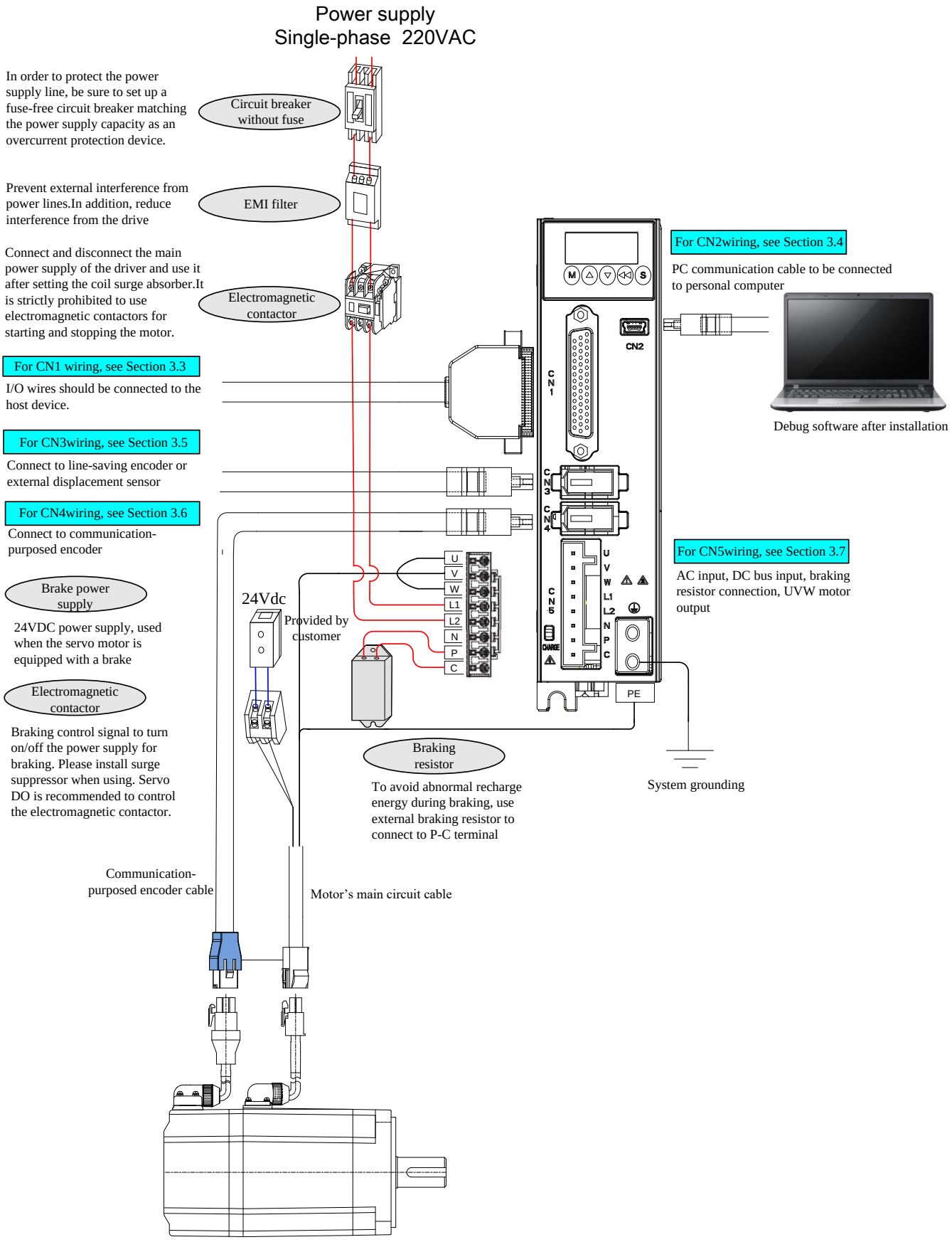
- Do not stress the outgoing and connecting part of the cable due to bending and self weight.
- Especially when moving the motor, use the trunk cable which can be stored in the cable tray. Minimize the bending stress of the cable.
- Increase the bending radius of the cable as much as possible, and make sure it is more than 10 times of the cable processing outer diameter.

## Connection

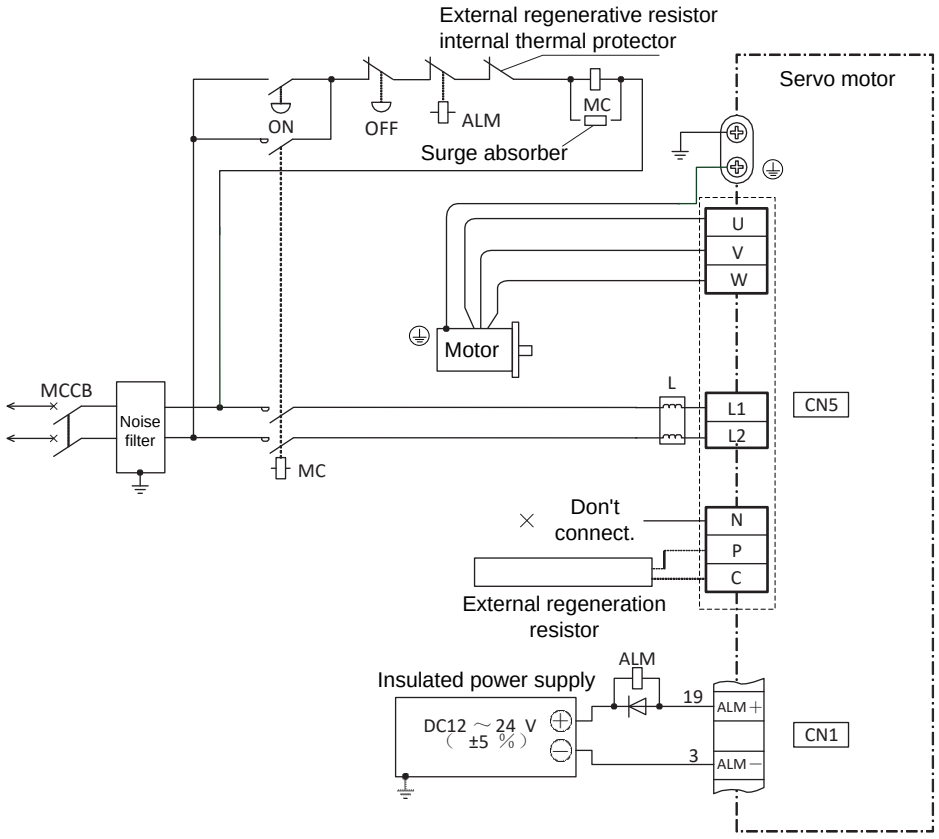
- During installation and wiring operation, do not let conductive objects such as wire chips fall into the connector.
- During wiring, make sure that the connector pins are correctly arranged.
- Please fully avoid the stress applied to the connector due to the bending of the cable, which may cause damage to the connector.
- Please make sure that the grounding of the motor is reliably connected with the driver to prevent noise or wrong action due to electric shock or other safety issues.

# Chapter 3 Peripheral Devices and Wiring

## 3.1 Diagram for wiring of peripheral devices



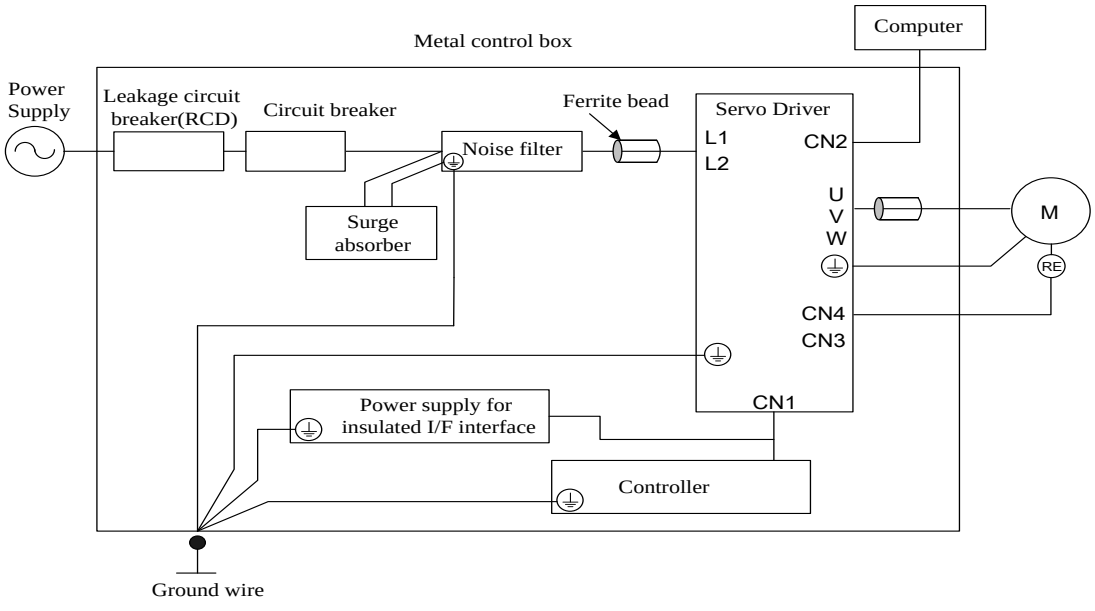
## Description on system wiring and key points

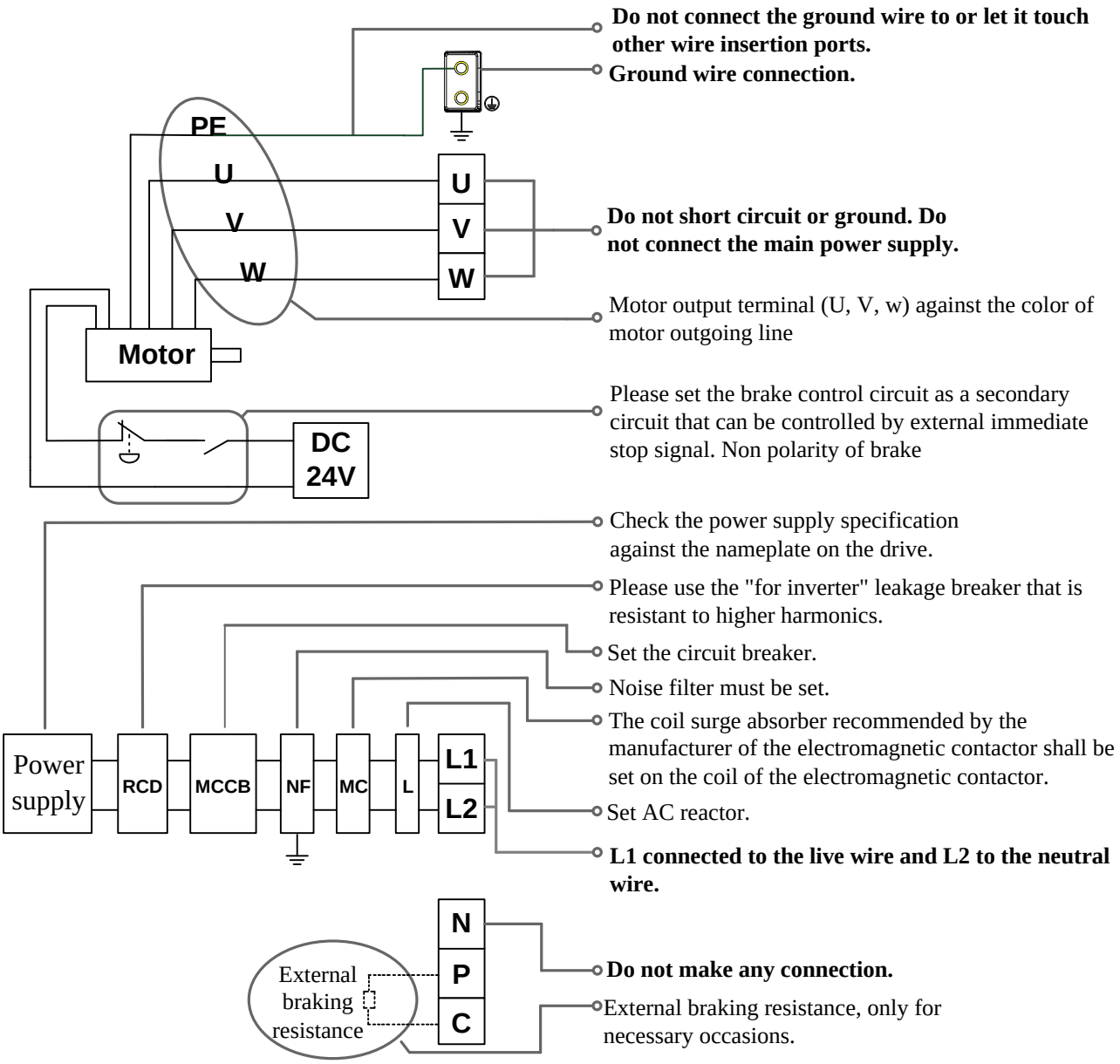



## Key points of wiring:

- Wiring operations shall be carried out by electrical engineering experts.
- Do not switch on the power supply before the wiring operation is finished, so as to avoid electric shock accidents.
- Please note that connector CN5 has high voltage to avoid electric shock.
- Please make sure the connector is inserted until a sound indicating that it get locked.

**In order to ensure a good EMC environment, be sure to use a single point grounding mode as shown in the figure**






**Do not connect the ground wire to or let it touch other wire insertion ports.**

**Ground wire connection.**

**Do not short circuit or ground. Do not connect the main power supply.**

Motor output terminal (U, V, w) against the color of motor outgoing line

Please set the brake control circuit as a secondary circuit that can be controlled by external immediate stop signal. Non polarity of brake

Check the power supply specification against the nameplate on the drive.

Please use the "for inverter" leakage breaker that is resistant to higher harmonics.

Set the circuit breaker.

Noise filter must be set.

The coil surge absorber recommended by the manufacturer of the electromagnetic contactor shall be set on the coil of the electromagnetic contactor.

Set AC reactor.

**L1 connected to the live wire and L2 to the neutral wire.**

**Do not make any connection.**

External braking resistance, only for necessary occasions.

## 3.2 Selection of cable and peripheral accessories

**List of cable supporting driver and motor**

| Model of Servo Motor | Name | Type | Long(L) | Order type |
|---|---|---|---|---|
| **EAM-SF/TF/TH-A5,01,02, 04,06,08,10 50W,100W,200W,400W, 600W,750W,1000W** | Motor main circuit cable | Motor with brake | 3m | EL-MSA00-03-E<br>EL-MMA00-03-E |
| | | | 5m | ELMSA00-05-E<br>EL-MMA00-05-E |
| | | | 10m | ELMSA00-10-E<br>EL-MMA00-10-E |
| | | | 20m | EL-MSA00-20-E<br>EL-MMA00-20-E |
| | | Motor without brake | 3m | EL-MMA00-03-E |
| | | | 5m | EL-MMA00-05-E |
| | | | 10m | EL-MMA00-10-E |
| | | | 20m | EL-MMA00-20-E |
| | Encoder cable | 2500 line-saving encoder cable | 3m | EL-PE700-03-E |
| | | | 5m | EL-PE700-05-E |
| | | | 10m | EL-PE700-10-E |
| | | | 20m | EL-PE700-20-E |
| | | Communication incremental encoder cable | 3m | EL-PI700-03-E |
| | | | 5m | EL-PI700-05-E |
| | | | 10m | EL-PI700-10-E |
| | | | 20m | EL-PI700-20-E |
| | | Communication absolute value encoder cable | 3m | EL-PA700-03-E |
| | | | 5m | EL-PA700-05-E |
| | | | 10m | EL-PA700-10-E |
| | | | 20m | EL-PA700-20-E |

**Servo option**

| Model of Servo Motor | Name | Order |
|---|---|---|
| **EAM-SF/TF/TH-A5,01, 02,04,06,08,10 50W,100W,200W, 400W,600W,750W,1kW** | Standard cable connector for motor main circuit | EU-M00 |
| | Cable connector for electric motor main circuit | EU-M01 |
| | 2500 line saving encoder cable connector | EU-P00 |
| | Communication absolute encoder cable | EU-P01 |
| | Battery options | EU-B00 |

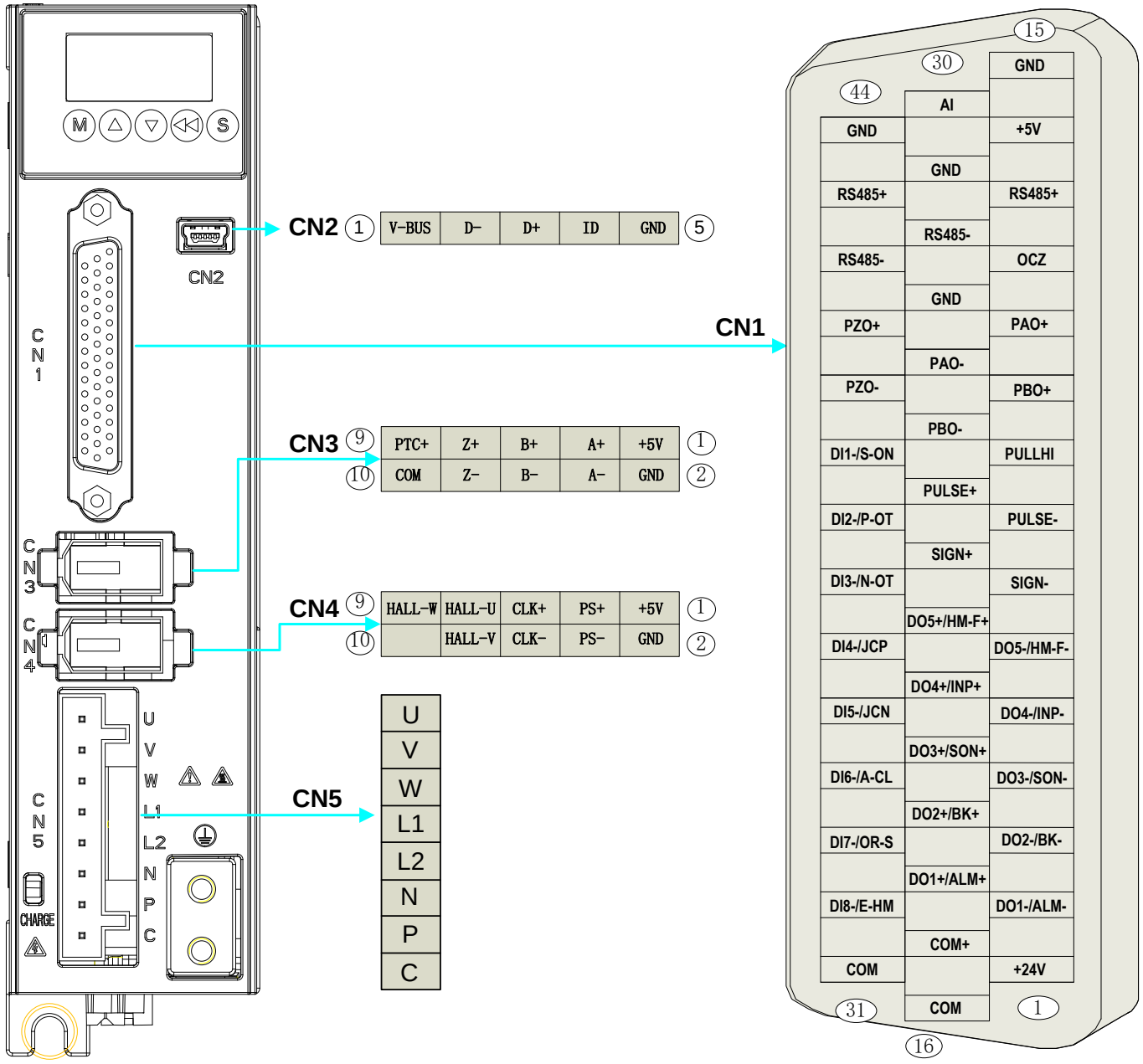
## Communication cable option

| Model | Description |
|---|---|
| **EL-CN700-01-E** | PC communication cable of servo driver |
| **EL-CN01-A3-E** | Multi-machine parallel communication cable for servo driver |

## Control cable option

| Model | Description |
|---|---|
| **EL-CA700-01-E** | Servo CN1 I/O signal cable |
| **EU-C01** | Servo CN1 terminal accessories |

## Description on definition of driver terminal



Description on CN1 Pins

| Pin No. | Name | Abbreviation | Description |
|---|---|---|---|
| 1 | Internal 24V Power Supply Positive | +24V | It is only used for internal DI and pulse input pull-up, and cannot supply power to external relay brake etc. |
| 2 | Digital Output 1 (Negative) | DO1- | Digital output can be freely configured with functions and output logic according to user'srequirements.When wiring, if relay needs to add freewheeling diode, if opt coupler accepts, it needs to connect current limiting resistor. Incorrect wiring will cause the DO port hardware to burn out. |
| 3 | Digital Output 2 (Negative) | DO2- | |
| 4 | Digital Output 3 (Negative) | DO3- | |
| 5 | Digital Output 4 (Negative) | DO4- | |
| 6 | Digital Output 5 (Negative) | DO5- | |
| 7 | Pulse Direction Signal (Negative) | SIGN- | Fordifferential input,themaximum frequency is4MHZ and 500KHZ for open-circuited collector. |
| 8 | Pulse Count Signal (Negative) | PULSE- | |
| 9 | Pulse Command Input Internal Resistor Common Terminal | PULLHI | When the pulse connection is open-circuited collector, PNP pin is connected to COM-, and NPN to 24V |
| 10 | Frequency Division Output Phase B (Positive) | PBO+ | The number of pulses output by one revolution of the motor is set by P02.03, and the number of frequency division outputs is set to be the number after 4 times of frequency multiplication. |
| 11 | Frequency Division Output Phase A (Positive) | PAO+ | |
| 12 | Phase Z Open-circuited Collector Output | OCZ | The motor rotates one revolution to output a Z pulse, the level is set by P02.05, and the output is open collector. |
| 13 | 485 Communication (Positive) | RS485+ | RS485+ |
| 14 | 5V Power Supply Reserved by Manufacturer | +5V | The manufacturer reserves 5V power supply, which is forbidden to use. |
| 15 | 5V Power Supply Reference Ground Reserved by Manufacturer | GND | The manufacturer reserves 5V power supply, which is forbidden to use. |
| 16 | Ground Corresponding to 24V | COM- | Internal 24V power reference ground. |
| 17 | DI Common Input | COM+ | When DI uses internal 24V power supply, this |

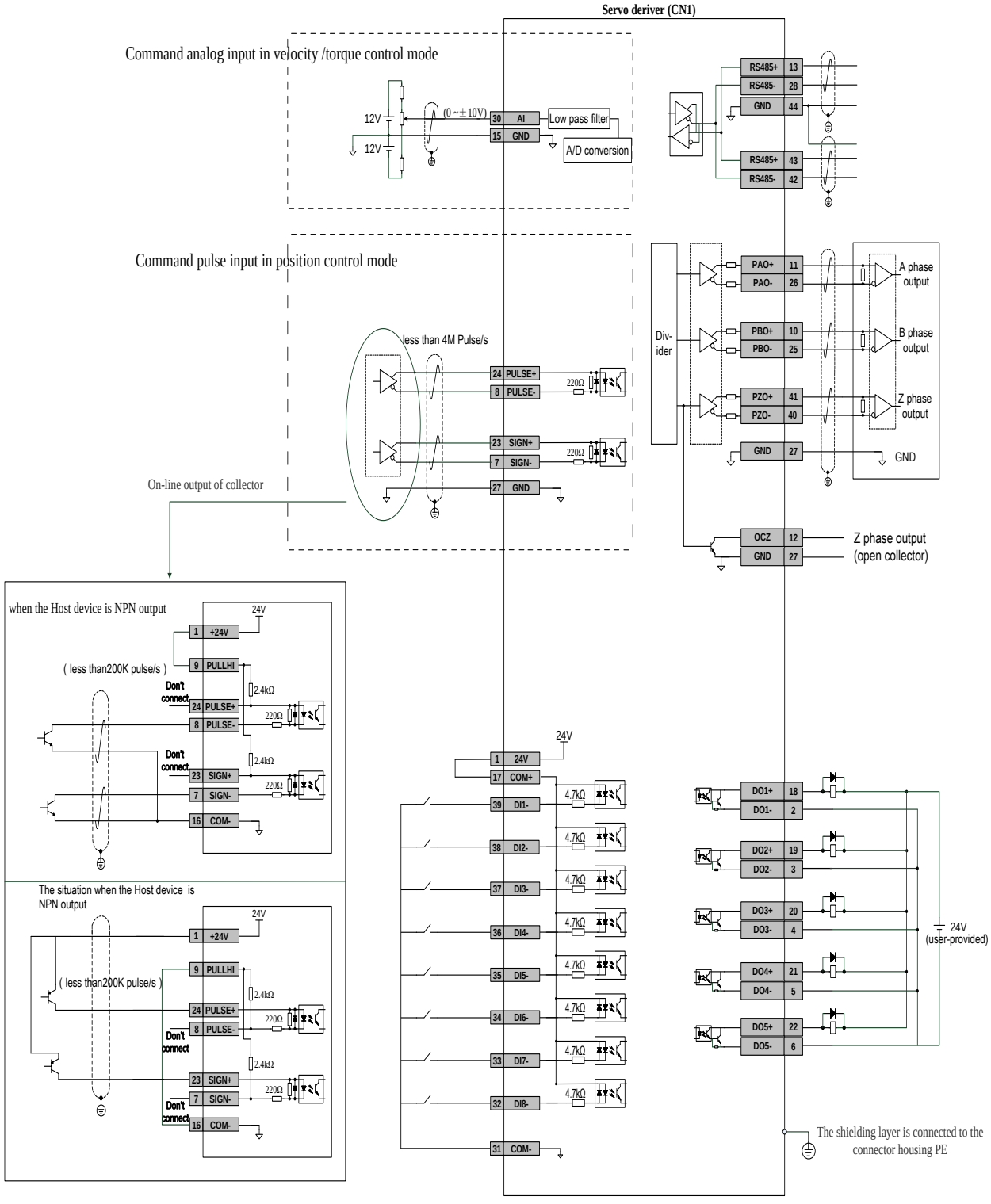
| Pin No. | Name | Abbreviation | Description |
|---|---|---|---|
| | Terminal | | pin is short circuited to internal 24V pin (1). |
| 18 | Digital Output 1 (Positive) | DO1+ | For digital output, functions and output logic can be freely configured according to user's requirements.<br>When wiring, if the relay needs to be added with freewheeling diode, such as optocoupler, it needs to be connected with current limiting resistor.<br>Incorrect wiring will cause the DO port hardware to burn out |
| 19 | Digital Output 2 (Positive) | DO2+ | |
| 20 | Digital Output 3 (Positive) | DO3+ | |
| 21 | Digital Output 4 (Positive) | DO4+ | |
| 22 | Digital Output 5 (Positive) | DO5+ | |
| 23 | Pulse Direction Signal (Positive) | SIGN+ | Incaseof differential input, the maximum frequency is 4MHZ, and 500KHZ for open-circuited collector. |
| 24 | Pulse Count Signal (Positive) | PULSE+ | |
| 25 | Frequency Division Output Phase B (Negative) | PBO- | The number of pulses output for one revolution of the motor is set by P02.03, and the number of frequency division outputs is set to be the number after 4 times of frequency multiplication. |
| 26 | Frequency Division Output Phase B (Negative) | PAO- | |
| 27 | Signal Ground | GND | When the pulse command input is in differential mode, the signal ground is connected with the signal ground of the upper computer, and the pulse frequency division output signal ground is connected with the signal ground of the upper computer. |
| 28 | 485 Communication (Negative) | RS485- | RS485- |
| 29 | Analog Output Reference Ground | GND | Analog output reference ground. |
| 30 | Analog Input | AI | The other end of the analog input channel is connected to pin 29. |
| 31 | Internal 24V Power Reference Ground | COM- | Internal 24V power reference ground |
| 32 | Digital Input 8 | DI8 | For digital quantity input, functions and input level logic can be freely configured according to user's requirements. During wiring, internal 24v or external 24V can be selected according to different working conditions, and different connection modes can be selected according to PNP type and NPN type. |
| 33 | Digital Input 7 | DI7 | |
| 34 | Digital Input 8 | DI6 | |
| 35 | Digital Input 9 | DI5 | |
| 36 | Digital Input 4 | DI4 | |
| 37 | Digital Input 3 | DI3 | |
| 38 | Digital Input 2 | DI2 | |

| Pin No. | Name | Abbreviation | Description |
|---|---|---|---|
| 39 | Digital Input 1 | DI1 | |
| 40 | Frequency Division Output Phase Z(Negative) | PZO- | For one revolution of the motor, a z pulse is output and the level is set by P02.05, with a differential 5V signal to be output. |
| 41 | Frequency Division Output Phase Z (Positive) | PZO+ | |
| 42 | 485 Communication (Negative) | RS485- | Internal connection to pin 28 |
| 43 | 485 Communication (Positive) | RS485+ | Internal connection to pin 13 |
| 44 | RS485 Communication Signal Ground | GND | RS485 Communication Signal Ground |

# 3.3 Wiring of connector CN1

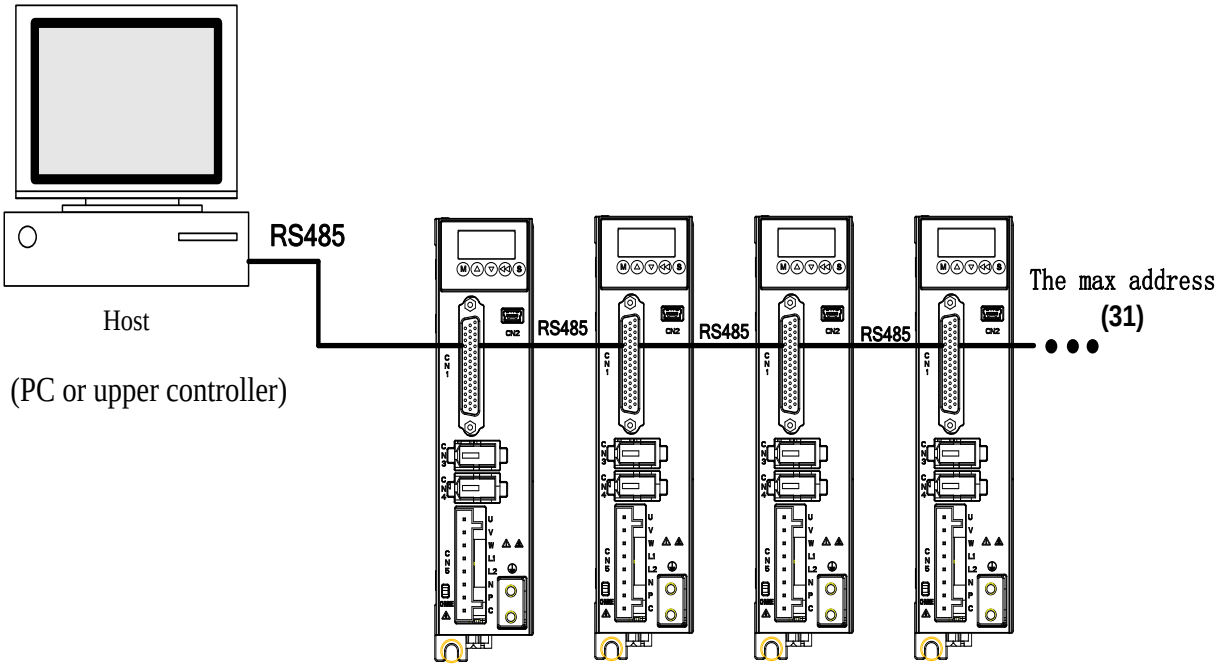
## Connection with upper controller

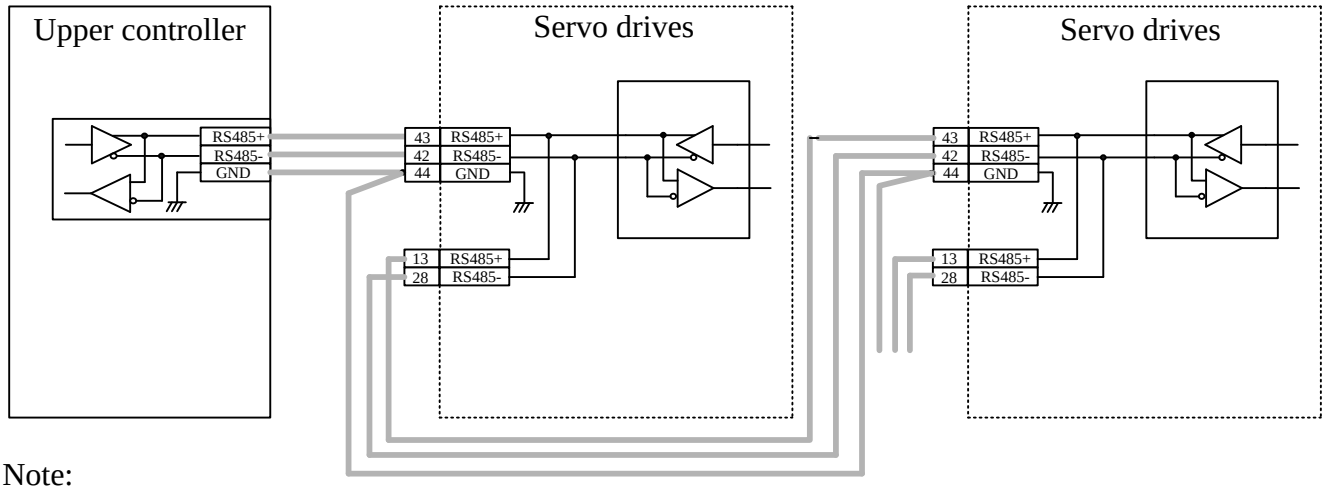
## Example for typical wiring of connector CN1



| Connection of RS485 communication signals | | |
|---|---|---|
| **Symbols** | **Connector pin number** | **Function** |
| **485+** | 43 | RS485 I/O signal |
| **485-** | 42 | |
| **GND** | 44 | RS485 communication station |

RS485 communication is used to connect one host and multiple TDS-R*, with P09.00 for each TDS-R* to be set to the value of 0 ~ 127.




Note:

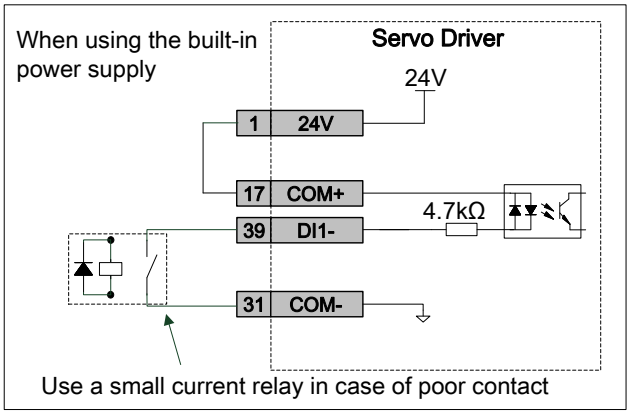
To determine the location of the signals between the servo drives, connect the GND of each drive

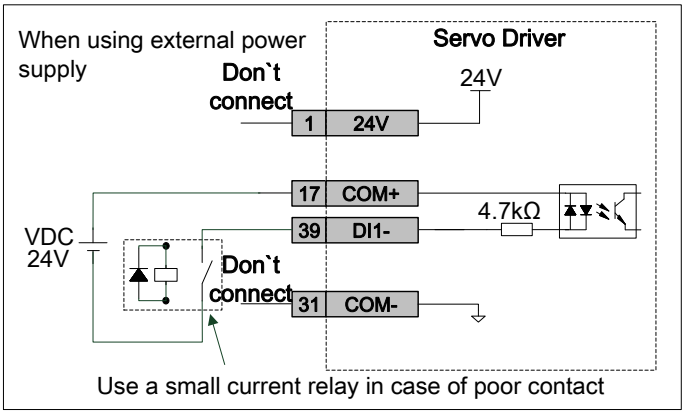
## Connection of control input signal

| Symbol | Function | Connector pin | Description |
|---|---|---|---|
| **DI1** | SRV_ON | 39 | Servo enable |
| **DI2** | POT (Non default) | 38 | Positive limit |
| **DI3** | NOT (Non default) | 37 | Negative limit |
| **DI4** | JogCmdP(Non default) | 36 | Positive jog |
| **DI5** | JogCmdN(Non default) | 35 | negative jog |
| **DI6** | A_Clr (Non default) | 34 | Failure reset |
| **DI7** | ORGP(Non default) | 33 | home switch |
| **DI8** | Execute_Homing(Non | 32 | Trigger homing enable |
| **+24V** | +24V | 1 | Internal 24V power supply, with a voltage range of +20~28V, and a power supply input(12V~24V) |
| **COM-** | COM- | 31 | |
| **COM+** | COM+ | 17 | |

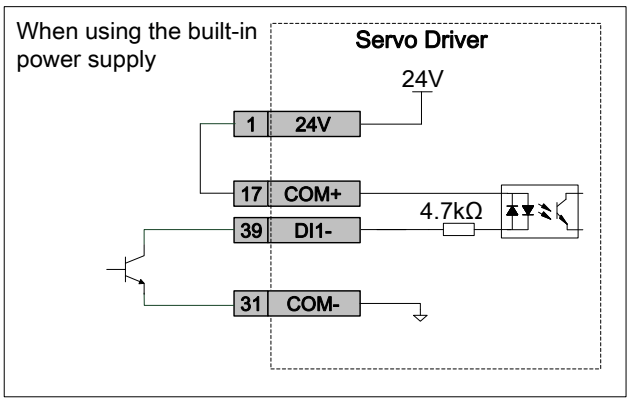
Taking DI1 as an example, other DIs are connected in the same way.

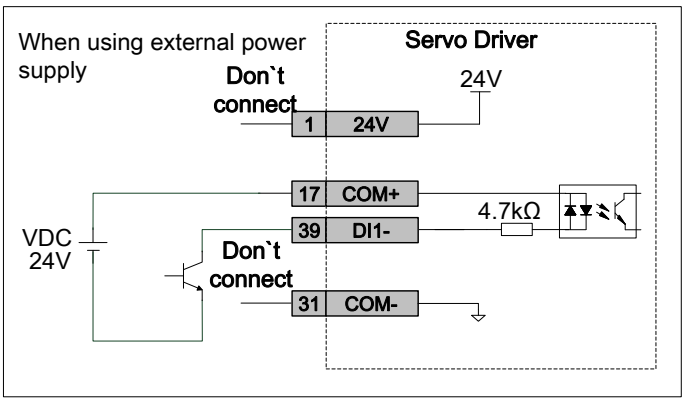
## When the higher-level device is a relay output



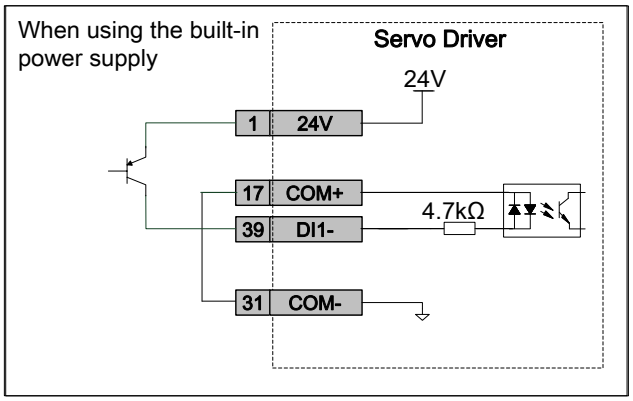



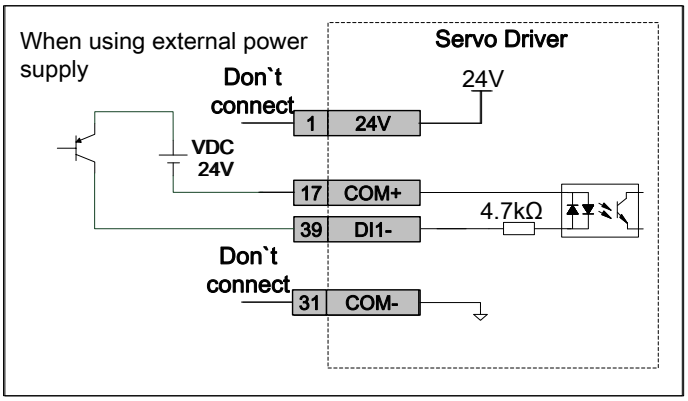

## When the higher-level device is NPN open-circuited collector output



## When the higher-level device is PNP open-circuited collector output




Note: Incompatible with PNP input to be used in combination with NPN input.

## Connection of pulse command input signals

| Symbol | Connector pin | Description |
|---|---|---|
| **PULSE+** | 24 | Pulse instruction input |
| **PULLHI** | 9 | Common terminal of built-in resistor for pulse |
| **GND** | 27 | Signal ground |

The driver is compatible with the long-line driver interface and the open-circuited collector output interface, with the corresponding input maximum frequency and minimum pulse width as shown in the following table:

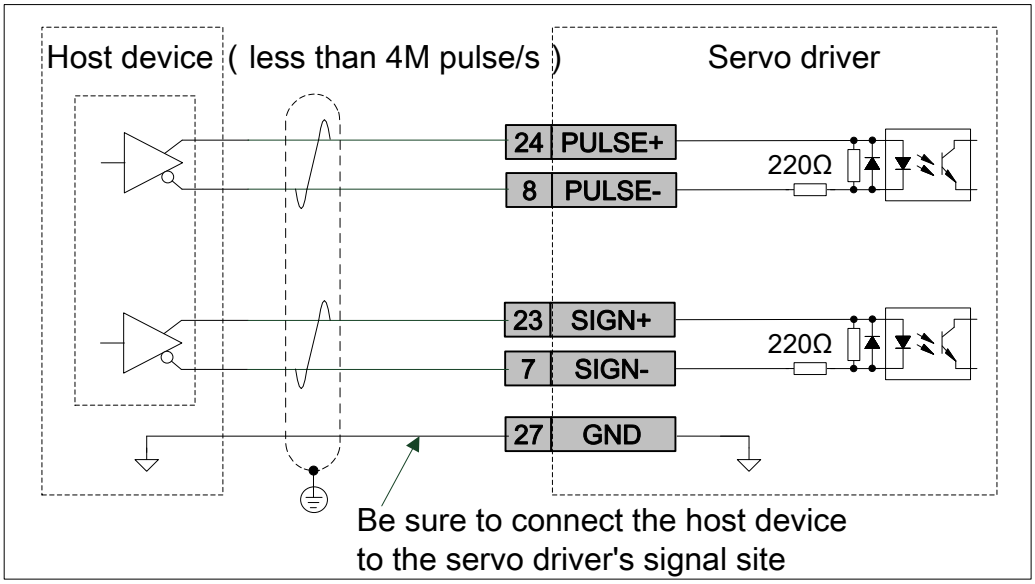
| PULS/SIGN signal pulse input mode | Allowable input maximum frequency | Min necessary pulse width(μs) |
|---|---|---|
| **Open-circuited collector interface** | 200k pulse/s | 2.5 |
| **Long line differential driver** | 4M pulse/s | 0.125 |

Note: If the output pulse width of the upper device is less than the minimum pulse width value, the driver will receive the pulse incorrectly.

In order to reduce the impact of noise, please use twisted pair shielded wire, with the wiring length to be controlled within 1 m.

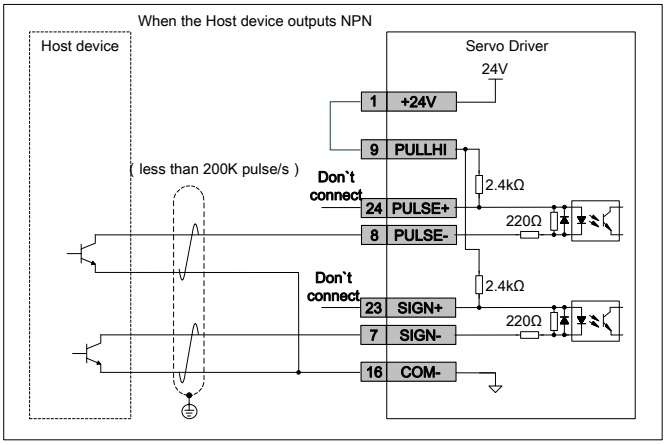
## When the host device is a differential driver output

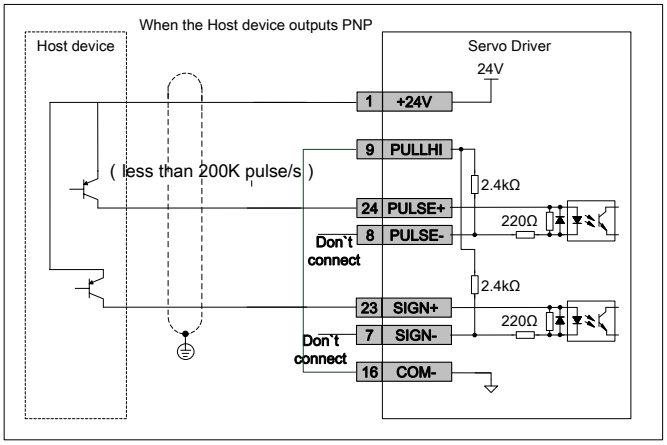
This is a signal transmission mode that is not easily affected by noise, which is therefore recommended to improve the accuracy of signal transmission.



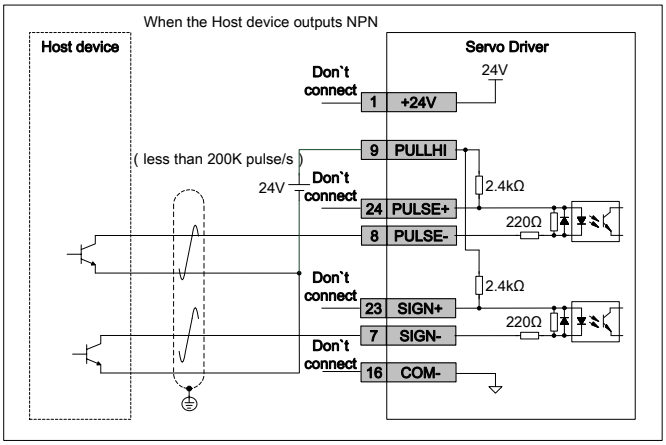

## When the upper device is open-circuited collector

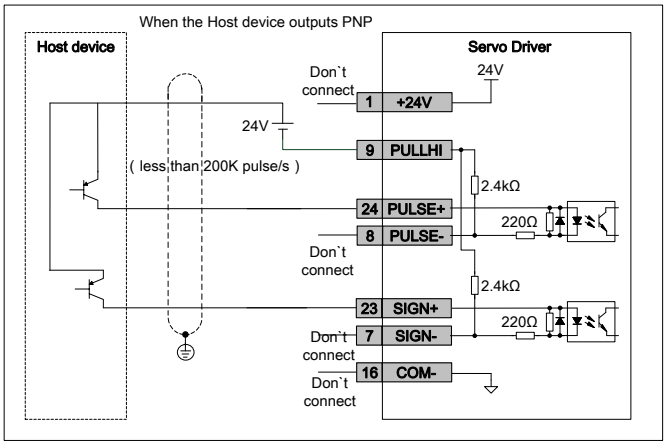
## In case of using the driver's built-in 24V power supply



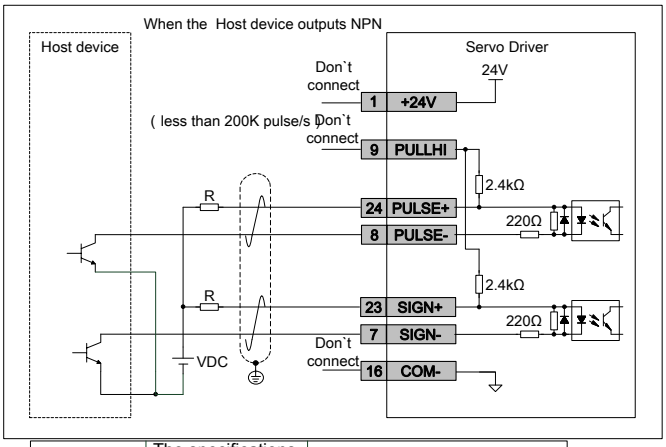



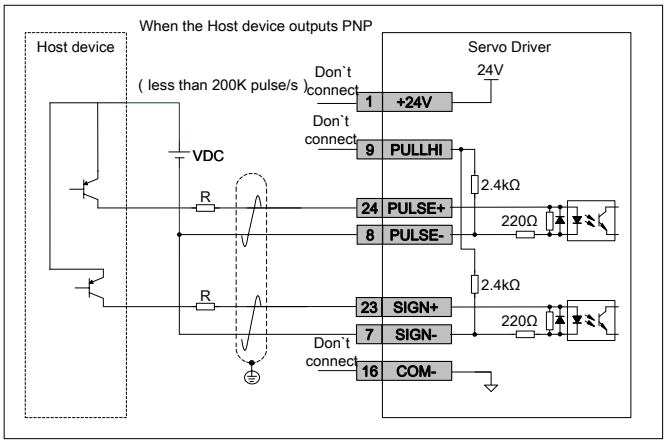

## In case of using an external 24V power supply and the driver's internal resistor



## When using external 12V and 24V power supplies and external resistors



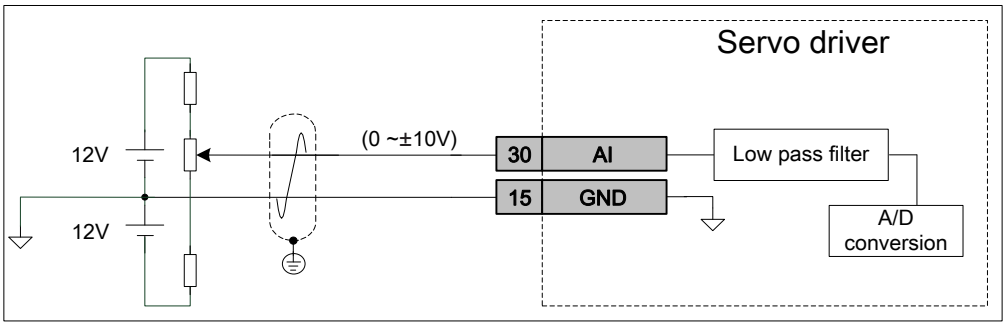




| VDC | The specifications of the R | $\frac{VDC-1.5}{R+220} \leq 10mA$ |
|---|---|---|
| 12V | 820Ω 0.5W | |
| 24V | 2kΩ 0.5W | |

## Connection of analog command input signals

| Symbol | Connector pin | Description |
|---|---|---|
| **AI** | 30 | Ordinary analog input signal, with a resolution of 12 bits and an input voltage of -10V~+10V. |
| **GND** | 29 | Analog input signal ground. |

The corresponding command of Analog input voltage value is set by P05 group.
Maximum allowable input voltage range: -10V~+10V;
A/D conversion resolution: 12bit;
Input impedance: appr 9kΩ.

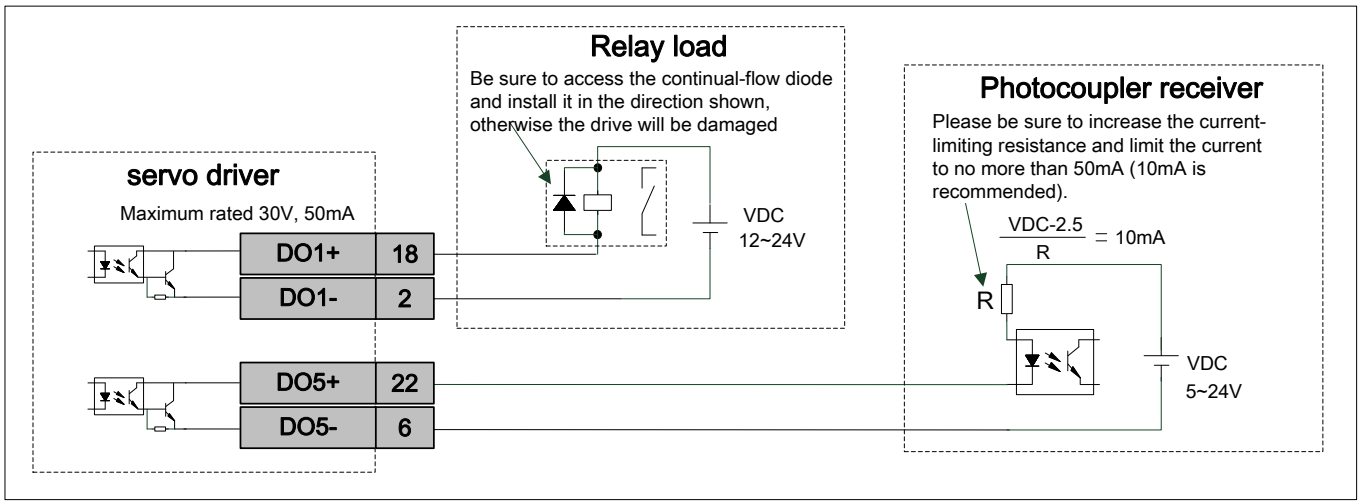



## Connection of control output signal

| Symbol | Function | Connector pin | Description |
|---|---|---|---|
| **DO1+** | Alm+ | 18 | Fault output signal |
| **DO1-** | Alm- | 2 | |
| **DO2+** | Blk+ | 19 | Brake signal |
| **DO2-** | Blk- | 3 | |
| **DO3+** | Son+ | 20 | Servo enable status output |
| **DO3-** | Son- | 4 | |

| | | | |
|---|---|---|---|
| **DO4+** | INP+ | 21 | Positioning OK output |
| **DO4-** | INP- | 5 | |
| **DO5+** | HomeOK+ | 22 | Homing OK output |
| **DO5-** | HomeOK- | 6 | |

Taking DO1 and DO5 as examples,other DOs are connected in the same way.




## Connection of frequency division pulse output signal

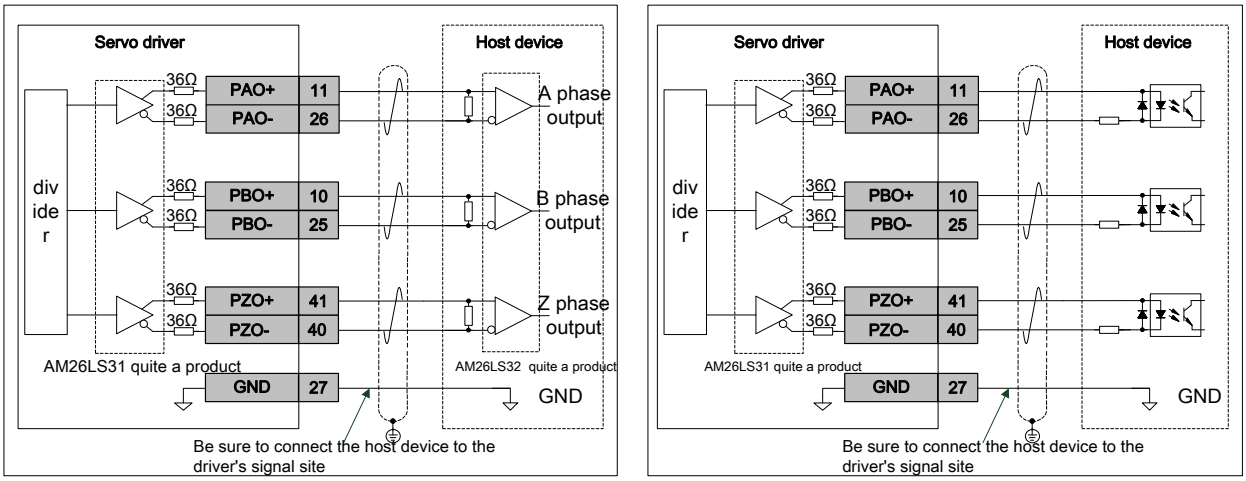
| Symbol | Connector pin | Function |
|---|---|---|
| **PAO+** | 11 | Phase-A frequency division output signal |
| **PBO+** | 10 | Phase-B frequency division output signal |
| **PZO+** | 41 | Phase-Z frequency division output signal |
| **OCZ** | 12 | Phase-Z frequency division output signal |
| **GND** | 27 | Home pulse open-circuited collector output signal ground |
| **+5V** | 14 | Manufacturers-reserved 5V power supply shall not be used |
| **GND** | 15 | |

The driver provides differential driver interface and Z-phase pulse open collector output interface.

## Differential driver output

The encoder signal outputs (A phase, B phase, Z phase) after frequency division processing are differentially output through a long-line driver.

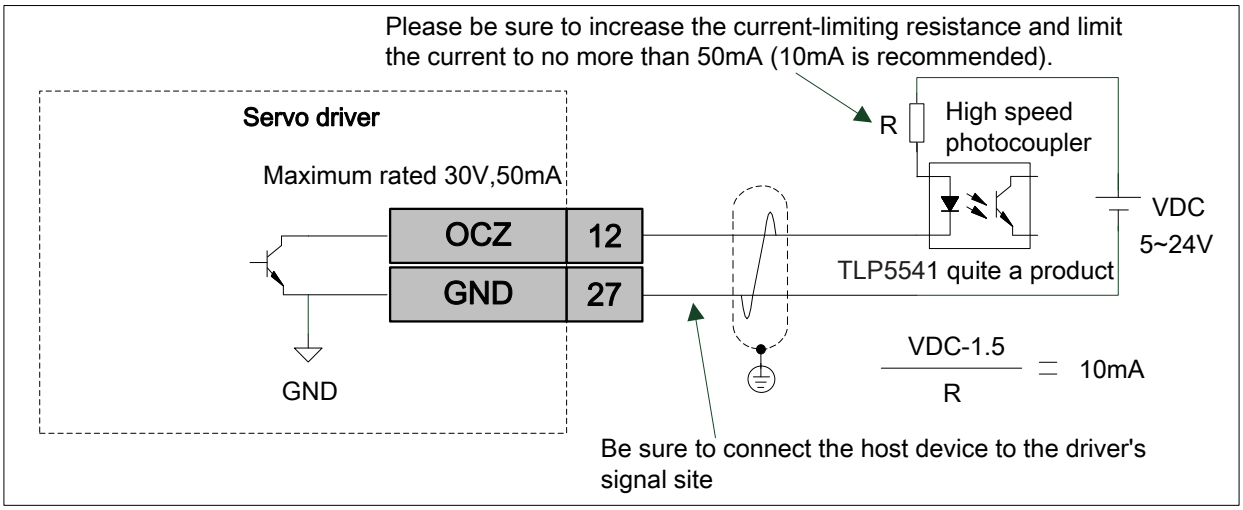
When receiving with a long-line receiver on the upper device side, be sure to install a termination resistor (about 330 Ω is recommended) at the input of the long-line receiver. When receiving with opt coupler circuit, please use high-velocity optocoupler and limit the line current to 20mA.




## Open-circuited collector output

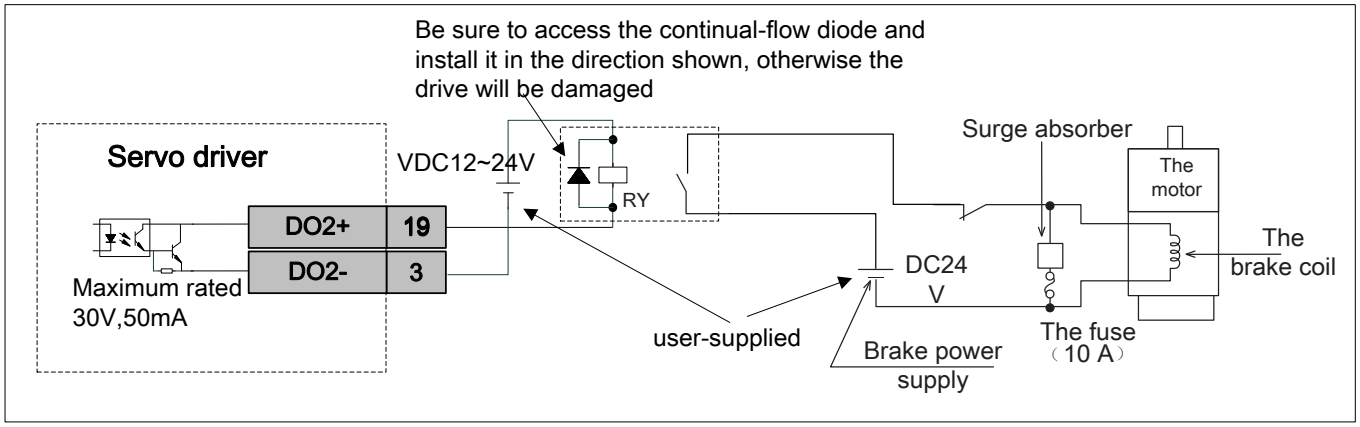
This interface is the open-circuited collector interface of encoder phase-Z frequency division output signal and is non-insulated interface.

Since the pulse width of phase-Z signal is narrow, please use a high-velocity photocoupler to receive the signal on the upper device side.



## Connection of brakesignals

| Symbol | Function | Connector pin | Description |
|---|---|---|---|
| **DO2+** | Blk+ | 19 | Brake signal |
| **DO2-** | Blk- | 3 | |




Note: The 24V power supply should be in the scope of supply of users.

## Precautions for use and wiring of brakes

- For the length of the motor brake cable, the voltage drop caused by cable resistance should be fully considered, and the input voltage should be at least 21.6V for brake operation.
- For the brake, it is better not to share power with other electrical appliances to prevent the brake from misoperation due to voltage or current reduction caused by the work of other electrical appliances.
- Cables with specifications above 0.5 are recommended.
- See Section 5.2 for timing chart of brake enable and relevant function code settings.
- The braking mechanism built into the servo motor is a fixed special mechanism of non-energized action type, which cannot be used for braking purposes and can only be used when the servo motor is kept in a stopped state.
- After the servo motor is shut down, turn off "servo enable" (S-ON).
- When the motor with the built-in brake is running, the brake may make a click sound, and the function is not affected.
- When the brake coil is energized (the brake is in an open state), magnetic flux leakage may occur at the Axes end and other parts. Please pay attention when using magnetic sensors and other instruments near the motor.

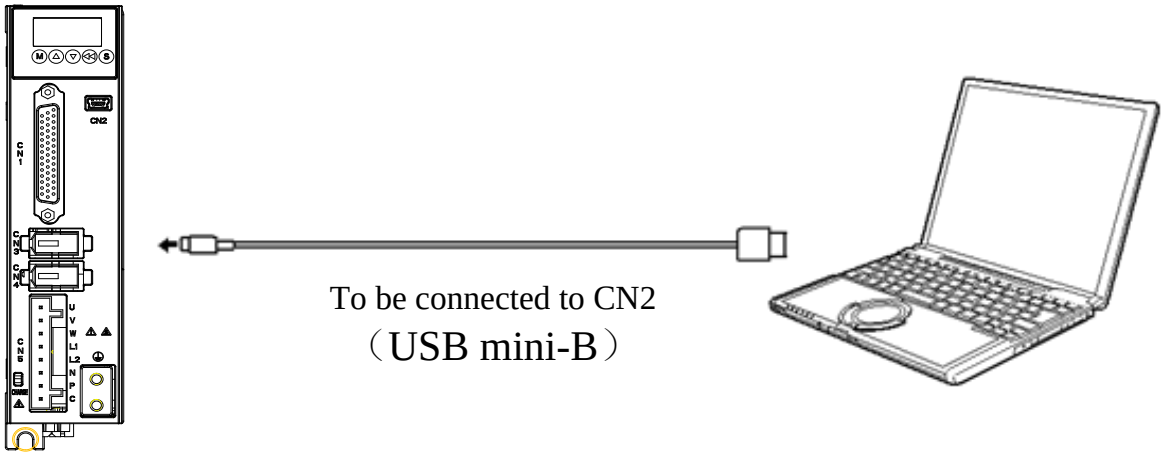
## 3.4 Wiring of connector CN2

### Connection with upper PC

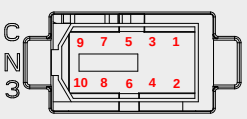
CN2 is the communication interface between the driver and PC for connecting the computer and USB, which can be used for parameter setting change and monitoring, etc.

PC communication cable: USB mini-B (commercially available)

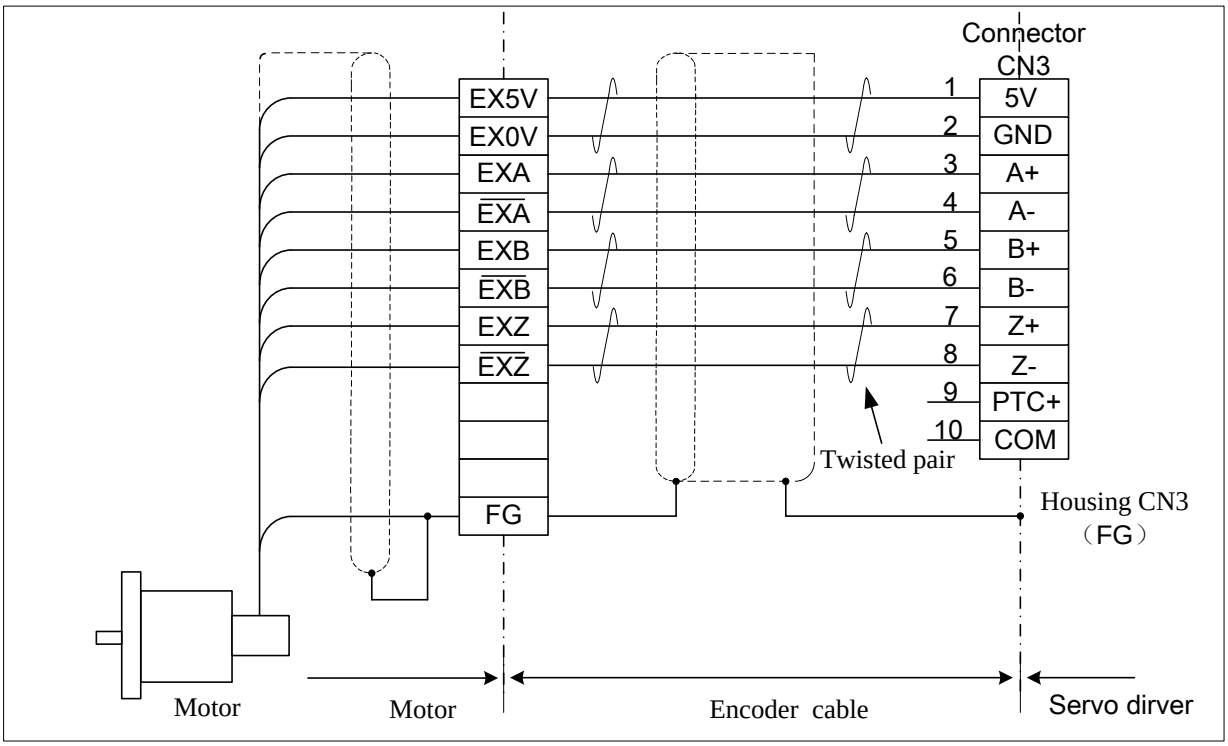
| Symbol | Connector pin | Description |
|---|---|---|
| **V-BUS** | 1 | An empty pin, which should not be connected |
| **D-** | 2 | Data signal line |
| **D+** | 3 | |
| **ID** | 4 | Not to be connected |
| **GND** | 5 | Signal ground |



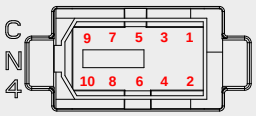

## 3.5 Wiring of connector CN3

| Application | Connector pin No. | Symbol | Description |
|---|---|---|---|
|  | 1 | 5V | Power supply for encoder. |
| | 2 | GND | Power ground, which should be connected to the internal signal ground of the driver. |
| | 3 | A+ | Encoder’s phase-A signal (twisted pair) |
| | 4 | A- | |
| | 5 | B+ | Encoder’s phase-B signal (twisted pair) |
| | 6 | B- | |
| | 7 | Z+ | Phase-Z’s zero pulse signal (twisted pair) |
| | 8 | Z- | |
| | 9 | PTC+ | Temperature sampling signal (no PTC |
| | 10 | COM | Temperature sampling signal reference |
| | Housing | PE | To be connected with PE terminal inside |

## Connection with incremental encoder

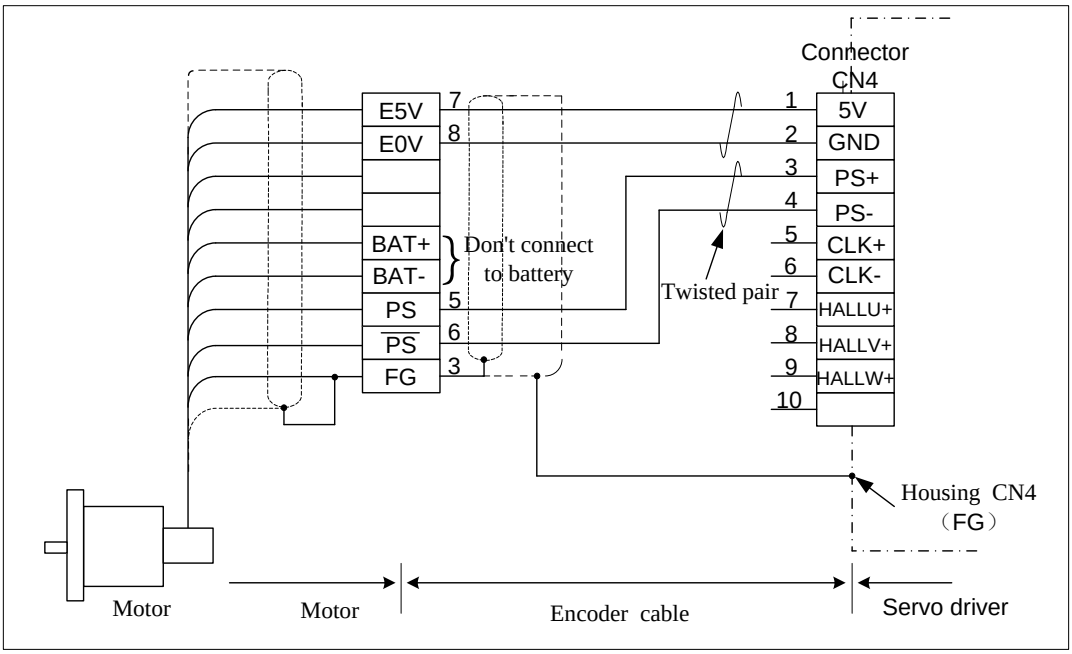



## 3.6 Wiring of connector CN4

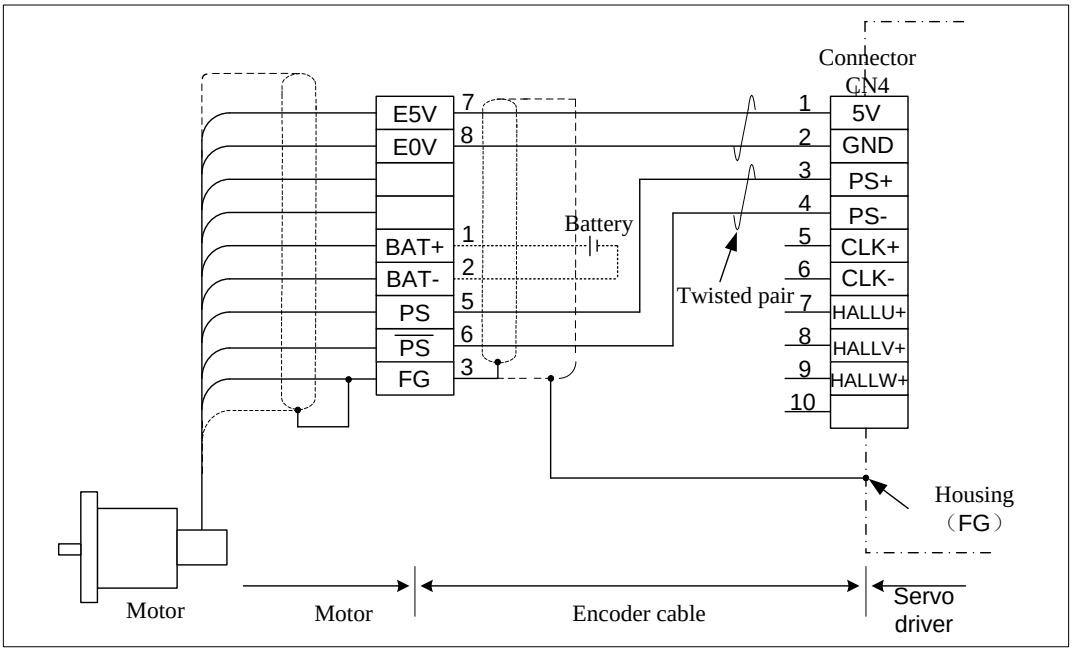
| Application | Connector pin number | Symbol | Description |
|---|---|---|---|
|  | 1 | 5V | Encoder +5V power supply |
| | 2 | GND | |
| | 3 | PS+ | Serial data transceiving signal |
| | 4 | PS- | |
| | 5 | CLK+ | Serial clock transmission signal |
| | 6 | CLK- | |
| | 7 | HALL-U | -- |
| | 8 | HALL-V | -- |
| | 9 | HALL-W | -- |
| | 10 | -- | Empty |
| | Housing | PE | To be connect with PE terminal inside the driver. |

## Connection with bus encoder

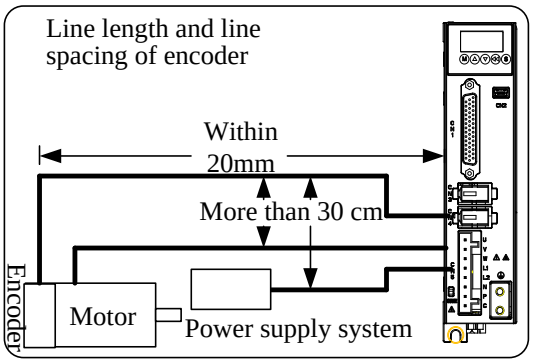
In case of application of single-ring absolute position encoder:




Application of multi-ring absolute position encoder:

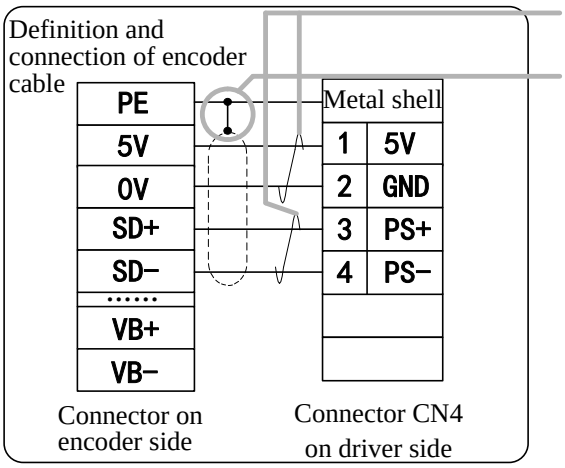


## Key Points of wring for communication encoder




- The cable length between the driver and the motor shall be within 20 m.
- The distance between the main circuit wiring and the main circuit wiring shall be more than 30cm, and they shall not be bundled together in the sleeve.
- Please set the input power voltage of the connector on the encoder side within the range of dc4.90v ~ 5.25V.
- Tips for making encoder cable by yourself:

① Refer to the wiring diagram.




② Wire: the core diameter of the wire used shall be more than 0.18m (awg24), and it shall be equipped with bending resistant twisted pair with shielding layer.

③ Twisted pair shall be used for wiring relative to signal / power supply.

④ Shielding treatment
-Shielding layer on driver side: to be welded to the shell of connector CN4.
-Shielding layer on motor side: (pin 1 of AMP 9 pin of SF series motor)

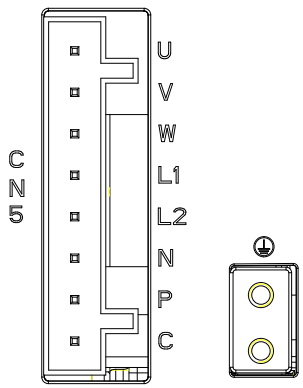
⑤ Do not connect the redundant terminals of each connector

## 3.7 Wiring of connector CN5

### Connection of main circuit terminal

### Description on definition for interface of connector CN5

| Terminal | Terminal name | Terminal function |
|---|---|---|
| **U、V、W** | Servo motor connection terminal | The connection terminal of servo motor shall be connected with U, V and W of motor. |
| **L1、L2** | Main circuit power input terminal | For single-phase power input of main circuit, AC220V power supply shall be connected between L1 and L2. |
| **N** | DC bus negative voltage terminal | Do not connect the DC bus terminals of the driver when the single unit is running. |
| **P、C** | Braking resistance connection terminal | External brake resistance connection terminal. |
| ⏚ | Grounding | Two ground terminals, to be connected with a power supply grounding terminal and a motor grounding terminal. |




For the wiring of the main circuit and its precaution, please refer to Chapter 3 → Description on System Wiring and Its Main Points (P23).

### Selection of braking resistors and precautions for wiring;

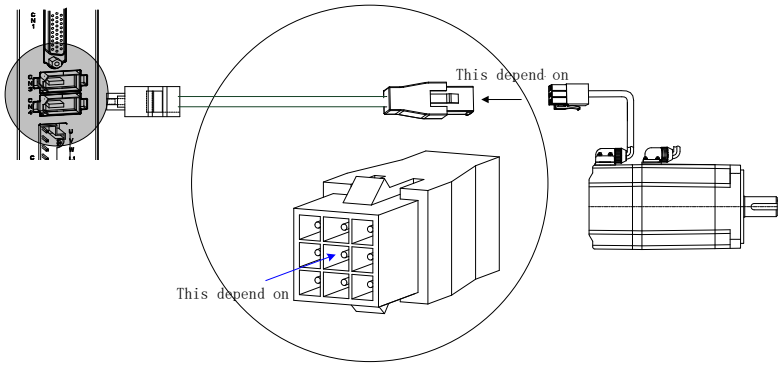
- Do not connect the external braking resistor directly to the positive pole P and negative pole N of the bus, otherwise it will cause explosion and fire.
- Please confirm that braking resistor's parameters P02-20, P02-21 and P02-22 have been correctly set before using the driver.
- Please install external braking resistor on non-combustible materials such as metal.

## 3.8 Wiring of connector on motor side

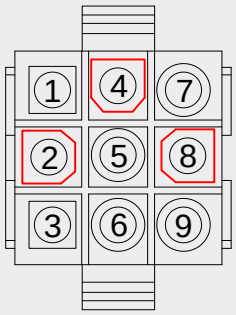
### Wiring of cables for EAM-S/T series motor

### Connection of encoder cable for EAM-S/T series motor

**Connector outline**



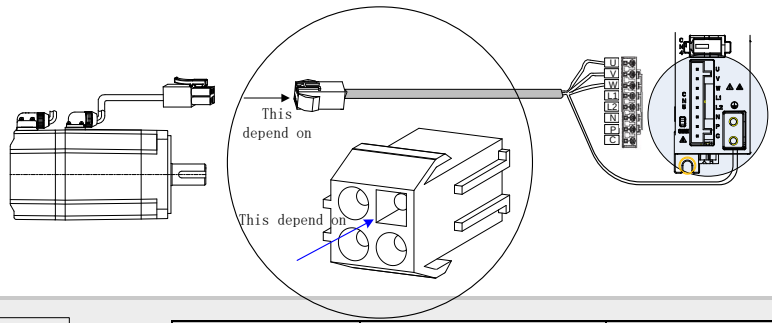

**Terminal pin distributionof the encoder cable**



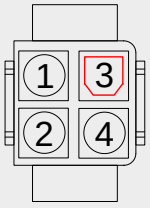

| Stitch number | Signal name | |
|---|---|---|
| 1 | BAT+ | Battery+ |
| 2 | BAT- | Battery - |
| 3 | PE | Shielding |
| 4 | PS+ | Serial data line |
| 5 | PS- | |
| 6 | - | Empty |
| 7 | +5V | Power supply for encoder |
| 8 | GND | Power supply ground |

### Connection of power cables for EAM-S/T series motor

**Outline sketch of connector**



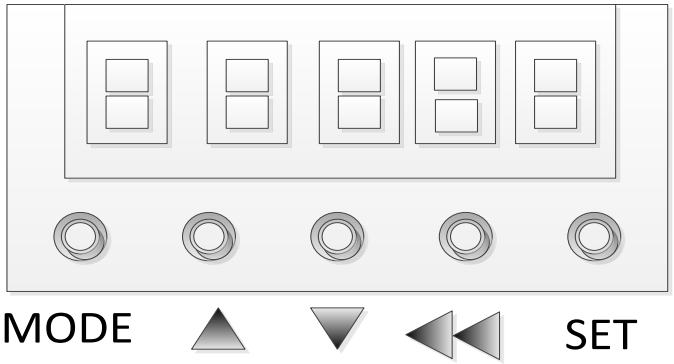

**Distribution of terminal pins of power lines**




| Pin No. | Signalname | |
|---|---|---|
| 1 | U | Power line of motor |
| 2 | V | |
| 3 | W | |
| 4 | PE | Ground wire |

# Chapter 4 Display and Operation of Panels

## 4.1 Introduction to keys on panel




The panel of the servo driver consists of a display (LED digital tube) and keys, which can be used for various types of display of the servo driver, with the Group-P parameter setting for as an example to show the typical functions of the display keys as follows:

Table 4-1 Introduction to typical functions of keys

| Keys | Typical functions |
|---|---|
| MODE | Used to change operating modes and parameter |
| UP | Used to increase the selected number (flashing number) |
| DOWN | Used to decrease the selected number (flashing number) |
| SHIFT | Used to move the selected number (flashing number) to the left or turn the page to the upper position. |
| SET | Used to enter the next menu or set parameters, etc. |

## 4.2 Change of operation mode

The servo running status is displayed on the panel by default.

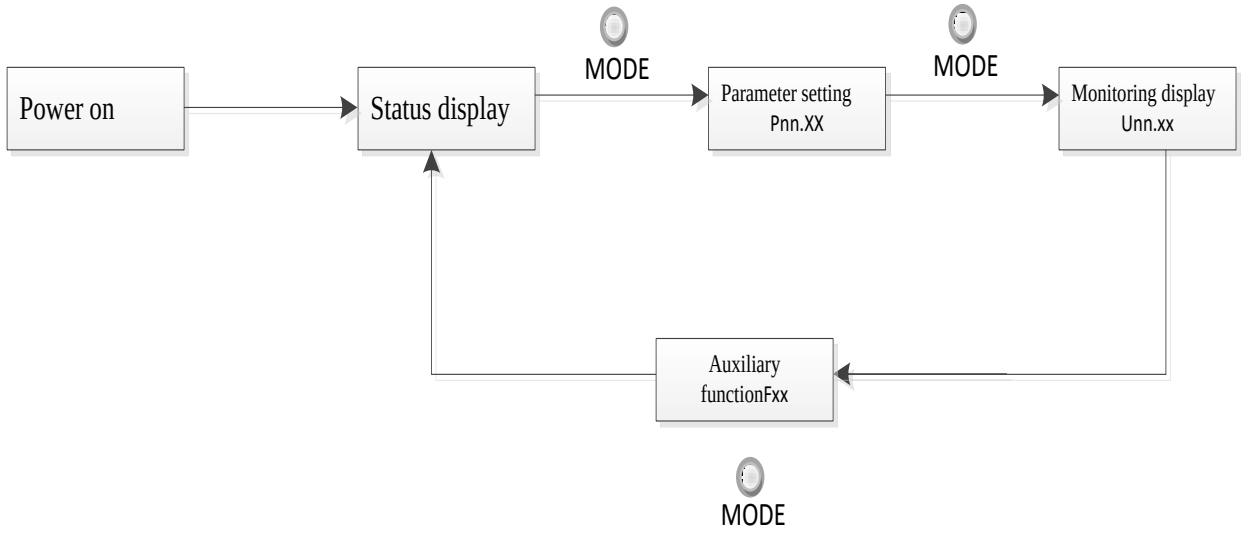



Figure 4-1 State Switching of Panel by Default

Press the key Mode to switch the level-1 menu of the panel, and after powered on, the default display menu of the panel is the status display.

Status display: To display the current status of the servo:

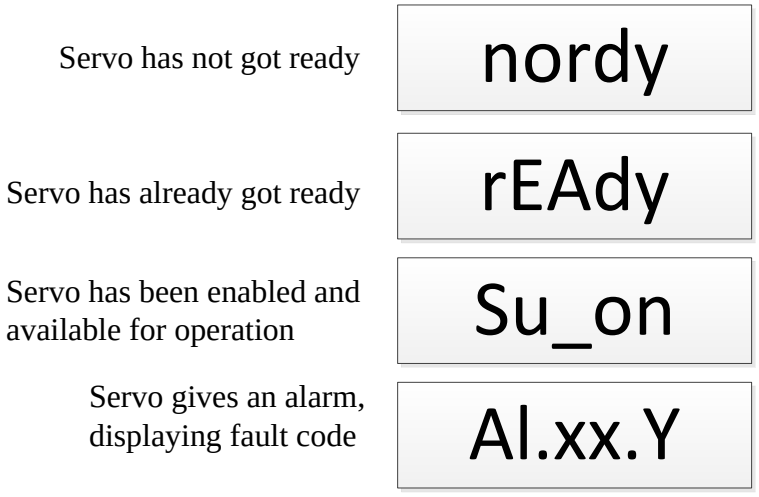



Figure 4-2 Operation and Display of Level 1 Menu on Panel

## 4.3 Setting of parameters for group P

Parameter setting: Let servo enter parameter setting mode. This group is used when servo parameter need to be changed, with P02.03 as an example:

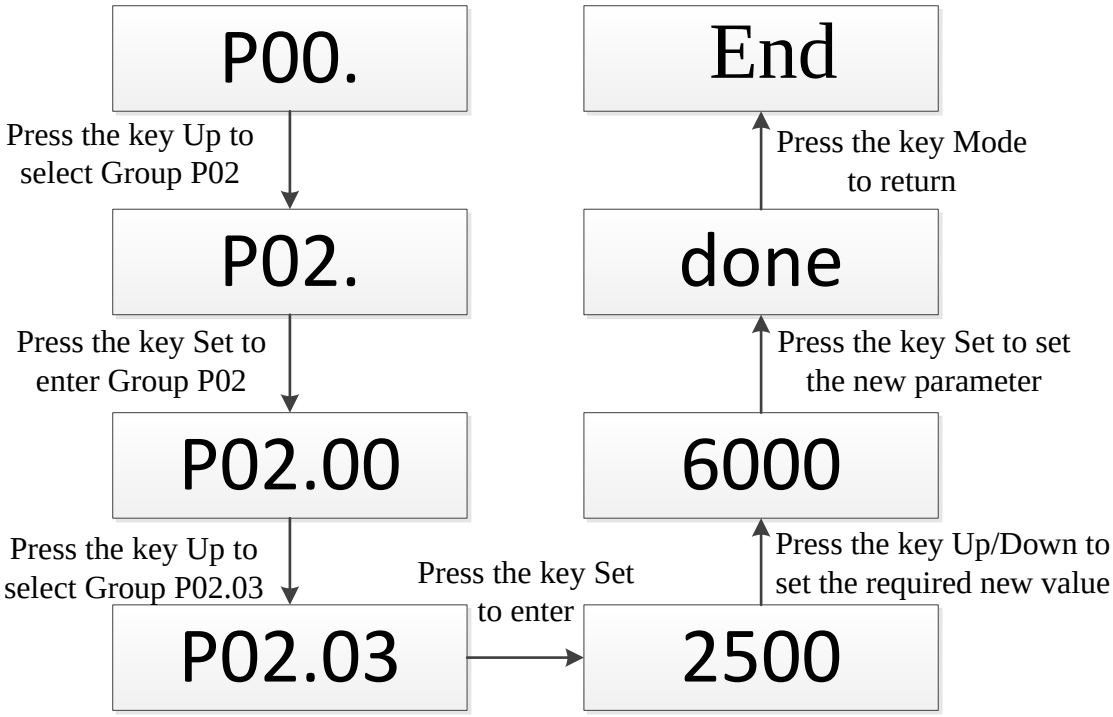



Fig. 4-3 Procedures for Setting Parameters

## 4.4 Display of parameter for group U

Monitoring display: An observation group for servo operation parameter, in which real-time displays such as servo velocity, DI, DO, current, temperature, etc. are provided

For example, select U00.20 to display the number of servo input pulses

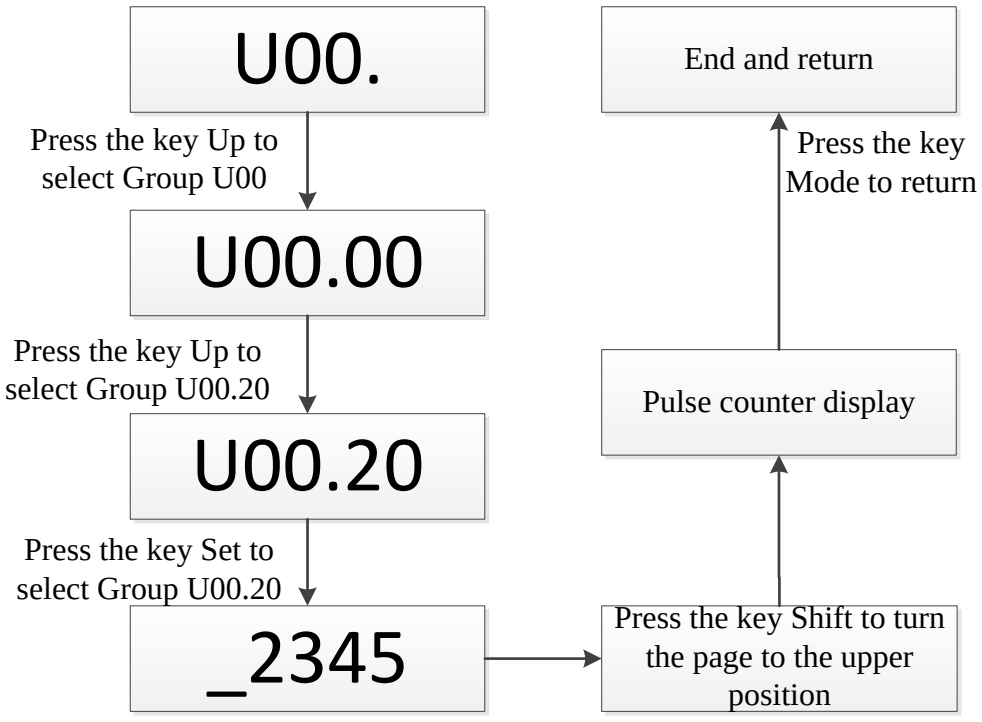



Fig. 4-4 Description on Operation of Parameter for Group U

For example: Select U00.01 to display the DI status of servo input

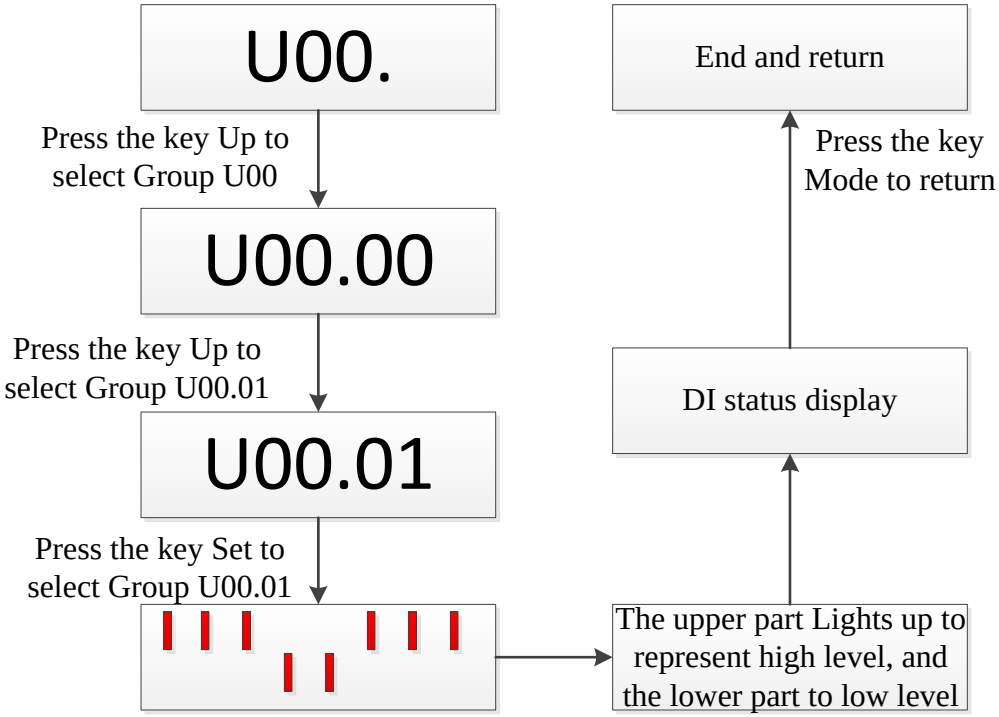



Figure 4-5 Description on DI Display

Note: The rightmost display of DI status indicates DI1 status, which, starting from the second on the right of DI2 status, sequentially corresponds to DI1 to DI8 from the right to the left.

## 4.5 Description on use of parameter of group F

Monitoring display: Servo auxiliary function group

For example, use of the jog function on the panel.

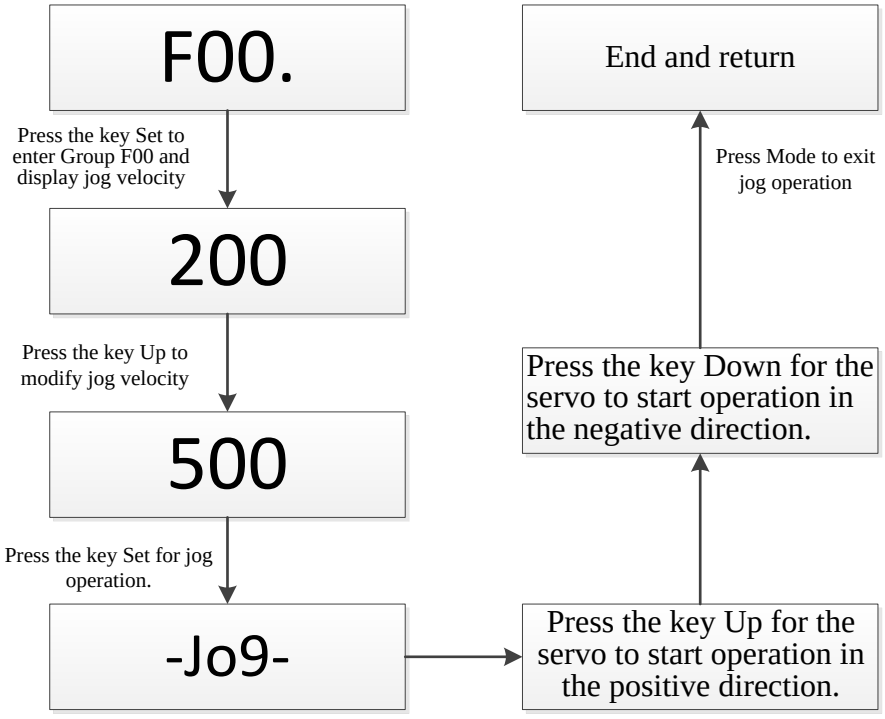
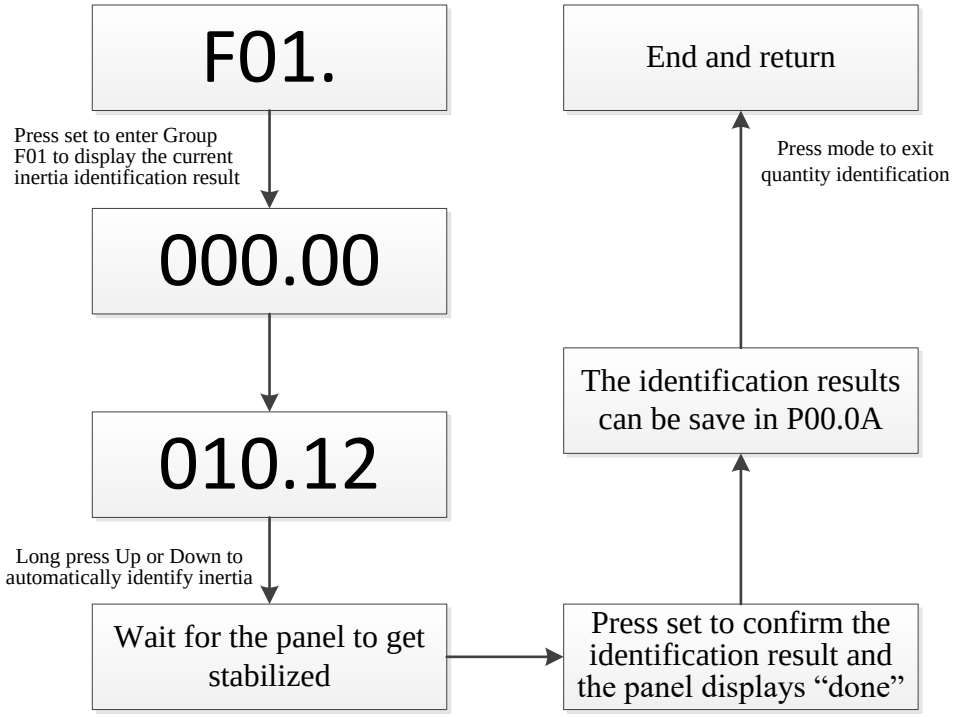



Figure 4-6 Description on Operation of Commissioning Panel

For example: Function of inertia identification




## 4.6 Fault display

Fault display :

| Display | Name | Contents |
|---|---|---|
| AL.10.1 | Current warning code | AL.: There is currently a drive failure or warning<br>10.1: Fault code (encoder fault) |

AL.XX.Y, where XX indicates the fault category and Y indicates the sub-fault code.

# Chapter 5 Control and Timing Sequence

## 5.1 Diagram for timing sequence of powering on

Diagram for timing sequence of powering on(timing sequence of receiving servo enable signal)

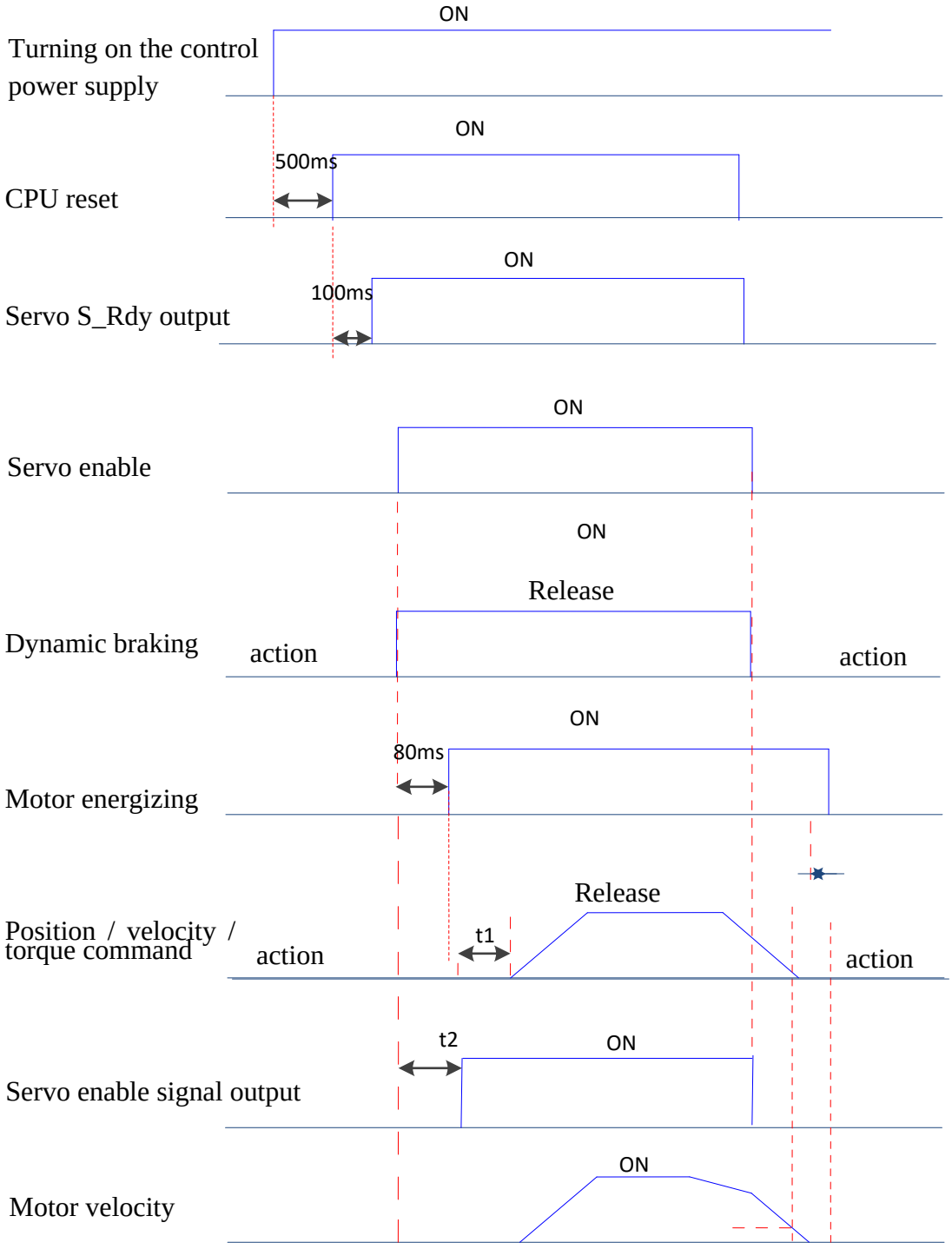



Figure 5-1 Timing sequence of receiving servo enable signal when powering on

t2 is the charging time (80ms) of the internal driver bootstrap circuit; the host devicecan not issue a command until it receives the enable DO fed back from the servo, or will delay for more than 80 ms.

## 5.2 Diagram for timing sequence of brake enable

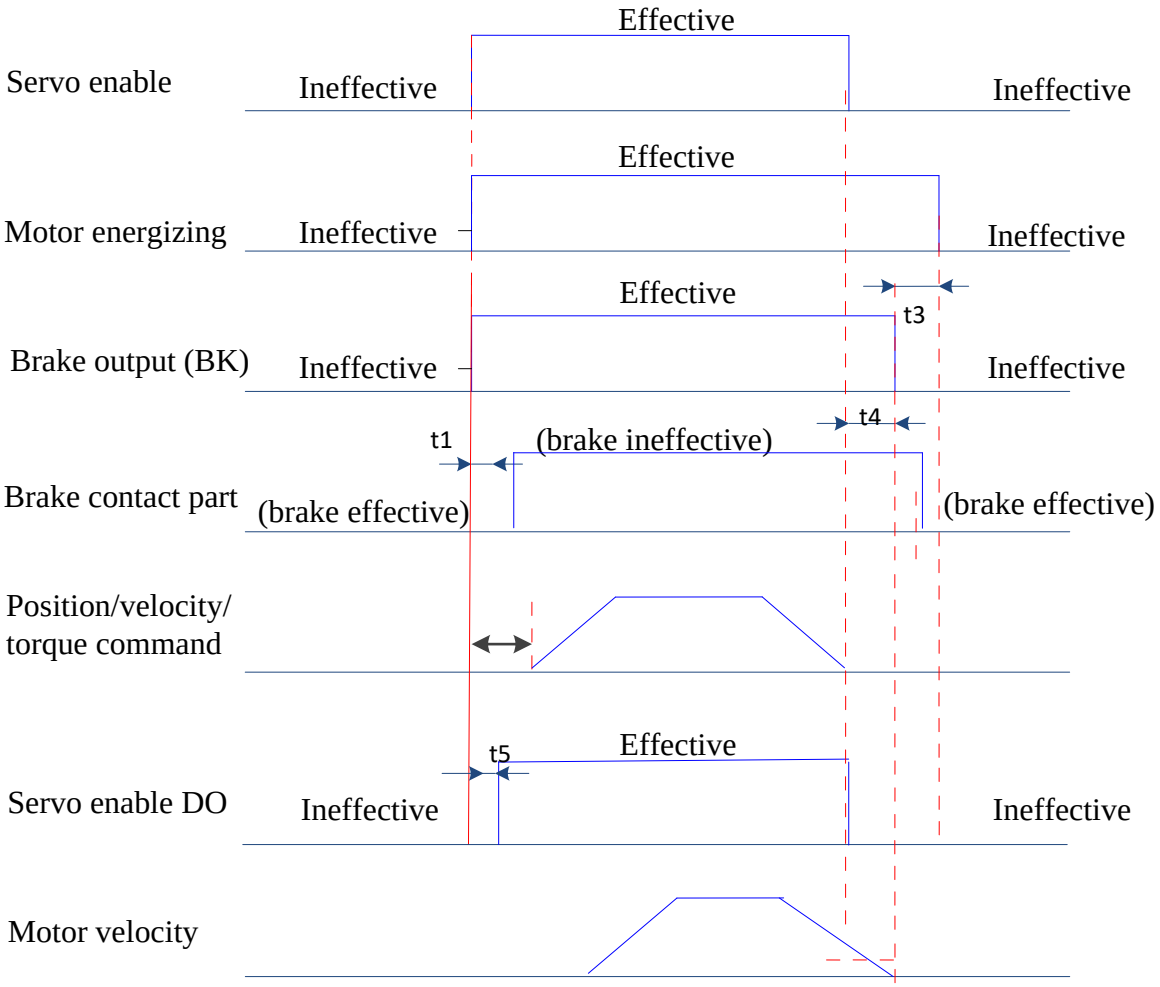



Fig.5.2 Diagram for Timing Sequence of Servo enable with Brake when Receiving Command

t1 is the action time of the brake.

t2 is the time set by P02.19, and before which the command from the host devicecannot be accepted

t3 is the time set by P02.1A, which is the enable time of the delay time period from when the brake is effective to when the motor is de-energized; when the delay time reaches the set time t4(P02.1C) or the velocity is less than (P02.1B set), the brake is effective

t5 is the charging time of the internal servo bootstrap circuit

Relevant function code of brake

| P02.18 Brake enable | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |
| Notes :<br>0-Not enable brake<br>1-Enableing brake<br>After enable brake, use FunOut.6 (BKout) output to control external relay (P06.02=6) | | | | | | |

| P02.19 Delay from brake ineffective to command receiving | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~500 | ms | 200 | P | S | T |
| Note:<br>After receiving the servo enable command, the brake is ineffective. Due to the action of the brake relays, the command can be received with a delay of some time. | | | | | | |

| P02.1A Delay from brake effective to motor getting off | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~1000 | ms | 150 | P | S | T |
| Note:<br>Effective movement of the brake; Due to the delay in the operation of the brake relay, the output of the motor needs to be disabled for a period of time. | | | | | | |

| P02.1B Effective velocity threshold of brake | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 20~300 | rpm(*mm/s) | 30 | P | S | T |
| Note:<br>In order to ensure that the brake can effectively execute the braking action after the velocity is lower than the set value<br>* Represent a linear motor unit | | | | | | |

| P02.1C Delay from servo enable command to brake effective | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~1000 | ms | 500 | P | S | T |
| Note:<br>After the servo receives the external disable command, it will delay for a period of time to perform the braking action | | | | | | |

## 5.3 Diagram for timing sequence of shutdown

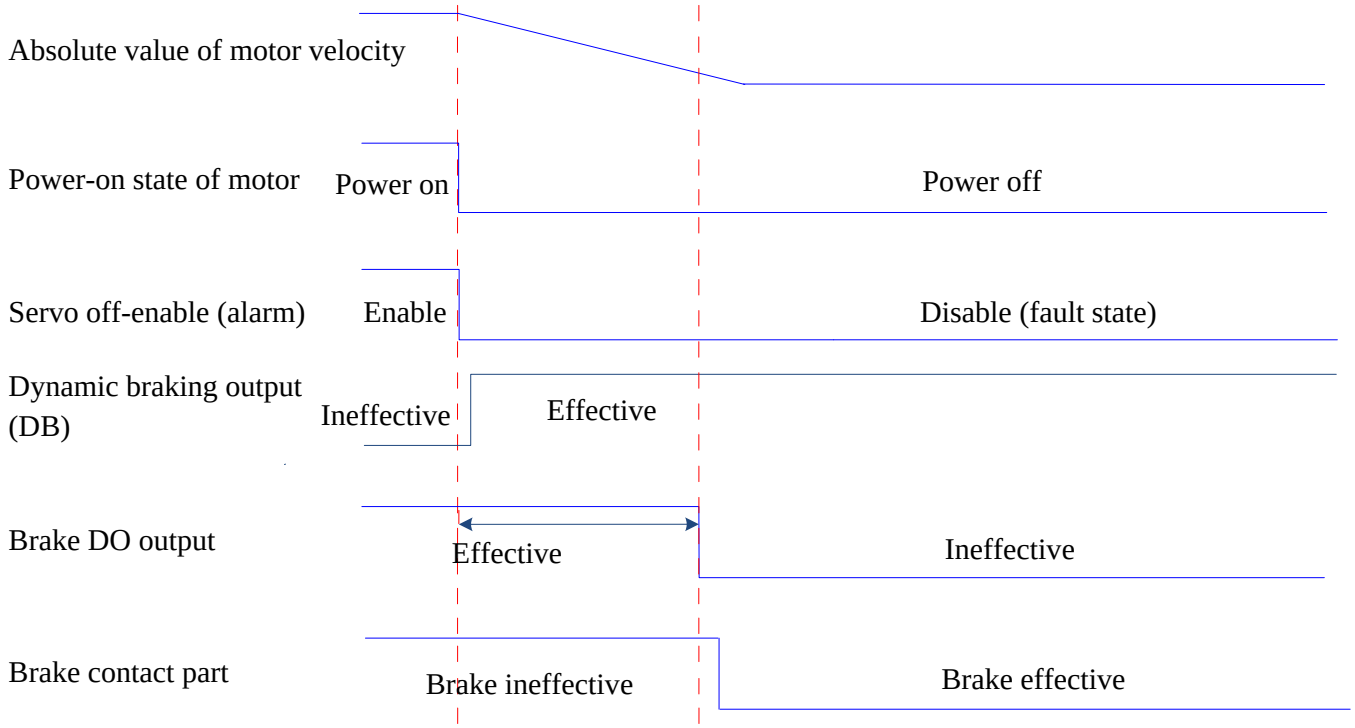



Figure 5-3 Diagram for Timing Sequence of Servo Shutdown

Function codes related to shutdown

| P02.10 Disable shutdown mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -2~2 | - | 0 | P | S | T |
| Notes:<br>The mode of servo disable shutdown should be changed according to the actual situation<br>-2 : Slope shutdown, with DB braking<br>-1 : DB shutdown DB status<br>0 : Free shutdown, keeping operating freely.<br>1 : Slope shutdown, keeping operating freely.<br>2 : Zero-velocity shutdown, keeping operating freely. | | | | | | |

| P02.11 Over travel stop mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 1 | P | S | T |
| Changes are generally not recommended | | | | | | |

| P02.12 Non-resettable failure shutdown mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~2 | - | 1 | P | S | T |
| Notes:<br>Shutdown mode in case of non-resettable failure<br>0-shutting down freely<br>1-DB shutdown free state<br>2-DB shutdown, keeping DB state | | | | | | |

| P02.13 Resettable fault shutdown mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -4~3 | - | 1 | P | S | T |

Notes:
Resettable shutdown mode in case of failure :
-4-Emergency torque shutdown, keeping DB State
-3-Slope shutdown, keeping DB State
-2-Slope shutdown, keeping DB State
-1-DB shutdown, keeping DB state
0-Free shutdown, keeping operating freely.
1-Slope shutdown, keeping operating freely.
2-Slope shutdown, keeping operating freely.
3-Emergency torque shutdown, keeping operating freely

| P02.14 Shutdown mode and shutdown state switching velocity condition value | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~1000 | Rpm (*mm/s) | 100 | P | S | T |

Notes:
When the actual running velocity of the motor is less than the threshold value, it is judged as a shutdown state.
*stands for linear motor's unit

| P07.20 Slope shutdown acceleration and deceleration time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 50 | P | S | T |

Notes:
Slope shutdown acceleration and deceleration time when the fault shutdown or servo off shutdown occurs

| P07.21 Emergency shutdown acceleration and deceleration time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~1000 | ms | 5 | P | S | T |

Notes:
Acceleration and deceleration time in case of emergency shutdown mode

| P07.22 Emergency torque shutdown deceleration | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 500 | P | S | T |

Change of slope torque in case emergency torque shutdown

## 5.4 Release Function Setting

When the inertia of external load is large (more than 5 times) and there is a large deceleration, it is necessary to use the release function to release the excessive bus voltage. Release the resistance value and power of the resistor appropriately as the instructions.

Release-setting related function codes

| P02.20 Release resistor's use mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3 | - | 1 | P | S | T |

Notes:

0-Built in resistor

1-External resistor

2-Air cooling of external resistor

3-No release

| P02.21 External release resistor's power | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | w | 800 | P | S | T |

Notes:

If the power is too small, the release resistor will overheat or overload

| P02.22 External release resistor's resistance value | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~1000 | Ω | 50 | P | S | T |

Notes:

The resistance value of the release resistor should be selected appropriately and should generally be 40-50 ohms; if the value is too small, the driver will be over-current, which will greatly affect the release effect.

| P02.26 Resistor's heat dissipation coefficient | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~1000 | 0.1% | 600 | P | S | T |

Notes:

The release resistor's resistance value and heat dissipation coefficient. The larger the setting, the better the heat dissipation effect of the release resistor, and the overload of the release resistor can be limited to a certain extent.

# Chapter 6 Control Mode

All control modes are described as follows: :

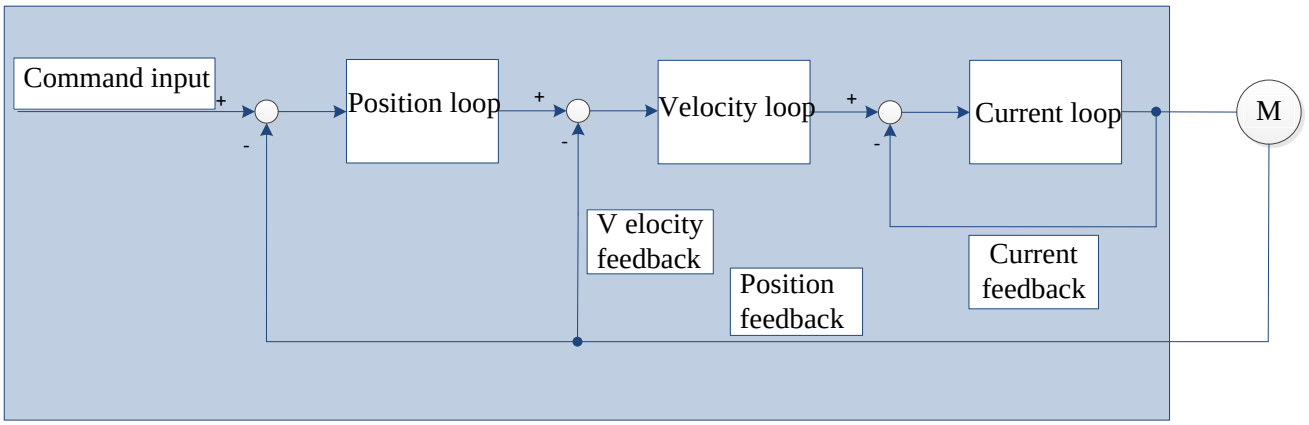



Fig. 6-1 Block Diagram for 3-Loop Control

By processing the input (pulse, analog quantity, communication, etc.) and feedback signals, the driver can accurately and rapidly control the position, velocity and torque of the motor, and support the real-time switching control of the above modes, of which, the position control has found widest application in servo system.

## 6.1 Position Control Pulse Mode

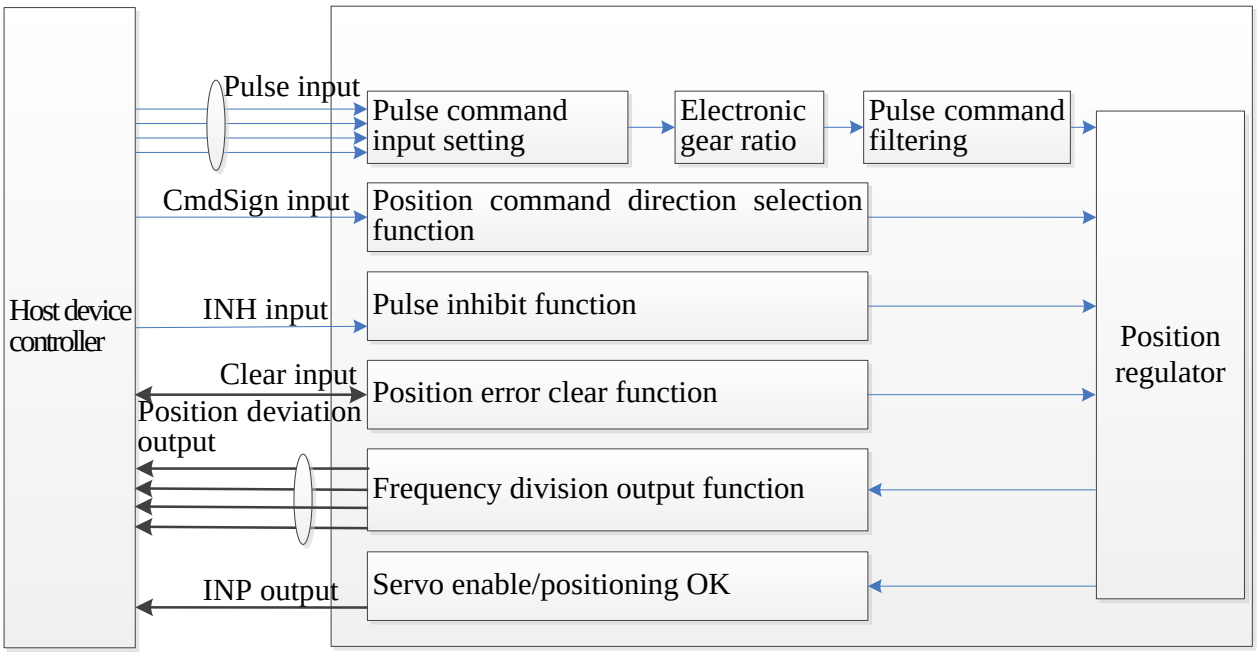



Fig. 6-2 Diagram for Source of Position Mode Pulse Command

The position control pulse mode mainly includes the following steps:

1. Installation wiring includes: servo enable (SRV_ON), pulse input (Puls+-, Sign+-), positioning OK (INP), servo enable output (Son), etc.
2. Set operation mode (P02.00 = 1), position mode
3. Set pulse input mode (P03.02), electronic gear ratio, etc.
4. Set DI and DO related functions
5. Other basic settings (release resistor, shutdown mode, etc.)

### 6.1.1 Position Control Pulse Mode Input Setting

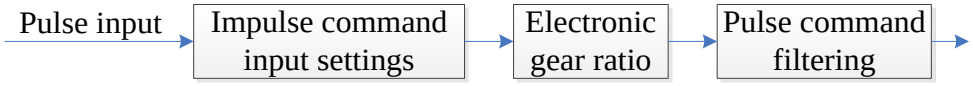
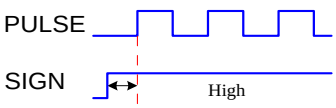
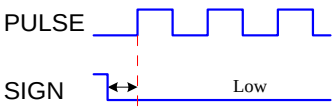
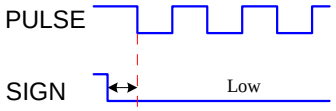
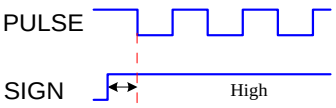
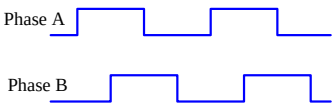
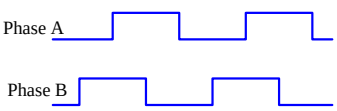


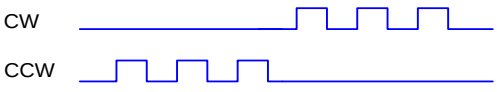
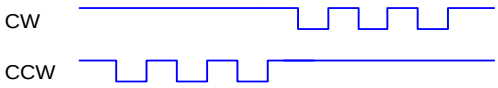

Figure 6-3 Position Mode Pulse Command Input Settings

| P03.00 Command pulse format | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |
| Notes:<br>0-Impulse command<br>1-Internal position | | | | | | |

| P03.02 Command pulse format | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3 | - | 0 | P | S | T |

Notes:

| Command format setting | Pulse format | positive pulse diagram | negative pulse diagram |
|---|---|---|---|
| 0 | Pulse + direction positive logic |  |  |
| 1 | Pulse + direction negative logic |  |  |
| 2 | Phase A+Phase B Orthogonal Pulse Quadruple Frequency |  <br>Phase A is ahead of Phase B by 90 ° |  <br>Phase B is ahead of Phase A by 90 ° |

| | | | | |
|---|---|---|---|---|
| | 3 | CW+CCW |  <br>  | |

| P03.04 Input pulse hardware filtering time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~255 | 25ns | 10 | P | S | T |

Notes:
The hardware filtering time can be set according to the frequency of the input pulse, which can filter out external interference signals to a certain extent.
General situation:
Set to 4 in case of more than 3M
Set 10 in case of less than 1M
Set to 20 in case of less than 500K

### 6.1.2 Electronic Gear Ratio in Position Control Pulse Mode

Number of pulses in actual operation of the motor:

$$\text{Input pulses} * \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ratio denominator}} = \text{Actual operating pulse number}$$

| P03.10 Number of command pulses per revolution of motor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~8388608 | - | 1000 | P | S | T |

Notes:
Directly specify the number of command pulses to be sent for one revolution of the motor.
The numerator equivalent to the electronic gear ratio is P03.10, and the denominator of the electronic gear ratio is the number of pulses per revolution of the encoder

*Notes to linear motor

| P03.10 Number of command pulses for motor moving one pole distance (N-N) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~8388608 | - | 0 | P | S | T |

Notes:
Directly specify the number of command pulses to be sent for one pole distance of movement of the motor .
The numerator equivalent to the electronic gear ratio is P03.10, and the denominator of the electronic gear ratio is one pole distance pulse number of grating scale (magnetic grating scale)

If P03.10 = 0, P03.12 and P03.14 take effect.

| P03.12 Electronic gear ratio 1 (numerator) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~ 1072741824 | - | 10 | P | S | T |

Note:
Setting thenumerator for the 1st group of electronic gear ratios.

| P03.14 Electronic gear ratio 1 (numerator) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~ 1072741824 | - | 1 | P | S | T |

Notes:
Setting the numerator for the 1st group of electronic gear ratios

| P03.16 Electronic gear ratio 2 (numerator) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~ 1072741824 | - | 10 | P | S | T |

Notes:
Setting the numerator for the 2nd group of electronic gear ratios.

| P03.18 Electronic gear ratio 2 (denominator) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~1072741824 | - | 1 | P | S | T |

Notes:
Setting the denominator for the 2st group of electronic gear ratios

Electronic gear ratio supports DI switching:
For DI input function FunIN.17 (GearSw), the first group of electronic gear ratios is used when GearSw is ineffective, and the second group of electronic gear ratios is used when GearSw is effective.
Setting range of electronic gear ratio:
Rotary motor：

$$2.5<= \frac{\text{gear ratio numerator}}{\text{gear ratio denominator}} * \text{number of pulse for one revolution of encoder} <=10000000$$

*Linear motor：

$$2.5 <= \frac{\text{gear ratio numerator}}{\text{gear ratio denominator}} * \text{number of pulse for one pole distance} <= 10000000$$

Otherwise, it will alarm AL.045 electronic gear ratio setting error.

### 6.1.3 Position Command Filtering Setting

When the host devicepulse needs to be smoothed, software filtering can be added:

| P03.06 Command FIR filtering time constant | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~65535 | 0.01ms | 0.0 | P | S | T |
| Notes:<br>Setting the time constant of FIR filter for position command | | | | | | |

| P03.07 Average filtering time constant | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~1280 | 0.1ms | 0.0 | P | S | T |
| Notes:<br>Setting the time constant of the average filter for the position command (encoder unit) | | | | | | |

### 6.1.4 Setting of Input and Output in Position Control Pulse Mode

Location DI input

Pulse inhibits function:

For the DI input function FunIN.18 (INH), when the INH is effective, the pulse command is no longer received.

Frequency division output setting.

| P02.02 Phase of frequency division output pulse | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |
| Notes:<br>Setting the phase relationship between phase-A pulse and phase-B of pulse output.<br>0-positive frequency division<br>1-negative frequency division | | | | | | |

| P02.03 Number of frequency division pulses of encoder | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~1048576 | p/revolution (*p/pole) | 1024 | P | S | T |

Notes:
For the number of pulses of output of phase A and phase B per revolution of the motor, the number of pulses after quadruple frequency is 4*P02.03.
Unit of linear motor is p/pole.

| P02.04 Selection of Z Pulse Output Polarity | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 1 | P | S | T |

Notes:
Setting the output level when the Z-phase pulse is effective
0- Positive polarity Output
(Z pulse is at high level)
1- Negative polarity output
(Z pulse is at low level)

Position OK output related function code

| P06.2C Positioning completion range | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | - | 100 | P | S | T |

Notes:
At the end of transmission of the position command, when the position deviation is |<=P06.2C, and held for a time period ofP06.2D, the positioning completion signal FunOut.3(INP) is output.
The Unit for this parameter is determined by P06.2E:
P06.2E=0 is user Unit, i.e. gear ratio
P06.2E=1 is encoder Unit

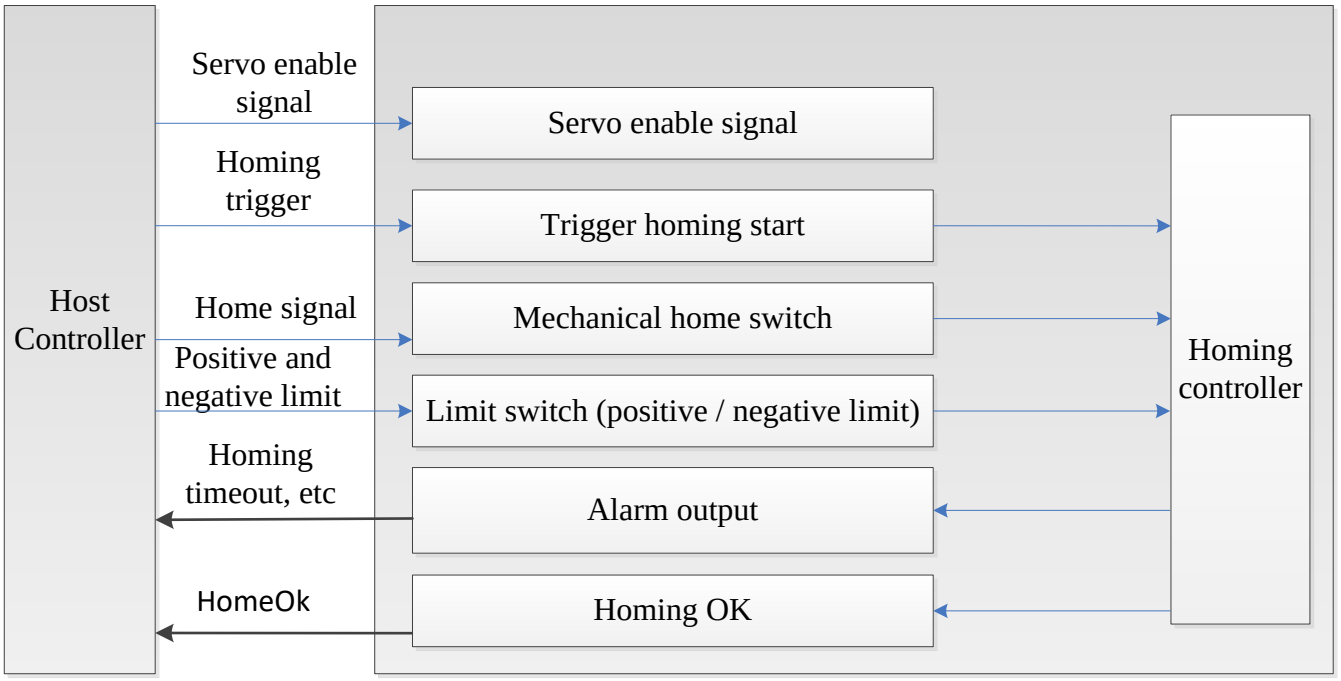
| P06.2D Waiting time after positioning completion | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~2000 | ms | 0 | P | S | T |

Notes:
At the end of transmission of the position command, when the |position deviation is |<=P06.2C, and held for a time period ofP06.2D, the positioning completion signal FunOut.3(INP) is output.
The Unit for this parameter is determined by P06.2E:
P06.2E=0 is user Unit, i.e. gear ratio
P06.2E=1 is encoder Unit

| P06.2E Position Reaching Window Unit Setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |

Notes:
Setting the unit of the position reaching threshold
0- User Unit
1-Encoder unit

## 6.2 Position control homing mode




The homing mode is used to find the mechanical home, the Z signal of the motor, or designate a fixed position as the home, for setting of the initial position of operation.

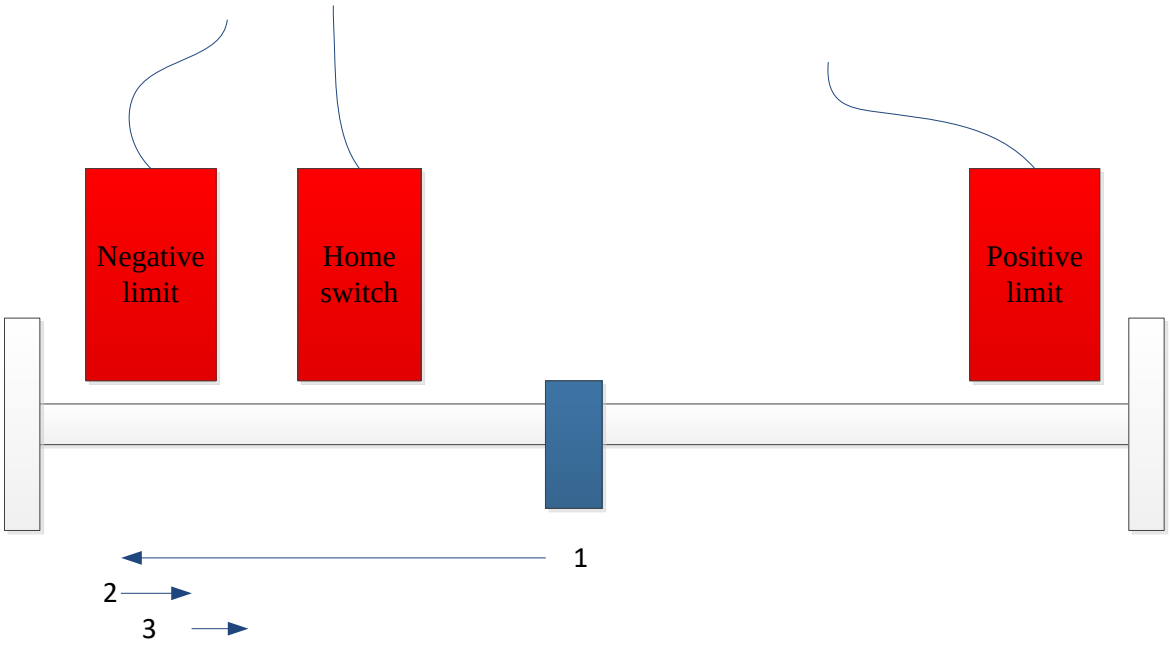
### Description on homing function

Related function code:

| | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| P03.31 Homing model | 0~36 | - | 1 | P | S | T |

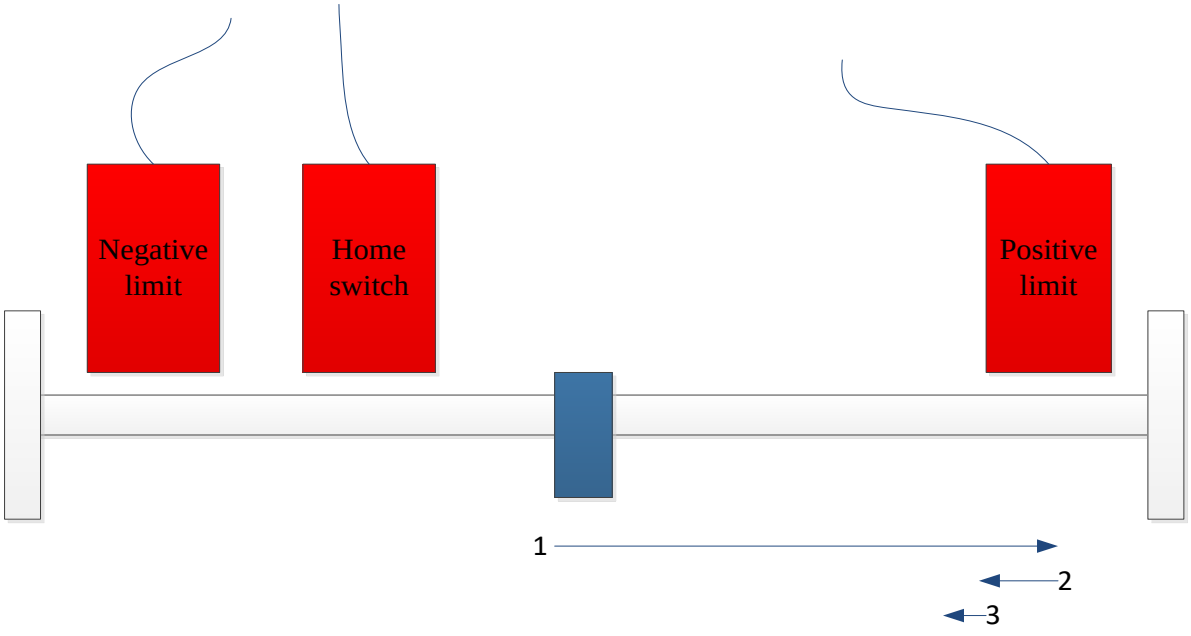
Notes:
Fully compatible with the homing mode of CanOpen402 (Cia402) protocol, as shown in the following table

Homing mode1(Mode17)



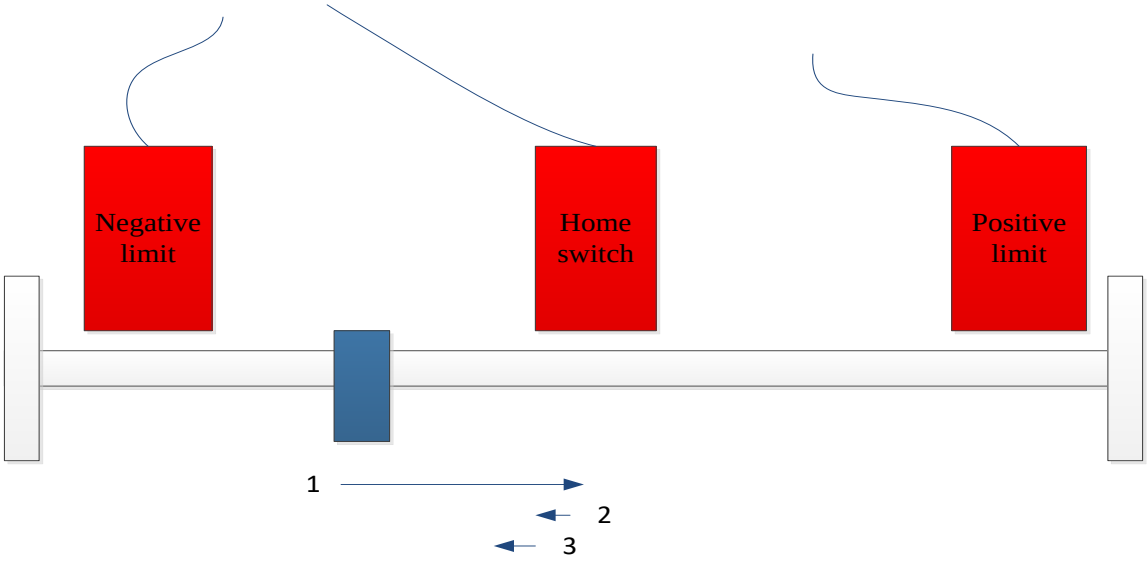

1. Operate in the negative direction to find the rising edge of the negative limit switch (high velocity switched to low velocity).
2. Operate in the positive direction to find the falling edge of the negative limit switch.
3. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 17).

Homing mode 2 (mode 18)



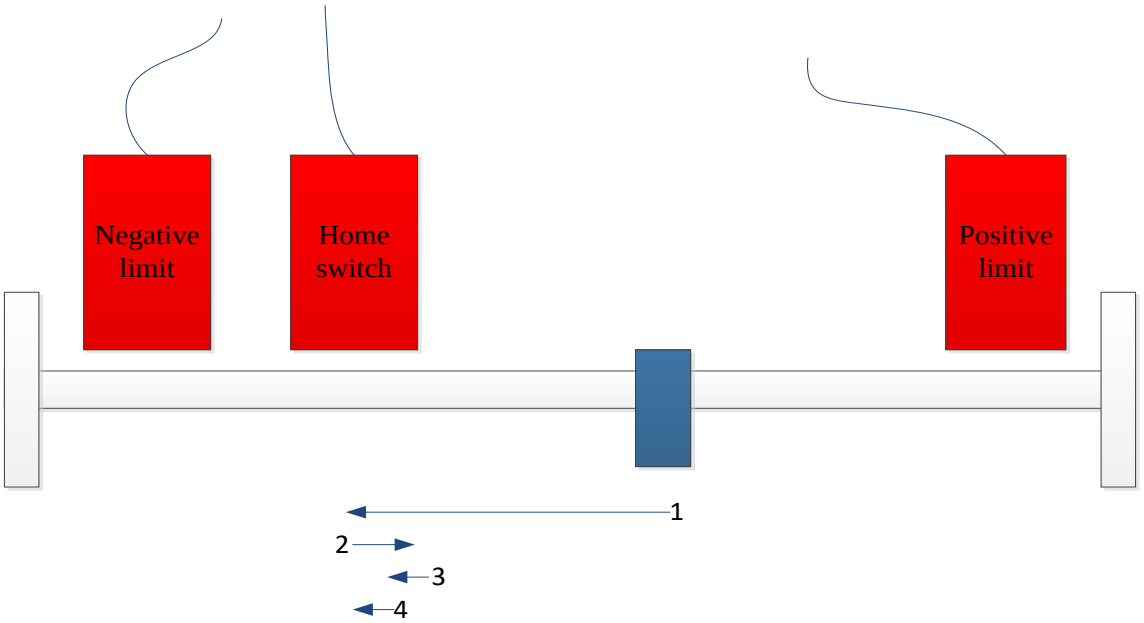

1. Operate in the positive direction to find the rising edge of the positive limit switch (high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the positive limit switch.
3. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 18)

Homing mode 3(mode 19)



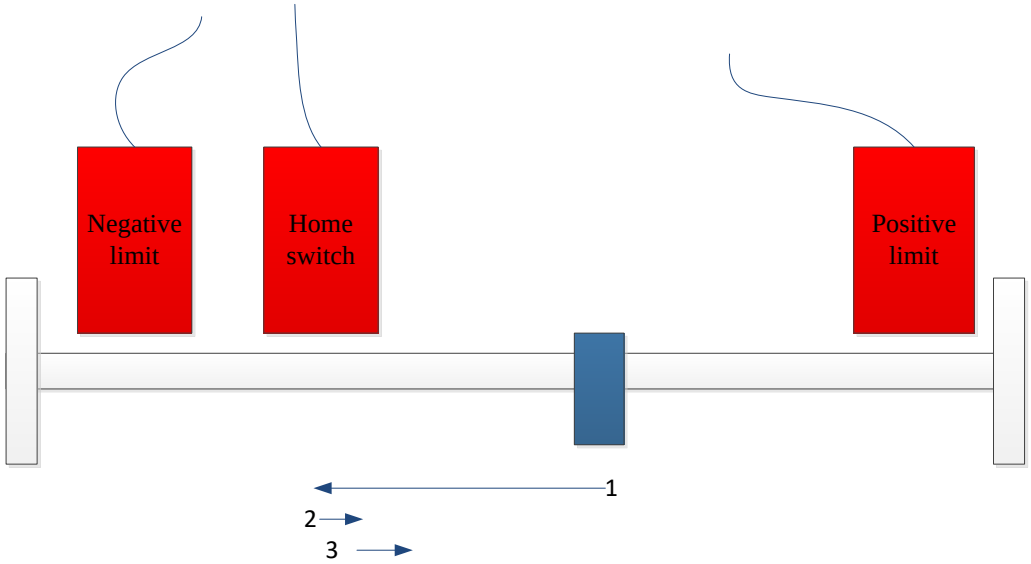

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch (on the same side).
3. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 19)

Homing mode 4(mode 20)



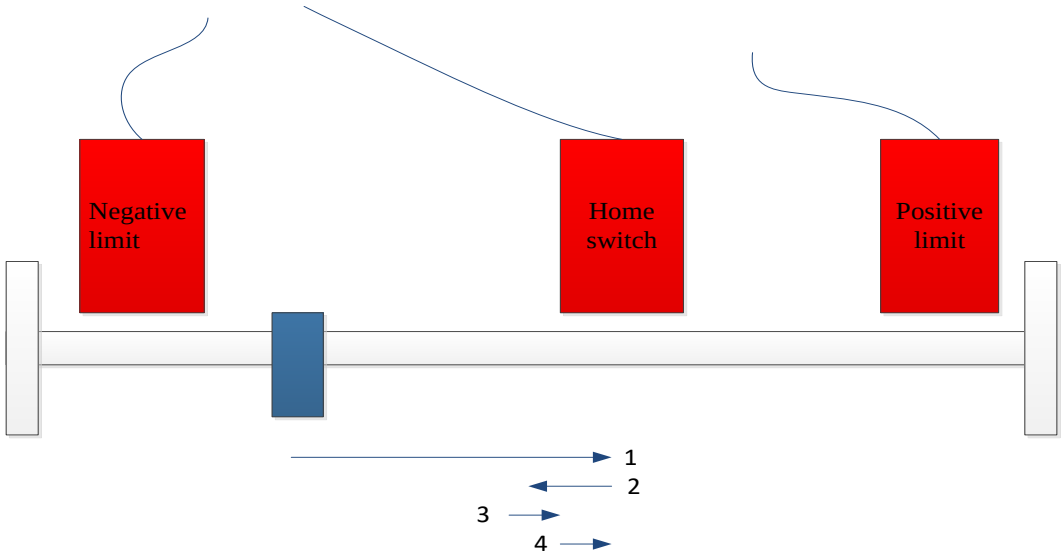

1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the positive direction to find the falling edge of the home switch (on the same side).
3. Operate in the negative direction to find the rising edge of the home switch.
4. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 20)

Homing mode 5(mode 21)



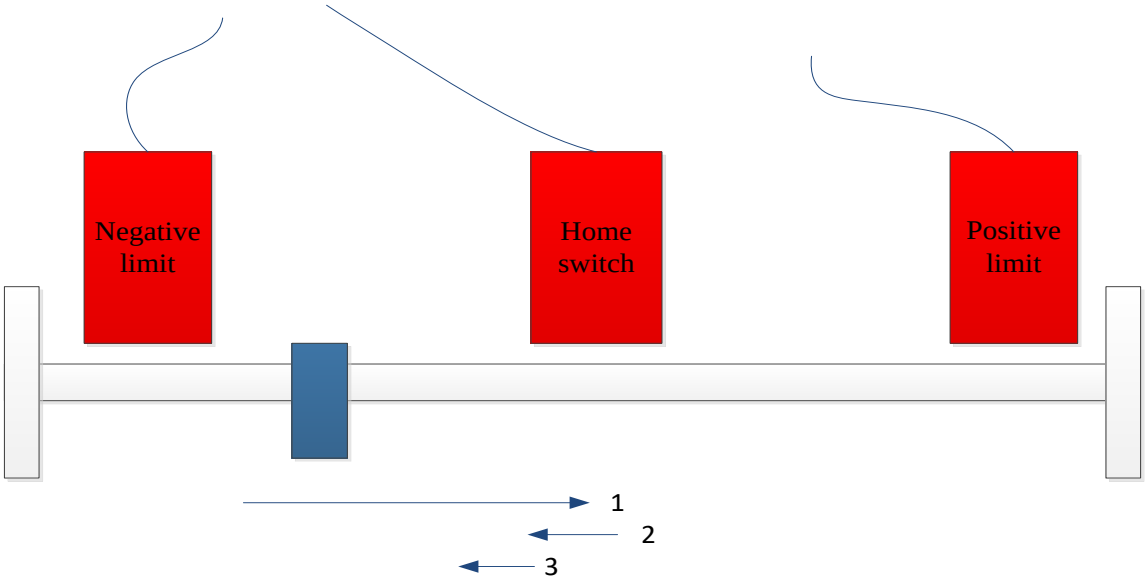

1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the positive direction to find the falling edge of the home switch (on the same side).
3. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 21)

Homing mode 6(mode 22)



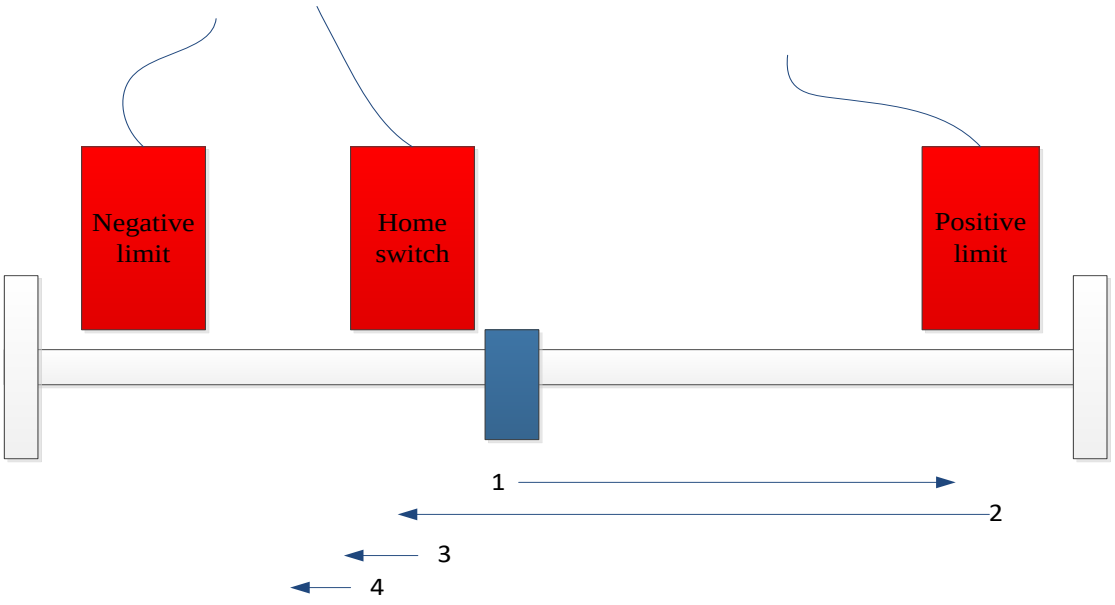

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch (on the same side).
3. Operate in the positive direction to find the rising edge of the home switch.
4. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 22)

Homing mode 7(mode 23)



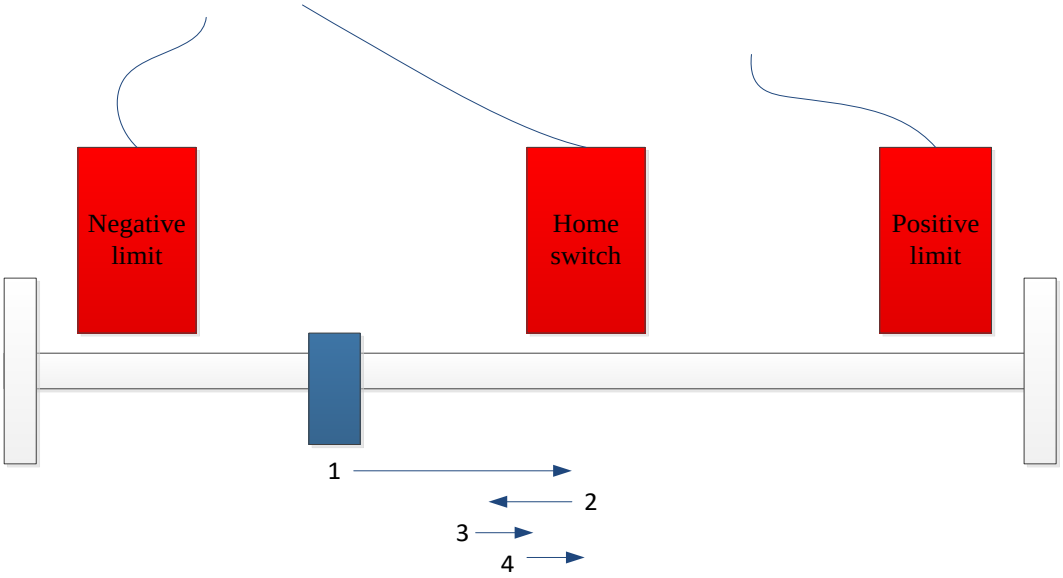

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch (on the same side).
3. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 23)

or



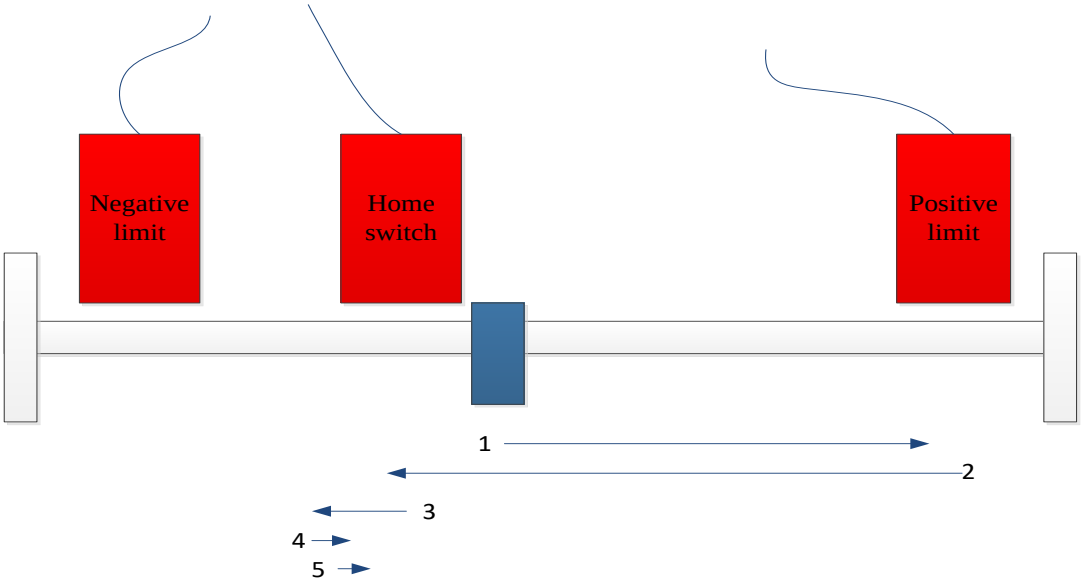

1. Operate in the positive direction to find the rising edge of the positive limit switch.
2. Operate in the negative direction to find the rising edge of the home switch (high velocity switched to low velocity).
3. Operate in the negative direction to find the falling edge of the home switch.
4. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 23)

Homing mode 8(mode 24)



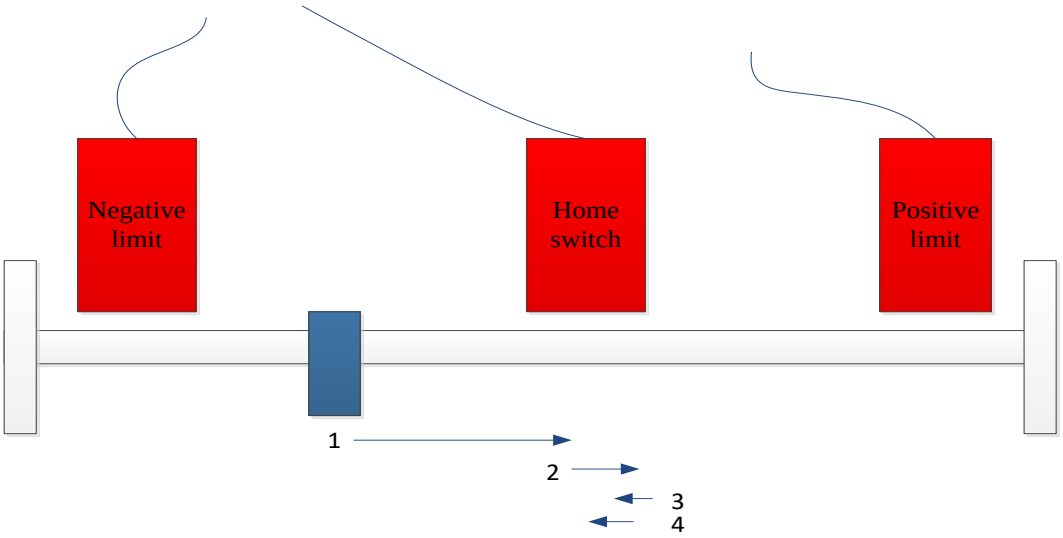

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch (on the same side).
3. Operate in the positive direction to find the rising edge of the home switch.
4. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 24)

Or:



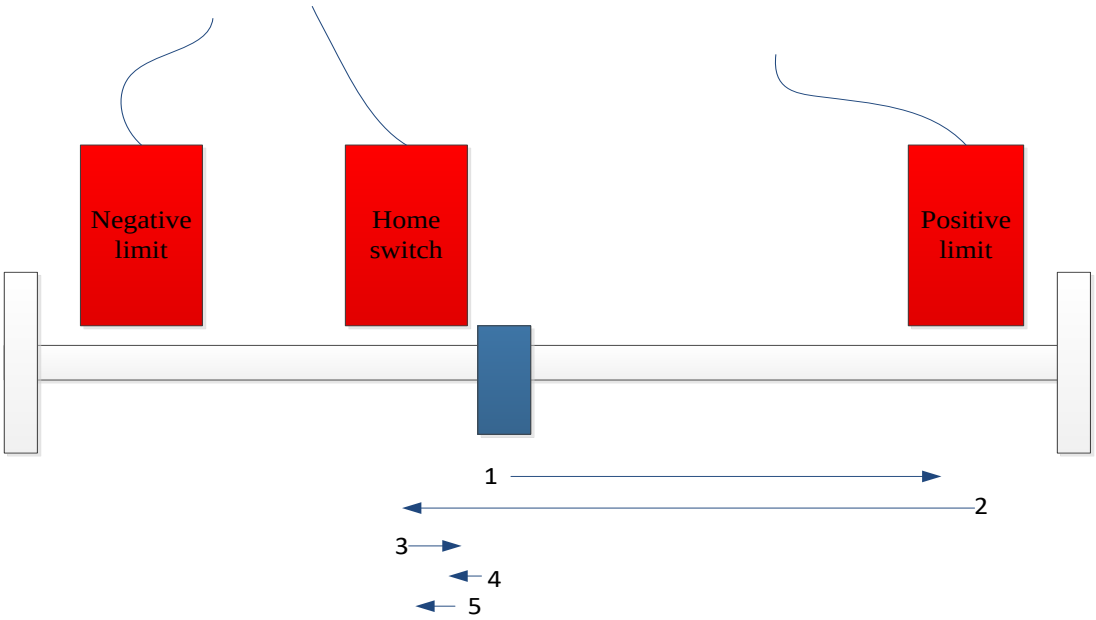

1. Operate in the positive direction to find the rising edge of the positive limit switch.
2. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the negative direction to find the falling edge of the home switch.
4. Operate in the positive direction to find the rising edge of the home switch.
5. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 24).

Homing mode 9(mode 25)



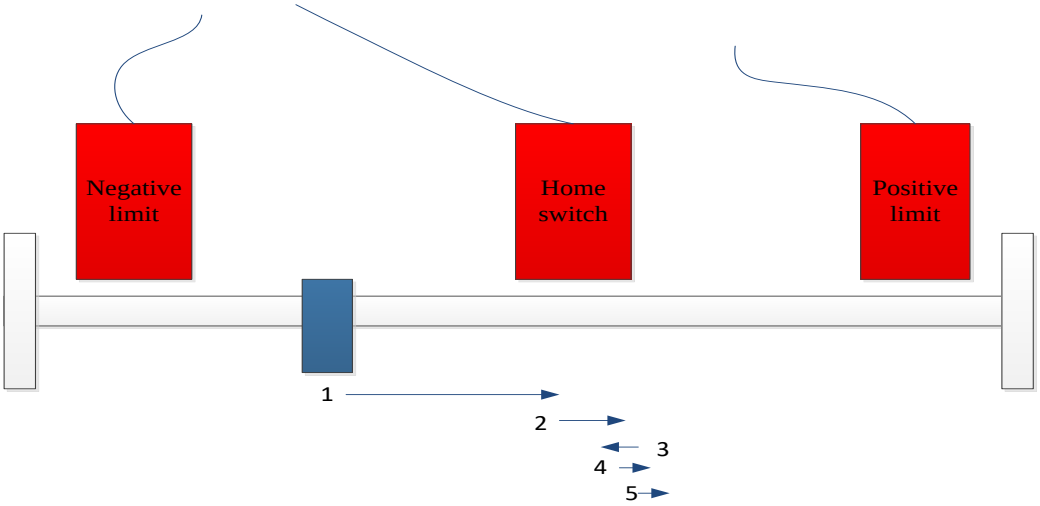

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the positive direction to find the falling edge of the home switch(on the other side).
3. Operate in the negative direction to find the rising edge of the home switch.
4. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 25)

or



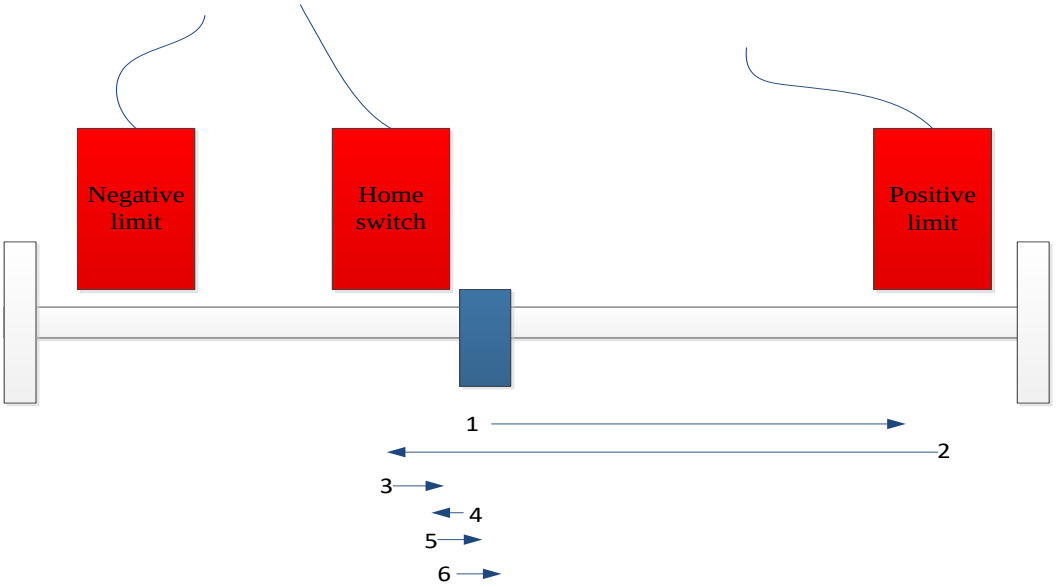

1. Operate in the positive direction to find the rising edge of the positive limit switch.
2. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the positive direction to find the falling edge of the home switch.
4. Operate in the negative direction to find the rising edge of the home switch.
5. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 25).

Homing 10(mode 26)



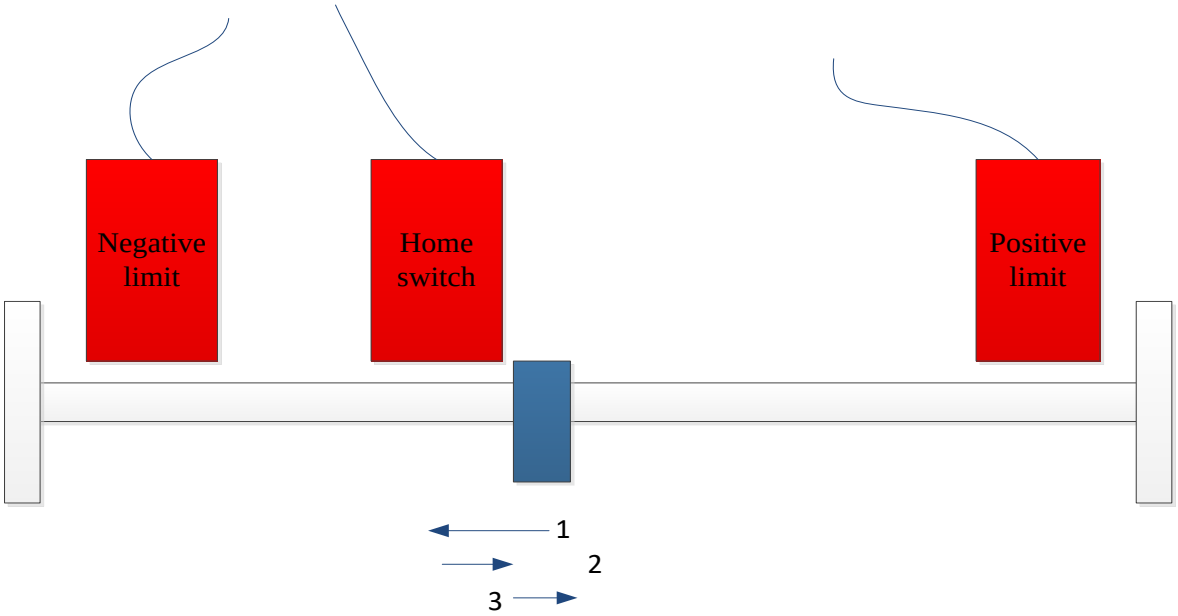

1. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the positive direction to find the falling edge of the home switch(on the same side)
3. Operate in the negative direction to find the rising edge of the home switch.
4. Operate in the positive direction to find the failing edge of the home switch.
5. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 26)

or



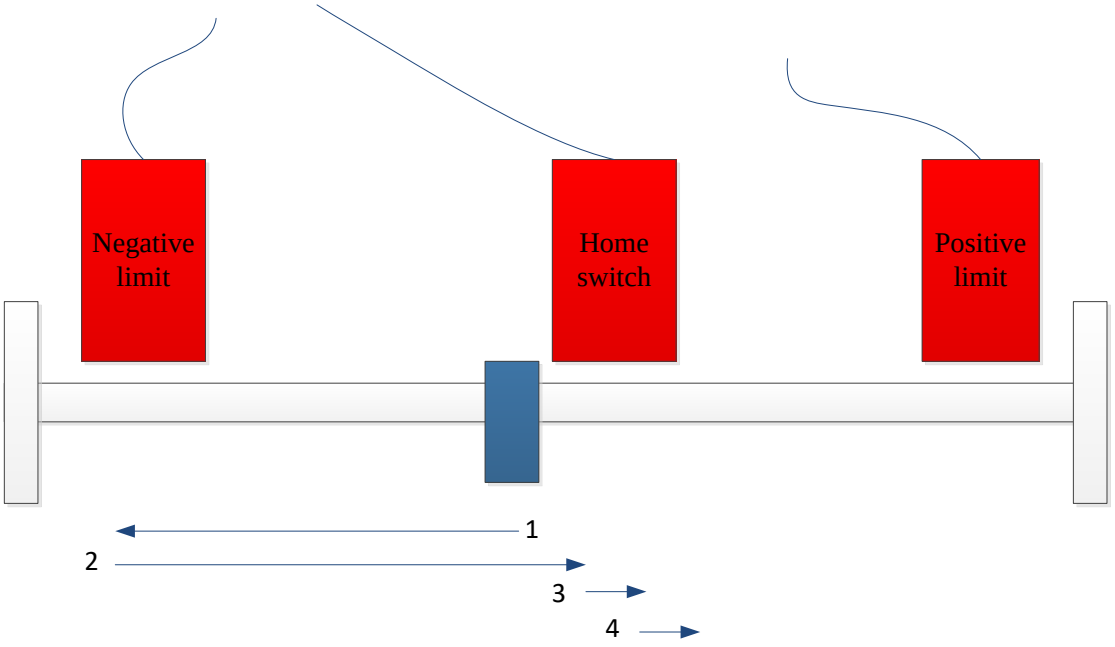

1. Operate in the positive direction to find the rising edge of the positive limit switch.
2. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the positive direction to find the failing edge of the home switch.
4. Operate in the negative direction to find the rising edge of the home switch.
5. Operate in the positive direction to find the falling edge of the home switch.
6. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 26)

Homing mode 11(mode 27)



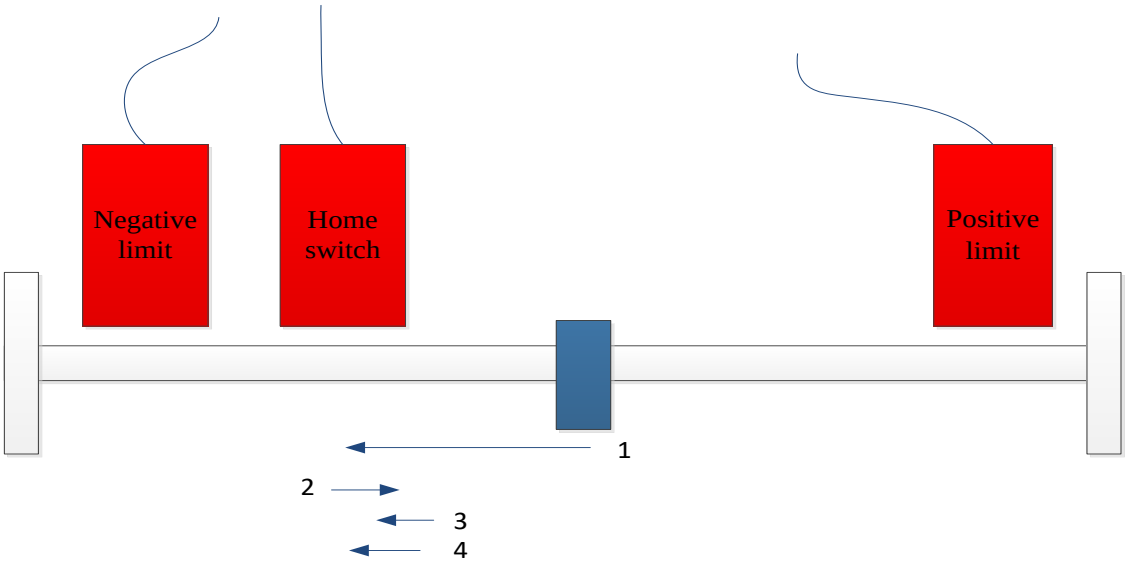

1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the positive direction to find the failing edge of the home switch(on the same side).
3. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 27)

or



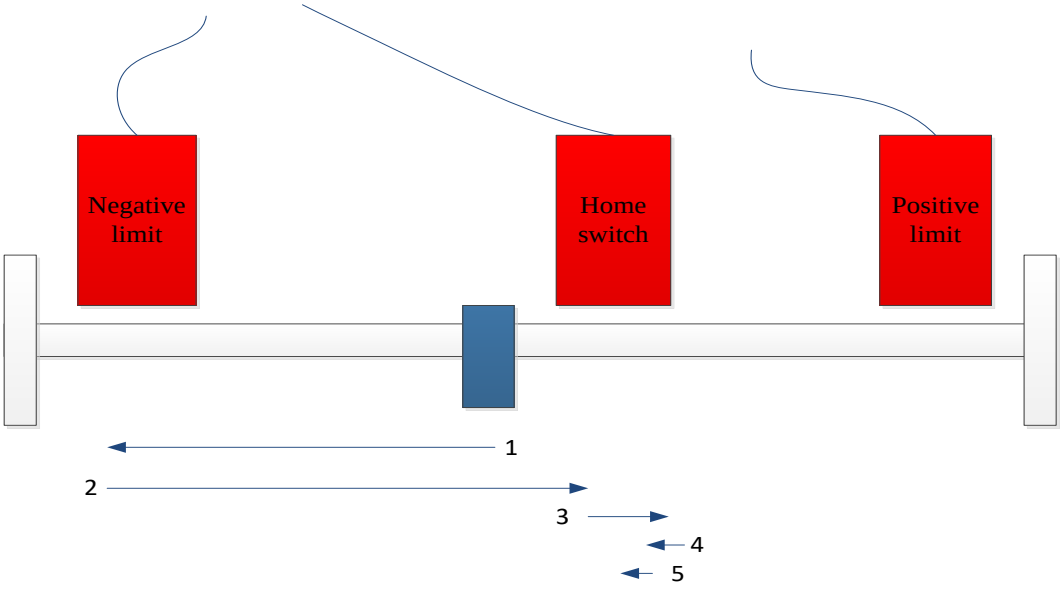

1. Operate in the negative direction to find the rising edge of the negative limit switch.
2. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the positive direction to find the rising edge of the home switch.
4. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 27)

Homing mode12(mode28)



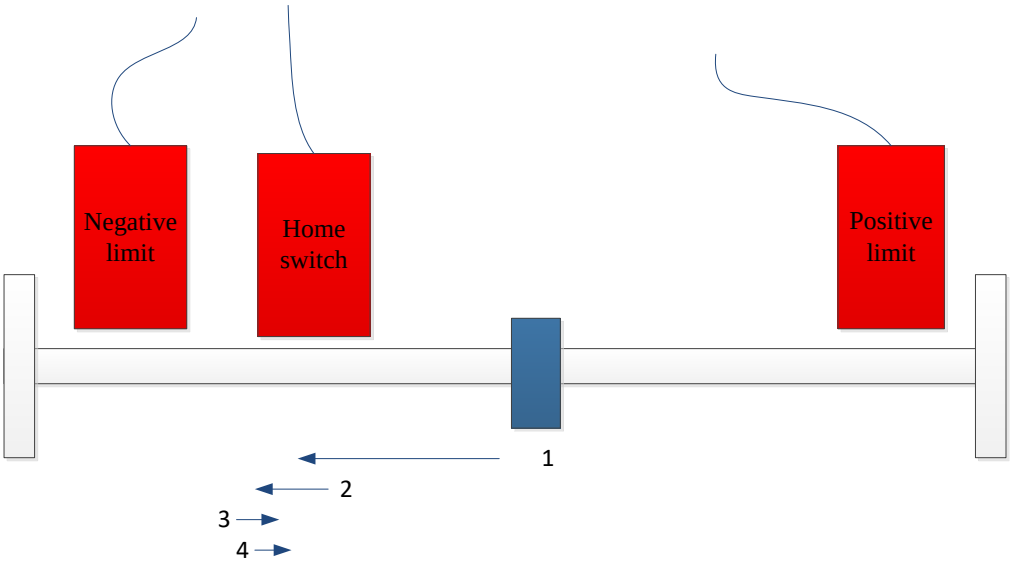

1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
1. Operate in the positive direction to find the falling edge of the home switch(on the same side)
2. Operate in the negative direction to find the rising edge of the home switch.
3. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 28)

or



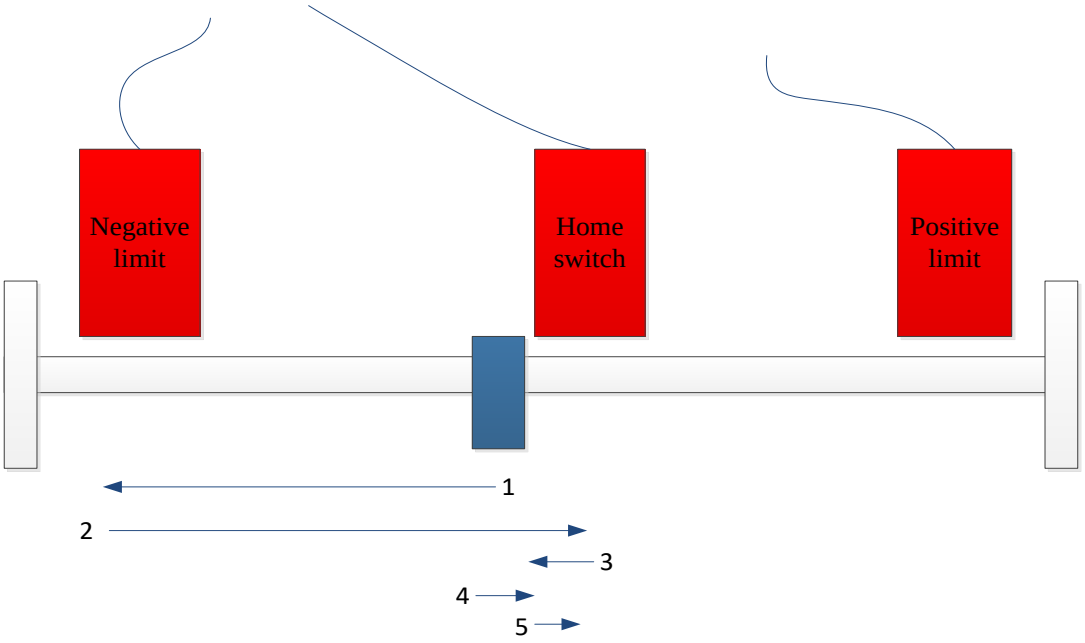

1. Operate in the negative direction to find the rising edge of the negative limit switch.
2. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the positive direction to find the falling edge of the home switch.
4. Operate in the negative direction to find the rising edge of the home switch.
4. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 28)

Homing mode 13(mode 29)



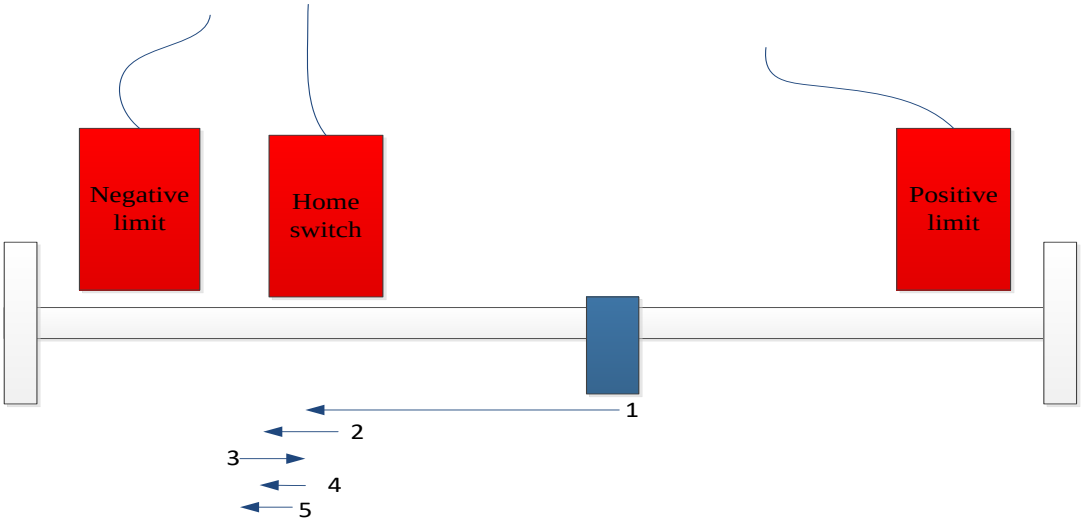

1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch(on the other side).
3. Operate in the positive direction to find the rising edge of the home switch.
4. Operate in the positive direction to find the Z signal. (not to find Z signal in mode 29)

or



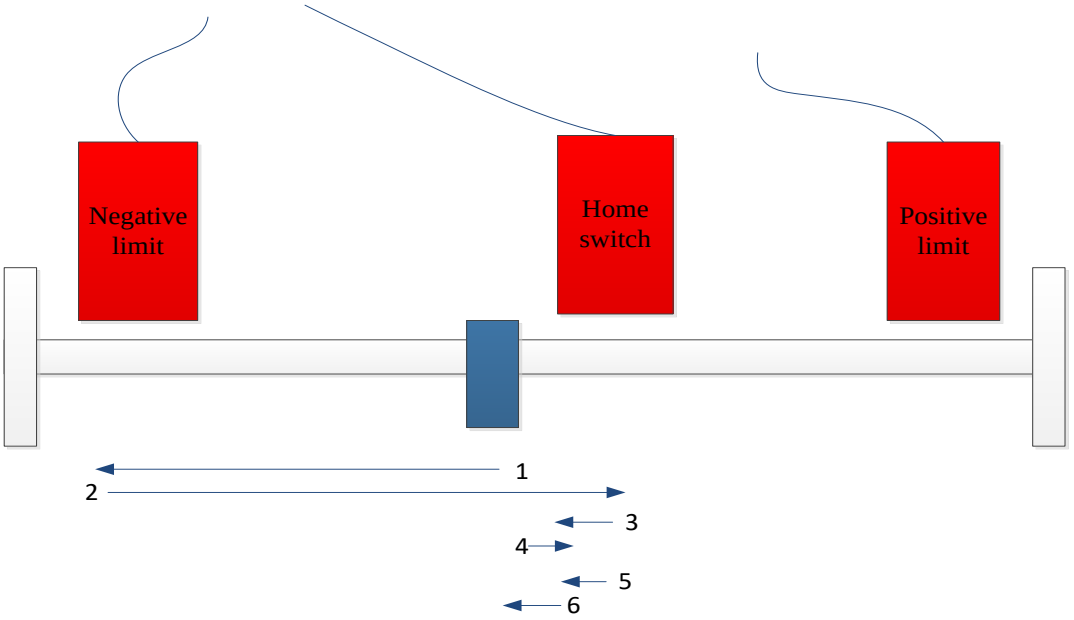

1. Operate in the negative direction to find the rising edge of the negative limit switch.
2. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the negative direction to find the falling edge of the home switch.
4. Operate in the positive direction to find the rising edge of the home switch.
5. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 29)

Homing mode 14(mode 30)




1. Operate in the negative direction to find the rising edge of the home switch(high velocity switched to low velocity).
2. Operate in the negative direction to find the falling edge of the home switch(on the other side).
3. Operate in the positive direction to find the rising edge of the home switch.
4. Operate in the negative direction to find the falling edge of the home switch.
5. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 30)

or




1. Operate in the negative direction to find the rising edge of the negative limit switch.
2. Operate in the positive direction to find the rising edge of the home switch(high velocity switched to low velocity).
3. Operate in the negative direction to find the falling edge of the home switch.
4. Operate in the positive direction to find the rising edge of the home switch.
5. Operate in the negative direction to find the falling edge of the home switch.
6. Operate in the negative direction to find the Z signal. (not to find Z signal in mode 30)

Homing mode 33
Operate in the negative direction to return to zero, with the home as the Z signal of the motor
Homing mode 34
Operate in the positive direction to return to zero, with the home as the Z signal of the motor
Homing mode 35
Take the current position as the home

If P03.36 is not 0, automatically run the distance of P03.36 after homing.

| P03.32 The high speed of homing | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~6000 | Rpm (*mm/s) | 100 | P | S | T |

Notes:
The velocity of the homing high-velocity stage.
The linear motor's Unit is mm/s.

| P03.33 The low speed of homing | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~6000 | Rpm (*mm/s) | 10 | P | S | T |

Notes:
The velocity of the homing low velocity stage.
The linear motor's Unit is mm/s.

| P03.34 Time limit of homing | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | ms | 10 | P | S | T |

Notes:
Set the acceleration and deceleration of the homing velocity.

| P03.35 Time timeout of homing | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 10ms | 50000 | P | S | T |

Notes:
Homing timeout AL.054, the home resets after shutdown, after need to reset once again the home,

| P03.36 Homing offset | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -1073807359 ~1073807359 | p | 0 | P | S | T |

Notes:
The offset of the operation after homing, with the unit as the encoder unit,

## Description of touchprobe function

The function that uses DI8 to capture sensor signals at high velocity for accurate positioning (software version 2.2 or above is compatible with this function)
Related function code:

| P03.38 Touchprobe move length | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -1073807359 ~1073807359 | p | 10000 | P | S | T |

Notes:
The displacement of the probe (DI8) at the probe position after triggering, which is the Unit of the encoder, and the electronic gear ratio has no effect..

| P03.3A Touchprobe move speed | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6000 | Rpm (mm/s) | 1000 | P | S | T |

Notes:
The velocity of operation after probe (DI8) is triggered

| P03.3B Touchprobe move acceleration and deceleration time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~60000 | ms | 100 | P | S | T |

Notes:
The velocity of operation after probe (DI8) is triggered

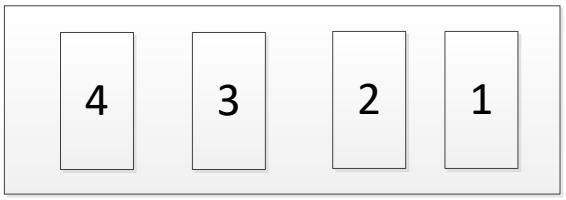
| P03.3C Configuration of touchprobe | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~0xFFFF | - | 0 | P | S | T |

Notes:

Configuration of probe function:

This setting is as follows:

The function code is set as 16bit




The first bit its the bit for the probe enable/disable, with 0 for disable and 1 for enable;

The second bit is the bit for the probe edge trigger setting, with 0 for rising edge triggering, 1 for falling edge triggering, and 2 for rising edge or falling edge triggering;

The third bit is the bit for the probe mode setting, with 0 for that the probe will automatically return to its original operating state at the end of operation, and 1 for that it will not return to its original operating state until receiving FunIN.20 probe release signal;

The fourth bit is kept at the probe locking time, and the output of FunOut17(ProbeLock) is effective.

For example:

Set to 0x0001 to enable the probe function, and the trigger is effective for the rising edge, which, after the trigger operation is completed, can automatically receive external commands and will also respond to the probe trigger again.

Set to 0x0011 to enable the probe function, and the trigger is effective for the falling edge, which, after the trigger operation is completed, can automatically receive external commands and will also respond to the probe trigger again.

Set to 0x0111 to enable the probe function, and trigger is effective for the falling edge, which will not return to its original operation state until receiving the FunIN.20 probe release signal.

| P03.3D Probe filtering time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~255 | 25ns | 5 | P | S | T |

Notes:

When the filtering time of probe hardware is amplified, interference can be prevented, but a certain degree of delay will be introduced. If the setting is too small, interference will easily occur and high-precision sensors are required.

It is effective after being powered on again.

## Description on Internal Position Function

In general, the internal position is used for internal testing, including: the internal position of 16 segments, of which, the displacement and velocity of each segment's operation, as well as the acceleration and deceleration time, waiting time and operation position attribute thereof, can be set separately.

Related function code:

| P10.00 Internal position operation mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |
| Notes:<br>To run internal commands, it is necessary to set P02.00=1 and P03.00=1; after given a servo enable signal and given FunIN.6(Execute_PP), the operation should be set according to the parameters of Group P10<br>When P10.00 is set to 0, the single operation ends after triggering the operation.<br>When P10.00 is set to 1, the operation will proceed circularly after triggering. | | | | | | |

| P10.03 Selection of number of operation segments | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~16 | - | 2 | P | S | T |
| Notes:<br>After triggering the internal position of the operation, it shall operate according to the displacement, velocity and other parameters set by P10.08~P10.77, and the number of operation segments shall be set as required.<br>(Software version 2.2 and above are compatible with the case of 16 segments) | | | | | | |

For example, setting 5 segments:

The set displacement is the user's unit, which is the unit before the electronic gear ratio, and the set velocity unit is rpm (mm/s for linear motor), and the acceleration/deceleration time is the time required for velocity to rise to 1000rpm (mm/s for linear motor).

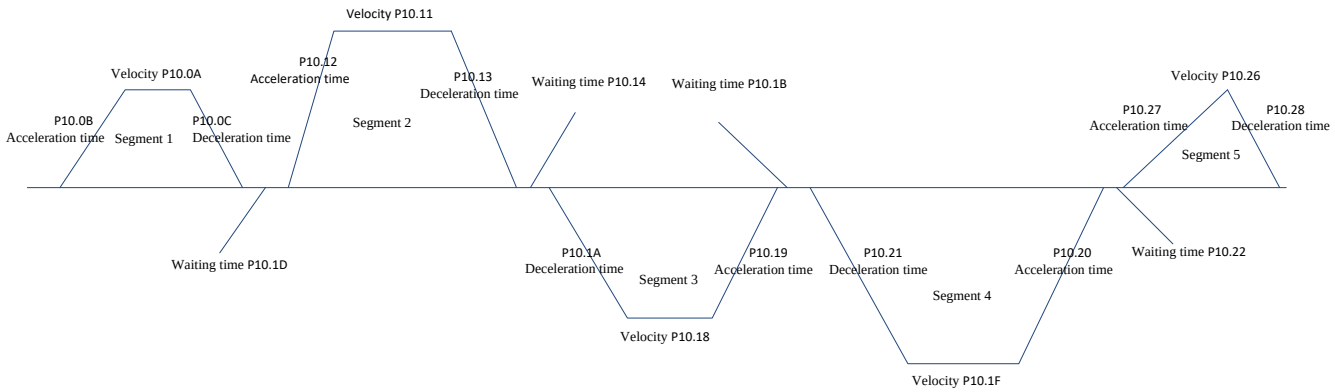



Fig. 6-13 Schematic Diagram for Operation of Internal Displacement

| P10.0E Configuration of Attributes for Segment 1 | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~65535 | - | 0 | P | S | T |

Notes:

Set to 0, indicating that the displacement of the operation of internal position is an absolute position and must be used after homing or used after determining the U00.07 position.

This Indicates that the set displacement is an absolute position relative to the home or initial position.

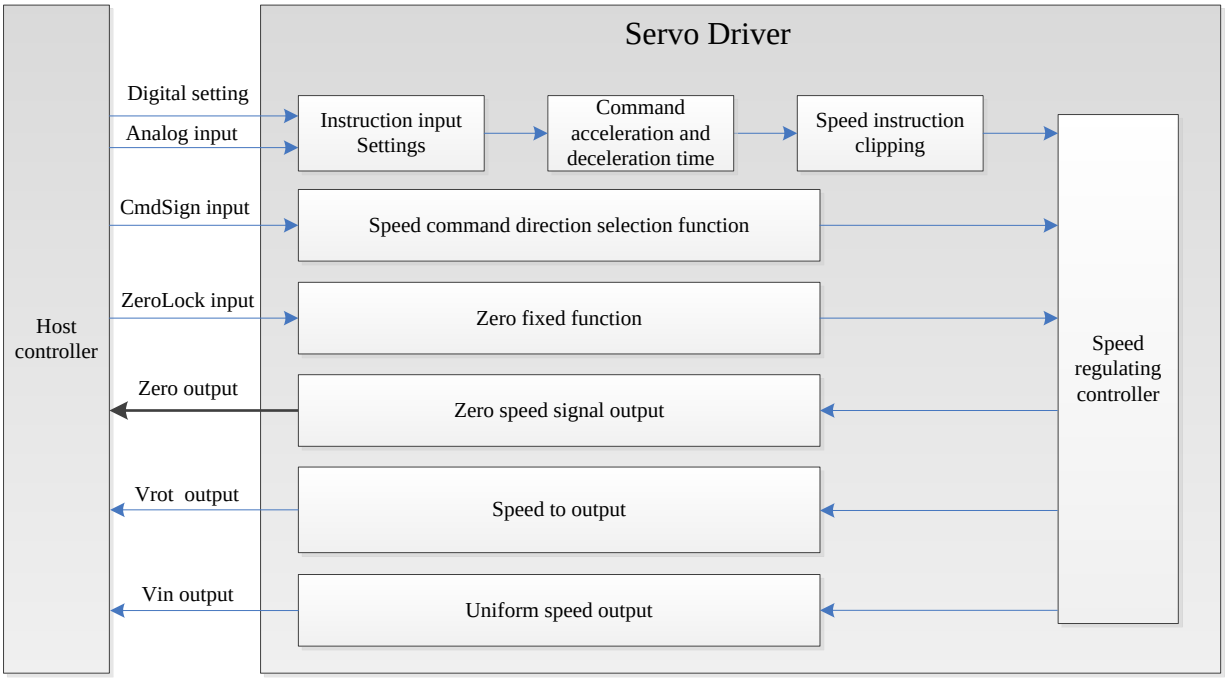
Set to 1, indicating that the displacement of the operation of internal position is an incremental position, which means that the operation starts with the current position as the starting point.

Other bits are reserved so that other movement functions can be added later and no need to be set at this time.

The attributes for other segments should be configured in the same way.

## 6.3 Speed mode

Speedmode related function




### Speed related function code

| P04.00 Speed command input setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | - | S | - |

Notes:

0-Digital setting

1- Analog input

The motor rotation is controlled by given velocity command

| P04.01 Set velocity number | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -6000~6000 | rpm(*mm/s) | 300 | - | S | - |
| Notes:<br>Digital set running velocity<br>Linear motor's unit is mm/S | | | | | | |

| P04.02 DI jog velocity setting value | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -6000~6000 | rpm(*mm/s) | 300 | | S | T |
| Notes:<br>velocity setting value when using DI jog<br>Linear motor's unit is mm/s | | | | | | |

| P04.03 Velocity command acceleration ramp time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 10 | - | S | T |
| Notes:<br>Rotary motor: The time for commanding acceleration from 0rpm to 1000rpm<br>Linear motor: The time for commanding acceleration from 0mm/s to 1000 mm/s. | | | | | | |

| P04.04 Velocity command deceleration ramp time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 10 | - | S | - |
| Notes:<br>Rotary motor: corresponding to the time for commanding deceleration from 1000rpm to 0rpm<br>Linear motor: is the time time for commanding deceleration from 1000rpm to 0rpm.. | | | | | | |

| P04.06 Jogging velocity acceleration ramp time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 10 | - | S | - |
| Notes:<br>Rotary motor: corresponding to the time for commanding deceleration from 1000rpm to 0rpm.<br>Linear motor: is the time for commanding deceleration from 1000rpm to 0rpm. | | | | | | |

| P04.07 Velocity corresponding to analog quantity 10V | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | rpm(*mm/s) | 3000 | - | S | - |
| Notes:<br>velocity value corresponding to voltage value when using analog input<br>Linear motor's unit is mm / S | | | | | | |

Velocity acceleration and deceleration time:

The servo driver includes position mode and velocity mode, with the velocity acceleration and deceleration as shown in the figure below: the acceleration time is set as T1, and the deceleration time is T2, which corresponds to the time for acceleration to 1000rpm (*mm/s), so the acceleration is t1/1000, and the deceleration is t2/1000.

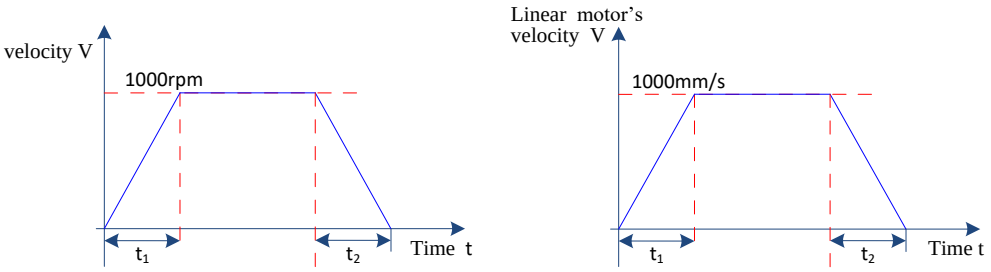



Figure 6-14 Description on Acceleration and Deceleration Time

Analog input setting:

| P05.30 Analog input offset | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -5000~5000 | 1mv | 0 | - | S | T |
| Note:<br>Modify the velocity (torque) offset corresponding to the analog voltage | | | | | | |

| P05.31 Analog input filtering | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~60000 | 0.01ms | 200 | - | S | T |
| Notes:<br>Possible to suppress the "burr" of analog input and improve the "abnormal noise" of operation" | | | | | | |

| P05.32 Analog input dead zone | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | 0.01mv | 100 | - | S | T |
| Notes:<br>When lower than this voltage input, the command is 0 | | | | | | |

| P05.33 Analog input zero drift | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | 0.01mv | 100 | - | S | T |
| Notes:<br>It is acceptable to use F09 to set to 1 for automatically adjusting the AI input zero drift | | | | | | |

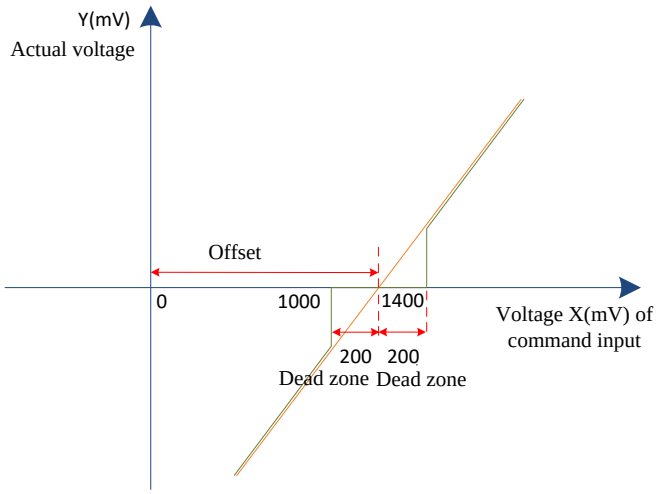



Figure 6-15 Schematic Diagram for Analog Input

Velocity DO output related function code

| P06.30 Zero position locked velocity command threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6000 | rpm(*mm/s) | 10 | P | S | T |
| Notes:<br>Set alocked threshold value of zero velocity. When the signal FunIn.15(z_Lock) is effective and the command is less than P06.30, the velocity command is 0<br>Linear motor's velocity unit is mm/s | | | | | | |

| P06.31 Motor rotation state threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | rpm(*mm/s) | 20 | P | S | T |
| Notes:<br>When the actual velocity of the motor is more than the set value, FunOut.17(VRot) is effective; when the velocity is less than the set value, FunOut.17(VRot) is ineffective.<br>Linear motor velocity's unit is mm / S | | | | | | |

| P06.32 Velocity reach signal width | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~200 | rpm(*mm/s) | 10 | P | S | T |
| Notes:<br>Meet:<br>When \| actual torque command-actual velocity feedback \|is <= P06.32, and kept for P06.36 time, the velocity remains at signal FunOut.14(VIn)<br>Linear motor velocity's Unit is mm/s. | | | | | | |

| P06.34 Zero velocity output signal threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~6000 | rpm(*mm/s) | 10 | P | S | T |

Notes:
When | motor velocity |<=P06.34 and kept for P06.37, the output of the zero velocity signal FunOut.12(VZero) is effective.
Linear motor velocity's Unit is mm/s.

| P06.35 Velocity DO filtering time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6000 | rpm(*mm/s) | 10 | P | S | T |

Notes:
Set the filtering of velocity feedback, and use the filtered velocity feedback to judge the velocity reach signal
Linear motor velocity's Unit is mm/s.

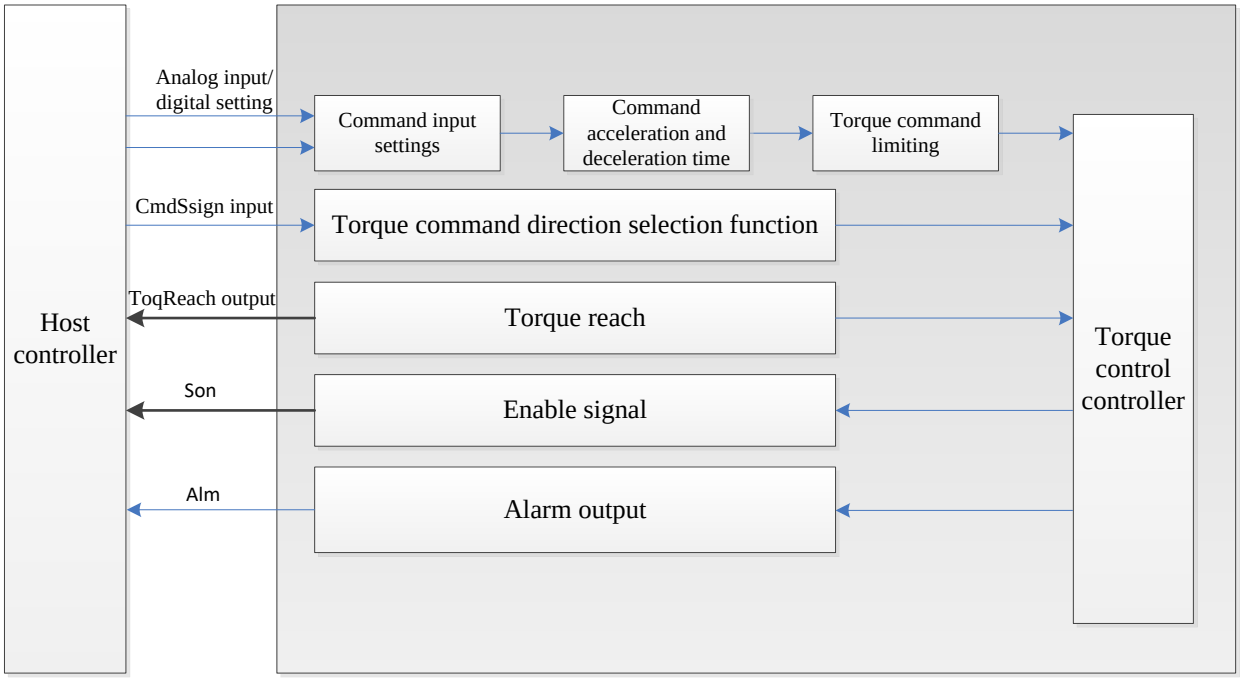
| P06.36 Velocity reach signal hold time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | ms | 0 | P | S | T |

Notes:
Meet:
When | actual torque command-actual velocity feedback |<= P06.32, and kept for P06.36 time, the velocity remains at signal FunOut.14(VIn)

| P06.37 Zero velocity signal hold time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | ms | 0 | P | S | T |

Notes:
When | motor velocity |<=P06.34, and keep for P06.37 time, the output of the zero velocity signal FunOut.12(VZero) is effective.

## 6.4 Torque mode



## Torque mode related function code

| P04.0A Torque command input setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | - | - | T |

Notes:
Control motor rotation by given torque command
0-digital setting
1-analog input

| P04.0B Digital set torque command | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -4000~4000 | 0.1% | 0 | - | - | T |

Notes:
Set digital given torque command (rated current percentage)

| P04.0C Torque command corresponding to analog quantity 10V | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 0 | - | - | T |

Notes:
Set digital given torque command (rated current percentage)

| P04.0D Torque command acceleration ramp time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 10 | - | - | T |

Notes:
Corresponding to the time for commanding increase from 0% torque to 100% torque

| P04.0E Torque command deceleration ramp time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | ms | 10 | P | S | T |

Notes:
Corresponding to the time for commanding decrease from 100% to 0%

| P04.0F Emergency stop torque | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 1000 | P | S | T |

Notes:
The value of the emergency stop torque when the emergency stop torque is used for shutdown

| P04.10 Velocity positive limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~6000 | rpm(*mm/s) | 3000 | P | S | |

Notes:
velocity positive limit in velocity position mode enters the velocity mode after reaching the limit value
Linear motor's Unit is mm/s

| P04.11 Velocity negative limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~6000 | rpm(*mm/s) | 3000 | P | S | |

Notes:
velocity reserve limit in velocity position mode enters the velocity mode after reaching the limit value
Linear motor's Unit is mm/s

| P04.12 Torque command positive limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~4000 | 0.1% | 3000 | P | S | T |

Note:
Mode torque command positive limit threshold is available

| P04.13 Torque command negative limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~4000 | 0.1% | 3000 | P | S | T |

Notes:
Mode torque command negative limit threshold is available

| P04.14 Torque mode velocity positive limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~6000 | rpm(*mm/s) | 3000 | - | - | T |

Notes:
velocity positive limit in torque mode enters the velocity mode after reaching the limit value
Linear motor's Unit is mm/s

| P04.15 Torque mode velocity negative limit | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~6000 | rpm(*mm/s) | 3000 | - | - | T |

Notes:
velocity negative limit in torque mode enters the velocity mode after reaching the limit value
Linear motor's Unit is mm/s

Torque DO output related function code

| P06.3A Torque reach reference value | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 0 | P | S | T |
| Notes:<br>Set the reference threshold of torque reach output | | | | | | |

| P06.3B Torque reach signal's effective threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 0 | P | S | T |
| Notes:<br>Meet:<br>When -P06.3B<= actual torque command -P06.3A<=P06.3B, the torque reach signal is effectively output | | | | | | |

| P06.3C Torque reach signal's ineffective threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.1% | 0 | P | S | T |
| Notes:<br>Meet:<br>When actual torque command -P06.3A>= P06.3C or<br>Actual torque command -P06.3A>= -P06.3C,<br>Torque reach signal is ineffective | | | | | | |

Torque reach signal FunOut.16

## 6.5 Mode switch

When P02.00=3, it is acceptable to use DI to switch operating modes as shown in the table below

| ModSel1 ( FunIn.11 ) | ModSel2 ( FunIn.12 ) | Mode |
|---|---|---|
| 0 | 0 | Position mode |
| 0 | 1 | Torque mode |
| 1 | 0 | Speed mode |
| 1 | 1 | Position mode |

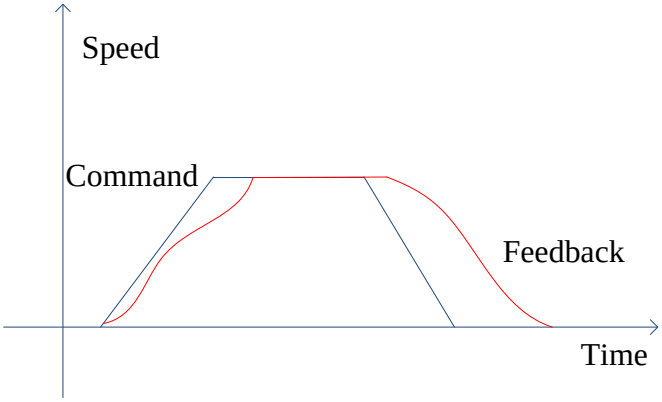
When the DI terminal is used for mode switching, only two modes are normally used for switching. The host devicecan only select and control one DI function, and the other DI function can be set as effective or ineffective by default.

# Chapter 7 Adjustment

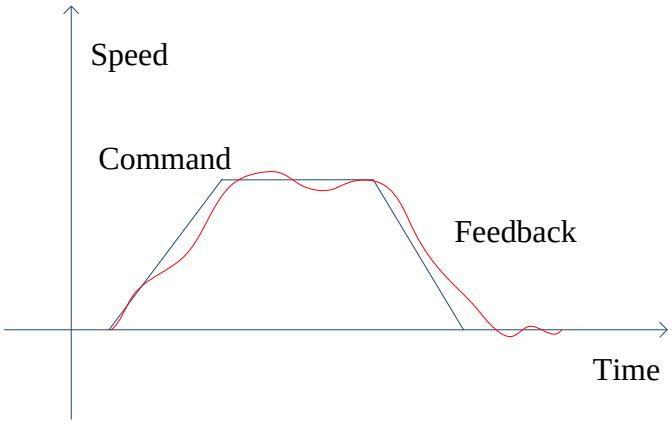
## 7.1 Gain adjustment target

Gain adjustment is for the purpose to allow the motor to work without delay according to the command from of the upper computer, which can give full play to the mechanical performance.Users often need to adjust the relative gains of position loop and velocity loop.

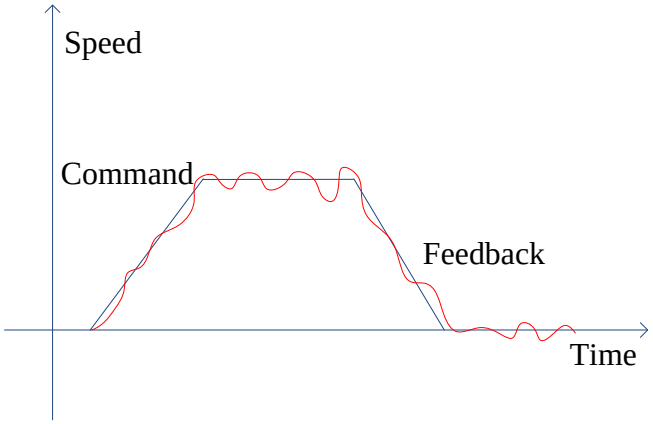
Here are some common commissioning waveforms




Due to the weak gain adjustment, the servo system has a slow response and a long tail

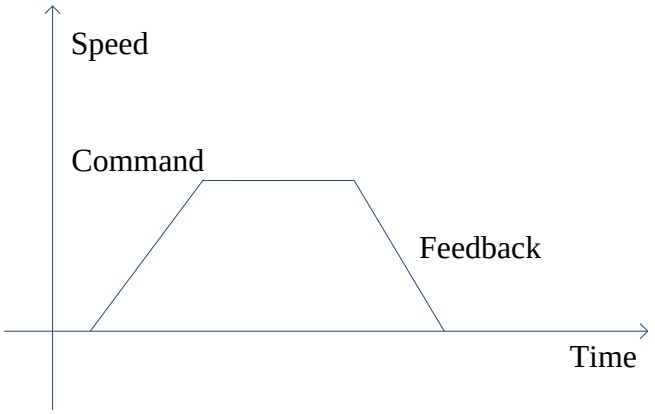



The gain matching between the position loop and the speed loop is unreasonable, resulting in overshoot.



The gain of position loop or speed loop is too strong, resulting in oscillation.

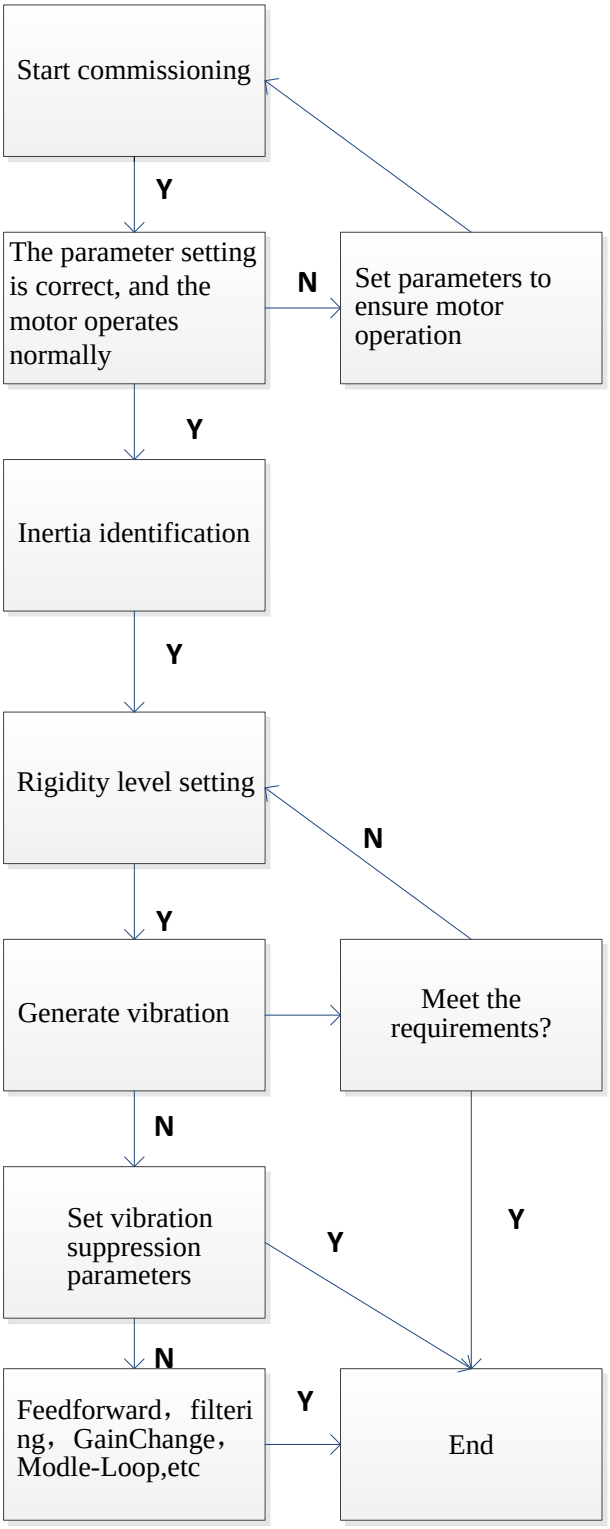
The ideal position response can be achieved by enhancing the gain of position loop and speed loop, as well as feedpositive and other parameters.




In the actual commissioning process, due to the influence of mechanical factors, the position feedback is difficult to completely coincide with the instruction. At this time, it is only necessary to ensure that the response has no overshoot or oscillation and the positioning time is less than the required value.

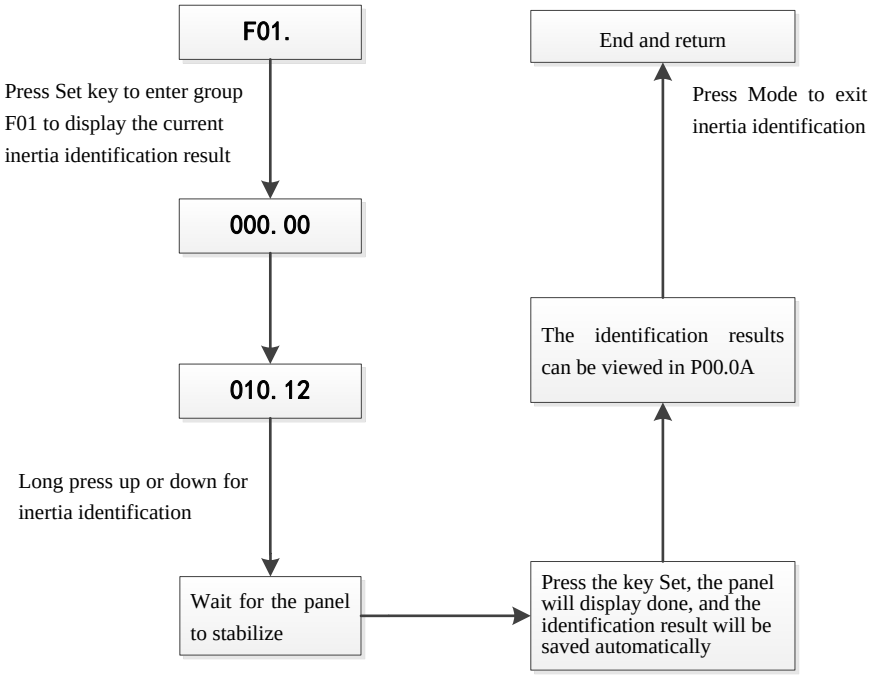
## 7.2 Manual gain adjustment

Gain adjustment often follows the following process



### 7.2.1 Inertia identification

Inertia identification is the first step for parameter adjustment, which can be identified by panel or background. If it is identified by background, it can be identified by wizard. If it is operated by panel, the operation process is as follows:




Schematic diagram for inertia identification

Inertia identification related function code

| F01 Automatic identification of load inertia ratio | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | - | - | - | P | S | T |
| Notes:<br>Auxiliary function manual automatic identification of inertia ratio | | | | | | |

| P00.0A Load inertia ratio | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~12000 | - | 1.00 | P | S | T |
| Notes:<br>Load inertia ratio = external load inertia / motor load inertia | | | | | | |

| P0A.00 Inertia identification operation track | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |
| Notes:<br>0- positive and negative triangle command (limited mechanical stroke, positive and negative motor operation)<br>1-Jog mode (unlimited mechanical stroke, motor running in one direction) | | | | | | |

### 7.2.2 Rigidity grade adjustment

When setting the initial parameters, you can select the self-adjusting mode, that is, P00.00 is set as a non-0 parameter, which is used to set the gain parameters by groups, and then set P00.01, which is used to gradually strengthen the servo response. The function codes affected by different modes of Pn00.00 are as follows:

| Function code | Description | Rigid table mode | Positioning mode | one-parameter mode |
|---|---|---|---|---|
| P00.02 | Group1speedloop gain | ○ | ○ | ○ |
| P00.03 | Group1speedloop integration time constant | ○ | ○ | ○ |
| P00.04 | Group 1 position loop gain | ○ | ○ | ○ |
| P00.05 | Group 1 torque filtering constant | ○ | ○ | ○ |
| P00.06 | Group 2 speed loop gain | × | ○ | × |
| P00.07 | Group 2 speed loop integration time constant | × | ○ | × |
| P00.08 | Group 2 position loop gain | × | ○ | × |
| P00.09 | Group 2 torque filtering constant | × | ○ | × |
| P00.10 | speed feed-positive gain | × | ○ | ○ |
| P00.12 | PDFF control factor | × | × | ○ |
| P00.19 | Gain switching mode | × | ○ | × |

Gain setting related function code

| P00.00 Self adjusting mode selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3 | - | 0 | P | S | T |

Notes:
0-manual gain setting
1-rigid table mode
2-positioning mode
3-single parameter mode
According to the load and operation mode, different adjustment methods are selected to give full play to the best responsiveness and stability of the system.

| P00.01 Rigidity grade selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~31 | - | 0 | P | S | T |

Note:
The higher the rigidity is, the better the responsiveness of the system is. However, the higher the rigidity is, the system will vibrate, which should be set according to the actual situation

| P00.02 Group 1 speed loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~20000 | 0.1HZ | 250 | P | S | T |

Notes:
The larger the velocity loop proportional gain setting is, the faster the velocity loop response is, which, however, is easy to cause system oscillation if it is too large

| P00.03 Group 1 speed loop integration time constant | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 15~51200 | 0.01ms | 3183 | P | S | T |

Notes:
The larger the velocity loop integration time constant proportional gain setting is, the smaller the velocity loop integration effect is..

| P00.04 Group 1 position loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~20000 | 0.1HZ | 400 | P | S | T |

Notes:
Position loop proportional gain

| P00.05 Group 1 torque filtering constants | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.01ms | 79 | P | S | T |

Notes:
velocity loop low pass filtering time

| P00.06 Group 2 speed loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~20000 | 0.1HZ | 250 | P | S | T |

Notes:
The larger the velocity loop proportional gain setting is, the faster the velocity loop response is, which, however, is easy to cause system oscillation if it is too large

| P00.07 Group 2 speed loop integration time constants | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 15~51200 | 0.01ms | 3183 | P | S | T |

Notes:
The larger the velocity loop integration time constant proportional gain setting is, the smaller the velocity loop integration effect is.

| P00.08 Group 2 position loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~20000 | 0.1HZ | 400 | P | S | T |

Notes:
Position loop proportional gain

| P00.09 Group 2 torque filtering constant | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | 0.01ms | 79 | P | S | T |

Notes:
velocity loop low pass filter time

| P00.10 Speed feedforward gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.01% | 0 | P | S | - |

Notes:
Used to set the position lead compensation

| P00.12 PDFF control factor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.01% | 1000 | P | S | T |

Notes:
Suppression velocity loop overshoot factor

| P00.19 Gain switching mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~4 | 0- | 0 | P | S | T |

Notes:
Set the first group of gain parameters and the second group of gain parameters switching method

When setting different rigidity grade P00.0, the loop gain corresponding to different grades is shown in the table below:

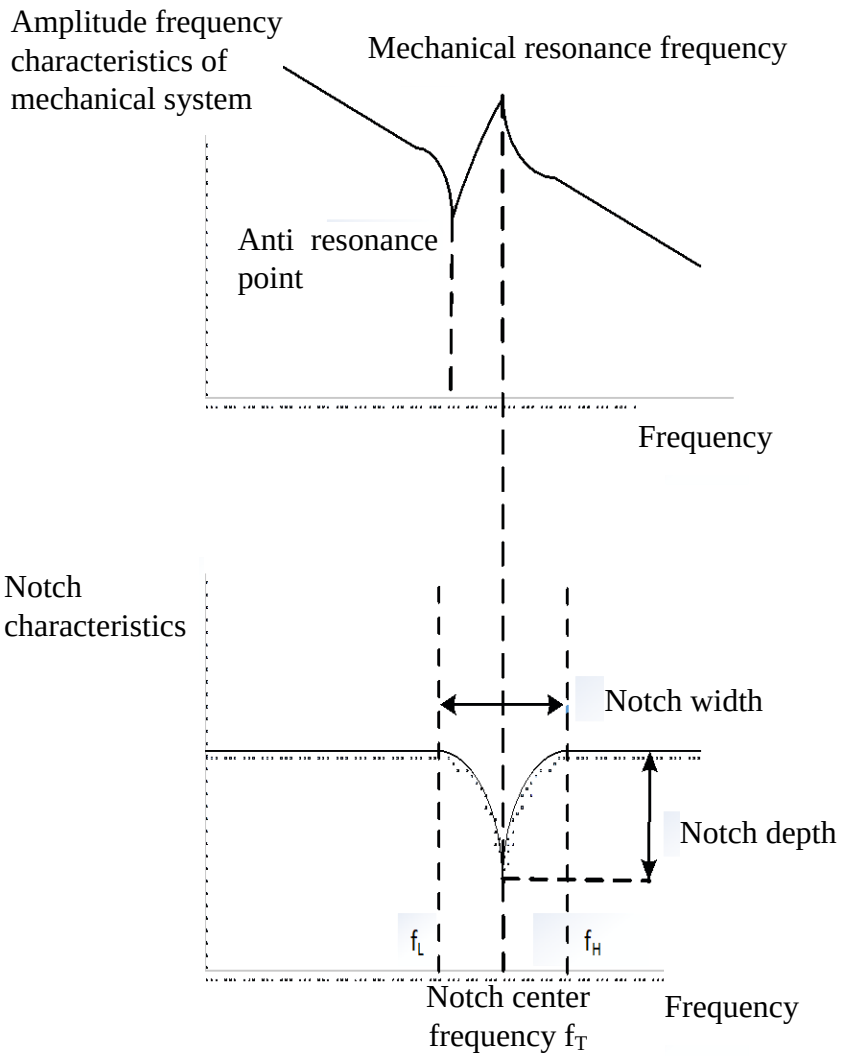
| Rigidity grade | Group 1 gain | | | | Group 2 gain | | | |
|---|---|---|---|---|---|---|---|---|
| | P00.02 | P00.03 | P00.04 | P00.05 | P00.06 | P00.07 | P00.08 | P00.09 |
| | First position loop gain (0.1/s) | First speed loop gain (0.1HZ) | First speedloop integration time constant (0.1ms) | First torque filtering time constant (0.01ms) | Second position loop gain (0.1/s) | Second speed loop gain (0.1HZ) | Second speedloop integration time constant (0.1ms) | Second torque filtering time constant (0.01ms) |
| 0 | 20 | 15 | 3700 | 1500 | 25 | 15 | 51200 | 1500 |
| 1 | 25 | 20 | 2800 | 1100 | 30 | 20 | 51200 | 1100 |
| 2 | 30 | 25 | 2200 | 900 | 40 | 25 | 51200 | 900 |
| 3 | 40 | 30 | 1900 | 800 | 45 | 30 | 51200 | 800 |
| 4 | 45 | 35 | 1600 | 600 | 55 | 35 | 51200 | 600 |
| 5 | 55 | 45 | 1200 | 500 | 70 | 45 | 51200 | 500 |
| 6 | 75 | 60 | 900 | 400 | 95 | 60 | 51200 | 400 |
| 7 | 95 | 75 | 700 | 300 | 120 | 75 | 51200 | 300 |
| 8 | 115 | 90 | 600 | 300 | 140 | 90 | 51200 | 300 |
| 9 | 140 | 110 | 500 | 200 | 175 | 110 | 51200 | 200 |
| 10 | 175 | 140 | 400 | 200 | 220 | 140 | 51200 | 200 |
| 11 | 320 | 180 | 310 | 126 | 380 | 180 | 51200 | 126 |
| 12 | 390 | 220 | 250 | 103 | 460 | 220 | 51200 | 103 |
| 13 | 480 | 270 | 210 | 84 | 570 | 270 | 51200 | 84 |
| 14 | 630 | 350 | 160 | 65 | 730 | 350 | 51200 | 65 |
| 15 | 720 | 400 | 140 | 57 | 840 | 400 | 51200 | 57 |
| 16 | 900 | 500 | 120 | 45 | 1050 | 500 | 51200 | 45 |
| 17 | 1080 | 600 | 110 | 38 | 1260 | 600 | 51200 | 38 |
| 18 | 1350 | 750 | 90 | 30 | 1570 | 750 | 51200 | 30 |
| 19 | 1620 | 900 | 80 | 25 | 1880 | 900 | 51200 | 25 |
| 20 | 2060 | 1150 | 70 | 20 | 2410 | 1150 | 51200 | 20 |
| 21 | 2510 | 1400 | 60 | 16 | 2930 | 1400 | 51200 | 16 |
| 22 | 3050 | 1700 | 50 | 13 | 3560 | 1700 | 51200 | 13 |
| 23 | 3770 | 2100 | 40 | 11 | 4400 | 2100 | 51200 | 11 |
| 24 | 4490 | 2500 | 40 | 9 | 5240 | 2500 | 51200 | 9 |
| 25 | 5000 | 2800 | 35 | 8 | 5900 | 2800 | 51200 | 8 |
| 26 | 5600 | 3100 | 30 | 7 | 6500 | 3100 | 51200 | 7 |
| 27 | 6100 | 3400 | 30 | 7 | 7100 | 3400 | 51200 | 7 |
| 28 | 6600 | 3700 | 25 | 6 | 7700 | 3700 | 51200 | 6 |
| 29 | 7200 | 4000 | 25 | 6 | 8400 | 400 | 51200 | 6 |
| 30 | 8100 | 4500 | 20 | 5 | 9400 | 4500 | 51200 | 5 |
| 31 | 9000 | 5000 | 20 | 5 | 10500 | 5000 | 51200 | 5 |

The factory rigidity level is generally 12 by default

## 7.2.3 Vibration suppression setting

### 7.2.3.1 Set resonant frequency manually.

Under the condition that the servo parameters continuously strengthen the gain, the connection rigidity of the mechanical system may be insufficient, so mechanical resonance may occur, and the vibration frequency may be different, some are high-frequency vibration, some are low-frequency vibration, so it is necessary to set a notch filter at the resonance frequency to suppress the mechanical resonance of the system. The amplitude characteristics of the system at high frequency resonance are as follows:




Servo provides 4 sets of trap parameters for resonance point suppression. Each set of trap can be set with resonance point, anti-resonance point, trap width, trap depth and the corresponding meaning of the parameters as shown in the above figure. When obtaining mechanical resonance point, there are usually two methods. One is to observe its vibration period through the background torque command waveform, and then obtain it through $f_0 = 1/T$ calculation, or obtain the mechanical resonance frequency through the background frequency sweeping function. Each trap set function code is as follows:

| P01.04 Group 1 notch filter anti-resonance frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system anti-resonance point

| P01.05 Group 1 notch frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system resonance point

| P01.06 Group 1 notch filter Band width | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~9 | - | 2 | P | S | T |

Notes:
Determine the frequency range for system suppression

| P01.07 Group 1 notch filter attenuation level | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~99 | - | 0 | P | S | T |

Notes:
Determine the suppression depth to the resonance point of the system

| P01.08 Group 2 notch filter anti-resonance frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~5000 | HZ | 5000 | P | S | T |

Note:
Corresponding system anti resonance point

| P01.09 Group 2 notch filter frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system resonance point

| P01.0A Group 2 notch filter band width | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~9 | - | 2 | P | S | T |

Notes:
Determine the frequency range of system suppression

| P01.0B Group 2 notch filter attenuation level | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~99 | - | 0 | P | S | T |

Notes:
Determine that depth of suppression to the resonance point of the system

| P01.0C Group 3 notch filter anti-resonance frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system anti resonance point

| P01.0D Group 3 notch filter frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~5000 | HZ | 5000 | P | S | T |

Note:
Corresponding system resonance point

| P01.0E Group notch filter band width | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~9 | - | 2 | P | S | T |

Note:
Determine the frequency range of system suppression

| P01.0F Group 3 notch filter attenuation level | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~99 | - | 0 | P | S | T |

Note:
Determine that depth of suppression to the resonance point of the system

| P01.10 Group 4 notch filter anti-resonance frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system anti resonance point

| P01.11 Group 4 notch filter frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~5000 | HZ | 5000 | P | S | T |

Notes:
Corresponding system resonance point

| P01.12 Group 4 notch filter band width | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~9 | - | 2 | P | S | T |

Notes:
Determine the frequency range for system suppression

| P01.13 Group 4 notch filter attenuation level | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~99 | - | 0 | P | S | T |

Notes:
Determine that depth of suppression to the resonance point of the system

In the meaning of the above function codes, the width is defined as shown in the following table

| Width setting | Actual suppression width of notch filter |
|---|---|
| 0 | $0.5*f_0$ |
| 1 | $0.6*f_0$ |
| 2 | $0.7*f_0$ |
| 3 | $0.8*f_0$ |
| 4 | $f_0$ |
| 5 | $1.2*f_0$ |
| 6 | $1.4*f_0$ |
| 7 | $1.6*f_0$ |
| 8 | $1.8*f_0$ |
| 9 | $2*f_0$ |

Depth definition represents the ratio of input and output of resonance frequency points. The smaller the value, the greater the suppression depth. The larger the value, the shallower the suppression depth, and the output amplitude/input amplitude = depth level/100.

The smaller the depth value is set, the deeper the notch depth is.

#### 7.2.3.2 Automatically set resonance frequency

If you don't want to set the function code manually to suppress resonance, you can turn on the adaptive filter to suppress resonance frequency. This function can automatically set the parameters of the third group and the fourth group of notch filters. When no resonance point is found after turning on, it will automatically exit 30 minutes later. If the resonance point is found and the notch filter is set, the vibration will become more intense, and it will also self The adaptive function is exited and the parameters of the notch filter are reset.

The adaptive related function codes are as follows:

| | P01.00 Adaptive filter mode selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|---|
| | | 0~4 | - | 0 | P | S | T |

Notes:

0- does not turn on the adaptive filter

1- Group 3 notch filter parameters automatically updated

2- Automatic update of notch filter parameters for groups 3 and 4

3- Test resonance frequency only, shown in P01.02

4- Clear the values of trap filters in groups 3 and 4

| P01.01 Vibration determination threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1% | 20 | P | S | T |

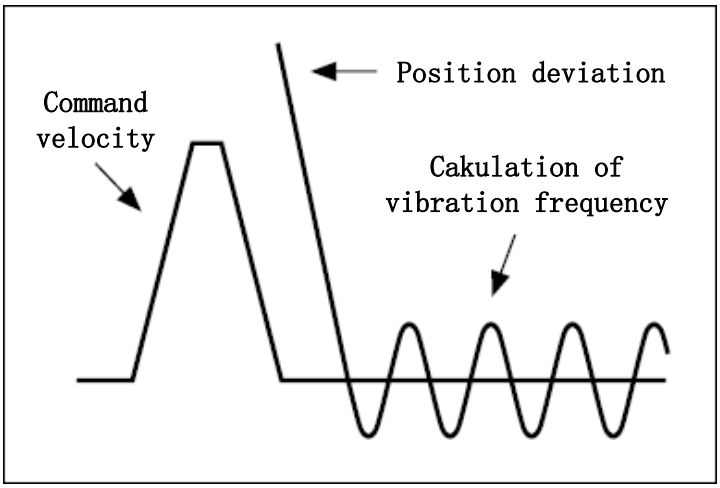
Note:
100% corresponds to the threshold value of motor rated torque to judge system oscillation

| P01.02 Resonance frequency identification results | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~5000 | HZ | - | P | S | T |

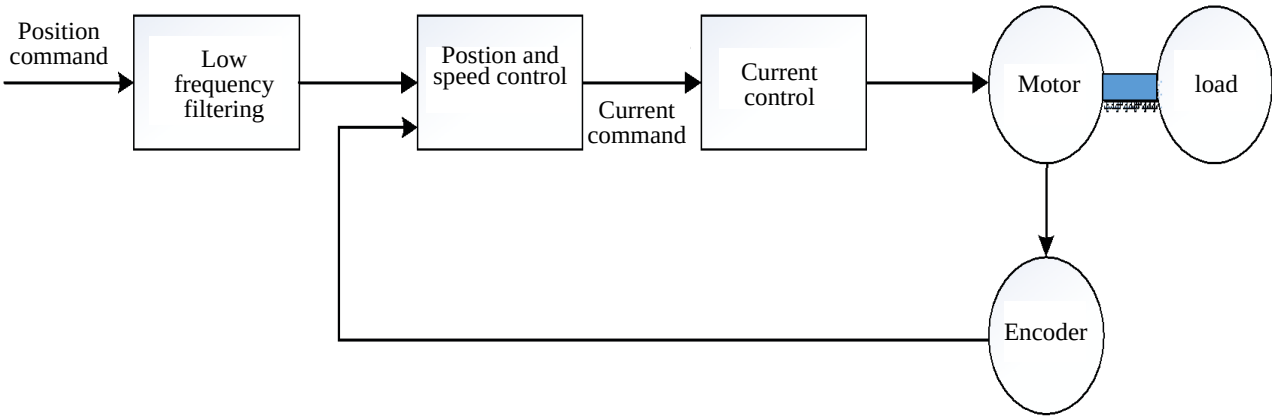
Notes:
Displays the tested resonant frequency value

### 7.2.3.3 Low frequency jitter suppression

In some flexible loads such as mechanical hands, when the motor running tracking command reaches a given position, the load will overshoot due to the non-rigid connection of the load, thus driving the motor to overshoot, resulting in low-frequency jitter, as shown in the following figure:




At this time, the jitter can be suppressed by setting the low-frequency vibration frequency. The filter directly acts on the position command, as follows:



The low frequency filter related function codes are as follows:

| P01.0F Low frequency vibration suppression mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | - | - |

Notes:
0-set the low frequency suppression filter manually
1-set the low frequency suppression filter automatically

| P01.20 Low frequency vibration determination threshold | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~65535 | - | 10 | P | - | - |

Notes:
When the position deviation is greater than the set value, it is considered that low frequency vibration occurs

| P01.21 Low frequency vibration frequency | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~1000 | 0.1HZ | 1000 | P | - | - |

Notes:
Measured low-frequency vibration frequency

| P01.22 Low-frequency vibration filter setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10 | - | 2 | P | - | - |

Notes:
The larger the value, the larger the filter width, but the greater the delay

| P01.23 Low-frequency resonance frequency attenuation ratio | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 12~30 | 0.1 | 12 | P | - | - |

Note:
The larger the value is, the greater the filtering depth is, and the smaller the position command delay is

### 7.2.3.4 Full closed loop vibration suppression

In the full closed-loop system, the servo system controls the velocity through the motor encoder and the position through the encoder on the load. Due to the torque between the motor and the load, the velocity fed back by the two encoders is not synchronous, which shows that there is shaking at the load end. In order to suppress the vibration caused by the asynchronous, the following parameter settings can be used to suppress it.

| P08.04 Hybrid vibration suppression gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -3000~3000 | 0.1HZ | 0 | P | - | - |
| Note:<br>Used to adjust the vibration suppression rate and has obvious effect when the torque of motor and load is large | | | | | | |

| P08.05 Cut-off frequency of hybrid vibration suppression filter | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~5000 | 1HZ | 500 | P | - | - |
| Note:<br>Vibration suppression filter setting | | | | | | |

| P08.06 Full closed loop velocity correction coefficient | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1% | 500 | P | - | - |
| Notes:<br>Put the velocity feedback compensation of the encoder at the load end into the actual velocity control loop | | | | | | |

| P08.07 Filter coefficient of internal and external ring position deviation | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1ms | 0 | P | - | - |
| Notes:<br>Filter the position feedback of load end and motor end | | | | | | |

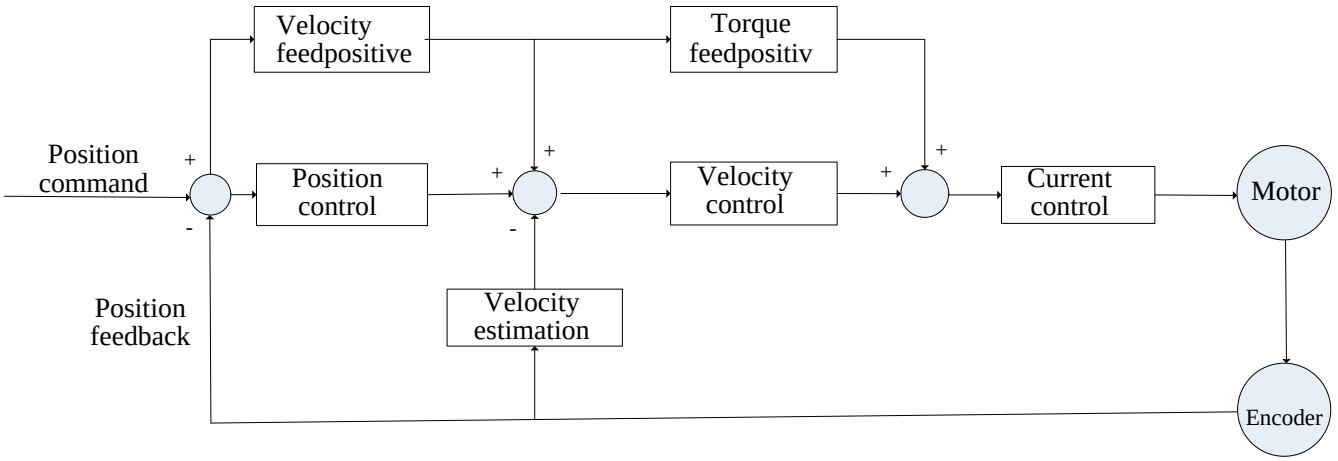
### 7.2.4 Practical application gain adjustment

#### 7.2.4.1 Feedpositive function

In the position control, the velocity command generated in the next cycle can be estimated by the position command, which can be directly compensated to the velocity control loop, avoiding the role of the position regulator, and effectively reducing the position deviation in the position control.

Similarly, in the velocity control, the torque command generated in the next cycle can be directly compensated to the current control loop through the velocity command estimation, which can effectively improve the velocity control response.

The control loop is as follows:




The function codes used for commissioning are as follows:

| P00.0F Velocity control feedpositive selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~2 | - | 1 | P | S | - |

Notes:
0~ no velocity feed positive
1~ internal velocity feedpositive
2~ external velocity feedpositive

| P00.10 Velocity feedpositive gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1% | 0 | P | - | - |

Notes:
Only the position mode is effective, the larger the velocity feedpositive is, the better the follow command is, the smaller the position deviation is, but the larger the feedpositive is, the system overshoot is easily caused, which should be set according to the actual situation

| P00.11 Velocity feedpositive filter time parameter | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6400 | 0.01ms | 50 | P | - | - |

Notes:
Low pass filter is used for velocity feedpositive to avoid too drastic change of velocity feedpositive

| P00.14 Torque feedpositive gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1% | 0 | P | S | - |

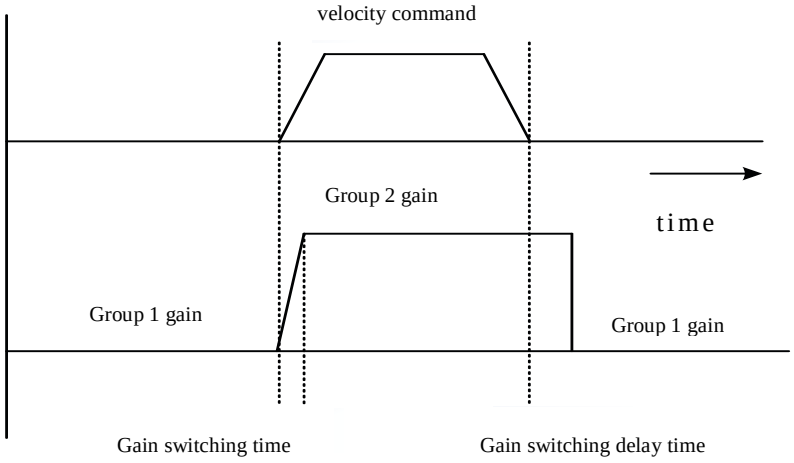
Notes:
The larger the torque feedpositive is, the better the follow-up velocity command is, but the larger the feedpositive is, the system will be overshoot, the stability will be poor, and the abnormal noise will be set according to the actual situation

| P00.15 Torque feedpositive filtering time parameter | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6400 | 0.01ms | 0 | P | S | - |

Notes:
The low-pass filter is applied to the torque feedpositive to avoid the drastic change of velocity feedpositive

### 7.2.4.2 Gain switching

When the servo is running and stopping, it is often necessary for the servo to have different response characteristics, namely:
Low gain is required to stop to avoid zero position vibration
High gain is required at stop to improve servo locking capability
High gain is needed in operation to improve servo tracking capability
In order to meet the requirements of operation and stop at the same time, the gain switching function needs to be introduced, as shown in the following figure:




The gain switching function mainly switches between the first group of gain and the second group of gain. In addition to the gain,
The function codes used are shown in the table below:

| P00.19 Gain switching mode selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~4 | - | 0 | P | - | - |

Notes:
0 ~ fixed as the first group gain
1 ~ maintain the first group of gain, and the di switching integral time is 0
2 ~ use DI to switch the first and second group gains
3 ~ use position command + velocity feedback to switch
4 ~ use position command + velocity feedback to switch to lock the gain

| P00.1A Gain switching delay time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | 0.1ms | 50 | P | - | - |

Notes:
Used to set the delay time for switching from the second gain to the first gain

| P00.1B Gain switching level | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~20000 | 0.1ms | 50 | P | - | - |

Notes:
If the switching condition is position, then the unit is p; if the switching condition is velocity, then the unit is RPM (* mm/s); if the switching condition is torque, then the unit is 0.1%

| P00.1C Gain switching delay | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~20000 | 0.1ms | 50 | P | - | - |

Notes:
If the switching condition is position, then the unit is p; if the switching condition is velocity, then the unit is RPM (* mm/s); if the switching condition is torque, then the unit is 0.1%

| P00.1D Gain switching time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | 0.1% | 30 | P | - | - |

Notes:
Used to set the time for switching from the first gain to the second gain

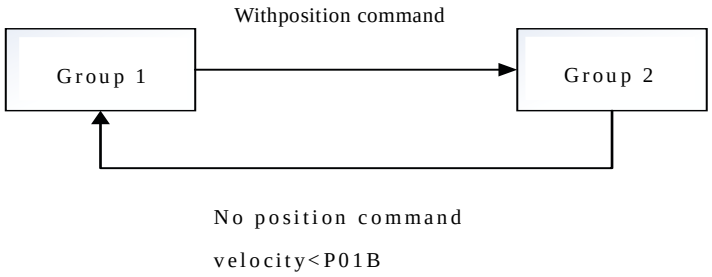
| P00.0E Group 3 gain coefficient | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~10000 | 1% | 30 | P | - | - |

Notes:
Used to set the amplification factor of the third group of gain and the first group of gain when stopping, and only amplify the position proportional gain and the velocity proportional gain

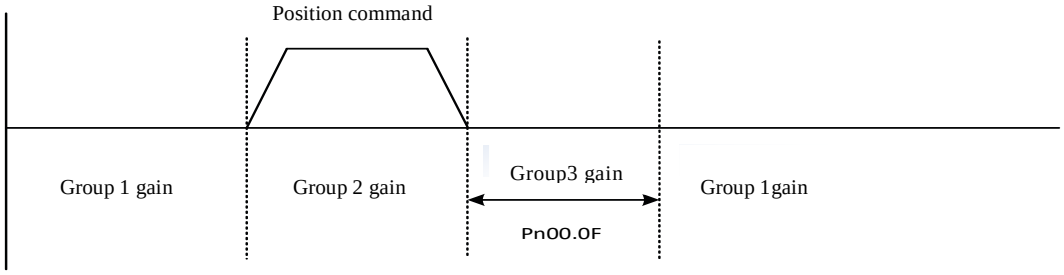
| P00.0F Group 3 gain hold times | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~10000 | | 0 | P | - | - |

Notes:
Used to set the group 3 gain holding time when stopping

When the gain switching mode is selected as 3, the switching process is as follows:



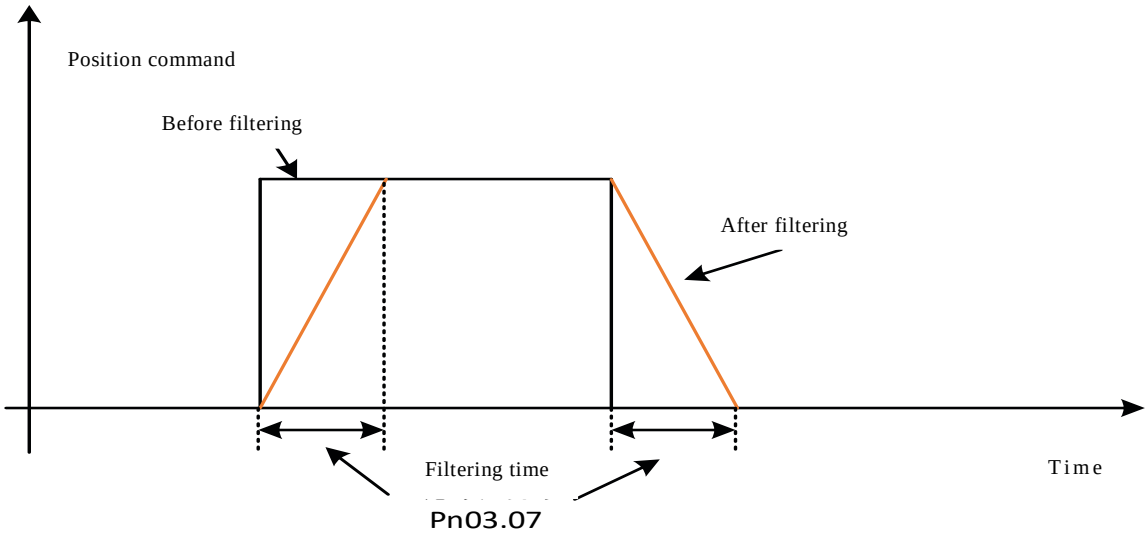

When the switching mode is selected as 4, a new group gain is introduced on the basis of 3. The group 3 gain amplification coefficient P00.0E is only for the position proportional gain and velocity proportional gain of the group 1 gain, and the velocity integration time and torque filtering coefficient remain the same as group 1, with the switching process as follows:



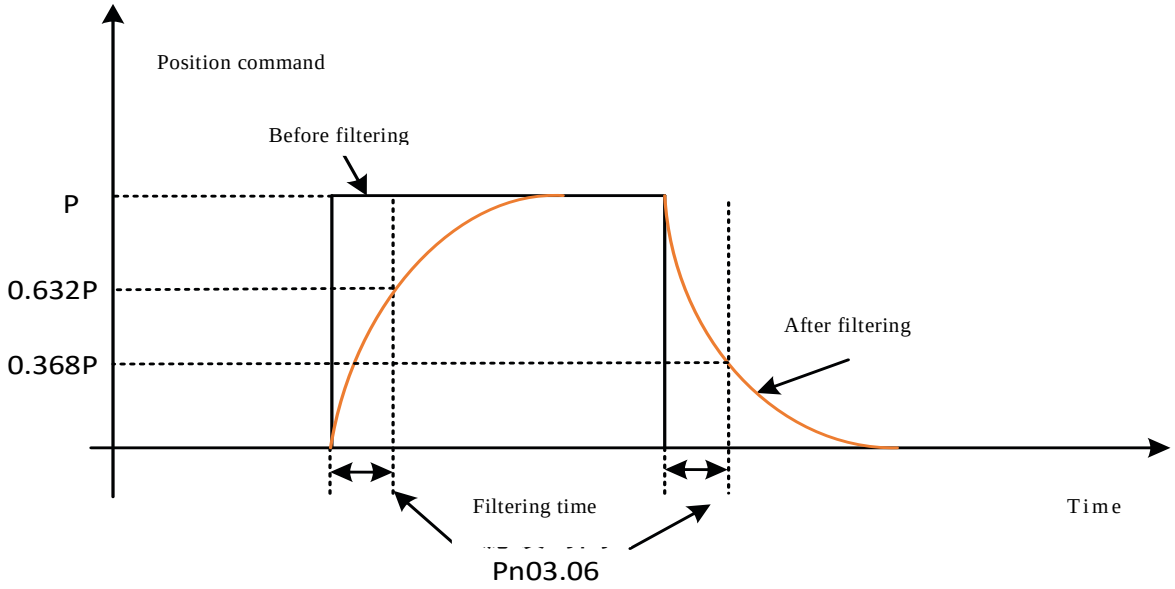

### 7.2.4.3 Command filtering function

In the position control, if the host devicesends commands with a fast frequency, which exceeds the overload capacity of the servo motor; or if the upper computer's commands have a large jump, resulting in obvious starting impact sound of the servo motor, the position commands need to be filtered to make the servo start smooth, reduce the impact on the load, and reduce the servo load rate.

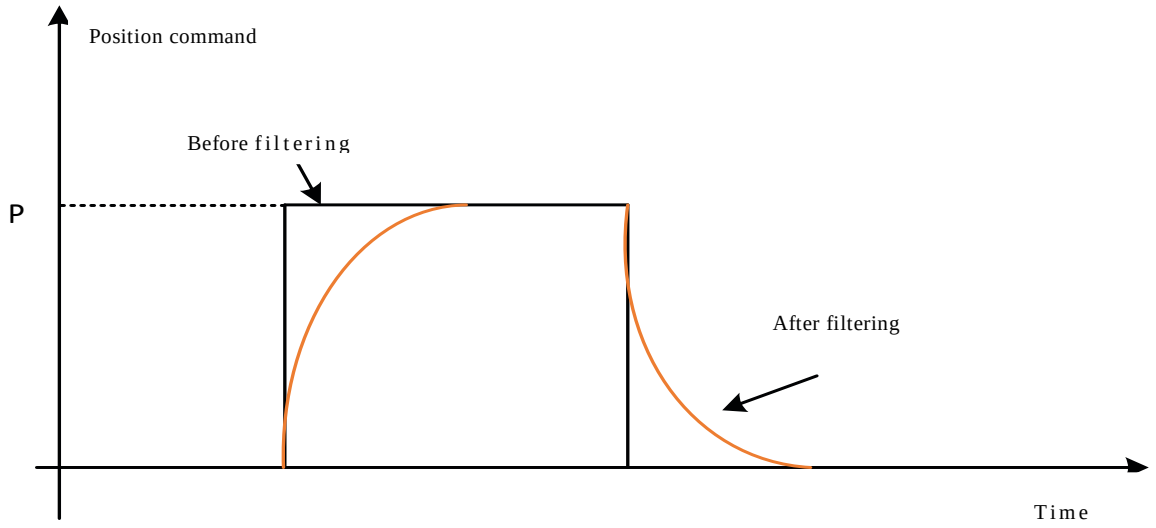
For the smooth filtering of the position command, when the filtering time is set, the position command changes as follows:



For the low-pass filtering of the position command, when the filtering time is set, the command will obviously decrease when accelerating to the highest velocity and decelerating to the lowest velocity, as shown below:




For model position command filtering, the filtering effect of position command can be increased or decreased by adjusting the model gain after the model loop is opened. Its effect on position command is similar to that of low-pass filtering. The smaller the model gain, the stronger the filtering effect, while the larger the model gain, the weaker the filtering effect.




The function codes related to position command are as follows:

| P00.25 Model loop enable | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | - | - |

Notes:
0 ~ disable model loop
1 ~ enable model loop

| P00.26 Model loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~20000 | 0.1HZ | 400 | P | - | - |

Notes:
The larger the gain, the higher the model loop response and the smaller the position instruction delay

### 7.2.4.4 Disturbance suppression of external forces

(1) Disturbance observer

When the servo motor is running, if the load is suddenly affected by external force, the velocity fluctuation of the servo motor may occur, resulting in mechanical noise or vibration. In order to suppress the impact of this load fluctuation and reduce the velocity fluctuation, the observer can be interfered. The adjustment function code is as follows:

| P00.26 Model loop gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~20000 | 0.1HZ | 400 | P | - | - |

Notes:
The larger the gain, the higher the model loop response and the smaller the position command delay

| P01.1A Disturbance torque compensation gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1000 | 0.1% | 0 | P | S | - |

Notes:
The larger the setting value is, the stronger the disturbance suppression effect will be, but high frequency noise may occur if it is too large. In this case, commissioning shall be carried out in coordination with the filtering time

| P01.1B Disturbance torque filtering time | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~2500 | 0.01ms | 50 | P | S | - |

Notes:
When reducing the noise produced by disturbance suppression, the larger the time is, the stronger the filtering effect will be, but it will slow down the suppression velocity

(2) Instantaneous velocity observation and velocity filtering

When the resolution of the motor encoder is low, if the loop gain is increased, strong noise may occur, even mechanical vibration may occur when the zero position is fixed. In order to suppress this noise, it is necessary to deal with the velocity feedback to reduce the velocity fluctuation.

| P00.20 Average filtering time of velocity feedback | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~5 | - | 0 | P | S | T |

Notes:
0 ~ no smooth filtering
1 ~ 2 times smooth filtering
2~-4 times smooth filtering
3~8 times smooth filtering
4 ~ 16 times smooth filtering
5 ~ 32 times smooth filtering

| P00.21 Cut-off frequency of velocity feedback low-pass filter | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 50~5000 | HZ | 5000 | P | S | T |

Note:
When it is set to 5000, there is no filtering effect. The smaller the setting value is, the stronger the filtering effect is

| P00.22 Cut-off frequency of torque observation | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~5000 | HZ | 400 | P | S | - |

Note:
Used to filter the observed torque value. The larger the value, the smaller the delay

| P00.23 Torque observation proportional gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~8000 | HZ | 400 | P | S | - |

Note:
As for the observed proportional gain, the larger the value is, the smaller the delay is

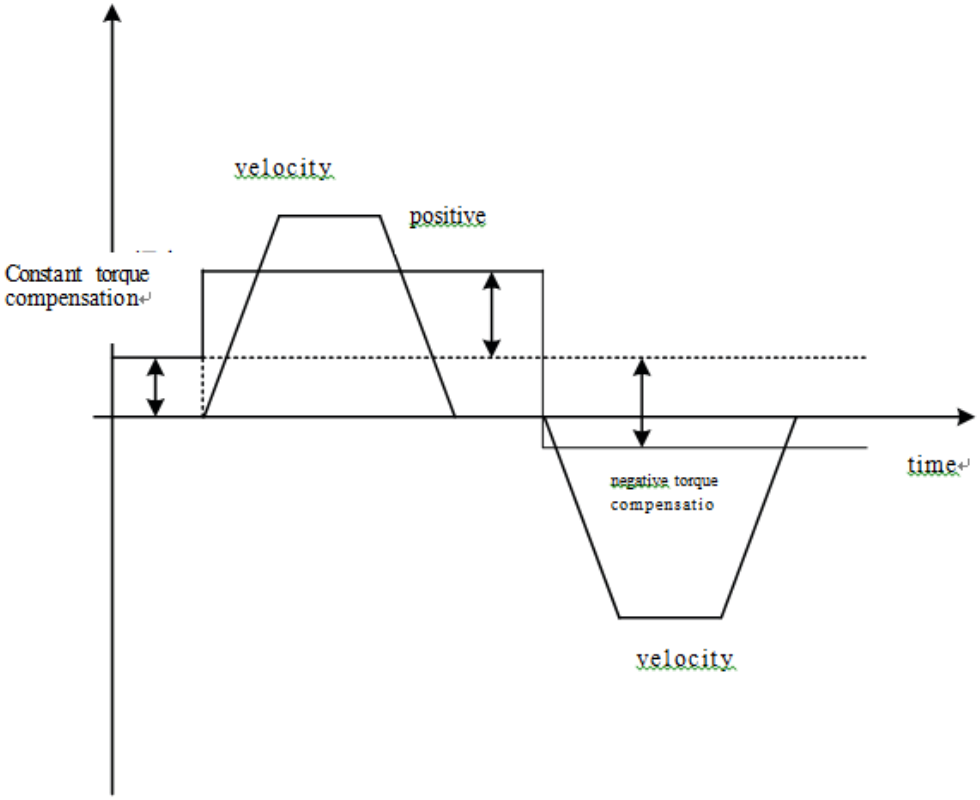
| P00.24 Velocity observation position compensation gain | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3000 | HZ | 400 | P | S | - |

Notes:
Used to compensate the velocity deviation caused by the position observation deviation

（2）Friction compensation

Friction compensation is used to solve the problem of starting delay caused by friction. After friction compensation is added, the servo motor can be started quickly

and the starting position deviation can be reduced. The compensation method is as follows:




Relevant function codes are set as follows:

| P01.1C Constant torque compensation value | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -1000~1000 | 0.1% | 0 | P | S | - |
| Notes:<br>Compensation for external constant load forces such as gravity | | | | | | |

| P01.1D positive friction compensation | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -1000~1000 | 0.1% | 0 | P | S | - |
| Note:<br>positive rotation compensation value | | | | | | |

| P01.1E Negative friction compensation | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | -1000~1000 | 0.1% | 0 | P | S | - |
| Note:<br>negative rotation compensation value | | | | | | |

# Chapter 8 Communication Mechanism

This servo driver is compatible with the serial communication function of RS-485 and RS-232. The parameters in the servo system can be accessed and changed by using the communication function. RS-485 and RS-232 communication functions can be used at the same time.

RS485 interface is located in CN1, for its wiring, see Chapter 3.2.5;

RS232 is CN2. For its wiring, see Chapter 3.3. You can use the commercially available USB mini-B to connect the PC.

Mobus related function settings：

| P09.00 Station number selection | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~127 | 1 | 0 | P | S | T |
| Notes:<br>When RS-232 / RS-485 communication is used, only one station number can be set for a group of servo drivers.<br>If the station number is set repeatedly, normal communication will not be possible | | | | | | |

| P09.01 Modbus communication baud rate communication setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6 | - | 6 | P | S | T |
| Notes:<br>0-2400 Kbp/s<br>1-4800 Kbp/s<br>2-9600 Kbp/s<br>3-19200 Kbp/s<br>4-38400 Kbp/s<br>5-57600 Kbp/s<br>6-115200 Kbp/s | | | | | | |

| P09.02 Modbus communication data format | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~3 | - | 0 | P | S | T |
| Notes:<br>To be compatible with the communication format of the upper computer<br>0-no check, 2 stop bits<br>1-even check, 1 stop bit<br>2-odd check, 1 stop bit<br>3-no check, 1 stop bit | | | | | | |

| P09.0a Background software 232 baud rate communication setting | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~6 | - | 6 | P | S | T |

Notes:
0-2400 Kbp/s
1-4800 Kbp/s
2-9600 Kbp/s
3-19200 Kbp/s
4-38400 Kbp/s
5-57600 Kbp/s
6-115200 Kbp/s

| P09.10485 EEROPM save prohibited during communication | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0~1 | - | 0 | P | S | T |

Notes:
0~ enables EEPROM save
1~ disable EERPOM save
Since EERPOM save is limited in number of times, it is better to set this parameter to 1 when frequently reading and writing parameters (function codes) in communication.
If you do not read and write frequently, you do not need to change. The setting of this parameter does not affect the setting of the panel.

## 8.1 Mod bus communication protocol

RTU (Remote Terminal Unit) mode generally begins with one static signal and ends with another static signal, and between which, there are communication positions, function codes, data contents, CRC (Cyclical RedundancyCheck), etc.
RTU mode: :

| | |
|---|---|
| start | Static time over 10ms |
| Slave Address | Communication address：1-byte |
| Function | Function code：1-byte |
| Data（0） | Data content：n-word =2n-byte，n<=10 |
| …… | |
| Data（n-1） | |
| CRC | Error check：1-byte |
| End | Static time over 10ms |

## 8.2 RTU function command

### Function：0x03 read function code

For example, the station number is 1 and the read function code is P04.10

Information sent from the master station:

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number：0x01 |
| Function | Function：0x03 |
| Data ( 0 ) | Beginning address group number：0x04 |
| Data ( 1 ) | Beginning address offset: 0x10 |
| Data ( 2 ) ( word ) | The high bit of the number of read function codes: 0x00 |
| Data ( 3 ) ( word ) | The lower bit of the number of read function codes: 0x01 |
| CRC Check Low | 0x84 |
| CRC Check High | 0xFF |
| End | Static time over 10ms |

Information returning from the master station：

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number：0x01 |
| Function | function：0x03 |
| Number of data(byte) | Data：0x02 |
| Data ( 0 ) | The high byte of beginning data: 0x17 |
| Data ( 1 ) | The low byte of beginning data: 0x17 |
| CRC Check Low | 0xB6 |
| CRC Check High | 0x50 |
| End | Static time over 10ms |

That is, the transmit frame is: 01 03 04 10 00 01 84 FF

The response is: 01 03 02 17 70 B6 50

### Function：0x06 write function code

For example, if the station number is 1 and the value of writing a 16 bit function code p02.19 is 300, this function cannot write a 32-bit function code.

Information sent from the master station:

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number:0x01 |
| Function | Function:0x06 |
| Data ( 0 ) | Address group number::0x02 |
| Data ( 1 ) | Address offset:0x19 |
| Data ( 2 ) | The high bit of the value of write function code:0x01 |
| Data ( 3 ) | The low bit of the value of write function code:0x2C |
| CRC Check Low | 0x59 |
| CRC Check High | 0xF8 |
| End | Static time over 10ms |

Information returning form the slave station:

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number:0x01 |
| Function | Function:0x06 |
| Data ( 0 ) | Address group number::0x02 |
| Data ( 1 ) | Address offset:0x19 |
| Data ( 2 ) | The high bit of the value of written function code:0x01 |
| Data ( 3 ) | The low bit of the value of written function code:0x2C |
| CRC Check Low | 0x59 |
| CRC Check High | 0xF8 |
| End | Static time over 10ms |

That is, the transmit frame is:01 06 02 19 01 2C 59 F8

The response is:01 06 02 19 01 2C 59 F8

## Function：0x10 Write 32-bit function code

For example, if the station number is 1 and the value of 32-bit function code p03.12 is 1048576, this function cannot write 16 bit function code

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number:0x01 |
| Function | Function:0x10 |
| Data ( 0 ) | Address group number::0x03 |
| Data ( 1 ) | Address offset:0x12 |
| Data ( 2 ) | The high bit of the number (word) of write function cod:0x00 |
| Data ( 3 ) | The low bit of the number (word) of write function code:0x02 |
| Data ( 4 ) | The lower bit of the number of write bytes (word):0x04 |
| Data ( 5 ) | The values of function codes bit8~bit15 , 0x00 |
| Data ( 6 ) | The values of function codes bit0~bit7 0x00 |
| Data ( 7 ) | The values of function codes bit24~bit31 0x00 |
| Data ( 8 ) | The values of function codes bit16~bit23 0x10 |
| CRC Check Low | 0x66 |
| CRC Check High | 0x46 |
| End | Static time over 10ms |

Information returning from the slave station:

| | |
|---|---|
| Start | Static time over 10ms |
| Slave Address | Station number:0x01 |
| Function | Function:0x10 |
| Data ( 0 ) | Address group number::0x03 |
| Data ( 1 ) | Address offset:0x12 |
| Data ( 2 ) | High bit of the number of written function code:0x00 |
| Data ( 3 ) | Low bit of the number of written function code:0x02 |
| CRC Check Low | 0xE1 |
| CRC Check High | 0x89 |
| End | Static time over 10ms |

That is, the transmit frame is:01 10 03 12 00 02 0400 00 00 10 66 46

The response is:01 10 03 12 00 02 E1 89

## 8.3Mod bus function code communication address

1. Set the function code to Pxx.YY and the corresponding modbus address to xx.yy, with, for example, P05.10 0x05 as the group number and 0x10 as the offset, which are both in hexadecimal format.

2. The corresponding communication address of observation group function code (this group is read-only) is:

**U00.YY:** The corresponding mod bus address: Group number is 0x20, address offset is 0xYY. For example, read the current temperatureU00.1Dof the driver, with the address as 0x20 and offset as 0x1D.

**U01.YY:** Corresponding modbus address: The group number is 0x21 and the address offset is 0xYY. For example, when reading the selected fault,the rotating velocity is U01.05, with the address as 0x21 and the offset as 0x05.

**U02.YY:** Corresponding modbus address: the group number is 0x22, with address offset of 0xYY,. For example, in caser of software versionU02.00, the address is 0x22, and the offset is 0x00.

3. The corresponding communication address of the auxiliary function code group is:

**FYY.:** Corresponding modbus address: The group number is 0x25, with address offset as 0xYY.

# Chapter 9 Alarm Treatment

List of alarm messages

| Alarm code | Alarm name | Alarm type | Mechanism and Treatment measures |
|---|---|---|---|
| **AL.00.0** | FPGA parallel port error | Non-resettable error | Power on again. If the alarm still occurs, please replace it with a new one |
| **AL.00.1** | Abnormal system parameters | Non-resettable error | Check the address of abnormal parameter function code of U00.3e and U00.3f, and if it indicates that this function range exceeds the limit value, please contact our personnel for changes. |
| **AL.00.2** | Abnormal function code parameter | Non-resettable error | Use F04 to reset the function code |
| **AL.00.3** | Abnormal manufacturer's parameters | Non-resettable error | Use F04 to reset the function code |
| **AL.00.7** | Incompatible software versions | Non-resettable error | Please contact our personnel |
| **AL.01.0** | Overvoltage | Resettable error | Ensure that the 220v input is within the range of (200V~240v) and an alarm is given for overvoltage during operation.<br>Set the release function and add an external release resistor to release excess energy or increase the acceleration and deceleration time. |
| **AL.01.1** | Under-voltage | Resettable error | Check whether the external power supply input is too low to ensure that the 220v input is within the range of 200V~240V |
| **AL.01.3** | Loss of phase in power supply | Resettable error | Test whether there is a loss of phase in the external power input, or it is acceptable to use P07.05=2 to shield this fault. |
| **AL.01.5** | Phase sequence error | Resettable error | UVW wiring error, need to change over the wiring of any two phases |
| **AL.02.0** | Over-current occurring in phase p of the bus. | Non-resettable error | Test the UVW wiring for a short and the resistor between the UVW phases for the correct resistance value<br>The resistance value of the brake resistor is too small or there is ashort |
| **AL.02.1** | Over-current occurring in phase | Non-resettable error | |

| | | | |
|---|---|---|---|
| | n of the bus. | | circuit |
| **AL.02.2** | Overcurrent fault in phase U | Non-resettable error | There is an error of short-circuit to ground or UVW is short circuited to PE<br>Parameter setting error leading to excessive gain, it is necessary to properly reduce the rigidity and gain |
| **AL.02.3** | Overcurrent fault in phase A | Non-resettable error | |
| **AL.02.4** | Short circuit to ground | Non-resettable error | Ensure that the insulation between U, V, W and preaches the level of M Ω |
| **AL.02.5** | Release overcurrent | Non-resettable error | The brake resistor is short circuited; check the resistance value of the brake resistor |
| **AL.02.6** | Abnormal PWM signal | Non-resettable error | Excessive velocity fluctuation and gain<br>If the current loop gain is too large, reduce the motor current loop gains P18.14 and P18.15. |
| **AL.02.7** | Excessive drive temperature | Resettable error | Increase space heat dissipation and reduce average load rate |
| **AL.02.8** | Driver overload | Resettable error | Reduce the average load rate, increase the acceleration and deceleration time, and detect whether there is mechanical jamming. |
| **AL.02.9** | Motor overload | Resettable error | Reduce the average load rate, increase the acceleration and deceleration time, detect whether there is mechanical jamming, and appropriately increase and adjust P07.11.<br>It is also acceptable to adjust P07.01 to 1 so as to turn off the overload error of the motor. |
| **AL.02.A** | Motor stalling | Resettable error | Test if there is mechanical jamming<br>Test if there is wrong UVW wiring<br>If case of an electrical angle error, use Fn03 to re-identify the electrical angle. |
| **AL.02.B** | Excessive Ptc motor temperature | Resettable error | Reduce motor load rate |

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|---|---|---|---|
| **AL.02.D** | Release resistor overload | Resettable error | After releasing the resistor overload, it can't continue to release. It is necessary to increase the power of the braking resistor and set correct parameters to P02.20~ P02.24, or increase the heat dissipation coefficient of the releasing resistor of P02.38 |
| **AL.03.0** | MCU lost | Non-resettable error | Please contact our personnel |
| **AL.03.1** | FPGA interrupt timeout | Non-resettable error | Please contact our personnel |
| **AL.03.2** | Current sampling timeout | Non-resettable error | Please contact our personnel |
| **AL.03.3** | Encoder timeout | Non-resettable error | Check the cable of encoder |
| **AL.03.4** | FPGA operation timeout | Non-resettable error | Please contact our personnel |
| **AL.04.0** | No corresponding drive | Non-resettable error | P19.00 setting error, no corresponding driver model, Please contact our personnel for change |
| **AL.04.1** | No corresponding motor | Non-resettable error | P18.00 setting error, no corresponding driver model, Please contact our personnel for change |
| **AL.04.4** | DI error | Resettable error | In case of DI function allocation failure, allocated the same DI function should to different DI; in case of frequency division errors, modify the function code settings and make changes |
| **AL.04.5** | Electronic gear ratio setting error | Resettable error | Modify the ratio of electronic gear (P03.12~P03.18) to make it within the correct Setting range. |
| **AL.04.6** | Frequency division output setting failure | Resettable error | The number of frequency division output pulses is greater than the frequency division rate of encoder, so it is necessary to reset P02.03 |
| **AL.04.8** | Soft limit setting failure | Resettable error | Upper limit of software position limit (P03.23) is less than lower limit (P03.21) |
| **AL.04.9** | Home position setting error | Resettable error | The mechanical home offset P03.36 is set outside the soft limit, the upper limit of the software position limit is (P03.23), the lower limit is (p03.21), |

| | | | |
|---|---|---|---|
| | | | P03.36 needs to be reset |
| **AL.04.A** | The resistance of external release resistor is too small | Warning | Change a suitable release resistor and set it to the correct value (P02.22) |
| **AL.05.0** | Positive overshoot | Warning | External (or software limit) positive over-travel signal is detected, and the servo no longer responds to the positive command |
| **AL.05.1** | Negative overshoot | Warning | External (or software limit) negative over-travel signal is detected, and the servo no longer responds to the negative command |
| **AL.05.2** | Emergency stop | Warning | External shutdown signal detected |
| **AL.05.3** | Excessive position deviation | Resettable error | Position deviation is greater than P03.26 set value detect if there is mechanical jamming<br>Increase P03.26 set value<br>Increase the gain, and add position smoothing filtering processing |
| **AL.05.4** | Home position reset timeout error | Warning | Time-out error in homing, with homing time exceeding the set value of P03.35 |
| **AL.05.5** | Runaway velocity alarm | Resettable error | UVW wiring error<br>Electric angle error<br>Encoder cable abnormal; check whether the feedback display is correct<br>Check whether P18.00 is set correctly |
| **AL.05.6** | Overvelocity | Resettable error | UVW wiring error<br>Electric angle error<br>Gain setting unreasonable<br>Encoder cable abnormal; check feedback display |
| **AL.05.7** | Servo enable failure | Resettable error | When Fn auxiliary function is used, external servo enable DI is effective |
| **AL.05.8** | STO protection | Warning | STO signal input |
| **AL.05.9** | Excessive internal and external deviation of full closed loop | Resettable error | Check whether external encoder feedback is correct<br>Check whether the feedback direction of the external encoder is correct<br>Check whether the machine slips or not<br>Set correct and suitable deviation range |

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|---|---|---|---|
| **AL.06.0** | Abnormal pulse input | Resettable error | Pulse input frequency is more than 4M reduce the upper computer's pulse frequency<br>Check whether the pulse input wiring, shielding wire andgrounding are correct |
| **AL.06.1** | Abnormal pulse input | Resettable error | Pulse input frequency is more than 4M reduce the upper computer's pulse frequency<br>Check whether the pulse input wiring, shielding wire and grounding are correct |
| **AL.06.2** | Abnormal frequency division output | Resettable error | Frequency division output velocity is greater than 4m<br>It is acceptable to reduce the output pulse number by one turn (P02.03) |
| **AL.06.3** | EERPOM read exception | Resettable error | Communication read function code too frequently<br>It is acceptable to set P09.10 to 1 |
| **AL.06.4** | EERPOM write exception | Resettable error | Communication read function code too frequently<br>It is acceptable to set P09.10 to 1 |
| **AL.06.5** | EERPOM exception | Resettable error | EEPROM is operated too frequently |
| **AL.06.6** | Ai1 voltage input too high | Resettable error | Ai1 input too large |
| **AL.07.0** | Angle identification failure | Resettable error | Make sure UVW wiring is correct<br>Check whether the motor parameters are set correctly, and whether the polar number, resolution and polar distance required for linear motor are set correctly.<br>Contact our personnel |
| **AL.07.1** | Angle identification failure 1 | Resettable error | Make sure UVW wiring is correct<br>The encoder cable is abnormal;<br>Check whether the position feedback is correct<br>Check whether the motor parameters are set correctly, and whether the polar number, resolution and polar distance required for linear motor are set correctly.<br>Contact our personnel |
| **AL.07.2** | Angle identification failure 2 | Resettable error | Make sure UVW wiring is correct<br>The encoder cable is abnormal;<br>Check whether the position feedback is correct |

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|---|---|---|---|
| | | | Contact our personnel |
| **AL.07.3** | Offline inertia identification failure | Resettable error | Check for correct UVW wiring<br>Check for mechanical jamming<br>Check for normal motor rotation. |
| **AL.07.4** | Angle identification stalling | Resettable error | Check for motor blocked during angle identification.<br>Check for UVW correctmechanically<br>Check for mechanical jamming |
| **AL.0A.0** | Power on again is required for parameters to get effective | Warning | The set parameters need to be powered on again. |
| **AL.0A.2** | Power phase loss warning | Warning | Check for loss of phase of the input of external power supply, or it is acceptable to use P07.05 = 2 to shield such warning |
| **AL.0A.4** | Motor overload warning | Warning | Motor overload warning; reduce average load |
| **AL.0A.5** | Motor power line disconnected | Warning | Check whether UVW is wired |
| **AL.0A.6** | Encoder external battery undervoltage | Warning | Check the circuit of external battery of encoder and check whether the battery voltage is normal |
| **AL.0A.7** | Encoder overheated | Warning | Reduce the load rate and check whether the motor is heated seriously |
| **AL.10.0** | Encoder disconnected | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is correct |
| **AL.10.1** | Encoder parameter error | Non-resettable error | Data verification error or parameter not stored in EEPROM of motor |
| **AL.10.2** | Encoder communication failure | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is correct |
| **AL.10.3** | Error in encoder resolution | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is correct |
| **AL.10.4** | Encoder count increment exception | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is correct |
| **AL.10.5** | Encoder parameter write failure | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is |

| | | | |
|---|---|---|---|
| | | | correct |
| **AL.10.6** | Encoder battery failure | Non-resettable error | Check whether the external battery is disconnected or the battery level is low<br>It is acceptable to reset the error using Fn07 |
| **AL.10.7** | Encoder multi-ring count error | Non-resettable error | Check whether the external battery is disconnected or the battery level is low<br>It is acceptable to reset the error using Fn07 |
| **AL.10.8** | Encoder multi-ring counter overflow | Non-resettable error | It is acceptable to reset the error using Fn07 |
| **AL.10.9** | Encoder parameter read-write check exception | Non-resettable error | Check whether P18.00 is set correctly<br>Check whether the encoder wiring is correct |
| **AL.10.A** | AB interference of incremental encoder | Non-resettable error | Check the wiring of encoder |
| **AL.10.B** | Z interference fault of incremental encoder | Non-resettable error | Check the wiring of encoder |
| **AL.10.C** | Error after power on incremental encoder | Non-resettable error | Check whether the wiring of encoder is correct, or whether the setting of encoder type p18.00 is wrong, or whether the motor encoder is faulty |
| **AL.10.D** | Incremental encoder disconnected | Non-resettable error | Check the wiring of encoder |

# Chapter 10 List of Function Code

## 10.1 List of parameter

Related modeP stands for the position mode, S stands for the velocity mode, T stands for the torque mode, and "*" in the Unit Table stands for the Unit in case of linear motor used.

**P00group gain parameter**

| Function code | | Description | Setting range | Unit | Default Setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P00 | 00 | Self adjusting mode selection | 0-manual gain adjustment<br>1-automatic rigid table adjustment<br>2-positioning mode 1<br>3-positioning mode 2 | - | 1 | Effective immediately |
| P00 | 01 | Group 1 response level selection | 1~31 | - | 11 | Effective immediately |
| P00 | 02 | Group 1 velocity loop gain | 1~20000 | 0.1HZ | 250 | Effective immediately |
| P00 | 03 | Group 1 velocity loop integration time constant | 15~51200 | 0.01ms | 3183 | Effective immediately |
| P00 | 04 | Group 1 position loop gain | 0~20000 | 0.1HZ | 400 | Effective immediately |
| P00 | 05 | Group 1 torque filtering constant | 0~3000 | 0.01ms | 79 | Effective immediately |
| P00 | 06 | Group 2 velocity loop gain | 1~20000 | 0.1HZ | 250 | Effective immediately |
| P00 | 07 | Group 2 velocity loop integration time constants | 15~51200 | 0.01ms | 3183 | Effective immediately |
| P00 | 08 | Group 2 position loop gain | 0~20000 | 0.1HZ | 400 | Effective immediately |
| P00 | 09 | Group 2 torque filtering constant | 0~3000 | 0.01ms | 79 | Effective immediately |
| P00 | 0A | Load inertia ratio | 0~1200 | 0.01 | 100 | Effective immediately |
| P00 | 0C | Torque command filter selection | 0- First order low-pass filter<br>1- Double second | - | 0 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default Setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | | order filter | | | |
| P00 | 0D | Single parameter adjustment Zeta value | 100~6000 | 0.01 | 150 | Effective immediately |
| P00 | 0E | Single parameter adjustment Nvp value | 100~6000 | 0.01 | 150 | Effective immediately |
| P00 | 10 | Velocity feedpositive gain | 0~1000 | 0.1% | 0 | Effective immediately |
| P00 | 11 | Velocity feedpositive filtering time | 0~6400 | 0.01ms | 50 | Effective immediately |
| P00 | 12 | PDFF control factor | 0~1000 | 0.1% | 1000 | Effective immediately |
| P00 | 14 | Torque feedpositive gain | 0~1000 | 0.1% | 0 | Effective immediately |
| P00 | 15 | Torque feedpositive filtering time | 0~6400 | 0.01ms | 50 | Effective immediately |
| P00 | 20 | Velocity feedback average filtering | 0~4 | - | 0 | Effective immediately |
| P00 | 21 | Velocity feedback low-pass filtering | 50~5000 | HZ | 5000 | Effective immediately |
| P00 | 22 | Torque observer cutoff frequency | 1~5000 | HZ | 400 | Effective immediately |
| P00 | 23 | Torque observer proportional gain | 1~8000 | HZ | 400 | Effective immediately |
| P00 | 24 | Velocity observer position compensation gain | 0~3000 | HZ | 0 | Effective immediately |
| P00 | 25 | Model loop enable | 0-disable<br>1- enable | | | Effective immediately |
| P00 | 26 | Model loop gain | 0~20000 | 0.1HZ | 400 | Effective immediately |

P01 group vibration suppression parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P01 | 00 | Adaptive filter mode selection | 0-adaptive notch filter does not update manual setting<br>1- one adaptive notch filter (group 3 is effective)<br>2-two adaptive notch filters (group 3 and group 4 are effective)<br>3-only test results are shown in P01.01<br>4-restore the set notch filter to default setting | - | 0 | Effective after shutdown |
| P01 | 01 | Vibration determination threshold | 1~1000 | 0.1% | 20 | Effective immediately |
| P01 | 02 | Resonance frequency identification results | 0~5000 | HZ | 250 | Effective immediately |
| P01 | 04 | Group 1 notch filter anti resonance frequency | 10~5000 | HZ | 5000 | Effective immediately |
| P01 | 05 | Group 1 notch filter frequency | 50~5000 | HZ | 5000 | Effective immediately |
| P01 | 06 | Group 1 notch filter band width | 0~20 | - | 2 | Effective immediately |
| P01 | 07 | Group 1 notch filter attenuation level | 0~99 | - | 0 | Effective immediately |
| P01 | 08 | Group 2 notch filter antiresonance frequency | 10~5000 | HZ | 5000 | Effective immediately |
| P01 | 09 | Group 2 notch filter frequency | 50~5000 | HZ | 5000 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P01 | 0A | Group 2 notch filter band width | 0~20 | - | 2 | Effective immediately |
| P01 | 0B | Group 2 notch filter attenuation level | 0~99 | - | 0 | Effective immediately |
| P01 | 0C | Group 3 notch filter anti-resonance frequency | 10~5000 | HZ | 5000 | Effective immediately |
| P01 | 0D | Group 3 notch filter frequency | 50~5000 | HZ | 5000 | Effective immediately |
| P01 | 0E | Group 3 notch filter band width | 0~20 | - | 2 | Effective immediately |
| P01 | 0F | Group 3 notch filter attenuation level | 0~99 | - | 0 | Effective immediately |
| P01 | 10 | Group 4 notch filter anti-resonance frequency | 10~5000 | HZ | 5000 | Effective immediately |
| P01 | 11 | Group 4 notch filter frequency | 50~5000 | HZ | 5000 | Effective immediately |
| P01 | 12 | Group 4 notch filter band width | 0~20 | - | 2 | Effective immediately |
| P01 | 13 | Group 4 notch filter attenuation level | 0~99 | - | 0 | Effective immediately |
| P01 | 1A | Disturbance torque compensation gain | 0~1000 | 0.1% | 0 | Effective immediately |
| P01 | 1B | Disturbance observer filter time | 0~2500 | 0.01ms | 50 | Effective immediately |
| P01 | 1C | Constant torque compensation value | -1000~1000 | 0.1% | 0 | Effective immediately |
| P01 | 1D | Positive friction compensation value | -1000~1000 | 0.1% | 0 | Effective immediately |
| P01 | 1E | Negative friction compensation value | -1000~1000 | 0.1% | 0 | Effective immediately |
| P01 | 1F | Servo low-frequency vibration position deviation judgment threshold | 0~65535 | p | 10 | Effective immediately |
| P01 | 21 | Low frequency resonance frequency A | 0~1000 | 0.1HZ | 1000 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P01 | 22 | Low frequency resonance frequency A filter setting | 0~10 | - | 2 | Effective immediately |
| P01 | 23 | Low frequency resonance frequency amplification factor | 12~30 | 0.1 | 12 | Effective immediately |

## P02 Group Basic Parameter Setting

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P02 | 00 | Mode selection | 0-velocity mode<br>1-position mode<br>2-torque mode<br>3-DI switch mixed mode | - | 0 | Effective after shutdown |
| P02 | 01 | Running direction selection | 0-cw positive direction<br>1-ccw negative direction | - | 0 | Effective after re-power-on |
| P02 | 02 | Frequency division output pulse phase | 0-A ahead of B<br>1-B ahead of A | - | 0 | Effective after re-power-on |
| P02 | 03 | Frequency division output pulse number | 1~1048576 | - | 2500 | Effective after re-power-on |
| P02 | 05 | Z-pulse output polarity setting , | 0- positive polarity<br>1- negative polarity | - | 0 | Effective after re-power-on |
| P02 | 07 | Velocity feedback source selection | 0-encoder direct feedback<br>1-velocity observer | - | 0 | Effective after shutdown |
| P02 | 09 | Enable automatic model identification | 0- Enable automatic identification<br>1- Disable automatic identification | - | 0 | Effective after re-power-on |
| P02 | 0A | Set the default display status of the panel | | | | |
| P02 | 0B | Enable absolute value encoder alarm | 0- disable absolute value alarm<br>1- enable absolute alarm | - | 0 | Effective after shutdown |
| P02 | 10 | Servo OFF shutdown mode | -2 : Slope shutdown, with DB braking | - | 0 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | selection | -1 : DB shutdown DB status<br>0 : Free shutdown, keeping operating freely.<br>1 : Slope shutdown, keeping operating freely.<br>2 : Zero-velocity shutdown, keeping operating freely. | | | |
| P02 | 11 | Overtravel stop mode | 0-shutting down freely<br>1- Zero-velocity shutdown | - | 2 | Effective after shutdown |
| P02 | 12 | Fault 1 shutdown mode selection | 0-shutting down freely<br>1-DB shutdown free state<br>2-DB shutdown, keeping DB state | - | 0 | Effective after shutdown |
| P02 | 13 | Fault 2 shutdown mode selection | -4-Emergency torque shutdown, keeping DB State<br>-3-Slope shutdown, keeping DB State<br>-2-Slope shutdown, keeping DB State<br>-1-DB shutdown, keeping DB state<br>0-Free shutdown, keeping operating freely.<br>1-Slope shutdown, keeping operating freely.<br>2-Slope shutdown, keeping operating freely.<br>3-Emergency torque shutdown, keeping operating freely | | | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P02 | 14 | Shutdown mode and shutdown state switching velocity threshold | 10~1000 | rpm (*mm/s) | 100 | Effective after shutdown |
| P02 | 18 | Brake enable | 0-brake disabled<br>1-brake enable | - | 0 | Effective after shutdown |
| P02 | 19 | Delay from brake output ON to command receiving | 0~500 | ms | 200 | Effective after shutdown |
| P02 | 1A | Delay from brake output Off to motor de-energized | 50~1000 | ms | 150 | Effective after shutdown |
| P02 | 1B | Velocity threshold when brake output Off | 20~300 | rpm (*mm/s) | 30 | Effective after shutdown |
| P02 | 1C | Delay from servo Off to brake output Off | 1~1000 | ms | 500 | Effective after shutdown |
| P02 | 20 | Setting of energy consumption resistor | 0-built in resistor<br>1-external resistor<br>2-air cooling of external resistor<br>3- no release. | - | | Effective after shutdown |
| P02 | 21 | Power capacity of external energy consumption resistor | 1~65535 | W | 800 | Effective after shutdown |
| P02 | 22 | Resistance value of external energy consumption resistor | 1~1000 | Ω | 50 | Effective after shutdown |
| P02 | 23 | Minimum value of energy consumption resistor allowable for driver | 1~1000 | Ω | 40 | Effective after shutdown |
| P02 | 24 | Power capacity of built-in energy consumption resistor | 1~65535 | W | 50 | Effective after shutdown |
| P02 | 25 | Resistance of built-in energy consumption resistor | 0~1000 | Ω | 40 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P02 | 26 | Heat dissipation coefficient of resistor | 0~1000 | % | 60 | Effective after shutdown |
| P02 | 29 | Password set by manufacturer | 0~65535 | - | - | Effective immediately |

P03group position mode parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P03 | 00 | Source of position command | 0- pulse<br>1 - internal position mode | - | 0 | Effective after shutdown |
| P03 | 02 | Shape of command pulse | 0-direction + pulse positive logic<br>1-direction + pulse negative logic<br>2-AB orthogonal<br>3-CW / CCW | - | 0 | Effective after re-power-on |
| P03 | 03 | Effective selection of pulse edge | 0-effective rising edge<br>1-effective falling edge | - | 0 | Effective after re-power-on |
| P03 | 04 | Input pulse filtering time | 0~255 | 25ns | 10 | Effective after re-power-on |
| P03 | 06 | Instruction FIR filtering time constant | 0~65535 | 0.01ms | 0 | Effective after shutdown |
| P03 | 07 | Moving average time of position command | 0~1280 | 0.01ms | 0 | Effective after shutdown |
| P03 | 10 | Number of command pulses per revolution of motor | 0~8388608 | - | 0 | Effective after shutdown |
| P03 | 12 | Group 1 electronic gear molecules | 1~ 1073741824 | - | 10 | Effective after shutdown |
| P03 | 14 | Group 1 electronic gear denominator | 1~ 1073741824 | - | 1 | Effective after shutdown |
| P03 | 16 | Group 2 electronic gear molecules | 1~ 1073741824 | - | 10 | Effective after shutdown |
| P03 | 18 | Group 2 electronic gear denominator | 1~ 1073741824 | - | 1 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P03 | 20 | Soft limit function selection | 0-disable soft limit function<br>1-enable soft limit function<br>2-enable soft limit function after homing | | | Effective after shutdown |
| P03 | 21 | Soft limit minimum value | -2147483648~2147483648 | p | 0 | Effective after shutdown |
| P03 | 23 | Soft limit maximum value | -2147483648~2147483648 | p | 0 | Effective after shutdown |
| P03 | 26 | Fault set value of excessive position deviation | 1~ 1073741824 | p | 3145728 | Effective after shutdown |
| P03 | 31 | Reset mode of home | 0~36 | - | 3 | Effective immediately |
| P03 | 32 | High-velocity search velocity of home | 1~1000 | rpm (*mm/s) | 100 | Effective immediately |
| P03 | 33 | Low-velocity search velocity of home | 1~1000 | rpm (*mm/s) | 10 | Effective immediately |
| P03 | 34 | Acceleration and deceleration time of home | 0~10000 | ms | 10 | Effective immediately |
| P03 | 35 | Search time of home | 0~60000 | ms | 50000 | Effective immediately |
| P03 | 36 | Mechanical offset of home | -2147483648~2147483648 | P | 0 | Effective immediately |
| P03 | 38 | Fixed length displacement of probe | -2147483648~2147483648 | P | 10000 | Effective immediately |
| P03 | 3A | Fixed length velocity of probe | 0~6000 | rpm | 1000 | Effective immediately |
| P03 | 3B | Fixed length acceleration and deceleration time of probe | 0~65535 | ms | 100 | Effective immediately |
| P03 | 3C | Configuration of probe | 0~0xFFFF | | 0 | Effective immediately |
| P03 | 3D | Filtering time Unit of probe | 0~255 | 25ns | 5 | effective after re-power-on |

P04group velocity torque parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P04 | 00 | Velocity command | 0-Digital setting<br>1-AI | - | 0 | Effective after shutdown |
| P04 | 01 | Velocity command digital setting | -9000~9000 | rpm (*mm/s) | 300 | Effective immediately |
| P04 | 02 | Di jogging velocity setting value | -9000~9000 | rpm (*mm/s) | 20 | Effective immediately |
| P04 | 03 | Velocity command acceleration time | 0~65535 | ms | 20 | Effective immediately |
| P04 | 04 | Velocity command deceleration time | 0~65535 | ms | 20 | Effective immediately |
| P04 | 06 | Jog velocity acceleration ramp time | 0~65535 | ms | 20 | Effective immediately |
| P04 | 07 | Analog 10V corresponding velocity | 0~10000 | rpm (*mm/s) | 3000 | Effective immediately |
| P04 | 0A | Torque command selection | 0- Digital Setting<br>1- 1-AI | - | 0 | Effective after shutdown |
| P04 | 0B | Torque command keyboard setting | -3000~3000 | 0.1% | 0 | Effective immediately |
| P04 | 0B | Analog 10V corresponding torque value | 0~8000 | 0.1% | 1000 | Effective immediately |
| P04 | 0D | Torque command acceleration time | 0~65535 | ms | 0 | Effective immediately |
| P04 | 0E | Torque command deceleration time | 0~65535 | ms | 0 | Effective immediately |
| P04 | 0F | Emergency stop torque | 0~3000 | 0.1% | 1000 | Effective after shutdown |
| P04 | 10 | Positive limit of velocity | 0~6000 | rpm (*mm/s) | 6000 | Effective immediately |
| P04 | 11 | Negative limit of velocity | 0~6000 | rpm (*mm/s) | 6000 | Effective immediately |
| P04 | 12 | Positive limit of torque | 0~3500 | 0.1% | 3000 | Effective immediately |
| P04 | 13 | Negative limit of torque | 0~3500 | 0.1% | 3000 | Effective immediately |
| P04 | 14 | Positive limit value of internal velocity during torque control | 0~6000 | rpm (*mm/s) | 3000 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P04 | 15 | Negative limit value of internal velocity during torque control | 0~6000 | rpm (*mm/s) | 3000 | Effective immediately |

## P05 group input parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P05 | 00 | DI function source selection bit0~bit15 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 01 | DI function source selection bit16~bit31 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 02 | DI function source selection bit32~bit47 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 03 | DI function source selection bit48~bit63 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 04 | DI1 terminal function selection | 0~30 | - | 1 | Effective after shutdown |
| P05 | 05 | DI1 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 06 | DI2 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 07 | DI2 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 08 | DI3 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 09 | DI3 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 0A | DI4 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 0B | DI4 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 0C | DI5 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 0D | DI5terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 0E | DI6 terminal function selection | 0~30 | - | 0 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P05 | 0F | DI6 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 10 | DI7 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 11 | DI7 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 12 | DI8 terminal function selection | 0~30 | - | 0 | Effective after shutdown |
| P05 | 13 | DI8 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P05 | 2A | Virtual DI logic setting bit0~bit15 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 2B | Virtual DI logic setting bit16~bit31 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 2C | Virtual DI logic setting bit32~bit47 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 2D | Virtual DI logic setting bit48~bit63 | 0~65535 | - | 0 | Effective after shutdown |
| P05 | 30 | AI1 offset | -5000~5000 | 1mv | 0 | Effective immediately |
| P05 | 31 | Input filtering time | 0~65535 | 0.01ms | 200 | Effective immediately |
| P05 | 32 | AI1dead zone | 0~10000 | 0.1mv | 100 | Effective immediately |
| P05 | 33 | AI1 null shift | -5000~5000 | 0.1mv | 0 | Effective immediately |
| P05 | 40 | DI filtering time | 0~65535 | 0.01us | 1000 | Effective immediately |

## P06 group output parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P06 | 00 | DO1 terminal function selection | 0~20 | - | 5 | Effective after shutdown |
| P06 | 01 | DO1 terminal logic selection | 0- active low<br>1- 1-active high | - | 0 | Effective after shutdown |
| P06 | 02 | DO2 terminal function selection | 0~20 | - | 6 | Effective after shutdown |
| P06 | 03 | DO2 terminal logic selection | 2- active low<br>3- active high | - | 0 | Effective after shutdown |
| P06 | 04 | DO3 terminal function selection | 0~20 | - | 0 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P06 | 05 | DO3 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P06 | 06 | DO4 terminal function selection | 0~20 | - | 0 | Effective after shutdown |
| P06 | 07 | DO4 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P06 | 08 | DO5 terminal function selection | 0~20 | - | 0 | Effective after shutdown |
| P06 | 09 | DO5 terminal logic selection | 0-active low<br>1-active high | - | 0 | Effective after shutdown |
| P06 | 20 | Virtual DO logic setting bit0~bit15 | 0~65535 | - | 0 | Effective after shutdown |
| P06 | 21 | Virtual DO logic setting bit16~bit31 | 0~65535 | - | 0 | Effective after shutdown |
| P06 | 22 | Virtual DO logic setting bit32~bit47 | 0~65535 | - | 0 | Effective after shutdown |
| P06 | 23 | Virtual DO logic setting bit48~bit63 | 0~65535 | - | 0 | Effective after shutdown |
| P06 | 2C | Positioning completion range | 100 | p | 0 | Effective immediately |
| P06 | 2D | Positioning completion hold time | 0~2000 | ms | 0 | Effective immediately |
| P06 | 2E | Position reach window unit setting | 0 -user's Unit<br>1-encoder’s Unit | - | 0 | Effective immediately |
| P06 | 30 | Zero velocity clamp / zero fixed velocity command threshold | 0~6000 | rpm (*mm/s) | 10 | Effective immediately |
| P06 | 31 | Motor rotation state threshold | 1~1000 | rpm (*mm/s) | 20 | Effective immediately |
| P06 | 32 | Velocity consistent signal width | 1~200 | rpm (*mm/s) | 10 | Effective immediately |
| P06 | 33 | Velocity reach signal threshold | 10~6000 | rpm (*mm/s) | 1000 | Effective immediately |
| P06 | 34 | Zero velocity output signal threshold | 1~200 | | 10 | Effective immediately |
| P06 | 35 | Velocity DO filter time | 0~65535 | 0.1ms | 0 | Effective immediately |
| P06 | 3A | Torque reaches reference value | 0~3000 | 0.1% | 0 | Effective immediately |
| P06 | 3B | Output torque value when torque reach DO signal is on | 200~3000 | 0.1% | 200 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P06 | 3C | Output torque value when torque reach DO signal is off | 100~3000 | 0.1% | 100 | Effective immediately |

P07group extended function parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P07 | 00 | Stalling over-temperature protection enable | 0~disable<br>1-enable | - | 1 | Effective immediately |
| P07 | 01 | Turn-off motor overload warning | 0-not shut down<br>1- shut down | - | 0 | Effective immediately |
| P07 | 02 | Runaway protection selection | 0-shield runaway alarm<br>1-enable runaway alarm | - | 1 | Effective after shutdown |
| P07 | 03 | Encoder multi-ring overflow fault prohibition | 0- enable alarm<br>1-shield alarm | - | 1 | Effective after shutdown |
| P07 | 04 | UVW Phase sequence identification enable | 0- disable phase sequence identification<br>1- enable phase sequence identification | - | 1 | Effective after shutdown |
| P07 | 05 | Power input phase loss protection selection | 0-enable absent alarm<br>1-enable absent alarm<br>2-shield missing item | - | 0 | Effective immediately |
| P07 | 06 | Fault record save switch | 0-save<br>1-unsave | - | 0 | Effective after shutdown |
| P07 | 07 | Power failure save EEPROM enable | 0 - no power failure save<br>1-enable power failure save | - | 0 | Effective after shutdown |
| P07 | 08 | Shield model identification | 0-use automatic model identification<br>1-set the model manually | - | 0 | Effective after shutdown |
| P07 | 09 | Set the default display status of the panel | 0~0x25<br>After use, the panel displays the status corresponding to U00.XX by default | | | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P07 | 10 | Stalling over-temperature protection time window | 10~1000 | ms | 20 | Effective immediately |
| P07 | 11 | Motor overload protection gain | 50~300 | % | 100 | Effective immediately |
| P07 | 12 | Linear motor PTC alarm enable | 0~ no alarm.<br>1~ alarm | - | 0 | Effective immediately |
| P07 | 14 | Over velocity judgment threshold | 0~65535 | rpm (*mm/s) | 0 | Effective after shutdown |
| P07 | 15 | Velocity display filtering time | 0~5000 | ms | 0 | Effective after shutdown |
| P07 | 1A | Nikon encoder reset when powered on | 0 - no reset after power on<br>1-reset after power on | - | - | Effective after shutdown |
| P07 | 1B | ROM disabled when encoder is powered on | 0 - do not read motor parameters<br>1 - read motor parameters | - | - | Effective after shutdown |
| P07 | 1D | Enable offline detection | 0-disable<br>1-enable | - | 0 | Effective after shutdown |
| P07 | 20 | Slope shutdown acceleration and deceleration time | 0~10000 | ms | 50 | Effective immediately |
| P07 | 21 | Emergency stop acceleration and deceleration time | 0~10000 | ms | 5 | Effective immediately |
| P07 | 22 | Torque stop torque acceleration | 0~3000 | 0.1% | 500 | Effective immediately |

## P08 full closed-loop parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P08 | 00 | Full closed-loop operation mode | 0 ~ disable full closed-loop<br>1-enable full closed-loop | - | 0 | Effective immediately |
| P08 | 01 | External encoder running direction selection | 0- positive<br>1- negative | - | 0 | effective after re-power-on |
| P08 | 02 | External encoder resolution | 0~8388608 | - | 10000 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P08 | 04 | Full closed-loop vibration suppression gain | -300.0~300.0 | - | 1 | Effective after shutdown |
| P08 | 05 | Full closed-loop vibration suppression cutoff frequency | 10~5000 | HZ | 500 | Effective after shutdown |
| P08 | 06 | Full closed loop velocity feedback correction coefficient | 0~120.0 | - | 100.0 | |
| P08 | 07 | Filtering time constant of inner and outer loop position deviation | 0~1000 | ms | 0 | Effective after shutdown |
| P08 | 0C | Maximum allowable deviation of internal and external loop encoder | 0~2,147,483,648 | External encoder's Unit | 0 | Effective after shutdown |
| P08 | 0E | Actual deviation of internal and external loop encoder | Display | External encoder's Unit | | |
| P08 | 10 | Internal encoder count value | Display | Encoder's Unit | | |
| P08 | 12 | External encoder count value | Display | External encoder's Unit | | |

## P09 group modbus communication parameters

| Function code | | Description | Setting range | Unit | default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P09 | 00 | 485 communication node | 0~128 | - | 1 | Effective immediately |
| P09 | 01 | Baud rate setting | 0.-2400<br>1-4800<br>2-9600<br>3-19200<br>4-38400<br>5-57600<br>6-115200 | - | 6 | Effective immediately |
| P09 | 02 | Data format | 0-no check 2 stop | | 0 | Effective |

| Function code | | Description | Setting range | Unit | default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | | bits<br>1-even check 1 stop bit<br>2-odd check 1 stop bit<br>3-no check 1 stop bit | | | immediately |
| P09 | 03 | Delay response time | 100 | ms | 0 | Effective immediately |
| P09 | 0A | 232 baud rate setting | 0.-2400<br>1-4800<br>2-9600<br>3-19200<br>4-38400<br>5-57600<br>6-115200 | - | 6 | Effective immediately |
| P09 | 10 | 485 communication function code forbid to save EEPROM or not | 0- save EEPROM<br>1- Unsave EEPROM | - | 0 | Effective immediately |

P0A group extended parameter group

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P0A | 00 | Offline inertia identification mode | 0. Positive and negative operation mode<br>1. Single direction operation mode | - | 1 | Effective immediately |
| P0A | 02 | Maximum velocity reached during inertia identification | 100~1000 | rpm (*mm/s) | 500 | Effective after shutdown |
| P0A | 03 | Time of acceleration to maximum velocity in inertia identification | 20~800 | ms | 120 | Effective after shutdown |
| P0A | 0A | UVW phase sequence identification enable | 0-disable phase sequence identification<br>1-enable phase sequence | | | |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | | identification | | | |
| P0A | 0B | Selection of angle identification mode | 0- pre-positioning<br>1-open-loop jogging<br>2-closed-loop jogging | - | 0 | Effective after shutdown |
| P0A | 0C | Electric angle action window of angle identification micromotion method | 0~900 | | 2 | Effective after shutdown |
| P0A | 0D | Stop window of angle identification jogging method | 0~100 | p | 3 | Effective after shutdown |
| P0A | 0E | Setting electric angle by direct pre-positioning method | 0~1800 | 0.1 ° | 10 | Effective after shutdown |
| P0A | 0F | Determine whether Hall signal identification is necessary | 0-disable hall identification<br>1-enable hall identification | - | 0 | Effective after shutdown |

P10 group internal position group

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P10 | 00 | Internal position operation mode selection | 0- Single operation<br>1- Cyclic operation | - | 0 | Effective immediately |
| P10 | 03 | Number of operation segments in internal position | 1~16 | - | 3 | Effective immediately |
| P10 | 08 | Displacement of Segment 1 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 0A | Velocity of Segment 1 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 0B | Acceleration time of Segment 1 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 0C | Deceleration time of Segment 1 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 0D | Waiting time of Segment 1 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 0E | Property | 0 ~ absolute | - | 0 | Effective |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | configuration of Segment 1 | displacement 1 ~ incremental displacement | | | immediately |
| P10 | 0F | Displacement of Segment 2 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 11 | Velocity of Segment 2 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 12 | Acceleration time of Segment 2 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 13 | Deceleration time of Segment 2 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 14 | Waiting time of Segment 2 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 15 | Property configuration of Segment 2 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 16 | Displacement of Segment 3 | -2147483648~2147483648 | user's Unit | 10000 | Effective immediately |
| P10 | 18 | Velocity of Segment 3 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 19 | Acceleration time of Segment 3 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 1A | Deceleration time of Segment 3 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 1B | Waiting time of Segment 2 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 1C | Property configuration of Segment 3 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 1D | Displacement of Segment 4 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 1F | Velocity of Segment 4 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 20 | Acceleration time of Segment 4 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 21 | Deceleration time of Segment 4 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 22 | Waiting time of Segment 4 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 23 | Property configuration of Segment 4 | 0~Absolute displacement 1~Incremental | - | 0 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | | displacement | | | |
| P10 | 24 | Displacement of Segment 5 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 26 | Velocity of Segment 5 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 27 | Acceleration time of Segment 5 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 28 | Deceleration time of Segment 5 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 29 | Waiting time of Segment 5 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 2A | Property configuration of Segment 5 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 2B | Displacement of Segment 6 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 2D | Velocity of Segment 6 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 2E | Acceleration time of Segment 6 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 2F | Deceleration time of Segment 6 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 30 | Waiting time of Segment 6 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 31 | Property configuration of Segment 6 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 32 | Displacement of Segment 7 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 34 | Velocity of Segment 7 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 35 | Acceleration time of Segment 7 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 36 | Deceleration time of Segment 7 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 37 | Waiting time of Segment 2 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 38 | Property configuration of Segment 7 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P10 | 39 | Displacement of Segment 8 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 3B | Velocity of Segment 8 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 3C | Acceleration time of Segment 8 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 3D | Deceleration time of Segment 8 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 3E | Waiting time of Segment 8 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 3F | Property configuration of Segment 8 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 40 | Displacement of Segment 9 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 42 | Velocity of Segment 9 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 43 | Acceleration time of Segment 9 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 44 | Deceleration time of Segment 9 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 45 | Waiting time of Segment 9 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 46 | Property configuration of Segment 9 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 47 | Displacement of Segment 10 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 49 | Velocity of Segment 10 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 4A | Acceleration time of Segment 10 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 4B | Deceleration time of Segment 10 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 4C | Waiting time of Segment 10 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 4D | Property configuration of Segment 10 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 4E | Displacement of Segment 11 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P10 | 50 | Velocity of Segment 11 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 51 | Acceleration time of Segment 2 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 52 | Deceleration time of Segment 11 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 53 | Waiting time of Segment 11 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 54 | Property configuration of Segment 11 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 55 | Displacement of Segment 12 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 57 | Velocity of Segment 12 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 58 | Acceleration time of Segment 12 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 59 | Deceleration time of Segment 12 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 5A | Waiting time of Segment 12 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 5B | Property configuration of Segment 12 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 5C | Displacement of Segment 13 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 5E | Velocity of Segment 13 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 5F | Acceleration time of Segment 13 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 60 | Deceleration time of Segment 13 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 61 | Waiting time of Segment 13 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 62 | Property configuration of Segment 13 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 63 | Displacement of Segment 14 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 65 | Velocity of Segment 14 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P10 | 66 | Acceleration time of Segment 14 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 67 | Deceleration time of Segment 14 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 68 | Waiting time of Segment 14 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 69 | Property configuration of Segment 14 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 6A | Displacement of Segment 15 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 6C | Velocity of Segment 15 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 6D | Acceleration time of Segment 15 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 6E | Deceleration time of Segment 15 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 6F | Waiting time of Segment 15 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 70 | Property configuration of Segment 15 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |
| P10 | 71 | Displacement of Segment 16 | -2147483648~2147483648 | User's Unit | 10000 | Effective immediately |
| P10 | 73 | Velocity of Segment 16 | 0~9000 | Rpm (mm/s) | 300 | Effective immediately |
| P10 | 74 | Acceleration time of Segment 17 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 75 | Deceleration time of Segment 17 | 0~65535 | ms | 10 | Effective immediately |
| P10 | 76 | Waiting time of Segment 17 | 0~65535 | ms | 0 | Effective immediately |
| P10 | 77 | Property configuration of Segment 17 | 0~Absolute displacement 1~Incremental displacement | - | 0 | Effective immediately |

## P18 group motor parameters

Table of parameters for rotating motor :

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P18 | 00 | Model of motor encoder | 0~65535 | - | 0x1012 | Effective after re-power-on |
| P18 | 02 | Motor parameters of incremental encoder | 0~65535 | - | 20001 | Effective after re-power-on |
| P18 | 03 | Number of encoder lines | 1~83888608 | p | 2500 | Effective after re-power-on |
| P18 | 07 | Absolute encoder position offset | 0~65535 | p | - | Effective after re-power-on |
| P18 | 0F | Bus encoder data transmission compensation time | 0~10000 | 0.01ms | 0 | Effective after re-power-on |
| P18 | 10 | Current loop configuration | 0~3 | - | 0 | Effective after re-power-on |
| P18 | 11 | Compensation coefficient of back EMF | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 12 | D-axis coupling voltage compensation system | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 13 | Q-axis coupling voltage compensation system | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 14 | Current loop kp | 1~20000 | HZ | 2000 | Effective immediately |
| P18 | 15 | Current loop ki | 0~2000 | 0 . 01 | 100 | Effective immediately |
| P18 | 20 | Rated power | 1~65535 | 0.01kw | - | Effective after shutdown |
| P18 | 22 | Rated current | 1~65535 | 0.01A | - | Effective after shutdown |
| P18 | 24 | Maximum current | 1~65535 | 0.01A | - | Effective after shutdown |
| P18 | 26 | Rated torque | 10~65535 | 0.01Nm | - | Effective after shutdown |
| P18 | 28 | Maximum torque | 10~65535 | 0.01Nm | - | Effective after shutdown |
| P18 | 2A | Rated velocity | 10~9000 | rpm | - | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P18 | 2C | Maximum velocity | 10~9000 | rpm | - | Effective after shutdown |
| P18 | 2E | Rotational inertia | 1~65535 | 0.01kg cm^2 | - | Effective after shutdown |
| P18 | 30 | Pole pairs of permanent magnet synchronous motor | 1~100 | - | - | Effective after shutdown |
| P18 | 31 | Stator resistance | 1~65535 | 0.001Ω | - | Effective after shutdown |
| P18 | 32 | Q-axis inductance | 1~65535 | 0.01H | - | Effective after shutdown |
| P18 | 33 | D-axis inductance | 1~65535 | 0.01H | - | Effective after shutdown |
| P18 | 34 | Back EMF coefficient | 1~65535 | 0.01mv / rpm | - | Effective after shutdown |
| P18 | 36 | Torque coefficient | 1~65535 | 0.01N/A | - | Effective after shutdown |

Parameter table of linear motor：

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P18 | 00 | Model of motor encoder | 0~65535 | - | 0xA000 | Effective after re-power-on |
| P18 | 05 | Pole distance of linear motor | 1~65535 | 0.01mm | 3200 | Effective after re-power-on |
| P18 | 06 | Resolution of grating ruler | 1~10000 | 0.01um | 100 | Effective after re-power-on |
| P18 | 07 | Absolute encoder position offset | 0~65535 | p | - | Effective after re-power-on |
| P18 | 09 | HALL signal UVW state 1 electrical angle | 0~3600 | 0.1° | 0 | Effective after re-power-on |
| P18 | 0A | HALL signal UVW state 2 electrical angle | 0~3600 | 0.1° | 0 | Effective after re-power-on |
| P18 | 0B | HALL signal UVW state 3 electrical angle | 0~3600 | 0.1° | 0 | Effective after re-power-on |
| P18 | 0C | HALL signal UVW state 4 electrical angle | 0~3600 | 0.1° | 0 | Effective after re-power-on |
| P18 | 0D | HALL signal UVW state 5 electrical | 0~3600 | 0.1° | 0 | Effective after re-power-on |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| | | angle | | | | |
| P18 | 0E | HALL signal UVW state 6 electrical angle | 0~3600 | 0.1 ° | 0 | Effective after re-power-on |
| P18 | 10 | Current loop configuration | 0~3 | - | 0 | Effective after re-power-on |
| P18 | 11 | Compensation coefficient of back EMF | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 12 | D-axis coupling voltage compensation system | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 13 | Q-axis coupling voltage compensation system | 0~5000 | 0.1% | 500 | Effective immediately |
| P18 | 14 | Current loop kp | 1~20000 | HZ | 2000 | Effective immediately |
| P18 | 15 | Current loop ki | 0~2000 | 0.01 | 100 | Effective immediately |
| P18 | 20 | Rated power | 1~65535 | 0.01kw | - | Effective after shutdown |
| P18 | 22 | Rated current of motor (continuous current) | 1~65535 | 0.01A | - | Effective after shutdown |
| P18 | 24 | Maximum current | 1~65535 | 0.01A | - | Effective after shutdown |
| P18 | 26 | Rated torque (continuous thrust) | 10~65535 | 0.01Nm | - | Effective after shutdown |
| P18 | 28 | Maximum torque | 10~65535 | 0.01Nm | - | Effective after shutdown |
| P18 | 2A | Rated velocity | 10~9000 | mm/s | - | Effective after shutdown |
| P18 | 2C | Maximum velocity | 10~9000 | mm/s | - | Effective after shutdown |
| P18 | 2E | Rotor mass | 1~65535 | g | - | Effective after shutdown |
| P18 | 30 | Pole pairs of permanent magnet synchronous motor | 1~100 | - | 1 | Effective after shutdown |
| P18 | 31 | Stator resistance | 1~65535 | 0.001Ω | - | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P18 | 32 | Q-axis inductance | 1~65535 | 0.01H | - | Effective after shutdown |
| P18 | 33 | D-axis inductance | 1~65535 | 0.01H | - | Effective after shutdown |
| P18 | 34 | Back EMF coefficient | 1~65535 | 0.01v/ mm/s | - | Effective after shutdown |
| P18 | 36 | Torque coefficient (thrust constant) | 1~65535 | 0.01N/ A | - | Effective after shutdown |

Note: For rotating motor Tamagawa 23bit, P18.00 is set to 0x1012, and Tamagawa 17bit is set to 0x1010,with the 2500 line motor to be set to 0x2020 and linear motor to be set to 0xA000

P19group drive parameters

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P19 | 00 | Drive model setting | 0~65535 | - | - | Effective after shutdown |
| P19 | 0A | Carrier frequency | 4000~16000 | HZ | 8000 | Effective after shutdown |
| P19 | 0B | Dead time | 0~2000 | 0.01u | 200 | Effective after shutdown |
| P19 | 0C | Minimum opening time of lower bridge of bootstrap circuit | 0~200 | 0.1u | 50 | Effective after shutdown |
| P19 | 0D | Relative gain of UV sampling | 1~65535 | - | 32767 | Effective after shutdown |
| P19 | 10 | Measuring range of current sensor | 1~999999 | 0.01A | - | Effective after shutdown |
| P19 | 12 | FPGA phase current protection point | 0~65535 | 0.1% current measur- ing range | - | Effective after shutdown |
| P19 | 14 | DC bus overvoltage protection point | 0~65535 | v | - | Effective after shutdown |
| P19 | 15 | DC bus voltage release point | 0~65535 | v | - | Effective after shutdown |
| P19 | 16 | DC Bus oltageundervoltage point | 0~65535 | v | - | Effective after shutdown |
| P19 | 17 | Bus voltage gain adjustment | 0~2000 | 0.1% | 1000 | Effective after shutdown |

| Function code | | Description | Setting range | Unit | Default setting | Manner of getting effective |
|---|---|---|---|---|---|---|
| P19 | 1B | Command scheduling frequency division factor | 0: 4KHZ<br>1: 2KHZ<br>2:1KHZ | - | 0 | Effective after shutdown |
| P19 | 20 | Sigma_Delta filtering time | 0~3 | 25ns | 2 | Effective after shutdown |
| P19 | 21 | Current sampling Sinc3 filter data extraction rate | 0~3 | - | 1 | Effective after shutdown |
| P19 | 22 | TZ signal filtering time | 0~31 | ns | 15 | Effective after shutdown |
| P19 | 23 | Orthogonal encoder filtering time | 0~255 | ns | 30 | Effective after shutdown |
| P19 | 24 | Filtering time of linear encoder | 0~255 | ns | 30 | Effective after shutdown |

## U00 group status display parameters

| Function code | | Description | Display range | Unit |
|---|---|---|---|---|
| U00 | 00 | Motor velocity | -32767~32767 | rpm(*mm/s) |
| U00 | 01 | Input signal monitoring DI | 0~65535 | - |
| U00 | 03 | Output signal monitoring DO | 0~65535 | - |
| U00 | 05 | Input command count (Use U00.34 if you need to view external commands) | -2147483647 ~2147483647 | Unit of command |
| U00 | 07 | Absolute position counter | -2147483647 ~2147483647 | Unit of command |
| U00 | 09 | Feedback pulse counter | -2147483647 ~2147483647 | Unit of pulse |
| U00 | 0B | Deviation counter | -2147483647 ~2147483647 | Unit of pulse |
| U00 | 0E | Average load rate | 0~3000 | 0.1% |
| U00 | 0F | Velocity command | -9000~9000 | rpm(*mm/s) |
| U00 | 10 | Internal torque command | -4000~4000 | 0.1% |
| U00 | 11 | Mechanical angle | 0~3600 | 0.1 ° |
| U00 | 12 | Electrical angle | 0~3600 | 0.1 ° |
| U00 | 14 | U current sample (rms) | -30000~30000 | 0.01A |
| U00 | 15 | Bus voltage | 0~30000 | 0.1v |
| U00 | 17 | AI voltage value | 0~20000 | 0.001v |
| U00 | 1A | Driver temperature | -10~200 | Celsius degree |
| U00 | 1D | Total run time | 0~4294967296 | 0.1s |

| Function code | | Description | Display range | Unit |
|---|---|---|---|---|
| U00 | 20 | Total number of input pulses | -2147483647 ~2147483647 | - |
| U00 | 23 | Extended data / multi-ring data of serial encoder | 0~65535 | - |
| U00 | 24 | Feedback single turn position of serial encoder | 0~8388608 | p |
| U00 | 34 | Actual input position command | -2147483647~ 2147483647 | - |
| U00 | 36 | Incremental encoder AB count | -2147483647~ 2147483647 | - |
| U00 | 38 | Incremental encoder Z signal count | 0~65535 | - |
| U00 | 3E | Function code group number with parameter exception | - | - |
| U00 | 3F | Function code intra group offset with parameter exception | - | - |
| U00 | 40 | Absolute encoder fault information given by FPGA | - | - |
| U00 | 41 | System state information given by FPGA | - | - |
| U00 | 42 | System fault information given by FPGA | - | - |
| U00 | 43 | Error information of incremental encoder | - | - |
| U00 | 44 | Error information of Nikon encoder | - | - |
| U00 | 45 | Error information of Tamagawa encoder | - | - |
| U00 | 43 | Error information of Sankyo encoder | - | - |

U01group fault and display parameters

| Function code | | Description | Display range | Unit |
|---|---|---|---|---|
| U01 | 00 | Fault record digital setting | 0~11 | - |
| U01 | 01 | Selected fault code | 0~65535 | - |
| U01 | 02 | Internal fault code for the selected fault | 0~65535 | - |
| U01 | 03 | Time stamp of the selected fault | 0~4294967296 | 0.1s |
| U01 | 05 | Velocity in case of selected fault | -37767~32767 | rpm(*mm/s) |
| U01 | 06 | Phase U current in case of selected fault | -37767~32767 | 0.01a |
| U01 | 07 | Phase V current in case of selected fault | -37767~32767 | 0.01a |
| U01 | 08 | Bus voltage in case of selected fault | 0~3000 | 0.1v |
| U01 | 09 | Input terminal status in case of selected fault | 0~65535 | - |
| U01 | 0A | Output terminal status in case of selected fault | 0~65535 | - |
| U01 | 10 | Absolute encoder fault information given by FPGA in case of selected fault | 0~65535 | - |
| U01 | 11 | System status information given by FPGA in case of selected fault | 0~65535 | - |
| U01 | 12 | System fault information given by FPGA in case of selected fault | 0~65535 | - |

| U02group software version display parameters | | | | |
|---|---|---|---|---|
| Function code | | Description | Display range | Unit |
| U02 | 00 | MCU Software version | - | - |
| U02 | 01 | FPGA Software version | - | - |
| U02 | 02 | MCU nonstandard number | - | - |
| U02 | 03 | Fpga nonstandard number | - | - |
| U02 | 04 | Temporary version number | - | - |

| Fgroup auxiliary function parameters | | |
|---|---|---|
| Function code | Description | Setting range |
| F00 | Panel key velocity Jog | - |
| F01 | Inertia identification enable | - |
| F02 | Emergency stop | 0~ no operation<br>1~ emergency stop |
| F03 | Initial angle identification of absolute encoder | 0~ no operation<br>1 ~ angle identification |
| F04 | Reset Function code | 0~ no operation<br>1 ~ reset function code |
| F05 | Fault reset operation | 0~ no operation<br>1 ~ fault reset |
| F06 | Software reset operation | 0~ no operation<br>1 ~ software reset |
| F07 | Absolute encoder reset operation | 0~ no operation<br>1 ~ clear multi-ring position<br>2 ~ clear multi-ring position and reset fault |
| F08 | Absolute encoder operation | 0~ no operation<br>1~ write rom<br>2~ read rom |
| F09 | AI1 automatic zero offset adjustment | 0~ no operation<br>1 ~ AI1 automatic correction |
| F0A | Position Jog jogging | - |
| F0B | Reset fault record | 0~ no operation<br>1 ~ reset fault record |

## 10.2 DI/DO function

### DIfunction parameter setting

| DI function serial number | DI function description |
|---|---|
| 1 | Servo enable SRV_ON |
| 2 | Positive limit POT |
| 3 | Negative limit NOT |
| 4 | Home switch ORGP |
| 5 | Trigger homing enable Execute_Homing |
| 6 | Internal position mode trigger Execute_PP |
| 7 | Fault reset A_Clr |
| 8 | Operation mode switching CmdSign |
| 9 | Emergency stop signal E_Stop |
| 10 | Pause signal HaltOption |
| 11 | Operation mode switching 1Mode_Sel1 |
| 12 | Operation mode switching 2Mode_Sel2<br>where ( 1Mode_Sel1=0 and Mode_Sel2=0 ) is position mode<br>( 1Mode_Sel1=1 and Mode_Sel2=0 ) is velocity mode<br>( 1Mode_Sel1=0 and Mode_Sel2=1 ) is torque mode<br>( 1Mode_Sel1=1 and Mode_Sel2=1 ) is position mode |
| 13 | Positive jogging JogCmdP |
| 14 | Negative joggingJogCmdN |
| 15 | Zero position fixing ZeroLock |
| 16 | Gain switching Gain |
| 17 | Electronic gear ratio switching GearSw |
| 18 | Pulse prohibition INH |
| 19 | Pulse deviation clearing CL |
| 20 | Probe release probeEnable |

### DO function parameter setting

| DO function serial number | DO functional description |
|---|---|
| 1 | Servo ready status output SRdy |
| 2 | Servo enable state output Son |
| 3 | Positioning OK output INP |
| 4 | Warning output signal Warn |
| 5 | Fault output signal Alm |
| 6 | Brake signal Blk |
| 7 | Homing OK output HomeOK |
| 13 | Zero velocity signal output SZero |
| 14 | velocity consistent signal VIn |
| 15 | velocity reach output VRot |
| 16 | Torque command reach signal ToqReach |
| 17 | Probe locking ProbeLock |

# Chapter 11 Commissioning of Linear Motor

## 11.1 Procedure for commissioning of linear motor

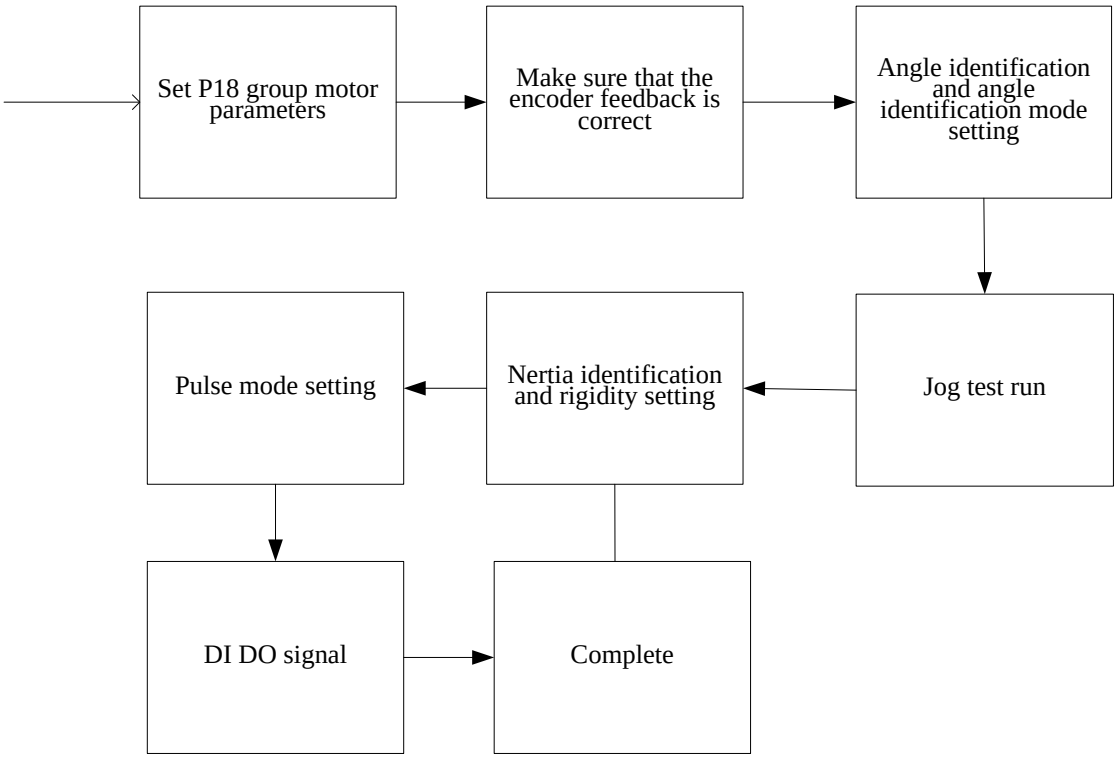



Figure 11-1 Flow Chart for Commissioning of Linear Motor

## 11.2 Parameter setting of linear motor

1. Set the parameters of linear motor:

| P18.00 Linear motor code | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | - | 0xA000 | P | S | T |
| Notes:The parameter of linear motor must be set to 0xA000 | | | | | | |

| P18.05 Pole distance of linear motor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01mm | 32.00 | P | S | T |
| Notes:<br>Set the distance length of N-N poles, for example, the pole distance is 25mm, with P18.05 to be set to 25.00. | | | | | | |

| P18.06 Resolution of grating ruler | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~10000 | 0.01um | 10 | P | S | T |

Notes:
Set the Unit of grating ruler resolution to 0.01u, i.e. the distance traveled by a pulse (after quadruple frequency) fed back by the grating ruler.
If the resolution of the grating ruler is 5um, set P18.06 to 5.00.

| P18.22 Rated current of motor (continuous current) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~10000 | 0.01A | 10 | P | S | T |

Notes:
Set the rated current value of the motor, Unit0.01A
If the rated current of the motor is 3.4A, set P18.2 to 3.40.

| P18.24 Maximum current of motor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~10000 | 0.01A | 10 | P | S | T |

Notes:
Set the maximum current value of the motor, Unit0.01A
If the maximum current of the motor is 12.3A, set P18.24 to 12.30.

| P18.26 Rated torque (continuous thrust) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01N | 10 | P | S | T |

Notes:
Set the rated torque (continuous thrust value) of the motor, for example, the continuous thrust of the linear motor is 106N,
set P18.26 to 106.00

| P18.2A Rated velocity of motor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~9000 | mm/s | 3000 | 0P | S | T |

Notes:
The default is 3000 mm/s.

| P18.2C Maximum velocity of motor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 10~9000 | mm/s | 5000 | P | S | T |

Notes:
The default is 5000mm/s

| P18.2E Rotor mass | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | g | 10 | P | S | T |
| Notes:<br>Set the unit of rotor mass to g, for example, the mass of motor rotor is 1.3kg.<br>Set P18.2E to 1300 | | | | | | |

| P18.30 Number of pole-pairs | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | - | - | P | S | T |
| Notes:The linear motor can be directly set to 1 | | | | | | |

| P18.31 Resistance value of stator resistor | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.001Ω | 10 | P | S | T |
| Notes:<br>Set the resistance value of the resistor of the motor stator, for example, if the motor linear resistance is 2.6Ω, the stator resistance is 2.6/2=1.3Ω<br>Set P18.31 to 1.300 | | | | | | |

| P18.32 Lq inductance value of stator | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01mh | 10 | P | S | T |
| Notes:<br>Set the inductance value of stator Lq , for example, if the linear inductance value is 8.6mh the inductance of stator is 8.6/2 = 4.3mH.<br>Set P18.32 to 4.30 | | | | | | |

| P18.33 Ld inductance value of stator | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01mh | 10 | P | S | T |
| Notes:<br>Set the Ld inductance value of the stator, for example, if the linear inductance is 8.6mh, the stator inductance is 8.6/2 = 4.3mH.<br>Set P18.32 to 4.30 (it will be OK to be set to that similar to P18.32) | | | | | | |

| P18.34 Back EMF coefficient | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01v/ mm/s | 10 | P | S | T |
| Notes:<br>Set the back EMF coefficient of the motor, for example, if the back EMF of the motor is 27.6 V/m/s, | | | | | | |

Set P18.34 to 27.60

| P18.36 Torque coefficient (thrust constant) | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 1~65535 | 0.01N/A | 10 | P | S | T |

Notes:
Set the thrust constant of the motor, for example, if the thrust constant of the motor is 22.4N/A
Set to 22.40

Effective after re-power-on at the end of setting,

## 11.3 Check the signal feedback of linear motor

Check the feedback pulse count of U00.09 grating ruler, and push the motor for a distance to observe whether U00.09 increases (or decreases) the corresponding pulse number. For example, if the resolution of grating ruler P18.06 is 1.00u, then U00.09 shouldincrease 100000 pulses after pushing the motor positively for 10cm, and decrease 100000 pulses after pushing the motor negatively for 10cm. If the grating ruler Z signal is used, you can check whether the Z signal count is normal through U00.38. Each time the Z signal is encountered, the U00.08 count increases by 1.

If the hall signal is used, the status of the hall signal can be displayed through function code U00.39

| U00.39 | Hall_W | Hall_V | Hall_U |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 |
| 2 | 0 | 1 | 0 |
| 3 | 0 | 1 | 1 |
| 4 | 1 | 0 | 0 |
| 5 | 1 | 0 | 1 |
| 6 | 1 | 1 | 0 |
| 7 | 1 | 1 | 0 |

## 11.4 Linear angle identification

When F03 = 1 is used for angle identification, the angle identification method shall be selected according to the actual situation:

| P0A.0B Selection of angle identification mode | Setting range | Unit | Factory default | Related mode | | |
|---|---|---|---|---|---|---|
| | 0-4 | - | 0 | P | S | T |

Notes:

0: Pre-positioning identification mode: In the identification process, the motor can move a maximum distance between poles.

1: Specified electric angle identification mode: In the identification process, the motor runs to the electric angle specified by the user (P0A.0E).

2: jogging identification mode 1: This mode can be used after the gain motor parameters are matched, and the moving distance is very small.

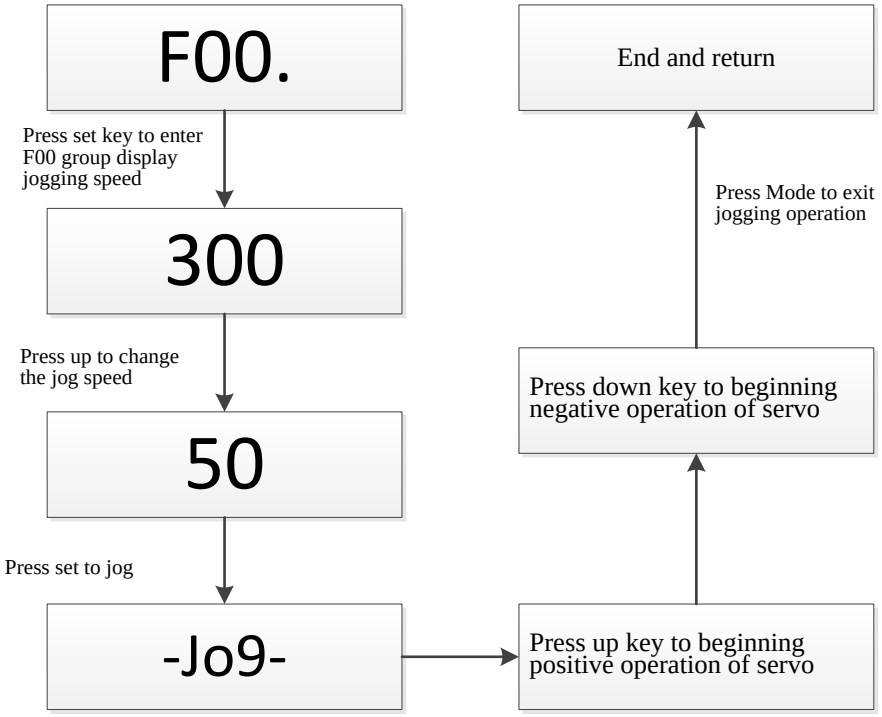
3: jogging identification mode 2: small moving distance, uncoupled gain. (Recommended).

4: Hall identification mode: learn the hall signal position. After the motor is installed, it only needs to be identified once, and then it does not need to identify the angle.

During hall identification, it is necessary to set P0a.0b to 4 and use F03 = 1 for angle identification. After identification, the angle corresponding to Hall signal is saved in P18.09 ~ P18.0E. Check the angle interval of the result about 60 °and roughly judge whether the identification result is accurate. If the alarm AI.01.5 (phase sequence error) occurs during angle identification, please replace phase sequence U and V.

## 11.5 Linear commissioning

For example, select a lower velocity for operation 50mm/s.




During the trial operation, in case of runaway AI.05.5, stalling AI.02.A and motor overload AI.02.9, the electric angle may be wrong.

It is necessary to confirm whether P18.05, P18.06 and P18.30 are set correctly.

Other gain commissioning and pulse mode can be set according to the requirements in the user instruction .