

User Manual of T6 Series AC Servo

Preliminary Version



Introduction

Thanks for purchasing OYOSTEPER T6-series AC servo drives; this instruction manual provides knowledge and attention for using this drive.

Contact oyostepper.com@gmail.com if you need more technical service.

Incorrect operation may cause unexpected accident, please read this manual carefully before using product.







- ✧ We reserve the right to modify equipment and documentation without prior notice.
- ✧ We won't undertake any responsibility with customer's any modification of product, and the warranty of product will be cancel at the same time.

Safety Items

T6 Series servo drive should be mounted in cover type control box during operating. The mounting of drive, wiring and motor should be under the regulations of EN 61800-5-1.

Safety items indicate a potential for personal injury or equipment damage if the recommended precautions and safe operating practices are not followed.

The following safety-alert symbols are used on the drive and in the documentation:

| | |
|---|--|
|  | Indicates great possibility of death or serious injury |
|  | Indicates something that must be done. |
|  | Indicates something that must not be done. |
|  | Indicates dangerous voltage. |
|  | Indicates do not touches hot heat sink when power on. |
|  | Protective Earth |

Safety precautions



- The design and manufacture of product doesn't use in mechanic and system which have a threat to operator.
- The safety protection must be provided in design and manufacture when using this product to prevent incorrect operation or abnormal accident.

Acceptance



- The product which is damaged or have fault is forbidden to use.

Transportation



- The storage and transportation must be in normal condition.
- Don't stack too high, prevent falling.
- The product should be packaged properly in transportation,
- Don't hold the product by the cable, motor shaft or encoder while transporting it.
- The product can't undertake external force and shock.

Installation



Caution

Servo Drive and Servo Motor:

- Don't install them on inflammable substance or near it to preventing fire hazard.
- Avoid vibration, prohibit direct impact.
- Don't install the product while the product is damaged or incomplete.

Servo Drive:

- Must install in control cabinet with sufficient safeguarding grade.
- Must reserve sufficient gap with the other equipment.
- Must keep good cooling condition.
- Avoid dust, corrosive gas, conducting object, fluid and inflammable ,explosive object from invading.

Servo Motor:

- Installation must be steady, prevent drop from vibrating.
- Prevent fluid from invading to damage motor and encoder.
- Prohibit knocking the motor and shaft, avoid damaging encoder.
- The motor shaft can't bear the load beyond the limits.

Wiring



Warning

- The workers of participation in wiring or checking must possess sufficient ability do this job.
- The wiring and check must be going with power off after 10 minutes
- Ground the earth terminal of the motor and drive without fail.
- The wiring should be connected after servo drive and servo motor installed correctly
- After correctly connecting cables, insulate the live parts with insulator.



Caution

- The wiring must be connected correctly and steadily, otherwise servo motor may run incorrectly, or damage the equipment.
- Servo motor U, V, W terminal should be connected correctly, it is forbidden to connect them directly to AC power.
- We mustn't connect capacitors, inductors or filters between servo motor and servo drive.
- The wire and temperature-resistant object must not be close to radiator of servo drive and motor.
- The freewheel diode which connect in parallel to output signal DC relay mustn't connect reversely.

Debugging and running



Caution

- Make sure the servo drive and servo motor installed properly before power on, fixed steadily, power voltage and wiring correctly.
- The first time of debugging should be run without loaded, debugging with load can be done after confirming parameter setting correctly, to prevent mechanical damage because of error operation.

Using



Caution

- Install a emergency stop protection circuit externally, the protection can stop running immediately to prevent accident happened and the power can be cut off immediately.
- The run signal must be cut off before resetting alarm signal, just to prevent restarting suddenly.

- The servo drive must be matched with specified motor.
- Don't power on and off servo system frequently, just to prevent equipment damaged.
- Forbidden to modify servo system.

Fault Processing



Warning

- The high voltage also will contain in several minutes even if the servo drive is powered off, please don't touch terminal strip or separate the wiring.
- The workers of participation in wiring or checking must possess sufficient ability do this job.



Caution

- The reason of fault must be figured out after alarm occurs, reset alarm signal before restart.
- Keep away from machine, because of restart suddenly if the drive is powered on again after momentary interruption(the design of the machine should be assured to avoid danger when restart occurs)

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T6 series function guidance

| NO | Function | Details | Section index |
|----|-------------------------------|--|------------------------------------|
| 1 | Position control | Position control parameter specification, guidance | 8.1 Position control |
| 2 | Encoder supported | 5000lines、17bit、23bit encoder | |
| 3 | Auxiliary Function | JOG、parameter initialization、Soft Reset、inertia ratio identification etc. | 7.2.3 Auxiliary Function |
| 4 | Vibration Suppression | It can suppress torque oscillation caused by too high rigidity | 8.5 Vibration Suppression |
| 5 | Inertia ratio identification | The inertia of the load can be accurately identified by a simple trial run | 8.4 Inertia ratio identification |
| 6 | Electronic gear function | A certain range of electronic gear ratio can be set | 8.1.2 Electronic gear function |
| 7 | Position command filter | FIR filter and command smoothing filter are used to smooth the position command | 8.1.3 Position command filter |
| 8 | Third gain switching | An additional third gain is added to allow faster positioning by switching between the first and second gain | 8.6 Third gain switching |
| 9 | Friction torque compensation | The friction torque and gravity torque are compensated for the load. | 8.7 Friction torque compensation |
| 10 | Alarm processing method | | 6.2 Alarm Processing Method |
| 11 | IO interface principle | IO input and output functions and each function can be freely configured to any physical IO port | 4.3 IO interface principle |
| 12 | Trial run | Directly through the servo drive panel or PC can achieve servo motor operation | 7.3 Trial run |
| 13 | Speed limit | | 8.9.1 Speed limit |
| 14 | Regenerative resister setting | Support internal brake resistance and external brake resistance, match the resistance through parameter setting | 8.8 Regenerative resister setting |
| 15 | Drive Operating Data Monitor | Drive operating data monitor | 7.2.2 Drive Operating Data Monitor |
| 16 | Alarm and Processing | A variety of alarm code output to protect the servo drive security | Chapter 6 Alarm and Processing |
| 17 | Multi-turn absolute encoder | The drive use the memory position of the motor with multi-turn absolute encoder to realize the function of not losing absolute position after restart power supply | 8.2 Multi-turn absolute encoder |

Chapter 1 Introduction

1.1 Product Introduction

T6/ELM Series AC servo products are cost-effective AC digital servo which is designed mainly for position high accurate control, power range up to 1kw, which can provide a perfect solution for different applications, performance with easy tuning process.

1.2 Inspection of product

1. You must check the following thing before using the products:

- a. Check if the product is damaged or not during transportation.
- b. Check if the servo drive & motor are complete or not.
- c. Check the packing list if the accessories are complete or not.

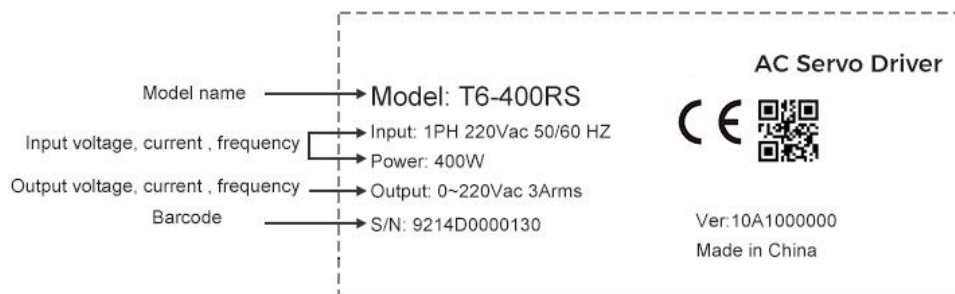
2. Type meaning

- a. T6 series servo drive

T6- 1000 RS

① ② ③

| NO | Details | | | |
|----|----------------|------------------------|-----------|------------|
| ① | Series | T6: Servo drive series | | |
| ② | Power | 400: 400W | 750: 750W | 1000:1000W |
| ③ | Command source | RS: RS485 | | |



- b. Servo motor type

The T6 series AC servo drive can be matched with a variety of domestic and foreign servo motor.

3. Accessory list

1. User manual
2. Power connector
3. Control signal terminal CN1 (6 pin)
4. Digital input/output terminal CN2(10 pin)
5. 1 press rod with plastic terminal

Chapter 2 Product Specification



Notice

Servo drive must be matched with relevant servo motor; this manual describes OYOSTEPER T6 series servo motor.

Contact oyostepper.com@gmail.com if you need more technical service.

2.1 Drive Technical Specification

Table 2.1 Drive Specification A

| Drive model | T6-400RS | T6-750RS | T6-1000RS |
|-----------------------------|--|---|------------|
| Rated output power | 400W | 750W | 1000w |
| Rated output current | 3 | 5.2 | 7 |
| Max output current | 13 | 18.4 | 26.5 |
| Mechanical Size | 175*168*40 | 175*168*50 | 175*168*50 |
| Main power Control power | Single phase 220V -15%~+10% 50/60HZ | | |
| Control mode | IGBT SVPWM sinusoidal wave control | | |
| Feedback mode | Bus encoder: RS485 protocol | | |
| Input pulse | 0-500kHz,5V differential input ; 0-200kHz,24V single-ended input | | |
| Position bandwidth | 200HZ | | |
| Electronic gear ratio | 1~8388608/1~8388608 | | |
| Velocity bandwidth | 500HZ | | |
| Input signal | DI: 4 inputs (Support common + and common - two wiring modes) Servo enable, over-travel inhibition, gain switching, command pulse inhibition, speed zero clamp, deviation counter clear, alarm clear | | |
| Output signal | DO: 3 outputs (2 single-ended, 1 differential) Alarm output, servo-ready, at-speed, zero-detection, velocity coincidence | | |
| Encoder signal output | A phase, B phase, Z phase, long-distance drive mode output | | |
| Alarm function | Over-voltage, under-voltage, over-current, over-load, encoder error, position deviation error, brake alarm, limit alarm, over-speed error etc. | | |
| Operation and display | jog, trapezoidal wave test, each parameter and input output signal can be modified and saved, five-bit LED to display rotational speed, current, position deviation, drive type version and address ID value etc. | | |
| Debug software | Can adjust the parameters of current loop, velocity loop, position loop, and change the value of input and output signals and the parameter of motor and save the values to the files which can be downloaded and uploaded, monitor the waveform of velocity and position in the ladder. | | |
| Communication interface | RS232: Based on Modbus protocol RS485: Based on Modbus protocol | | |
| Brake mode | Built-in brake 50Ω/50W | | |
| Adapt load inertia weight | Less than 20 times motor inertia About 1.5-3Kg | | |
| Environment | Environment | Avoid dust, oil fog and corrosive gases | |
| | Ambient Temp | 0 to +40℃. | |
| | Humidity | 40% RH to 90%RH , no condensation | |
| | Vibration | 5.9 m/s ² MAX | |
| | Storage Temperature | -20~80℃ | |
| | Installation | Vertical installation | |

Table 2.2 Drive Specification B

| Servo drive series | T6-D***Z | T6-RS***Z |
|----------------------------------|---|---|
| Control mode | <ul style="list-style-type: none"> ● Position control ● JOG | <ul style="list-style-type: none"> ● Position control ● Velocity control ● Torque control ● JOG |
| Encoder output | 5V differential,0~500kHz 24Vsingle-ended,0~200kHz | 5V differential,0~500kHz 24Vsingle-ended,0~200kHz |
| Digital input | 4 inputs (common-cathode common-anode) | 4 inputs (common-cathode common-anode) |
| Digital output | 3 outputs(2 single-ended, 1 differential) | |
| Communication | -- | Modbus RTU(RJ45) |
| Maximum frequency of pulse input | 5V differential,0~500kHz 24Vsingle-ended,0~200kHz | 5V differential,0~500kHz 24Vsingle-ended,0~200kHz |

2.2 Accessory selection

1. Motor cable:
CABLE-RZ3M0-S (V3.0)
2. Encoder cable:
CABLE-7BM3M0-Z (V3.0)
3. Brake cable (if necessary):
CABLE-SC3M0-S (V3.0)
4. Software configuration cable:
CABLE-L6TS1M5
5. Communication cable
CABLE-TX3M0-BUS

Chapter 3 Installation

3.1 Storage and Installation Circumstance

Table 3.1 Servo Drive, Servo Motor Storage Circumstance Requirement

| Item | T6 series drive | Servo motor |
|-------------------------|--|--|
| Temperature | -20-80℃ | -25-70℃ |
| Humidity | Under 90%RH (free from condensation) | Under 80%RH (free from condensation) |
| Atmospheric environment | Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust | Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust |
| Altitude | Lower than 1000m | Lower than 2500m |
| Vibration | Less than 0.5G (4.9m/s ²) 10-60Hz (non-continuous working) | |
| Protection level | IP20(no protection) | IP54 or IP65 |

Table 3.2 Servo Drive, Servo Motor Installation Circumstance Requirement

| Item | T6 series drive | Servo motor |
|-------------------------|--|--|
| Temperature | 0-55℃ | -25-40℃ |
| Humidity | Under 90%RH (free from condensation) | Under 90%RH (free from condensation) |
| Atmospheric environment | Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust | Indoor(no exposure)no corrosive gas or flammable gas, no oil or dust |
| Altitude | Lower than 1000m | Lower than 2500m |
| Vibration | Less than 0.5G (4.9m/s ²) 10-60Hz (non-continuous working) | |
| Protection level | IP20(no protection) | IP54 or IP65 |

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3.2 Servo Drive Installation

Notice

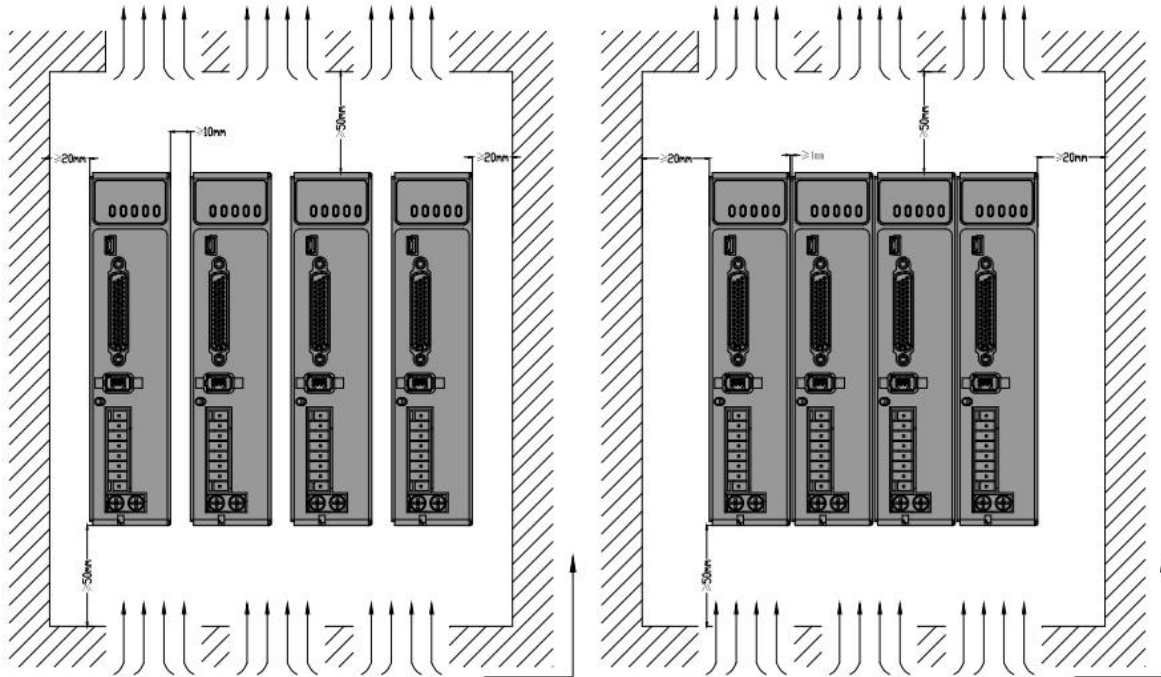
- Must install in control cabinet with sufficient safeguarding grade.
- Must install with specified direction and intervals, and ensure good cooling condition.
- Don't install them on inflammable substance or near it to prevent fire hazard.

Install in vertical position, and reserve enough space around the servo drive for ventilation.

The user may install the product in the mode of bottom plate installation or panel installation, and the installation direction is perpendicular to the installation face. In order to ensure good heat dissipation conditions, at least 10MM of installation space should be set aside in the actual installation.

When mounting drives compactly, consider installation tolerances and leave at least 1MM between each two drives. Use it below 75% of the actual load rate.

Installation diagram as follow:



3.3 Servo Motor Installation



Notice

- Don't hold the product by the cable, motor shaft or encoder while transporting it.
- No knocking motor shaft or encoders, prevent motor by vibration or shock.
- The motor shaft can't bear the load beyond the limits.
- Motor shaft does not bear the axial load, radial load, otherwise you may damage the motor.
- Use a flexible with high stiffness designed exclusively for servo application in order to make a radial thrust caused by micro misalignment smaller than the permissible value.
- Install must be steady, prevent drop from vibrating.

Chapter 4 Wiring



Warning

- The workers of participation in wiring or checking must possess sufficient ability do this job.
- The wiring and check must be going with power off after five minutes.



Caution

- Ground the earth terminal of the motor and drive without fail.
- The wiring should be connected after servo drive and servo motor installed correctly

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4.1 Wiring

4.1.1 Wire Gauge

(1) Power supply terminal TB

- Diameter:

Table 4.1 Power wiring specification

| Drive | Wire diameter (mm ² /AWG) | | | |
|-----------|--------------------------------------|-----------|-----------|-----------|
| | L1.L2.L3 | P+.BR | U.V.W | PE |
| T6-400RS | 1.3/AWG16 | 2.1/AWG14 | 1.3/AWG16 | 2.1/AWG14 |
| T6-750RS | 1.3/AWG16 | 2.1/AWG14 | 1.3/AWG16 | 2.1/AWG14 |
| T6-1000RS | 2.1/AWG14 | 2.1/AWG14 | 2.1/AWG14 | 2.1/AWG14 |

- Grounding: The grounding wire should be as thick as possible, drive servo motor the PE terminal point ground, ground resistance <100 Ω.

- Use noise filter to remove external noise from the power lines and reduce an effect of the noise generated by the servo drive.

- Install fuse (NFB) promptly to cut off the external power supply if drive error occurs.

(2) The control signal CN1、CN2, and feedback signal CN3

- **Diameter:** shielded cable (twisting shield cable is better), the diameter of CN1 $\geq 0.14\text{mm}^2$, the diameter of CN2 $\geq 0.25\text{mm}^2$, the shield should be connected to FG terminal.

- **Length of line:** cable length should be as short as possible and control CN1 cable is no more than 3 meters, the CN3 cable length of the feedback signal is no more than 10 meters.

- **Wiring:** be away from the wiring of power line, to prevent interference input.

- Install a surge absorbing element for the relevant inductive element (coil), DC coil should be in parallel connection with freewheeling diode reversely; AC coil should be in parallel connection with RC snubber circuit.

(3) Regenerative resistor

When the torque of the motor is opposite to the direction of rotation (common scenarios such as deceleration, vertical axis descent, etc.), energy will feedback from the load to the drive. At this time, the energy feedback is first received by the capacitor in the drive, which makes the voltage of the capacitor rise. When it rises to a certain voltage value, the excess energy needs to be consumed by the regenerative resistance

The recommended regenerative resistance specifications for the T6 series are as follows:

Table 4.2 Regenerative resistance specification sheet

| Drive | Built-in resistor value (Ω) | Built-in resistor power (W) |
|-----------|--------------------------------------|-----------------------------|
| T6-400RS | 100 | 50 |
| T6-750RS | 50 | 50 |
| T6-1000RS | 50 | 100 |

Method for determining regenerative resistance specification

- Firstly, use the built-in resistance of the drive to run for a long time to see if it can meet the requirements: ensure that the drive temperature $d33 < 60^{\circ}\text{C}$, the braking circuit does not alarm (Regeneration load factor $d14 < 80$), and the drive does not report overvoltage error
- If the drive temperature is high, try to reduce the regenerative energy power, or external resistance of the same specification (in this case, cancel the built-in resistance).
- If the brake resistance burns out, try to reduce the regenerative energy power, or put an external resistance of the same specification or even more power (in this case, cancel the built-in resistance).
- If $d14$ is too large or accumulates too fast, it means that the regenerative energy is too large, and the built-in resistance cannot consume the generated energy, the regenerative energy power will be reduced, or the external resistance with higher resistance value or power will be reduced.
- If an overvoltage error is reported by the drive, the regenerative energy power is reduced, or a resistance with a smaller external resistance, or a parallel resistance.



Attention

- Match the colors of the motor lead wires to those of the corresponding motor output terminals (U.V.W)
- Never start nor stop the servo motor with this magnetic contactor.
- Cable must be fixed steadily, avoid closing to radiator and motor to prevent reducing the properties of heat insulation

4.1.2 Position Control Mode

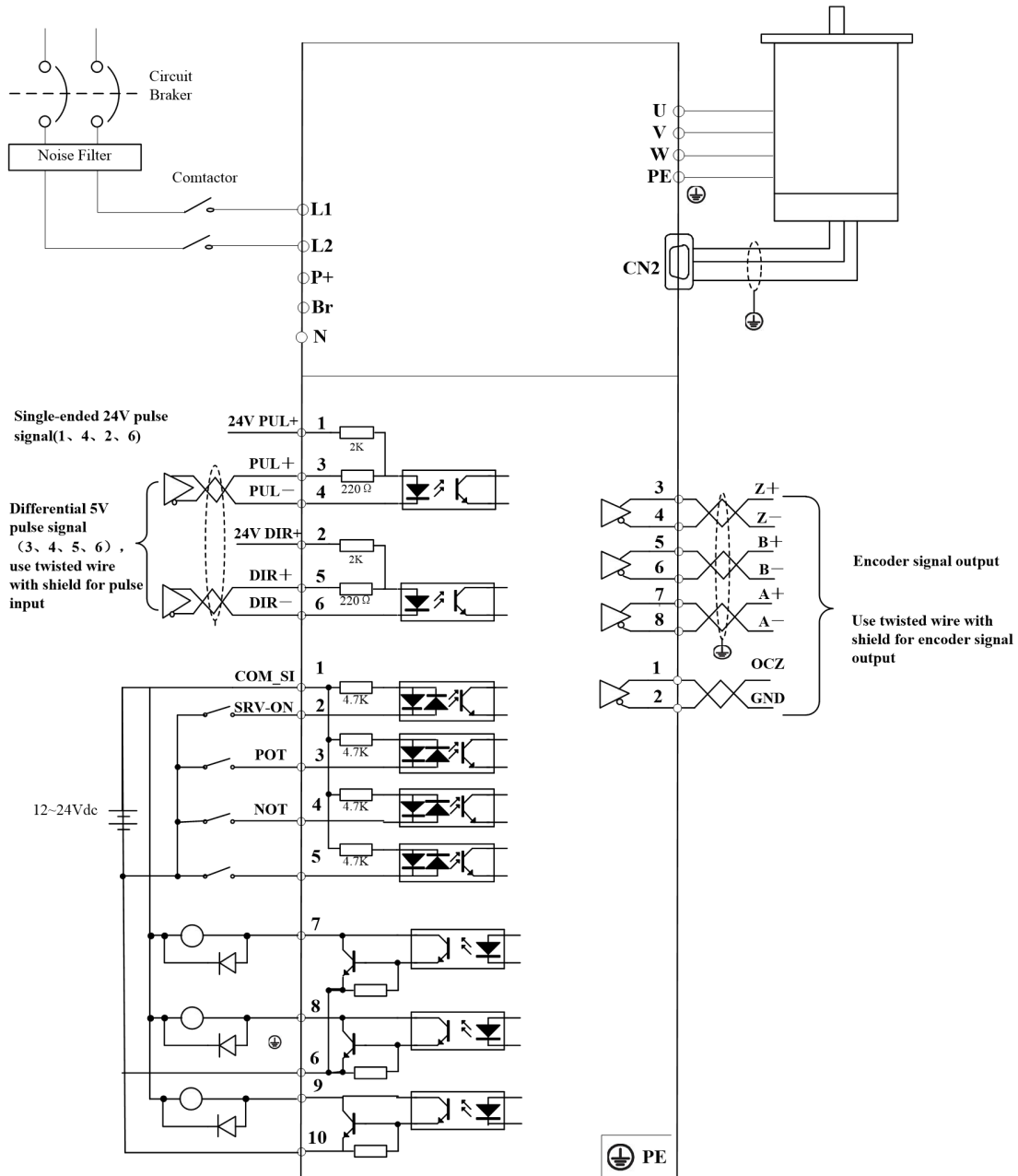


Figure 4-1 Positional Control Mode Wiring

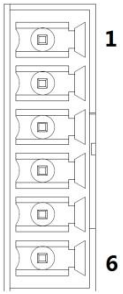
4.2 Drive Terminals Function

Table 4.3 Functions of drive port

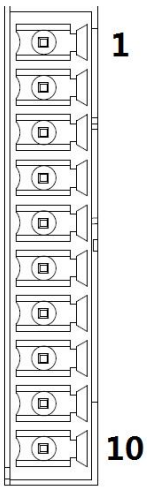
| Port | Function |
|------|--------------------------------|
| CN1 | Pulse + Direction Signal Port |
| CN2 | Digital input/output Port |
| CN3 | Encoder Input Port |
| CN4 | RS232、RS485 Communication Port |
| CN5 | RS232、RS485 Communication Port |
| CN6 | Encoder output Port |
| X1 | Power Port |

4.2.1 Pulse + Direction Signal Port -CN1 Terminal

Table 4.4 Signal Explanation of Control Signal Port-CN1

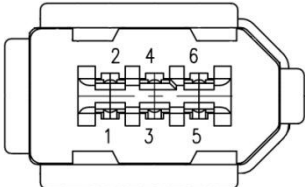
| Port | | Pin | Signal | Name | Explanation |
|------|---|-----|-----------|----------------|---|
| CN1 |  | 1 | PUL + _24 | 24V pulse+ | Hardware filtering achieves the maximum bandwidth of 750kHz |
| | | 2 | DIR + _24 | 24V direction+ | |
| | | 3 | PUL + | 5V pulse+ | |
| | | 4 | PUL - | Pulse- | |
| | | 5 | DIR + | 5V direction+ | |
| | | 6 | DIR - | Direction- | |

4.2.2 Digital input/output Port-CN3 Terminal

| Port | | Pin | Signal | Name | Explanation | |
|------|--|-----|--------|--|--|--|
| CN2 |  | 1 | COM+ | Digital input common terminal, 12VDC~24VDC | Two-way digital input with common terminal, function can be configured. 12VDC ~ 24VDC | |
| | | 2 | SI1 | Digital input 1 | | |
| | | 3 | SI2 | Digital input 2 | | |
| | | 4 | SI3 | Digital input 3 | | |
| | | 5 | SI4 | Digital input 4 | | |
| | | 6 | COM - | Digital output common-terminal | Low resistor output in default . OC, the maximum voltage/current is no more than 30V, 50mA. Recommend the voltage: 12 V-24V. Current :10mA | |
| | | 7 | SO1 | Digital output 1 | | |
| | | 8 | SO2 | Digital output 2 | | |
| | | 9 | SO3 + | Differential Digital output 3 | Differential Digital output 3 | Differential Digital output , the maximum voltage/current is no more than 30V/50mA . Recommended voltage: 12 -24V. Current :10mA |
| | | 10 | SO3 - | | | |

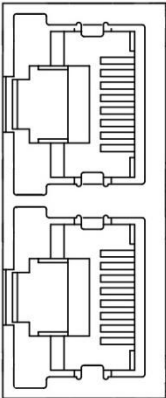
4.2.3 Encoder Input Port-CN3 Terminal

Table 4.5 Encoder Input Port-CN3 Terminal Signal Explain

| Port | | Pin | Signal |
|------|---|-------|--------|
| CN3 |  | 1 | VCC5V |
| | | 2 | GND |
| | | 3 | BAT+ |
| | | 4 | BAT- |
| | | 5 | SD+ |
| | | 6 | SD- |
| | | Shell | PE |

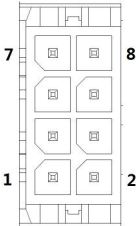
4.2.4 RS232/RS485 Communication Port-CN4、CN5 Terminal

Table 4.6 signal explanation of drive interconnection interface-CN4 CN5

| Port | | Pin | Signal | Explanation |
|------------|---|-------|--------------|-------------------|
| CN4 CN5 |  | 1, 9 | CAN_H / RDO+ | CAN / RS485 data+ |
| | | 2, 10 | CAN_L / RDO- | CAN / RS485 data- |
| | | 3, 11 | CAN_GND | CAN GND |
| | | 4, 12 | / | / |
| | | 5, 13 | / | / |
| | | 6, 14 | TXD | RS232 transmit |
| | | 7, 15 | RXD | RS232 receive |
| | | 8, 16 | GND | GND |
| | | | PE | PE ground |

4.2.5 Encoder output Port-CN6 Terminal

Table 4.7 Encoder output Port –CN6

| Port | | Pin | Signal | Name | Explanation |
|------|---|-----|--------|---|---|
| CN6 |  | 1 | OCZ | OC output terminal of motor encoder Z phase | Differential output, High >= 2.5vdc, low <= 0.5vdc, maximum current ±20mA |
| | | 2 | GND | OC output GND terminal of motor encoder | |
| | | 3 | Z + | Differential output terminal of motor encoder Z phase | |
| | | 4 | Z - | | |
| | | 5 | B + | Differential output terminal of motor encoder B phase | |
| | | 6 | B - | | |
| | | 7 | A + | Differential output terminal of motor encoder A phase | |
| | | 8 | A - | | |

4.2.6 Power Port

Table 4.8 Main Power Input Port-X1

| Port | Pin | Signal | Detail |
|-------|---|-----------------------|---|
| X1 | L1 | For single phase 220V | For single phase 220V, +15~-15%, 50/60Hz |
| | L2 | For single phase 220V | |
| Notes | ① Isolation transformer can be used for power supply; ② Do not access the 380VAC power supply, otherwise it will cause serious damage to the drive; ③ In the case of serious interference, it is recommended to use noise filter for power supply; ④ It is recommended to install a non-fusible circuit breaker to cut off external power supply in time when the drive fails. | | |
| Port | Pin | Signal | Detail |
| X1 | P + | DC bus + terminal | ① Drive DC bus + terminal ② External regenerative resistor P+ terminal |

| | Br | External regenerative resistor terminal | External regenerative resistor terminal | | | | | |
|--------|--|--|---|-----------------------|-----------|--------|-----------|-----|
| | N | DC bus - terminal | Drive DC bus - terminal | | | | | |
| Notes | When using external resistors, the values of resistance and power are selected as follows: | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Drive</th> <th>Resistor (Ω)</th> <th>Power (W)</th> </tr> </thead> <tbody> <tr> <td>T6-400</td> <td>≥ 40</td> <td>100</td> </tr> </tbody> </table> | Drive | Resistor (Ω) | Power (W) | T6-400 | ≥ 40 | 100 |
| Drive | Resistor (Ω) | Power (W) | | | | | | |
| T6-400 | ≥ 40 | 100 | | | | | | |
| Port | Pin | Signal | Detail | | | | | |
| X1 | U | U | 3 phase motor power input | | | | | |
| | V | V | | | | | | |
| | W | W | | | | | | |
| | PE | PE | Frame ground | | | | | |
| Notes | ① Connect the drive to the ground end (PE) of the motor and connect it to the earth | | | | | | | |

4.3 I/O Interface Principles

4.3.1 Switch Input Interface

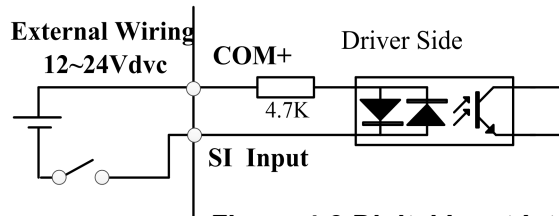


Figure 4-3 Digital Input Interface

1. The user provide power supply, DC12-24V, current \geq 100mA
2. **Notice:** if current polar connect reversely, servo drive doesn't run.

| | | | | | | | | |
|----------|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr4.00 * | Name | Input selection SI1 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 303 | | |
| | Data Type | 16bit | Access | R/W | Address | 0401H | | |
| | Repower | o | | | | | | |
| Pr4.01 * | Name | Input selection SI2 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0403H | | |
| | Repower | o | | | | | | |
| Pr4.02 * | Name | Input selection SI3 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0405H | | |
| | Repower | o | | | | | | |
| Pr4.03 * | Name | Input selection SI4 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0207H | | |
| | Repower | o | | | | | | |

Set SI input function allocation.

This parameter use 16 binary system to set up the values,

For the function number, please refer to the following Figure.

| Signal name | Symbol | Setup value | |
|---|---------|---------------|-----------------|
| | | Normally open | Normally closed |
| Invalid | - | 00h | Do not setup |
| Positive direction over-travel inhibition | POT | 01h | 81h |
| Negative direction over-travel inhibition | NOT | 02h | 82h |
| Servo-ON input | SRV-ON | 03h | 83h |
| Alarm clear input | A-CLR | 04h | Do not setup |
| Control mode switching input | C-MODE | 05h | 85h |
| Gain switching input | GAIN | 06h | 86h |
| Deviation counter clear input | CL | 07h | Do not setup |
| Command pulse inhibition input | INH | 08h | 88h |
| Electronic gear switching input 1 | DIV1 | 0Ch | 8Ch |
| Electronic gear switching input 2 | DIV2 | 0Dh | 8Dh |
| Selection 1 input of internal command speed | INTSPD1 | 0Eh | 8Eh |
| Selection 2 input of internal command speed | INTSPD2 | 0Fh | 8Fh |
| Selection 3 input of internal command speed | INTSPD3 | 10h | 90h |
| Speed zero clamp input | ZEROSPD | 11h | 91h |
| Speed command sign input | VC-SIGN | 12h | 92h |
| Torque command sign input | TC-SIGN | 13h | 93h |
| Forced alarm input | E-STOP | 14h | 94h |

Note:

- Normally open means input signal comes from external controller or component, for example: PLC.
- Normally closed means input signal comes from drive internally.
- Don't setup to a value other than that specified in the table .
- Don't assign specific function to 2 or more signals. Duplicated assignment will cause Err21.0 I/F input multiple assignment error 1or Err21.1 I/F input multiple assignment error 2

Pr-Mode related input setup as below:

| Signal name | Symbol | Input | |
|-------------------------|--------|---------------|-----------------|
| | | Setup value | |
| | | Normally open | Normally closed |
| Trigger command | CTRG | 20h | A0h |
| Homing signal | HOME | 21h | A1h |
| Forced stop | STP | 22h | A2h |
| Forward direction JOG | JOG+ | 23h | A3h |
| Opposite direction JOG | JOG- | 24h | A4h |
| Positive limit switch | PL | 25h | A5h |
| Negative limit switch | NL | 26h | A6h |
| Homing signal | ORG | 27h | A7h |
| Road strength address 0 | ADD0 | 28h | A8h |
| Road strength address 1 | ADD1 | 29h | A9h |
| Road strength address 2 | ADD2 | 2ah | Aah |
| Road strength address 3 | ADD3 | 2bh | Abh |
| Torque switching | TC-SEL | 09h | 89h |

Note:

CTRG, HOME is edge triggered, but the valid level must be last more than 1ms.

| | | | | | | | | |
|---|-----------|--------------------|--------|-------|---------|----------|----------|----------|
| Pr5.15 * | Name | I/F reading filter | | | Mode | P | S | T |
| | Range | 0~255 | Unit | 0.1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 051FH | | |
| | Repower | o | | | | | | |
| I/O input digital filtering; higher setup will arise control delay. | | | | | | | | |

4.3.2 Switch Output Interface

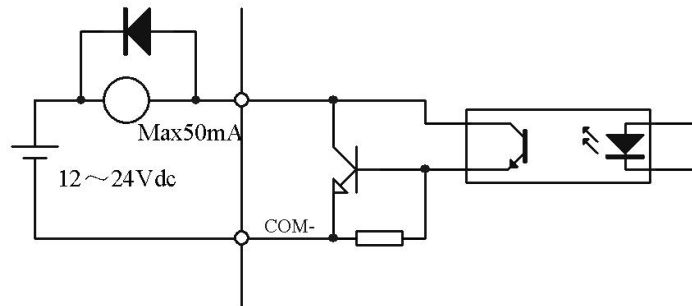


Figure 4-4 Switch Output Interface

- (1) The user provide the external power supply . However, if current polarity connects reversely, servo drive is damaged.
- (2) The output of the form is open-collector, the maximum voltage is 25V, and maximum current is 50mA. Therefore, the load of switch output signal must match the requirements. If you exceed the requirements or output directly connected with the power supply, the servo drive is damaged.
- (3) If the load is inductive loads relays, etc., there must be anti-parallel freewheeling diode across the load. If the freewheeling diode is connected reversely, the servo drive is damaged.
- (4) Pin7、 Pin8 and Pin6: Single-ended output;
Pin9、 Pin10: Differential output.

| | | | | | | | | |
|-----------------|-----------|----------------------|--------|-----|---------|----------|----------|----------|
| Pr4.10 * | Name | Output selection SO1 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 101 | | |
| | Data Type | 16bit | Access | R/W | Address | 0415H | | |
| | Repower | o | | | | | | |
| Pr4.11 * | Name | Output selection SO2 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 202 | | |
| | Data Type | 16bit | Access | R/W | Address | 0417H | | |
| | Repower | o | | | | | | |
| Pr4.12 * | Name | Output selection SO3 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 404 | | |
| | Data Type | 16bit | Access | R/W | Address | 0419H | | |
| | Repower | o | | | | | | |

Assign functions to SO outputs.
 This parameter use 16 binary system do setup
 For the function number, please refer to the following Figure.

| Signal name | Symbol | Setup value |
|----------------------------------|----------|-------------|
| Invalid | - | 00h |
| Alarm output | Alm | 01h |
| Servo-Ready output | S-RDY | 02h |
| Eternal brake release signal | BRK-OFF | 03h |
| Positioning complete output | INP | 04h |
| At-speed output | AT-SPPED | 05h |
| Zero-speed detection output | ZSP | 07h |
| Velocity coincidence output | V-COIN | 08h |
| Positional command ON/OFF output | P-CMD | 0Bh |
| Speed command ON/OFF output | V-CMD | 0Fh |

Pr-Mode related output setup as below;

| Signal name | Symbol | Output | |
|-----------------------|---------|---------------|-----------------|
| | | Set value | |
| | | Normally open | Normally closed |
| Command complete | CMD-OK | 20h | A0h |
| Road strength address | MC-OK | 21h | A1h |
| Homing finish | HOME-OK | 22h | A2h |
| Torque limit | TQL | 06h | 86h |

Note:

CMD-OK indicates PR command sent complete, but the motor may not in-position.
 MC-OK indicates command complete and the motor in-position.

*1 Pay attention to the front panel display is hexadecimal.

4.3.3 Pulse Input Interface

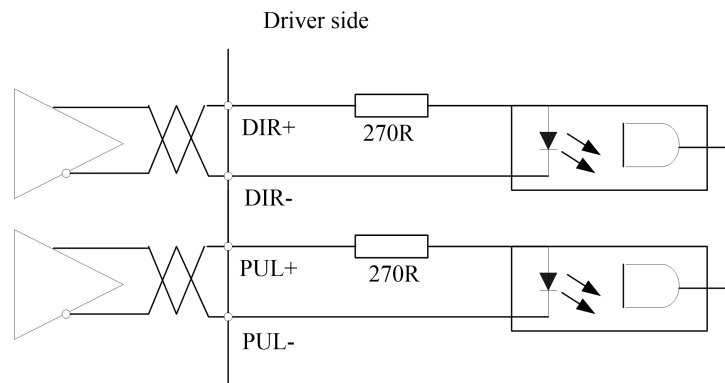
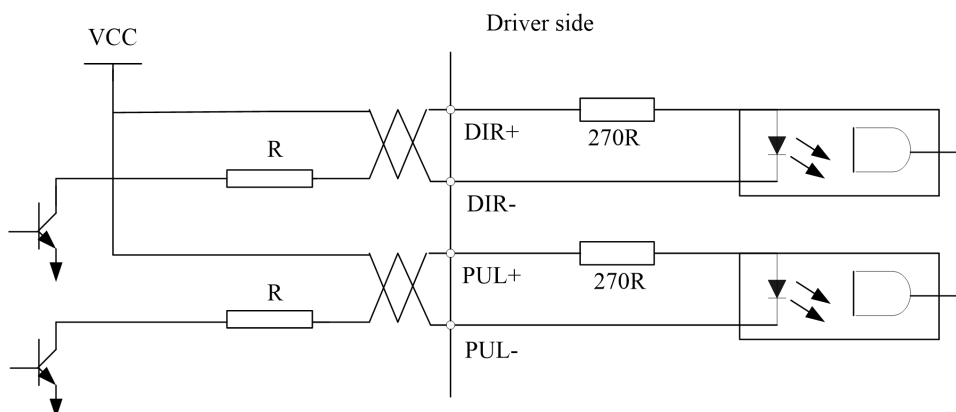


Figure 4-5 5V Differential Pulse Signal (Pin3、Pin4、Pin5、Pin6 of CN1 Terminal)



Vcc =12V, R = 1K, 0.25W; Vcc =24V, R = 2K, 0.25W

Figure 4-6 24V Single-ended Pulse Signal (Pin1、 Pin4、 Pin2、 Pin6 of CN1 Terminal)

- (1) In order to transmit pulse data correctly, we recommend using the differential drive mode.
- (2) The differential drive mode, AM26LS31, MC3487 or similar RS422 line drive.
- (3) Using of single-ended drive will cause reduction of the operation frequency. The value of the resistance R depends on pulse input circuit and the external voltage, while drive current should be at the range of 10 - 15mA and the maximum voltage is no more than 25V .

Recommendation:

VCC = 24V, R = 1.3 to 2KΩ;
 VCC = 12V, R = 510 ~ 820Ω;
 VCC = 5V, R = 82 ~ 120Ω.

- (4) The user provides external power supply for single-ended pulse signal. However, the wrong connection of pulse polarity will cause servo drive damaged.
- (5) The form of pulse input is the following form 4.9 below, while the arrows indicate the count.

Table 4.9 Pulse Input Form

| Pulse command form | CCW | CW | Parameter setting value |
|--------------------|-----|----|-------------------------|
| Pulse symbol | | | Pulse + direction |

The form of pulse input timing parameter is the following form 4.10 below. The 4 times pulse frequency ≤ 500kHz if 2-phase input form is used.

Table 4.10 the parameters of pulse input time sequence

| Parameter | Differential drive input | Single-ended drive input |
|------------------|--------------------------|--------------------------|
| t _{ck} | > 2μs | > 5μs |
| t _h | > 1μs | > 2.5μs |
| t _l | > 1μs | > 2.5μs |
| t _{rh} | < 0.2μs | < 0.3μs |
| t _{rl} | < 0.2μs | < 0.3μs |
| t _s | > 1μs | > 2.5μs |
| t _{qck} | > 8μs | > 10μs |
| t _{qh} | > 4μs | > 5μs |
| t _{ql} | > 4μs | > 5μs |
| t _{qrh} | < 0.2μs | < 0.3μs |
| t _{qrl} | < 0.2μs | < 0.3μs |
| t _{qs} | > 1μs | > 2.5μs |

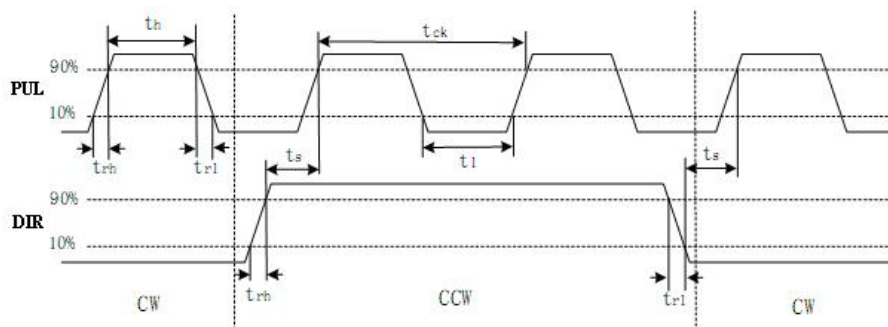


Figure 4-7 pulse + direction input interface timing (the maximum of pulse frequency: 500KHZ)

| | | | | | | |
|---------|-----------|--|--------|-----|---------|-------|
| Pr0.06* | Name | Command Pulse Rotational Direction Setup | | | Mode | P |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 000DH |
| | Repower | o | | | | |

Set command pulse input rotate direction, command pulse input type

| | | | | | | |
|---------|-----------|--------------------------------|--------|-----|---------|-------|
| Pr0.07* | Name | Command Pulse Input Mode Setup | | | Mode | P |
| | Range | 0~3 | Unit | — | Default | 1 |
| | Data Type | 16bit | Access | R/W | Address | 000FH |
| | Repower | o | | | | |

| Pr0.06 | Pr0.07 | Command Pulse Format | Signal | Positive Direction Command | Negative Direction Command |
|--------|--------|---|------------|----------------------------|----------------------------|
| 0 | 0 or 2 | 90 phase difference 2-phase pulse(A phase +B phase) | Pulse sign | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | |
| | 3 | Pulse + sign | Pulse sign | | |
| 1 | 0 or 2 | 90 phase difference 2 phase pulse(A phase +B phase) | Pulse sign | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | |
| | 3 | Pulse + sign | Pulse sign | | |

Command pulse input signal allow largest frequency and smallest time width

| PULS/SIGN Signal Input I/F | | Permissible Max. Input Frequency | Smallest Time Width | | | | | |
|----------------------------|-------------------------|----------------------------------|---------------------|-----|-----|-----|-----|-----|
| | | | t1 | t2 | t3 | t4 | t5 | t6 |
| Pulse series interface | Long distance interface | 500kpps | 2 | 1 | 1 | 1 | 1 | 1 |
| | Open-collector output | 200kpps | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |

4.3.4 Servo Motor Encoder Input Interface

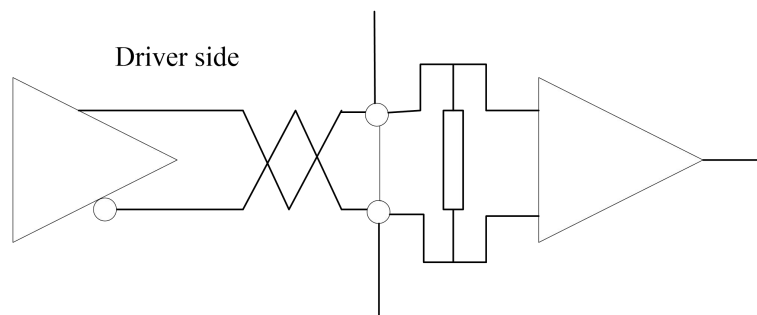


Figure 4-8 Servo Motor optical-electrical Encoder Input Interface

Chapter 5 Parameter

5.1 Parameter List

Notes: The parameters like Pr0.01*, which contain '*' means that the new value of this parameters will valid after power is restarted!

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|----------------------------|----|--|---------------|---------|------|---|---|---------------|--------|------------------|
| Classify | NO | | | | P | V | T | Data Type | Access | Add |
| 【Class 0】 Basic setting | 00 | MFC function | 1 | — | O | — | — | 16bit | R/W | 0001H |
| | 01 | Control mode setup | 0 | O | O | O | O | 16bit | R/W | 0003H |
| | 02 | Real-time auto-gain tuning | 2 | — | O | O | O | 16bit | R/W | 0005H |
| | 03 | Selection of machine stiffness at real-time auto-gain tuning | 70 | — | O | O | O | 16bit | R/W | 0007H |
| | 04 | Inertia ratio | 250 | — | O | O | O | 16bit | R/W | 0009H |
| | 06 | Command pulse rotational direction setup | 0 | O | O | — | — | 16bit | R/W | 000DH |
| | 07 | Command pulse input mode setup | 3 | O | O | — | — | 16bit | R/W | 000FH |
| | 08 | Command pulse per one motor revolution | 10000 | O | O | — | — | 32bit | R/W | 0010H 0011H |
| | 09 | 1st numerator of electronic gear | 1 | O | O | — | — | 32bit | R/W | 0012H 0013H |
| | 10 | Denominator of electronic gear | 1 | O | O | — | — | 32bit | R/W | 0014H 0015H |
| | 11 | Output pulse counts per one motor revolution | 2500 | O | O | O | O | 16bit | R/W | 0017H |
| | 12 | Reverse of pulse output logic | 0 | O | O | O | O | 16bit | R/W | 0019H |
| | 13 | 1st torque limit | 300 | — | O | O | O | 16bit | R/W | 001BH |
| | 14 | Position deviation excess setup | 200 | — | O | — | — | 16bit | R/W | 001DH |
| | 15 | Absolute encoder setup | 0 | — | O | O | O | 16bit | R/W | 001FH |
| | 16 | External regenerative discharge resistor setup | 100 | — | O | O | O | 16bit | R/W | 0021H |
| | 17 | External regenerative discharge power value | 50 | — | O | O | O | 16bit | R/W | 0023H |
| | 25 | Auxiliary function | 0 | — | O | O | O | 16bit | R/W | 0033H |
| | 40 | Mapping parameter 1 | / | — | O | O | O | / | R/W | 0050H |
| | 41 | Mapping parameter 2 | / | — | O | O | O | / | R/W | 0052H |
| | 42 | Mapping parameter 3 | / | — | O | O | O | / | R/W | 0054H |
| | 43 | Mapping parameter 4 | / | — | O | O | O | / | R/W | 0056H |
| | 44 | Mapping parameter 5 | / | — | O | O | O | / | R/W | 0058H |
| | 45 | Mapping parameter 6 | / | — | O | O | O | / | R/W | 005AH |
| | 46 | Mapping parameter 7 | / | — | O | O | O | / | R/W | 005CH |
| | 47 | Mapping parameter 8 | / | — | O | O | O | / | R/W | 005EH |
| | 50 | Mapping parameter 1 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x0064 0x0065 |
| | 51 | Mapping parameter 2 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x0066 0x0067 |
| | 52 | Mapping parameter 3 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x0068 0x0069 |

| | | | | | | | | | |
|----|---------------------------|---------------|---|---|---|---|-------|-----|------------------|
| 53 | Mapping parameter 4 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x006A 0x006B |
| 54 | Mapping parameter 5 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x006C 0x006D |
| 55 | Mapping parameter 6 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x006E 0x006F |
| 56 | Mapping parameter 7 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x0070 0x0071 |
| 57 | Mapping parameter 8 index | 0049 0049H | — | O | O | O | 32bit | R/W | 0x0072 0x0073 |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|--------------------------|---|--|---------------|---------|------|---|-------|---------------|--------|---------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 1】 Gain Adjust | 00 | 1st gain of position loop | 320 | — | O | — | — | 16bit | R/W | 0101H |
| | 01 | 1st gain of velocity loop | 180 | — | O | O | O | 16bit | R/W | 0103H |
| | 02 | 1st time constant of velocity loop integration | 310 | — | O | O | O | 16bit | R/W | 0105H |
| | 03 | 1st filter of velocity detection | 15 | — | O | O | O | 16bit | R/W | 0107H |
| | 04 | 1st time constant of torque filter | 126 | — | O | O | O | 16bit | R/W | 0109H |
| | 05 | 2nd gain of position loop | 380 | — | O | — | — | 16bit | R/W | 010BH |
| | 06 | 2nd gain of velocity loop | 180 | — | O | O | O | 16bit | R/W | 010DH |
| | 07 | 2nd time constant of velocity loop integration | 10000 | — | O | O | O | 16bit | R/W | 010FH |
| | 08 | 2nd filter of velocity detection | 15 | — | O | O | O | 16bit | R/W | 0111H |
| | 09 | 2nd time constant of torque filter | 126 | — | O | O | O | 16bit | R/W | 0113H |
| | 10 | Velocity feed forward gain | 300 | — | O | — | — | 16bit | R/W | 0115H |
| | 11 | Velocity feed forward filter | 50 | — | O | — | — | 16bit | R/W | 0117H |
| | 12 | Torque feed forward gain | 0 | — | O | O | — | 16bit | R/W | 0119H |
| | 13 | Torque feed forward filter | 0 | — | O | O | — | 16bit | R/W | 011BH |
| | 15 | Control switching mode | 0 | — | O | — | — | 16bit | R/W | 011FH |
| | 17 | Control switching level | 50 | — | O | — | — | 16bit | R/W | 0123H |
| | 18 | Control switch hysteresis | 33 | — | O | — | — | 16bit | R/W | 0125H |
| | 19 | Gain switching time | 33 | — | O | — | — | 16bit | R/W | 0127H |
| | 35 | Positional command filter setup | 0 | O | O | — | — | 16bit | R/W | 0147H |
| 36 | Encoder feedback pulse digital filter setup | 0 | — | O | O | O | 16bit | R/W | 0149H | |
| 37 | Special register | 0 | — | O | O | O | 16bit | R/W | 014BH | |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|--|----|----------------------------------|---------------|---------|------|---|---|---------------|--------|---------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 2】 Vibration Restrain Function | 00 | Adaptive filter mode setup | 0 | — | O | O | — | 16bit | R/W | 0201H |
| | 01 | 1st notch frequency | 2000 | — | O | O | O | 16bit | R/W | 0203H |
| | 02 | 1st notch width selection | 2 | — | O | O | O | 16bit | R/W | 0205H |
| | 03 | 1st notch depth selection | 0 | — | O | O | O | 16bit | R/W | 0207H |
| | 04 | 2nd notch frequency | 2000 | — | O | O | O | 16bit | R/W | 0209H |
| | 05 | 2nd notch width selection | 2 | — | O | O | O | 16bit | R/W | 020BH |
| | 06 | 2nd notch depth selection | 0 | — | O | O | O | 16bit | R/W | 020DH |
| | 07 | 3rd notch frequency | 2000 | — | O | O | O | 16bit | R/W | 020FH |
| | 08 | 3rd notch width selection | 2 | — | O | O | O | 16bit | R/W | 0211H |
| | 09 | 3rd notch depth selection | 0 | — | O | O | O | 16bit | R/W | 0213H |
| | 14 | 1st damping frequency | 0 | — | O | — | — | 16bit | R/W | 021DH |
| | 16 | 2nd damping frequency | 0 | — | O | — | — | 16bit | R/W | 0221H |
| | 22 | Positional command smooth filter | 0 | O | O | — | — | 16bit | R/W | 022DH |
| | 23 | Positional command FIR filter | 0 | O | O | — | — | 16bit | R/W | 022FH |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|------------------------------------|----|--|---------------|---------|------|---|---|---------------|--------|---------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 3】 Speed, Torque Control | 00 | Velocity setup internal /external switching | 0 | — | — | O | — | 16bit | R/W | 0301H |
| | 01 | Speed command rotational direction selection | 0 | — | — | O | — | 16bit | R/W | 0303H |
| | 03 | Speed command reversal input | 0 | — | — | O | — | 16bit | R/W | 0307H |
| | 04 | 1st speed setup | 0 | — | — | O | — | 16bit | R/W | 0309H |
| | 05 | 2nd speed setup | 0 | — | — | O | — | 16bit | R/W | 030BH |
| | 06 | 3rd speed setup | 0 | — | — | O | — | 16bit | R/W | 030DH |
| | 07 | 4th speed setup | 0 | — | — | O | — | 16bit | R/W | 030FH |
| | 08 | 5th speed setup | 0 | — | — | O | — | 16bit | R/W | 0311H |
| | 09 | 6th speed setup | 0 | — | — | O | — | 16bit | R/W | 0313H |
| | 10 | 7th speed setup | 0 | — | — | O | — | 16bit | R/W | 0315H |

| | | | | | | | | | |
|----|---|-----|---|---|---|---|-------|-----|-------|
| 11 | 8th speed setup | 0 | — | — | O | — | 16bit | R/W | 0317H |
| 12 | time setup acceleration | 100 | — | — | O | — | 16bit | R/W | 0319H |
| 13 | time setup deceleration | 100 | — | — | O | — | 16bit | R/W | 031BH |
| 14 | Sigmoid acceleration /deceleration time setup | 0 | O | — | O | — | 16bit | R/W | 031DH |
| 15 | Speed zero-clamp function selection | 0 | — | — | O | — | 16bit | R/W | 031FH |
| 16 | Speed zero-clamp level | 30 | — | — | O | — | 16bit | R/W | 0321H |
| 17 | Torque command selection | 0 | — | — | — | O | 16bit | R/W | 0323H |
| 18 | Torque command direction selection | 0 | — | — | — | O | 16bit | R/W | 0325H |
| 19 | Torque command input gain | 30 | — | — | — | O | 16bit | R/W | 0327H |
| 20 | Torque command input reversal | 0 | — | — | — | O | 16bit | R/W | 0329H |
| 21 | Speed limit value 1 | 0 | — | — | — | O | 16bit | R/W | 032BH |
| 22 | 2nd torque limit | 0 | — | O | O | O | 16bit | R/W | 032DH |
| 24 | Maximum speed of motor rotation | 0 | — | O | O | O | 16bit | R/W | 0331H |
| 28 | Synchronous parameter setting of gantry | 0 | — | O | O | O | 16bit | R/W | 0339H |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|----------------------------------|----|-----------------------------------|---------------|---------|------|---|---|---------------|--------|---------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 4】 I/F Monitor Setting | 00 | input selection SI1 | 3 | O | O | O | O | 16bit | R/W | 0401H |
| | 01 | input selection SI2 | 0 | O | O | O | O | 16bit | R/W | 0403H |
| | 02 | input selection SI3 | 0 | O | O | O | O | 16bit | R/W | 0405H |
| | 03 | input selection SI4 | 0 | O | O | O | O | 16bit | R/W | 0407H |
| | 10 | output selection SO1 | 1 | O | O | O | O | 16bit | R/W | 0415H |
| | 11 | output selection SO2 | 2 | O | O | O | O | 16bit | R/W | 0417H |
| | 12 | output selection SO3 | 4 | O | O | O | O | 16bit | R/W | 0419H |
| | 31 | Positioning complete range | 10 | — | O | — | — | 16bit | R/W | 043FH |
| | 32 | Positioning complete output setup | 0 | — | O | — | — | 16bit | R/W | 0441H |
| | 33 | INP hold time | 0 | — | O | — | — | 16bit | R/W | 0443H |
| | 34 | Zero-speed | 50 | — | O | O | O | 16bit | R/W | 0445H |
| | 35 | Speed coincidence range | 50 | — | | O | — | 16bit | R/W | 0447H |
| | 36 | At-speed | 1000 | — | | O | — | 16bit | R/W | 0449H |
| | 37 | Mechanical brake | 0 | — | O | O | O | 16bit | R/W | 044BH |

| | | | | | | | | | | |
|--|----|--|----|---|---|---|---|-------|-----|-------|
| | | action at stalling setup | | | | | | | | |
| | 38 | Mechanical brake action at running setup | 0 | — | 0 | 0 | 0 | 16bit | R/W | 044DH |
| | 39 | Brake action at running setup | 30 | — | 0 | 0 | 0 | 16bit | R/W | 044FH |
| | 43 | E-stop function active | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0457H |

| Parameter Number | | Name | Default value | Reower | Mode | | | Communication | | |
|-------------------------------------|-----------------------|----------------------------------|---------------|--------|------|---|-------|---------------|--------|----------------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 5】 Extended Setup | 00 | 2nd numerator of electronic gear | 10000 | 0 | 0 | — | — | 32bit | R/W | 0500H 0501H |
| | 01 | 3rd numerator of electronic gear | 1 | 0 | 0 | — | — | 32bit | R/W | 0502H 0503H |
| | 02 | 4th numerator of electronic gear | 1 | 0 | 0 | — | — | 32bit | R/W | 0504H 0505H |
| | 04 | Drive inhibit input setup | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0509H |
| | 06 | Sequence at servo-off | 0 | — | 0 | 0 | 0 | 16bit | R/W | 050DH |
| | 09 | Main power off detection time | 70 | — | 0 | 0 | 0 | 16bit | R/W | 0513H |
| | 10 | Dynamic braking mode | 0 | 0 | 0 | 0 | 0 | 16bit | R/W | 0515H |
| | 11 | Torque setup for emergency stop | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0517H |
| | 12 | Over-load level setup | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0519H |
| | 13 | Over-speed level setup | 0 | — | 0 | 0 | 0 | 16bit | R/W | 051BH |
| | 15 | I/F reading filter | 0 | 0 | 0 | 0 | 0 | 16bit | R/W | 051FH |
| | 17 | Counter clear up input mode | 3 | — | 0 | — | — | 16bit | R/W | 0523H |
| | 20 | Position setup unit select | 2 | — | 0 | — | — | 16bit | R/W | 0529H |
| | 21 | Selection of torque limit | 0 | — | 0 | 0 | 0 | 16bit | R/W | 052BH |
| | 22 | 2nd torque limit | 300 | — | 0 | 0 | 0 | 16bit | R/W | 052DH |
| | 23 | Torque limit switching setup 1 | 0 | — | 0 | 0 | 0 | 16bit | R/W | 052FH |
| | 24 | Torque limit switching setup 2 | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0531H |
| | 28 | LED initial status | 1 | — | 0 | 0 | 0 | 16bit | R/W | 0539H |
| 29 | RS485 mode selection | 21 | — | 0 | 0 | 0 | 16bit | R/W | 053BH | |
| 30 | RS485 baud rate setup | 2 | — | 0 | 0 | 0 | 16bit | R/W | 053DH | |
| 31 | RS485 slave ID | 1 | — | 0 | 0 | 0 | 16bit | R/W | 053FH | |
| 32 | Command pulse | 0 | — | 0 | — | — | 16bit | R/W | 0541H | |

| | | | | | | | | | | |
|----|--|--|---|---|---|---|---|-------|-----|-------|
| | | input maximum setup | | | | | | | | |
| 35 | | Front panel lock setup | 0 | — | O | O | O | 16bit | R/W | 0547H |
| 36 | | Password for opening group 7 parameter | 0 | — | O | O | O | 16bit | R/W | 0549H |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | |
|----------------------------|--|--|---------------|---------|------|---|-------|---------------|--------|---------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address |
| 【Class 6】 Special Setup | 01 | Encoder zero position compensation | 0 | O | O | O | O | 16bit | R/W | 0603H |
| | 03 | JOG trial run command torque | 0 | — | O | — | — | 16bit | R/W | 0607H |
| | 04 | JOG trial run command speed | 400 | — | O | — | — | 16bit | R/W | 0609H |
| | 05 | Position 3rd gain valid time | 0 | — | O | — | — | 16bit | R/W | 060BH |
| | 06 | Position 3rd gain scale factor | 100 | — | O | — | — | 16bit | R/W | 060DH |
| | 07 | Torque command additional value | 0 | — | O | O | O | 16bit | R/W | 060FH |
| | 08 | Positive direction torque compensation value | 0 | — | O | O | O | 16bit | R/W | 0611H |
| | 09 | Negative direction torque compensation value | 0 | — | O | O | O | 16bit | R/W | 0613H |
| | 10 | Function expansion setup | 0 | O | O | O | O | 16bit | R/W | 0615H |
| | 11 | Current response setup | 100 | — | O | O | O | 16bit | R/W | 0617H |
| | 14 | Emergency stop time at alarm | 0 | — | O | O | O | 16bit | R/W | 061DH |
| | 20 | distance of trial running | 10 | — | O | — | — | 16bit | R/W | 0629H |
| | 21 | waiting time of trial running | 100 | — | O | — | — | 16bit | R/W | 062BH |
| | 22 | cycling times of trial running | 5 | — | O | — | — | 16bit | R/W | 062DH |
| | 25 | Acceleration of trial running | 200 | — | O | — | — | 16bit | R/W | 0633H |
| 63 | Absolute multi-turn position upper bound | 0 | O | O | O | O | 16bit | R/W | 067FH | |

| Parameter Number | | Name | Default value | Repower | Mode | | | Communication | | | |
|---------------------------------|----|--|---------------|---------|------|---|---|---------------|--------|----------------|-------|
| Classify | NO | | | | P | V | T | Data Type | Access | Address | |
| 【Class B】 Status Information | 00 | Software version 1 (DSP) | | — | O | O | O | 16bit | R | 0B00H | |
| | 01 | Software version 2 (CPLD) | | — | O | O | O | 16bit | R | 0B01H | |
| | 02 | Software version 3 (other) | | — | O | O | O | 16bit | R | 0B02H | |
| | 03 | Error code | | — | O | O | O | 16bit | R | 0B03H | |
| | 04 | Factor of no-motor running | | — | O | O | O | 16bit | R | 0B04H | |
| | 05 | Drive operating state | | — | O | O | O | 16bit | R | 0B05H | |
| | 06 | Actual velocity (unfiltered) | | | | O | O | O | 16bit | R | 0B06H |
| | 07 | Actual torque feedback | | — | O | O | O | 16bit | R | 0B07H | |
| | 08 | Actual current feedback | | — | O | O | O | 16bit | R | 0B08H | |
| | 09 | Actual velocity(After filtering) | | — | O | O | O | 16bit | R | 0B09H | |
| | 10 | DC bus voltage | | — | O | O | O | 16bit | R | 0B0AH | |
| | 11 | Drive temperature | | — | O | O | O | 16bit | R | 0B0BH | |
| | 12 | Analog input1 | | — | O | O | O | 16bit | R | 0B0CH | |
| | 13 | Analog input2 | | — | O | O | O | 16bit | R | 0B0DH | |
| | 14 | Analog input3 | | — | O | O | O | 16bit | R | 0B0EH | |
| | 15 | Over-load ratio | | — | O | O | O | 16bit | R | 0B0FH | |
| | 16 | Regeneration load ratio | | — | O | O | O | 16bit | R | 0B10H | |
| | 17 | Digital input signal status | | — | O | O | O | 16bit | R | 0B11H | |
| | 18 | Digital output signal status | | — | O | O | O | 16bit | R | 0B12H | |
| | 20 | Motor position feedback (Command unit) | | — | O | O | O | 32bit | R | 0B14H 0B15H | |
| | 21 | Command pulse sum (Command unit) | | — | O | - | - | 32bit | R | 0B16H 0B17H | |
| | 22 | Positional deviation (Command unit) | | — | O | O | O | 32bit | R | 0B18H 0B19H | |
| | 23 | Position command (Encoder unit) | | — | O | O | O | 32bit | R | 0B1AH 0B1BH | |
| | 24 | Motor position (encoder unit) | | — | O | - | - | 32bit | R | 0B1CH 0B1DH | |
| | 25 | Positional deviation (encoder unit) | | — | O | O | O | 32bit | R | 0B1EH 0B1FH | |
| | 26 | Position feedback in rotation mode(encoder unit) | | — | O | - | - | 32bit | R | 0B20H 0B21H | |

Notes:

- (1) The "O" in the repower bar indicates that the new value valid after repower, and the "-" indicates that the new value valid immediately;
- (2) The "O" in the mode bar indicates this parameter related to this mode, "—" indicates this parameter dose not related to this mode;
- (3) 32bit data, high data in front, low data after.

5.2 Parameter Function

Here is the explanation of parameters, you can check them or modify the value using software Protuner or the front panel of drive.

Contact oyostepper.com@gmail.com if you need more technical service.

5.2.1 【Class 0】 Basic Setting

| | | | | | | | | |
|---------------|-----------|----------------|--------|-------|---------|-------|---|---|
| Pr0.00 | Name | Mode loop gain | | | Mode | P | S | T |
| | Range | 0-2000 | Unit | 0.1Hz | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 0001H | | |
| | Repower | -- | | | | | | |

Set up the bandwidth of MFC , it is similar to the response bandwidth

| Setup value | Meaning |
|-------------|---|
| 0 | Disable the function. |
| 1 | Enable the function, set the bandwidth automatically, recommended for most application. |
| 2-10 | Forbidden and reserved. |
| 11-20000 | Set the bandwidth manually , 1.1Hz – 2000Hz |

MFC is used to enhance the performance of dynamic tracing for input command, make positioning faster, cut down the tracking error, run more smooth and steady. It is very useful for multi-axis synchronous movement and interpolation, the performance will be better.

The main way to use this function :

- a. Choose the right control mode : Pr0.01 = 0
- b. Set up Pr0.02=1 for interpolation movement
- c. Set up the inertia of ratio : Pr0.04
- d. Set up the rigidity : Pr0.03
- e. Set up the Pr0.00 :
 - 1) If no multi-axis synchronous movement , set Pr0.00 as 1 or more than 10 ;
 - 2) If multi-axis synchronous movement needed, set Pr0.00 as the same for all the axes.
 - 3) If Pr0.00 is more than 10, start with 100, or 150, 200, 250

Caution:

- 1. Set up the right control mode, the right inertia of ratio and rigidity firstly.
- 2. Don't change the value of Pr0.00 when the motor is running , otherwise vibration occurs

Set up a small value from the beginning if using it in manual mode , smaller value means running more smooth and steady , while bigger one means faster positioning

| | | | | | | | | |
|----------------|-----------|--------------------|--------|-----|---------|----------|----------|----------|
| Pr0.01* | Name | Control Mode Setup | | | Mode | P | S | T |
| | Range | 0~10 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0003H | | |
| | Repower | o | | | | | | |

Set using control mode:

| Setup value | Content | |
|-------------|----------|----------|
| | 1st mode | 2nd mode |
| 0 | Position | - |
| 1 | Velocity | - |
| 2 | Torque | - |
| 3 | Position | Velocity |
| 4 | Position | Torque |
| 5 | Velocity | Torque |
| 6 | Pr-Mode | - |
| 7~10 | Reserved | |

When you set up the combination mode of 3.4.5, you can select either the 1st or the 2nd with control mode switching input(C-MODE).

When C-MODE is off, the 1st mode will be selected.
When C-MODE is on, the 2nd mode will be selected.

| | | | | | | | | |
|---------------|-----------|----------------------------|--------|-----|---------|----------|----------|----------|
| Pr0.02 | Name | Real-time Auto-gain Tuning | | | Mode | P | S | T |
| | Range | 0~2 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0005H | | |
| | Repower | - | | | | | | |

You can set up the action mode of the real-time auto-gain tuning:

| Setup value | mode | Varying degree of load inertia in motion |
|-------------|-------------|---|
| 0 | invalid | Real-time auto-gain tuning function is disabled. |
| 1 | standard | Basic mode. do not use unbalanced load, friction compensation or gain switching. It is usually for interpolation movement. |
| 2 | positioning | Main application is positioning. it is recommended to use this mode on equipment without unbalanced horizontal axis, ball screw driving equipment with low friction, etc. it is usually for point-to point movement . |

Caution: If pr0.02=1 or 2 , you can't modify the values of Pr1.01 – Pr1.13, the values of them depend on the real-time auto-gain tuning ,all of them are set by the drive itself

For **Standard** mode (Pr0.02=1), **it is usually for interpolation movement.** It is unavailable to modify the value of Pr1.00- 1.14, just need to change the value of Pr0.03, and then all values of Pr1.00-1.14 will be changed accordingly.

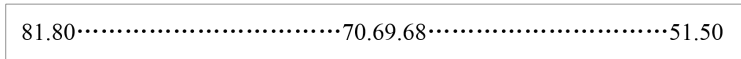
For **Positioning** mode (Pr0.02=2), **it is usually for point to point movement.** It is unavailable to modify the value of Pr1.00- 1.14, just change the value of Pr0.03 ,then all values of Pr1.00-1.14 will be changed

| | | | | | | | | |
|---------------|-----------|--|--------|-----|---------|----------|----------|----------|
| Pr0.03 | Name | Selection of machine stiffness at real-time auto-gain tuning | | | Mode | P | S | T |
| | Range | 50 -81 | Unit | — | Default | 70 | | |
| | Data Type | 16bit | Access | R/W | Address | 0007H | | |
| | Repower | - | | | | | | |

You can set up response while the real-time auto-gain tuning is valid.

Low —▶ Machine stiffness —▶ High

Low —▶ Servo gain —▶ High



Low —▶ Response —▶ High

Notice: Lower the setup value, higher the velocity response and servo stiffness will be obtained. However, when decreasing the value, check the resulting operation to avoid oscillation or vibration.

Control gain is updated while the motor is stopped. If the motor can't be stopped due to excessively low gain or continuous application of one-way direction command, any change made to Pr0.03 is not used for update. If the changed stiffness setting is made valid after the motor stopped, abnormal sound or oscillation will be generated. To prevent this problem, stop the motor after changing the stiffness setting and check that the changed setting is enabled.

| | | | | | | | | |
|---------------|-----------|---------------|--------|-----|---------|----------|----------|----------|
| Pr0.04 | Name | Inertia ratio | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | % | Default | 250 | | |
| | Data Type | 16bit | Access | R/W | Address | 0009H | | |
| | Repower | - | | | | | | |

You can set up the ratio of the load inertia against the rotor(of the motor)inertia.

$$\text{Pr0.04} = (\text{load inertia} / \text{rotor inertia}) \times 100\%$$

Notice:

If the inertia ratio is correctly set, the setup unit of Pr1.01 and Pr1.06 becomes (Hz). When the inertia ratio of Pr0.04 is larger than the actual value, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual value, the setup unit of the velocity loop gain becomes smaller.

| | | | | | | | | |
|----------------|-----------|--|--------|-----|---------|----------|--|--|
| Pr0.06* | Name | Command Pulse Rotational Direction Setup | | | Mode | P | | |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 000DH | | |
| | Repower | o | | | | | | |

Set command pulse input rotate direction, command pulse input type

| | | | | | | | | |
|----------------|-----------|--------------------------------|--------|-----|---------|----------|--|--|
| Pr0.07* | Name | Command Pulse Input Mode Setup | | | Mode | P | | |
| | Range | 0~3 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 000FH | | |
| | Repower | o | | | | | | |

| Pr0.06 | Pr0.07 | Command Pulse Format | Signal | Positive Direction Command | Negative Direction Command |
|--------|--------|---|------------|----------------------------|----------------------------|
| 0 | 0 or 2 | 90 phase difference 2-phase pulse(A phase +B phase) | Pulse sign | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | |
| | 3 | Pulse + sign | Pulse sign | | |
| 1 | 0 or 2 | 90 phase difference 2 phase pulse(A phase +B phase) | Pulse sign | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | |
| | 3 | Pulse + sign | Pulse sign | | |

Command pulse input signal allow largest frequency and smallest time width

| PULS/SIGN Signal Input I/F | | Permissible Max. Input Frequency | Smallest Time Width | | | | | |
|----------------------------|---------------------------|----------------------------------|---------------------|-----|-----|-----|-----|-----|
| | | | t1 | t2 | t3 | t4 | t5 | t6 |
| Pulse series interface | Differential pulse signal | 500kpps | 2 | 1 | 1 | 1 | 1 | 1 |
| | Single-ended pulse signal | 200kpps | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |

| | | | | | | | | |
|--------|-----------|---|--------|-----|---------|----------------|---|---|
| Pr0.08 | Name | Command pulse counts per one motor revolution | | | Mode | P | S | T |
| | Range | 0-8388608 | Unit | P | Default | 0 | | |
| | Data Type | 32bit | Access | R/W | Address | 0010H 0011H | | |
| | Repower | o | | | | | | |

Set the command pulse that causes single turn of the motor shaft.

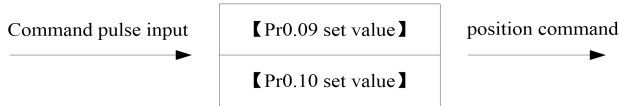
- 1) If Pr008≠0 , the actual motor rotation turns = pulse number / Pr008
- 2) If Pr008 = 0, Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic gear valid.

| | | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|----------------|--|--|
| Pr0.09 | Name | 1st numerator of electronic gear | | | Mode | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Data Type | 32bit | Access | R/W | Address | 0012H 0013H | | |
| | Repower | o | | | | | | |

Set the numerator of division/multiplication operation made according to the command pulse input.

| | | | | | | | | |
|--------|-----------|------------------------------------|--------|-----|---------|----------------|--|--|
| Pr0.10 | Name | 1st denominator of electronic gear | | | Mode | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Data Type | 32bit | Access | R/W | Address | 0014H 0015H | | |
| | Repower | o | | | | | | |

Set the denominator of division/multiplication operation made according to the command pulse input.

| | | |
|----------------------------|----------------------------|--|
| Pr0.09 1-10737 41824 | Pr0.10 1-10737 41824 | Command division/multiplication operation  |
|----------------------------|----------------------------|--|

1. Settings:

- 1)The drive input command pulse number is X
- 2)The pulse number of encoder after frequency division and frequency doubling is Y
- 3)The number of pulses per revolution of the motor encoder is Z
- 4)Number of turns of motor is W

2. Calculations:

- 1)Y=X* Pr0.09 / Pr0.10
- 2)17Bit encoder: Z=2¹⁷ = 131072
- 23Bit encoder: Z=2²³ = 8388608

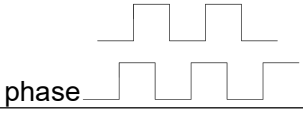
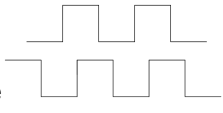
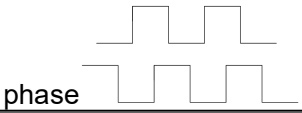
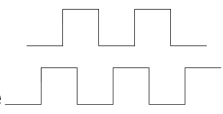
| Pr0.11 * | Name | Output pulse counts per one motor revolution | | | Mode | P | S | T |
|----------|-----------|--|--------|-----|---------|-------|---|---|
| | Range | 1~2500 | Unit | P/r | Default | 2500 | | |
| | Data Type | 16bit | Access | R/W | Address | 0017H | | |
| | Repower | o | | | | | | |

For example, if this parameter is set to 1000, it means that the frequency division output signal of the encoder outputs 4000 pulses per turn.

| Pr0.12 * | Name | reversal of pulse output logic | | | Mode | P | S | T |
|----------|-----------|--------------------------------|--------|-----|---------|-------|---|---|
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0019H | | |
| | Repower | o | | | | | | |

You can set up the B phase logic and the output source of the pulse output. With this parameter, you can reverse the phase relation between the A-phase pulse and B-phase pulse by reversing the B-phase logic.

< reversal of pulse output logic >

| Pr0.12 | B-phase Logic | CCW Direction Rotation | CW Direction Rotation |
|--------|---------------|--|--|
| 0 | Non-Reversal | A phase  | A phase  |
| 1 | Reversal | A phase  | A phase  |

| Pr0.13 | Name | 1st Torque Limit | | | Mode | P | S | T |
|--------|-----------|------------------|--------|-----|---------|-------|---|---|
| | Range | 0~500 | Unit | % | Default | 300 | | |
| | Data Type | 16bit | Access | R/W | Address | 001BH | | |
| | Repower | - | | | | | | |

You can set up the limit value of the motor output torque, as motor rate current %, the value can't exceed the maximum of output current.

| | | | | | | | | |
|--|-----------|---------------------------------|--------|--------|---------|-------|--|--|
| Pr0.14 | Name | Position Deviation Excess Setup | | | Mode | P | | |
| | Range | 0~500 | Unit | 0.1rev | Default | 200 | | |
| | Data Type | 16bit | Access | R/W | Address | 001DH | | |
| | Repower | - | | | | | | |
| Set excess range of positional deviation by the command unit(default).Setting the value too small will cause Err18.0 (position deviation excess detection) | | | | | | | | |

| | | | | | | | | |
|--------|-----------|------------------------|--------|-----|---------|-------|---|---|
| Pr0.15 | Name | Absolute Encoder Setup | | | Mode | P | S | T |
| | Range | 0~15 | Unit | | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 001FH | | |
| | Repower | o | | | | | | |

How to use:

0: Incremental position mode:

The encoder is used as a incremental encoder, and the position retentive at power failure is not supported.

1: Absolute position linear mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is applicable to the scenario where the travel range of device load is fixed and the encoder multi-turn data dose not overflow.

2: Absolute position rotation mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than 0~(Pr6.63+1)

5: Clean multi-turn alarm, and open multi-turn absolute function.

It will become 1 when normal clearance, if it's still 5 after 3seconds, please deal with according to 153 alarm processing.

9: Clear multi-turn position and reset multi-turn alarm, open multi-turn absolute function.

It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.

Notes: Set to 9 after homing process finished and servo disabled, valid after repower.

| | | | | | | | | |
|--|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| Pr0.16 | Name | External regenerative resistance | | | Mode | P | S | T |
| | Range | 10~50 | Unit | Ω | Default | 100 | | |
| | Data Type | 16bit | Access | R/W | Address | 0021H | | |
| | Repower | - | | | | | | |
| Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current. | | | | | | | | |

| | | | | | | | | |
|--|-----------|--|--------|-----|---------|-------|---|---|
| Pr0.17 | Name | External regenerative resistor power value | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | W | Default | 20 | | |
| | Data Type | 16bit | Access | R/W | Address | 0023H | | |
| | Repower | - | | | | | | |
| Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current. | | | | | | | | |

| | | | | | | | | |
|--------|-----------|--------------------|--------|-----|---------|-------|---|---|
| Pr0.25 | Name | Auxiliary function | | | Mode | P | S | T |
| | Range | 0~0xFFFF | Unit | | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0033H | | |
| | Repower | - | | | | | | |

| Value | Auxiliary function |
|--------|--|
| 0x1111 | Reset current alarm |
| 0x1122 | Reset history alarm |
| 0x2211 | Save parameter to EEPROM |
| 0x2222 | Reset to factory setting except motor parameters |
| 0x2233 | Reset to factory setting |
| 0X4001 | JOG_P (50ms time period) |
| 0X4002 | JOG_N (50ms time period) |
| 0x6666 | Soft reset |

5.2.2 【Class 1】 Gain Adjust

| | | | | | | |
|---|-----------|---------------------------|--------|-------|---------|-------|
| Pr1.00 | Name | 1st gain of position loop | | | Mode | P |
| | Range | 0~30000 | Unit | 0.1/s | Default | 320 |
| | Data Type | 16bit | Access | R/W | Address | 0101H |
| | Repower | - | | | | |
| <p>You can determine the response of the positional control system. Higher the gain of position loop you set, faster the positioning time you can obtain. Note that too high setup may cause oscillation.</p> | | | | | | |

| | | | | | | | | |
|--|-----------|---------------------------|--------|-------|---------|-------|---|---|
| Pr1.01 | Name | 1st gain of velocity loop | | | Mode | P | S | T |
| | Range | 0~32767 | Unit | 0.1Hz | Default | 180 | | |
| | Data Type | 16bit | Access | R/W | Address | 0103H | | |
| | Repower | - | | | | | | |
| <p>You can determine the response of the velocity loop. In order to increase the response of overall servo system by setting high position loop gain, you need higher setup of this velocity loop gain as well. However, too high setup may cause oscillation.</p> | | | | | | | | |

| | | | | | | | | |
|---|-----------|--|--------|-------|---------|-------|---|---|
| Pr1.02 | Name | 1st Time Constant of Velocity Loop Integration | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 0.1ms | Default | 310 | | |
| | Data Type | 16bit | Access | R/W | Address | 0105H | | |
| | Repower | - | | | | | | |
| <p>You can set up the integration time constant of velocity loop, Smaller the setup value, faster you can dog-in deviation at stall to 0.The integration will be maintained by setting to"9999".The integration effect will be lost by setting to"10000".</p> | | | | | | | | |

| | | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| Pr1.03 | Name | 1st Filter of Velocity Detection | | | Mode | P | S | T |
| | Range | 50~81 | Unit | — | Default | 15 | | |
| | Data Type | 16bit | Access | R/W | Address | 0107H | | |
| | Repower | - | | | | | | |

You can set up the time constant of the low pass filter (LPF) after the speed detection, in 32 steps (0 to 31). Higher the setup, larger the time constant you can obtain so that you can decrease the motor noise, however, response becomes slow.

You can set the filter parameters through the loop gain, referring to the following table:

| Setup Value | Speed Detection Filter Cut-off Frequency(Hz) | Setup Value | Speed Detection Filter Cut-off Frequency(Hz) |
|-------------|--|-------------|--|
| 81 | 2500 | 65 | 750 |
| 80 | 2250 | 64 | 700 |
| 79 | 2100 | 63 | 650 |
| 78 | 2000 | 62 | 600 |
| 77 | 1800 | 61 | 550 |
| 76 | 1600 | 60 | 500 |
| 75 | 1500 | 59 | 450 |
| 74 | 1400 | 58 | 400 |
| 73 | 1300 | 57 | 350 |
| 72 | 1200 | 56 | 300 |
| 71 | 1100 | 55 | 250 |
| 70 | 1000 | 54 | 200 |
| 69 | 950 | 53 | 175 |
| 68 | 900 | 52 | 150 |
| 67 | 850 | 51 | 125 |
| 66 | 800 | 50 | 100 |

| | | | | | | | | |
|--------|-----------|------------------------------------|--------|--------|---------|-------|---|---|
| Pr1.04 | Name | 1st Time Constant of torque filter | | | Mode | P | S | T |
| | Range | 0~2500 | Unit | 0.01ms | Default | 126 | | |
| | Data Type | 16bit | Access | R/W | Address | 0109H | | |
| | Repower | - | | | | | | |

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-------|---------|-------|--|--|
| Pr1.05 | Name | 2nd gain of position loop | | | Mode | P | | |
| | Range | 0~30000 | Unit | 0.1/s | Default | 380 | | |
| | Data Type | 16bit | Access | R/W | Address | 010BH | | |
| | Repower | - | | | | | | |

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-------|---------|-------|---|---|
| Pr1.06 | Name | 2nd gain of velocity loop | | | Mode | P | S | T |
| | Range | 0~32767 | Unit | 0.1Hz | Default | 180 | | |
| | Data Type | 16bit | Access | R/W | Address | 010DH | | |
| | Repower | - | | | | | | |

| | | | | | | | | |
|--------|-----------|--|--------|-------|---------|-------|---|---|
| Pr1.07 | Name | 2nd Time Constant of Velocity Loop Integration | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 0.1ms | Default | 10000 | | |
| | Data Type | 16bit | Access | R/W | Address | 010FH | | |
| | Repower | - | | | | | | |

| | | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| Pr1.08 | Name | 2nd Filter of Velocity Detection | | | Mode | P | S | T |
| | Range | 0~31 | Unit | — | Default | 15 | | |
| | Data Type | 16bit | Access | R/W | Address | 0111H | | |
| | Repower | - | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------------------|--------|--------|---------|-------|---|---|
| Pr1.09 | Name | 2nd Time Constant of torque filter | | | Mode | P | S | T |
| | Range | 0~2500 | Unit | 0.01ms | Default | 126 | | |
| | Data Type | 16bit | Access | R/W | Address | 0113H | | |
| | Repower | - | | | | | | |
| Position loop, velocity loop, velocity detection filter, torque command filter have their 2 pairs of gain or time constant (1st and 2nd). | | | | | | | | |

| | | | | | | | | |
|--|-----------|----------------------------|--------|-------|---------|-------|--|--|
| Pr1.10 | Name | Velocity feed forward gain | | | Mode | P | | |
| | Range | 0~1000 | Unit | 0.10% | Default | 300 | | |
| | Data Type | 16bit | Access | R/W | Address | 0115H | | |
| | Repower | - | | | | | | |
| Multiply the velocity control command calculated according to the internal positional command by the ratio of this parameter and adds the result to the speed command resulting from the positional control process. | | | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------------|--------|--------|---------|-------|--|--|
| Pr1.11 | Name | Velocity feed forward filter | | | Mode | P | | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 50 | | |
| | Data Type | 16bit | Access | R/W | Address | 0117H | | |
| | Repower | - | | | | | | |
| <p>Set the time constant of 1st delay filter which affects the input of speed feed forward. (usage example of velocity feed forward) The velocity feed forward will become effective as the velocity feed forward gain is gradually increased with the speed feed forward filter set at approx.50 (0.5ms). The positional deviation during operation at a constant speed is reduced as shown in the equation below in proportion to the value of velocity feed forward gain. Position deviation [unit of command]=command speed [unit of command /s]/position loop gain[1/s]×(100-speed feed forward gain[%])/100</p> | | | | | | | | |

| | | | | | | | | |
|--|-----------|--------------------------|--------|------|---------|-------|---|--|
| Pr1.12 | Name | Torque feed forward gain | | | Mode | P | S | |
| | Range | 0~1000 | Unit | 0.1% | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0119H | | |
| | Repower | - | | | | | | |
| <ul style="list-style-type: none"> ● Multiply the torque control command calculated according to the velocity control command by the ratio of this parameter and add the result to the torque command resulting from the velocity control process. ● To use torque feed forward, correctly set ratio of inertia. Set the inertia ratio that can be calculated from the machine specification to Pr0.04 inertia ratio. ● Positional deviation at a constant acceleration/deceleration can be minimized close to 0 by increasing the torque forward gain .this means that positional deviation can be maintained at near 0 over entire operation range while driving in trapezoidal speed pattern under ideal condition where disturbance torque is not active. | | | | | | | | |

| | | | | | | | | |
|--------|-----------|----------------------------|--------|--------|---------|-------|---|--|
| Pr1.13 | Name | Torque feed forward filter | | | Mode | P | S | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 011BH | | |
| | Repower | - | | | | | | |

Set up the time constant of 1st delay filter which affects the input of torque feed forward. zero positional deviation is impossible in actual situation because of disturbance torque. as with the velocity feed forward, large torque feed forward filter time constant decreases the operating noise but increases positional deviation at acceleration change point.

| | | | | | | |
|--------------------|-------------------------------------|---|--------|-----|---------|----------|
| Pr1.15 | Name | Mode of position control switching | | | Mode | P |
| | Range | 0~10 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 011FH |
| | Repower | - | | | | |
| Setup value | Switching condition | Gain switching condition | | | | |
| 0 | Fixed to 1st gain | Fixed to the 1st gain (Pr1.00-Pr1.04) | | | | |
| 1 | Fixed to 2nd gain | Fixed to the 2nd gain (Pr1.05-Pr1.09) | | | | |
| 2 | with gain switching input | <ul style="list-style-type: none"> ● 1st gain when the gain switching input is open. ● 2nd gain when the gain switching input is connected to com- . ◇ If no input signal is allocated to the gain switching input, the 1st gain is fixed. | | | | |
| 3 | Torque command is large | <ul style="list-style-type: none"> ● Shift to the 2nd gain when the absolute value of the torque command exceeded (level + hysteresis)[%]previously with the 1st gain. ● Return to the 1st gain when the absolute value of the torque command was kept below (level + hysteresis) [%]previously during delay time with the 2nd gain. | | | | |
| 4-9 | reserved | reserved | | | | |
| 10 | Have position command +actual speed | <ul style="list-style-type: none"> ● Valid for position control. ● Shift to the 2nd gain when the positional command was not 0 previously with the 1st gain. ● Return to the 1st gain when the positional command was kept at 0 during the delay time and the absolute value of actual speed was kept below (level - hysteresis) (r/min) previously with the 2nd gain. | | | | |

| | | | | | | |
|---|-----------|-------------------------------------|--------|---------------|---------|----------|
| Pr1.17 | Name | Level of position control switching | | | Mode | P |
| | Range | 0~20000 | Unit | Mode specific | Default | 50 |
| | Data Type | 16bit | Access | R/W | Address | 0123H |
| | Repower | - | | | | |
| Unit of setting varies with switching mode. switching condition: position :encoder pulse number ; speed : r/min ; torque : % . Notice: set the level equal to or higher than the hysteresis. | | | | | | |

| | | | | | | |
|--|-----------|--|--------|---------------|---------|----------|
| Pr1.18 | Name | Hysteresis at position control switching | | | Mode | P |
| | Range | 0~20000 | Unit | Mode specific | Default | 33 |
| | Data Type | 16bit | Access | R/W | Address | 0125H |
| | Repower | - | | | | |
| Combining Pr1.17(control switching level)setup Notice: when level< hysteresis, the hysteresis is internally adjusted so that it is equal to level. | | | | | | |

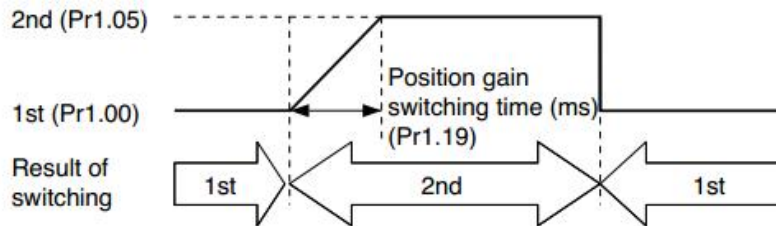
| | | | | | | | | |
|---------------|-----------|------------------------------|--------|-------|---------|----------|--|--|
| Pr1.19 | Name | position gain switching time | | | Mode | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 33 | | |
| | Data Type | 16bit | Access | R/W | Address | 0127H | | |
| | Repower | - | | | | | | |

For position controlling: if the difference between 1st gain and 2nd gain is large, the increasing rate of position loop gain can be limited by this parameter.

<Position gain switching time>

Notice: when using position control, position loop gain rapidly changes, causing torque change and vibration. By adjusting Pr1.19 position gain switching time, increasing rate of the position loop gain can be decreased and variation level can be reduced.

Example: 1st (Pr1.00) <-> 2nd (Pr1.05)



| | | | | | | | | |
|----------------|-----------|---------------------------------|--------|--------|---------|----------|--|--|
| Pr1.35* | Name | positional command filter setup | | | Mode | P | | |
| | Range | 0~200 | Unit | 0.05us | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0147H | | |
| | Repower | - | | | | | | |

Do filtering for positional command pulse, eliminate the interference of the narrow pulse, over-large setup will influence the input of high frequency positional command pulse, and make more time-delayed.

| | | | | | | | | |
|---------------|-----------|------------------|--------|-----|---------|----------|----------|----------|
| Pr1.37 | Name | Special register | | | Mode | P | S | T |
| | Range | 0~32767 | Unit | - | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 014BH | | |
| | Repower | - | | | | | | |

Under binary, these bits in register are used for some function operation.

- Bit2=1, shield the speed out of control alarm (1A1)
- Bit4=1, shield the over-load alarm 100,101
- Bit6=1, shield the excessive vibration alarm 190
- Bit7=1, shield the braking resistor over-load alarm 120
- Bit9=1, shield the lacking of phase alarm0dl (other bits are forbidden to use, default 0)

For example : Pr137 = 4 can be used to shield alarm code 1A1
 Pr137 = 64 can be used to shield alarm code 190
 Pr137 =68 can be used to shield both 1A1 and 190.

5.2.3 【Class 2】 Vibration Suppression

| Pr2.00 | Name | Adaptive filter mode setup | | | Mode | P | S | | | | | | | | | | | | | | | | |
|--|---|---|--------|-----|---------|-------|---|--|-------------|---------|--|---|--------------------------|--|---|--|---|---|---|--|-----|---------|-----------------------------------|
| | Range | 0~4 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0201H | | | | | | | | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | | | | | | | | |
| Set up the resonance frequency to be estimated by the adaptive filter and the special the operation after estimation. | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Setup value</th> <th colspan="2">Details</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Adaptive filter: invalid</td> <td>Parameters related to the 3rd and 4th notch filter hold the current value.</td> </tr> <tr> <td>1</td> <td>Adaptive filter, 1 filter is valid, one time</td> <td>One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation.</td> </tr> <tr> <td>2</td> <td>Adaptive filter, 1 filter is valid, It will be valid all the time</td> <td>One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance.</td> </tr> <tr> <td>3-4</td> <td>Not use</td> <td>Non-professional forbidden to use</td> </tr> </tbody> </table> | | | | | | | | | Setup value | Details | | 0 | Adaptive filter: invalid | Parameters related to the 3rd and 4th notch filter hold the current value. | 1 | Adaptive filter, 1 filter is valid, one time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation. | 2 | Adaptive filter, 1 filter is valid, It will be valid all the time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance. | 3-4 | Not use | Non-professional forbidden to use |
| Setup value | Details | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Adaptive filter: invalid | Parameters related to the 3rd and 4th notch filter hold the current value. | | | | | | | | | | | | | | | | | | | | | |
| 1 | Adaptive filter, 1 filter is valid, one time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation. | | | | | | | | | | | | | | | | | | | | | |
| 2 | Adaptive filter, 1 filter is valid, It will be valid all the time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance. | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | Not use | Non-professional forbidden to use | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | |
|--------|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr2.01 | Name | 1st notch frequency | | | Mode | P | S | T |
| | Range | 50~2000 | Unit | Hz | Default | 2000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0203H | | |
| | Repower | - | | | | | | |

Set the center frequency of the 1st notch filter

Notice: the notch filter function will be invalid by setting up this parameter to “2000”.

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.02 | Name | 1st notch width selection | | | Mode | P | S | T |
| | Range | 0~20 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 0205H | | |
| | Repower | - | | | | | | |

Set the width of notch at the center frequency of the 1st notch filter.

Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation.

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.03 | Name | 1st notch depth selection | | | Mode | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0207H | | |
| | Repower | - | | | | | | |

Set the depth of notch at the center frequency of the 1st notch filter.

Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.

| | | | | | | | | |
|--|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.04 | Name | 2nd notch frequency | | | Mode | P | S | T |
| | Range | 50~2000 | Unit | Hz | Default | 2000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0209H | | |
| | Repower | - | | | | | | |
| Set the center frequency of the 2nd notch filter Notice: the notch filter function will be invalid by setting up this parameter to “2000”. | | | | | | | | |
| Pr2.05 | Name | 2nd notch width selection | | | Mode | P | S | T |
| | Range | 0~20 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 020BH | | |
| | Repower | - | | | | | | |
| Set the width of notch at the center frequency of the 2nd notch filter. Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation. | | | | | | | | |
| Pr2.06 | Name | 2nd notch depth selection | | | Mode | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 020DH | | |
| | Repower | - | | | | | | |
| Set the depth of notch at the center frequency of the 2nd notch filter. Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | | |

| | | | | | | | | |
|--|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.07 | Name | 3rd notch frequency | | | Mode | P | S | T |
| | Range | 50~2000 | Unit | Hz | Default | 2000 | | |
| | Data Type | 16bit | Access | R/W | Address | 020FH | | |
| | Repower | - | | | | | | |
| Set the center frequency of the 3rd notch filter Notice: the notch filter function will be invalid by setting up this parameter to “2000”. | | | | | | | | |
| Pr2.08 | Name | 3rd notch width selection | | | Mode | P | S | T |
| | Range | 0~20 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 0211H | | |
| | Repower | - | | | | | | |
| Set the width of notch at the center frequency of the 3rd notch filter. Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation. | | | | | | | | |
| Pr2.09 | Name | 3rd notch depth selection | | | Mode | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0213H | | |
| | Repower | - | | | | | | |
| Set the depth of notch at the center frequency of the 3rd notch filter. Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | | |

| | | | | | | |
|---------|-----------|-----------------------|--------|-------|---------|-------|
| Pr2.14* | Name | 1st damping frequency | | | Mode | P |
| | Range | 10~2000 | Unit | 0.1HZ | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 021DH |
| | Repower | - | | | | |

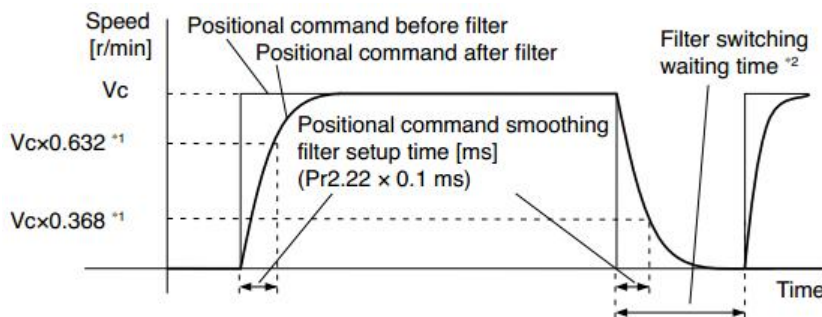
0: close
Setup damping frequency, to suppress vibration at the load edge.

| | | | | | | |
|---------|-----------|-----------------------|--------|-------|---------|-------|
| Pr2.16* | Name | 2nd damping frequency | | | Mode | P |
| | Range | 10~2000 | Unit | 0.1HZ | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0221H |
| | Repower | - | | | | |

0: close
Setup damping frequency, to suppress vibration at the load edge

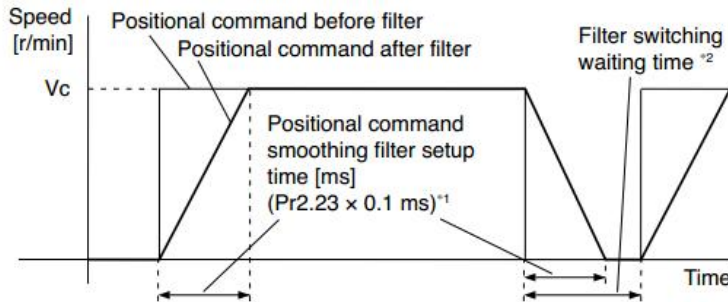
| | | | | | | |
|--------|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr2.22 | Name | positional command smoothing filter | | | Mode | P |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022DH |
| | Repower | o | | | | |

- Set up the time constant of the 1st delay filter in response to the positional command.
- When a square wave command for the target speed V_c is applied ,set up the time constant of the 1st delay filter as shown in the figure below



| | | | | | | |
|---------------|-----------|-------------------------------|--------|-------|---------|----------|
| Pr2.23 | Name | positional command FIR filter | | | Mode | P |
| | Range | 0~10000 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022FH |
| | Repower | o | | | | |

- Set up the time constant of the 1st delay filter in response to the positional command.
- When a square wave command for the target speed V_c is applied, set up the V_c arrival time as shown in the figure below.



5.2.4 【Class 3】 Velocity/ Torque Control

| | | | | | | |
|---------------|-----------|---|--------|-----|---------|----------|
| Pr3.00 | Name | Speed setup, Internal /External switching | | | Mode | S |
| | Range | 0~3 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0301H |
| | Repower | - | | | | |

This drive is equipped with internal speed setup function so that you can control the speed with contact inputs only.

| Setup value | Speed setup method |
|-------------|---|
| 1 | Internal speed command 1st to 4th speed (PR3.04-PR3.07) |
| 2 | Internal speed command 1st to 3rd speed (PR3.04-PR3.06), Analog speed command (SPR) |
| 3 | Internal speed command 1st to 8th speed (PR3.04-PR3.11) |

<relationship between Pr3.00 Internal/External switching speed setup and the internal command speed selection 1-3 and speed command to be selected>

| Setup value | 1 st selection of internal command speed (INTSPD1) | 2 nd selection of internal command speed (INTSPD2) | 3 rd selection of internal command speed (INTSPD3) | selection of Speed command |
|-------------|---|---|---|----------------------------|
| 1 | OFF | OFF | NO effect | 1st speed |
| | ON | OFF | | 2nd speed |
| | OFF | ON | | 3rd speed |
| | ON | ON | | 4th speed |
| 2 | OFF | OFF | NO effect | 1st speed |
| | ON | OFF | | 2nd speed |
| | OFF | ON | | 3rd speed |
| | ON | ON | | Analog speed command |
| 3 | The same as [Pr3.00=1] | | OFF | 1st to 4th speed |
| | OFF | OFF | ON | 5th speed |
| | ON | OFF | ON | 6th speed |
| | OFF | ON | ON | 7th speed |
| | ON | ON | ON | 8th speed |

| | | | | | | |
|--|-----------|--------------------------|--------|-------|---------|----------|
| Pr3.04 | Name | 1st speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0309H |
| | Repower | - | | | | |
| Pr3.05 | Name | 2nd speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030BH |
| | Repower | - | | | | |
| Pr3.06 | Name | 3rd speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 030DH |
| | Repower | - | | | | |
| Pr3.07 | Name | 4th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 030FH |
| | Repower | - | | | | |
| Pr3.08 | Name | 5th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0311H |
| | Repower | - | | | | |
| Pr3.09 | Name | 6th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0313H |
| | Repower | - | | | | |
| Pr3.10 | Name | 7th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0315H |
| | Repower | - | | | | |
| Pr3.11 | Name | 8th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0317H |
| | Repower | - | | | | |
| Set up internal command speeds, 1st to 8th | | | | | | |

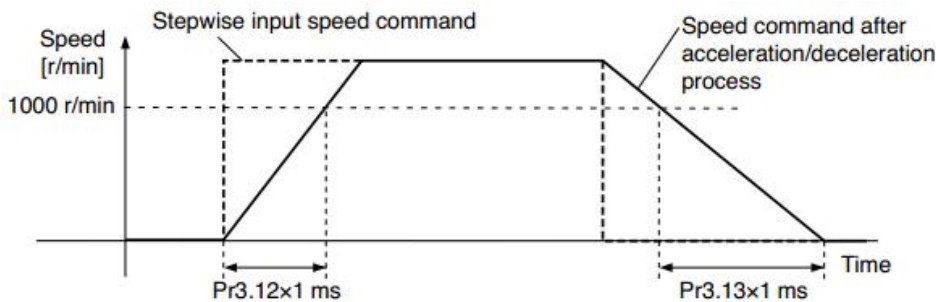
| | | | | | | |
|--------|-----------|-------------------------|--------|--------------------|---------|-------|
| Pr3.12 | Name | time setup acceleration | | | Mode | S |
| | Range | 0~10000 | Unit | Ms/ (1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 0319H |
| | Repower | - | | | | |
| Pr3.13 | Name | time setup deceleration | | | Mode | S |
| | Range | 0~10000 | Unit | Ms/ (1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 031BH |
| | Repower | - | | | | |

Set up acceleration/deceleration processing time in response to the speed command input. Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12 Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration time setup.

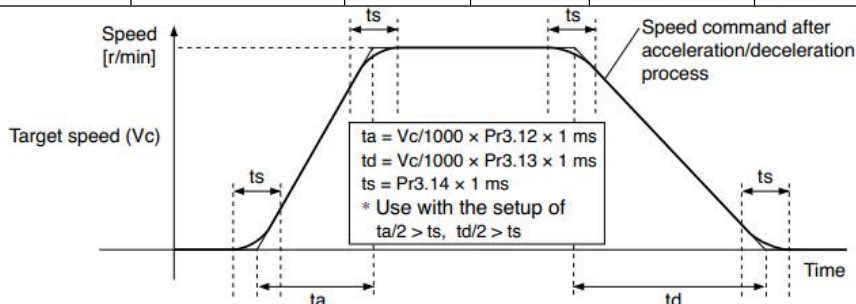
Assuming that the target value of the speed command is V_c (r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

Acceleration time (ms)= $V_c/1000 \times Pr3.12 \times 1ms$

Deceleration time (ms)= $V_c/1000 \times Pr3.13 \times 1ms$



| | | | | | | |
|--------|-----------|---|--------|-----|---------|-------|
| Pr3.14 | Name | Sigmoid acceleration /deceleration time setup | | | Mode | S |
| | Range | 0~1000 | Unit | ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 031DH |
| | Repower | o | | | | |



Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of acceleration/deceleration.

| | | | | | | | |
|---------------|-----------|-----------------------------|--------|-------------------------|---------|-------|----------|
| Pr3.17 | Name | Selection of torque command | | | Mode | | T |
| | Range | 0、1、2 | Unit | | Default | 0 | |
| | Data Type | 16bit | Access | R/W | Address | 0323H | |
| | Repower | - | | | | | |
| Setup value | | Torque command input | | Velocity limit input | | | |
| 2 | | Parameter value (P3.22) | | Parameter value (P3.21) | | | |

| | | | | | | | |
|--|-----------|---|--------|-----|---------|-------|----------|
| Pr3.18 | Name | Torque command direction selection | | | Mode | | T |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Data Type | 16bit | Access | R/W | Address | 0325H | |
| | Repower | - | | | | | |
| Select the direction positive/negative direction of torque command | | | | | | | |
| Setup value | | Details | | | | | |
| 0 | | Specify the direction with the sign of torque command Torque command input[+]→ positive direction, [-]→ negative direction | | | | | |
| 1 | | Specify the direction with torque command sign(TC-SIGN). OFF: positive direction ON: negative direction | | | | | |

| | | | | | | | |
|--|-----------|---------------------|--------|-------|---------|-------|----------|
| Pr3.21 | Name | Speed limit value 1 | | | Mode | | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | |
| | Data Type | 16bit | Access | R/W | Address | 032BH | |
| | Repower | - | | | | | |
| Set up the speed limit used for torque control. During the torque controlling, the speed set by the speed limit cannot be exceeded. | | | | | | | |

| | | | | | | | |
|---|-----------|----------------|--------|-----|---------|-------|----------|
| Pr3.22 | Name | Torque command | | | Mode | | T |
| | Range | 0~300 | Unit | % | Default | 0 | |
| | Data Type | 16bit | Access | R/W | Address | 032DH | |
| | Repower | - | | | | | |
| Set up torque limit value in torque mode control. | | | | | | | |

| | | | | | | | | |
|--|-----------|----------------------------------|--------|-------|---------|----------|----------|----------|
| Pr3.24 * | Name | Motor rotate maximum speed limit | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 3000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0331H | | |
| | Repower | - | | | | | | |
| Set up motor running max rotate speed, but can't be exceeded motor allowed max rotate speed. | | | | | | | | |

5.2.5 【Class 4】 I/F Monitor Setting

| | | | | | | | | |
|----------|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr4.00 * | Name | Input selection SI1 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 3 | | |
| | Data Type | 16bit | Access | R/W | Address | 0401H | | |
| | Repower | o | | | | | | |
| Pr4.01 * | Name | Input selection SI2 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0403H | | |
| | Repower | o | | | | | | |
| Pr4.02 * | Name | Input selection SI3 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0405H | | |
| | Repower | o | | | | | | |
| Pr4.03 * | Name | Input selection SI4 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0207H | | |
| | Repower | o | | | | | | |

Set digital SI input function allocation.

This parameter use 16 binary system to set up the values,

For the function number, please refer to the following Figure.

| Signal name | Symbol | Setup value | |
|---|---------|---------------|-----------------|
| | | Normally open | Normally closed |
| Invalid | - | 00h | Do not setup |
| Positive direction over-travel inhibition | POT | 01h | 81h |
| Negative direction over-travel inhibition | NOT | 02h | 82h |
| Servo-ON input | SRV-ON | 03h | 83h |
| Alarm clear input | A-CLR | 04h | Do not setup |
| Control mode switching input | C-MODE | 05h | 85h |
| Gain switching input | GAIN | 06h | 86h |
| Deviation counter clear input | CL | 07h | Do not setup |
| Command pulse inhibition input | INH | 08h | 88h |
| Torque switching | TC-SEL | 09h | 89h |
| Selection 1 input of internal command speed | INTSPD1 | 0Eh | 8Eh |
| Selection 2 input of internal command speed | INTSPD2 | 0Fh | 8Fh |
| Selection 3 input of internal command speed | INTSPD3 | 10h | 90h |
| Forced alarm input | E-STOP | 14h | 94h |
| Inertia ratio switching | J-SEL | 15h | 95h |

Note:

- Normally open means input signal comes from external controller or component, for example: PLC.
- Normally closed means input signal comes from drive internally.

- Don't setup to a value other than that specified in the table.
- Don't assign specific function to 2 or more signals. Duplicated assignment will cause Err210 I/F input multiple assignment error 1 or Err211 I/F input multiple assignment error 2

Pr-Mode related input setup as below:

| Signal name | Symbol | Input | |
|-------------------------|--------|---------------|-----------------|
| | | Setup value | |
| | | Normally open | Normally closed |
| Trigger command | CTRG | 20h | A0h |
| Homing signal | HOME | 21h | A1h |
| Forced stop | STP | 22h | A2h |
| Forward direction JOG | JOG+ | 23h | A3h |
| Opposite direction JOG | JOG- | 24h | A4h |
| Positive limit switch | PL | 25h | A5h |
| Negative limit switch | NL | 26h | A6h |
| Homing switch signal | ORG | 27h | A7h |
| Road strength address 0 | ADD0 | 28h | A8h |
| Road strength address 1 | ADD1 | 29h | A9h |
| Road strength address 2 | ADD2 | 2ah | Aah |
| Road strength address 3 | ADD3 | 2bh | Abh |

Note:

CTRG, HOME is edge triggered. the active duration must more than 1ms.

| | | | | | | | | |
|-----------------|-----------|----------------------|--------|-----|---------|----------|----------|----------|
| Pr4.10 * | Name | Output selection SO1 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 101 | | |
| | Data Type | 16bit | Access | R/W | Address | 0415H | | |
| | Repower | o | | | | | | |
| Pr4.11 * | Name | Output selection SO2 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 202 | | |
| | Data Type | 16bit | Access | R/W | Address | 0417H | | |
| | Repower | o | | | | | | |
| Pr4.12 * | Name | Output selection SO3 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 404 | | |
| | Data Type | 16bit | Access | R/W | Address | 0419H | | |
| | Repower | o | | | | | | |

Set digital SO output functions allocation.

This parameter use 16 binary system do setup

For the function number, please refer to the following Figure.

| Signal name | Symbol | Setup value |
|-------------------------------|----------|-------------|
| Invalid | - | 00h |
| Alarm output | Alm | 01h |
| Servo-Ready output | S-RDY | 02h |
| External brake release signal | BRK-OFF | 03h |
| Positioning complete output | INP | 04h |
| At-speed output | AT-SPPED | 05h |
| Torque limitation output | TLC | 06h |
| Zero-speed detection output | ZSP | 07h |
| Velocity coincidence output | V-COIN | 08h |

| | | |
|----------------------------------|---------|-----|
| Positional command ON/OFF output | P-CMD | 0Bh |
| Speed command ON/OFF output | V-CMD | 0Fh |
| Servo enabled output | SEV-ST | 12h |
| Positive limit active | POT-OUT | 15h |
| Negative limit active | NOT-OUT | 16h |

Pr-Mode related output setup as below;

| Output | | | |
|-----------------------|---------|---------------|-----------------|
| Signal name | Symbol | Setup value | |
| | | Normally open | Normally closed |
| Command complete | CMD-OK | 20h | A0h |
| Road strength address | MC-OK | 21h | A1h |
| Homing finish | HOME-OK | 22h | A2h |
| Torque limit | TQL | 06h | 86h |

Note:

CMD-OK indicates PR command sent complete, but the motor may not in-position.

MC-OK indicates command complete and the motor in-position.

*1 Pay attention to the front panel display is hexadecimal.

| | | | | | | |
|---------------|-----------|----------------------------|--------|-----------|---------|----------|
| Pr4.31 | Name | Positioning complete range | | | Mode | P |
| | Range | 0~10000 | Unit | 0.0001rev | Default | 10 |
| | Data Type | 16bit | Access | R/W | Address | 043FH |
| | Repower | - | | | | |

Set up the timing of positional deviation at which the positioning complete signal (INP1) is output.

| | | | | | | |
|---------------|-----------|-----------------------------------|--------|--------------|---------|----------|
| Pr4.32 | Name | Positioning complete output setup | | | Mode | P |
| | Range | 0~3 | Unit | command unit | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0441H |
| | Repower | - | | | | |

Select the condition to output the positioning complete signal (INP1).

| Setup value | Action of positioning complete signal |
|-------------|--|
| 0 | The signal will turn on when the positional deviation is smaller than Pr4.31 [positioning complete range]. |
| 1 | The signal will turn on when there is no position command and position deviation is smaller than Pr4.31 [positioning complete range]. |
| 2 | The signal will turn on when there is no position command, the zero-speed detection signal is ON and the positional deviation is smaller than Pr4.31 [positioning complete range]. |
| 3 | The signal will turn on when there is no position command and the positional deviation is smaller than Pr4.31 [positioning complete range]. Then holds "ON" states until the next position command is entered. Subsequently, ON state is maintained until Pr4.33 INP hold time has elapsed. After the hold time, INP output will be turned ON/OFF according to the coming positional command or condition of the positional deviation. |

| | | | | | | | | |
|---------------|-----------|---------------|--------|-----|---------|----------|--|--|
| Pr4.33 | Name | INP hold time | | | Mode | P | | |
| | Range | 0~30000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0443H | | |
| | Repower | - | | | | | | |

Set up the hold time when Pr 4.32 positioning complete output setup=3

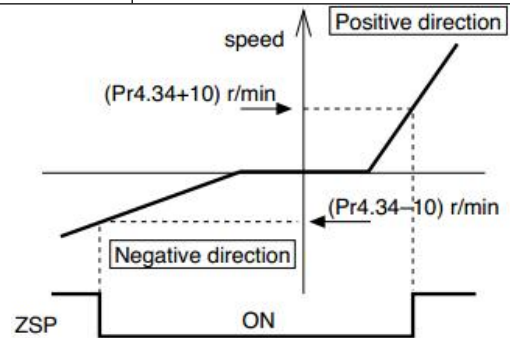
| Setup value | State of Positioning complete signal |
|-------------|--|
| 0 | The hold time is maintained definitely, keeping ON state until next positional command is received. |
| 1-30000 | ON state is maintained for setup time (ms) but switched to OFF state as the positional command is received during hold time. |

| | | | | | | | | |
|---------------|-----------|------------|--------|-------|---------|----------|----------|----------|
| Pr4.34 | Name | Zero-speed | | | Mode | P | S | T |
| | Range | 10~20000 | Unit | r/min | Default | 50 | | |
| | Data Type | 16bit | Access | R/W | Address | 0445H | | |
| | Repower | - | | | | | | |

You can set up the timing to feed out the zero-speed detection output signal(ZSP or TCL) in rotate speed (r/min).

The zero-speed detection signal(ZSP) will be fed out when the motor speed falls below the setup of this parameter, Pr4.34

- The setup of pr4.34 is valid for both positive and negative direction regardless of the motor rotating direction.
- There is hysteresis of 10[r/min]

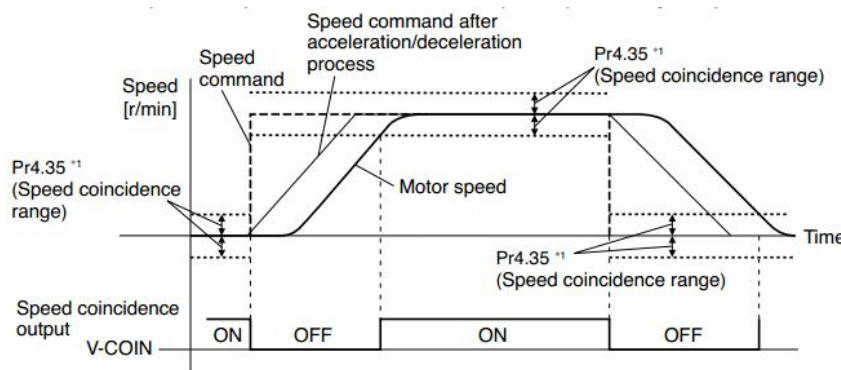


| | | | | | | |
|---------------|-----------|-------------------------|--------|-------|---------|-------|
| Pr4.35 | Name | Speed coincidence range | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 50 |
| | Data Type | 16bit | Access | R/W | Address | 0447H |
| | Repower | - | | | | |

Set the speed coincidence (V-COIN) output detection timing.
 Output the speed coincidence (V-COIN) when the difference between the speed command and the motor speed is equal to or smaller than the speed specified by this parameter.

Because the speed coincidence detection is associated with 10 r/min hysteresis, actual detection range is as shown below.

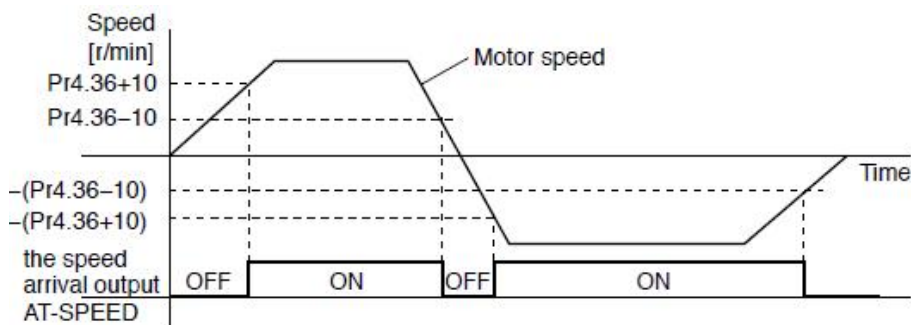
- Speed coincidence output OFF -> ON timing (Pr4.35 -10) r/min
- Speed coincidence output ON -> OFF timing (Pr4.35 +10) r/min



| | | | | | | |
|---------------|-----------|-------------------------|--------|-------|---------|-------|
| Pr4.36 | Name | At-speed(Speed arrival) | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 1000 |
| | Data Type | 16bit | Access | R/W | Address | 0449H |
| | Repower | - | | | | |

Set the detection timing of the speed arrival output (AT-SPEED).
 When the motor speed exceeds this setup value, the speed arrive output (AT-SPEED) is output.

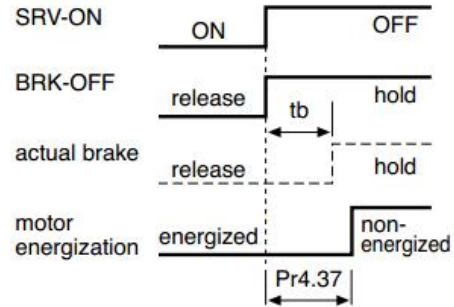
Detection is associated with 10r/min hysteresis .



| | | | | | | | | |
|---------------|-----------|---|--------|-----|---------|----------|----------|----------|
| Pr4.37 | Name | Mechanical brake action setting when stopping | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044BH | | |
| | Repower | - | | | | | | |

Motor brake delay time setup, mainly used to prevent servo on “galloping” phenomenon. Set up the time from when the brake release signal(BRK-OFF) turns off to when the motor is de-energized (servo-free),when the motor turns to servo-off while the motor is at stall

- Set up to prevent a micro-travel/drop of the motor (work) due to the action delay time(tb) of the brake.
- Ni After setting up Pr4.37>=tb, then compose the sequence so as the turns to servo-off after the brake is actually activated.

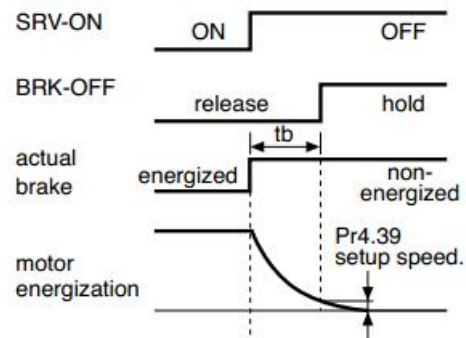


| | | | | | | | | |
|---------------|-----------|---------------------------------|--------|-----|---------|----------|----------|----------|
| Pr4.38 | Name | Mechanical brake action setting | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044DH | | |
| | Repower | - | | | | | | |

Mechanical brake start delay time setup, mainly used to prevent servo off “galloping” phenomenon.

Set up time from when detecting the off of servo-on input signal(SRV-ON)is to when external brake release signal(BRK-OFF)turns off, while the motor turns to servo off during the motor in motion

- Set up to prevent the brake deterioration due to the motor
- At servo-OFF during the motor is running , tb of the right fig will be a one of either Pr4.38 setup time, or lapse till the motor speed falls below setup speed



| | | | | | | | | |
|---------------|-----------|---------------------------|--------|-----|---------|----------|----------|----------|
| Pr4.39 | Name | Brake release speed setup | | | Mode | P | S | T |
| | Range | 30~3000 | Unit | 1ms | Default | 30 | | |
| | Data Type | 16bit | Access | R/W | Address | 044FH | | |
| | Repower | - | | | | | | |

Set up the speed timing of braking output checking during operation

5.2.6 【Class 5】 Extended Setup

| | | | | | | | | |
|---|-----------|---|--------|-----|---------|----------------|--|--|
| Pr5.00 | Name | 2nd Command pulse counts per one motor revolution | | | Mode | P | | |
| | Range | 0-8388608 | Unit | P | Default | 0 | | |
| | Data Type | 32bit | Access | R/W | Address | 0500H 0501H | | |
| | Repower | o | | | | | | |
| <p>Set the command pulse that causes single turn of the motor shaft. Select Pr0.08 1st or Pr5.00 2nd by IO signal.</p> <p>1) If Pr5.00≠0 , the actual turns = pulse number / Pr5.00</p> <p>2) If Pr5.00 = 0 , Pr5.01 2nd numerator of electronic gear and Pr5.02 2nd Denominator of electronic Gear become valid.</p> | | | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------------------|--------|-----|---------|----------------|--|--|
| Pr5.01 | Name | 2nd numerator of electronic gear | | | Mode | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Data Type | 32bit | Access | R/W | Address | 0502H 0503H | | |
| | Repower | o | | | | | | |
| <p>Set the numerator of division/multiplication operation made according to the command pulse input</p> | | | | | | | | |
| Pr5.02 | Name | 2nd denominator of electronic gear | | | Mode | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Data Type | 32bit | Access | R/W | Address | 0504H 0505H | | |
| | Repower | o | | | | | | |
| <p>Set the denominator of division/multiplication operation made according to the command pulse input.</p> <p>Instructions refer to Pr0.09 and Pr0.10 and select by IO signal</p> | | | | | | | | |

| | | | | | | | | |
|---|-----------|---------------------------------|--------|-----|---------|-------|---|---|
| Pr5.04 | Name | Over-travel inhibit input setup | | | Mode | P | S | T |
| | Range | 0/1/2 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0509H | | |
| | Repower | - | | | | | | |
| <p>0: positive and negative limit effective, no alarm output; 1: positive and negative limit effective invalid; 2: positive and negative limit effective, alarm output;</p> | | | | | | | | |

| Pr5.06 | Name | Servo stop mode | | | Mode | P | S | T | | | | | | |
|--|--|-----------------|--------|-----|---------|-------|---|---|-------------|-----------------|---|--|---|---|
| | Range | 0~1 | Unit | — | Default | 0 | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 050DH | | | | | | | | |
| | Repower | - | | | | | | | | | | | | |
| <p>Specify the status during deceleration and after stop, after servo-off.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Setup value</th> <th>Servo stop mode</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>When servo-disable signal active, servo-disable after the speed reduced less than Pr4.39</td> </tr> <tr> <td style="text-align: center;">1</td> <td>When servo-disable signal active, servo-disable right away, motor in free-run mode.</td> </tr> </tbody> </table> | | | | | | | | | Setup value | Servo stop mode | 0 | When servo-disable signal active, servo-disable after the speed reduced less than Pr4.39 | 1 | When servo-disable signal active, servo-disable right away, motor in free-run mode. |
| Setup value | Servo stop mode | | | | | | | | | | | | | |
| 0 | When servo-disable signal active, servo-disable after the speed reduced less than Pr4.39 | | | | | | | | | | | | | |
| 1 | When servo-disable signal active, servo-disable right away, motor in free-run mode. | | | | | | | | | | | | | |

| | | | | | | | | |
|--------|-----------|-------------------------------------|--------|-----|---------|-------|---|---|
| Pr5.08 | Name | LV trip selection at main power OFF | | | Mode | P | S | T |
| | Range | 0~1 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 0511H | | |
| | Repower | - | | | | | | |

You can select whether or not to activate Err0d.0 (main power under-voltage protection)function while the main shutoff continues for the setup of Pr5.09(The main power-OFF detection time).

| Setup value | Action of main power low voltage protection |
|-------------|--|
| 0 | When the main power is shut off during Servo-On,Err0d.0 will not be triggered and the drive turns to Servo-OFF. The drive returns to Servo-On again after the main power resumption. |
| 1 | When the main power is shut off during Servo-On, the drive will trip due to Err0d.0 |

Caution: Err0d.0(main power under-voltage protection) is trigged when setup of Pr5.09 is long and P-N voltage of the main converter falls below the specified value before detecting the main power shutoff , regardless of the Pr5.08 setup.

| | | | | | | | | |
|----------|-----------|-----------------------------------|--------|-----|---------|-------|---|---|
| Pr5.09 * | Name | The main power-OFF detection time | | | Mode | P | S | T |
| | Range | 70~2000 | Unit | 1ms | Default | 70 | | |
| | Data Type | 16bit | Access | R/W | Address | 0513H | | |
| | Repower | o | | | | | | |

You can set up the time to detect the shutoff while the main power is kept shut off continuously. The main power off detection is invalid when you set up this to 2000.

| | | | | | | | | |
|--------|-----------|----------------------|--------|-----|---------|-------|---|---|
| Pr5.10 | Name | Dynamic braking mode | | | Mode | P | S | T |
| | Range | 0~2 | Unit | | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0515H | | |
| | Repower | o | | | | | | |

0: Dynamic braking is valid in both normal and abnormal conditions.
 1: Dynamic braking is valid in normal condition, invalid in abnormal condition. (used to prevent abnormal conditions, high speed and large inertia to burn up the dynamic braking)
 2: Dynamic braking is invalid in both normal and abnormal conditions.

| | | | | | | | | |
|----------|-----------|---------------------------------|--------|-----|---------|------|---|---|
| Pr5.11 * | Name | Torque setup for emergency stop | | | Mode | P | S | T |
| | Range | 0~500 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 051H | | |
| | Repower | - | | | | | | |

Set up the torque limit at emergency stop
 When setup value is 0, the torque limit for normal operation is applied.

| | | | | | | | | |
|---|-----------|-----------------------|--------|-----|---------|-------|---|---|
| Pr5.12 | Name | Over-load level setup | | | Mode | P | S | T |
| | Range | 0~115 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0519H | | |
| | Repower | - | | | | | | |
| <p>You can set up over-load level. The overload level becomes 115% by setting up this value to 0. Use this with 0 setup in normal operation, set up other value only when you need to low this over-load level. The setup value of this parameter is limited by 115% of the motor rating.</p> | | | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------|--------|-------|---------|-------|---|---|
| Pr5.13 | Name | Over-speed level setup | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 051BH | | |
| | Repower | - | | | | | | |
| <p>If the motor speed exceeds this setup value, Err1A.0 [over-speed protect] occurs. The over-speed level becomes 1.2 times of the motor max, speed by setting up this to 0.</p> | | | | | | | | |

| | | | | | | | | |
|--|-----------|--------------------|--------|-------|---------|-------|---|---|
| Pr5.15 * | Name | I/F reading filter | | | Mode | P | S | T |
| | Range | 0~255 | Unit | 0.1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 051FH | | |
| | Repower | o | | | | | | |
| <p>I/O input digital filtering; higher setup will arise control delay.</p> | | | | | | | | |

| Pr5.17 | Name | Counter clear input mode | | | Mode | P | | | | | | | | | | |
|--|---------------------|--------------------------|--------|-----|---------|-------|--|--|-------------|-----------------|-------|---------|---|--------------|---|---------------------|
| | Range | 0~4 | Unit | — | Default | 3 | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0523H | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | |
| <p>Set up the clearing conditions of the counter clear input signal</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th>Clear condition</th> </tr> </thead> <tbody> <tr> <td>0/2/4</td> <td>invalid</td> </tr> <tr> <td>1</td> <td>Always clear</td> </tr> <tr> <td>3</td> <td>Only clear one time</td> </tr> </tbody> </table> | | | | | | | | | Setup value | Clear condition | 0/2/4 | invalid | 1 | Always clear | 3 | Only clear one time |
| Setup value | Clear condition | | | | | | | | | | | | | | | |
| 0/2/4 | invalid | | | | | | | | | | | | | | | |
| 1 | Always clear | | | | | | | | | | | | | | | |
| 3 | Only clear one time | | | | | | | | | | | | | | | |

| Pr5.20 | Name | Position setup unit select | | | Mode | P | | | | | | | | | | |
|--|---------------------|----------------------------|--------|-----|---------|-------|--|--|-------------|------|---|--------------|---|--------------|---|---------------------|
| | Range | 0~2 | Unit | — | Default | 2 | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0529H | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | |
| <p>Specify the unit to determine the range of positioning complete and excessive positional deviation</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th>unit</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Encoder unit</td> </tr> <tr> <td>1</td> <td>Command unit</td> </tr> <tr> <td>2</td> <td>10000pulse/rotation</td> </tr> </tbody> </table> | | | | | | | | | Setup value | unit | 0 | Encoder unit | 1 | Command unit | 2 | 10000pulse/rotation |
| Setup value | unit | | | | | | | | | | | | | | | |
| 0 | Encoder unit | | | | | | | | | | | | | | | |
| 1 | Command unit | | | | | | | | | | | | | | | |
| 2 | 10000pulse/rotation | | | | | | | | | | | | | | | |

| | | | | | | | | |
|---------------|-----------|---------------------------|--------|-----|---------|----------|----------|----------|
| Pr5.21 | Name | Selection of torque limit | | | Mode | P | S | T |
| | Range | 0~5 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 052BH | | |
| | Repower | - | | | | | | |

Set up the torque limiting method

| Setup value | | Limiting value | |
|-------------|------------|--|--|
| 0 | | PR0.13 | |
| 1 | | PR5.22 | |
| 2 | TL-SEL off | PR0.13 | |
| | TL-SEL on | PR5.22 | |
| 5 | | PR0.13 Positive torque limit PR5.22 Negative torque limit | |

| | | | | | | | | |
|---------------|-----------|------------------|--------|-----|---------|----------|----------|----------|
| Pr5.22 | Name | 2nd torque limit | | | Mode | P | S | T |
| | Range | 0~500 | Unit | % | Default | 300 | | |
| | Data Type | 16bit | Access | R/W | Address | 052DH | | |
| | Repower | - | | | | | | |

Set up the 2nd limit value of the motor torque output

The value of the parameter is limited to the maximum torque of the applicable motor.

| | | | | | | | | |
|---------------|-----------|-------------------------|--------|-----|---------|----------|----------|----------|
| Pr5.23 | Name | Positive torque reached | | | Mode | P | S | T |
| | Range | 0~300 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 052FH | | |
| | Repower | - | | | | | | |

- Default setting is 0, if the torque feedback is greater than 95% of the rated torque, output TCL signal.
- If the torque feedback is greater than the user setting value, output TCL signal.

| | | | | | | | | |
|---------------|-----------|-------------------------|--------|-----|---------|----------|----------|----------|
| Pr5.24 | Name | Negative torque reached | | | Mode | P | S | T |
| | Range | 0~300 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0531H | | |
| | Repower | - | | | | | | |

- Default setting is 0, if the torque feedback is greater than 95% of the rated torque, output TCL signal.
- If the torque feedback is greater than the user setting value, output TCL signal.

| | | | | | | | | |
|-----------------|-----------|--------------------|--------|-----|---------|----------|----------|----------|
| Pr5.28 * | Name | LED initial status | | | Mode | P | S | T |
| | Range | 0~35 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 0539H | | |
| | Repower | - | | | | | | |

You can select the type of data to be displayed on the front panel LED (7-segment) at the initial status after power-on.

| Setup value | content | Setup value | content | Setup value | content |
|-------------|------------------------------|-------------|-------------------|-------------|----------|
| 0 | Positional command deviation | 12 | I/O signal status | 24 | Reserved |

| | | | | | |
|----|-----------------------------|----|---|----|------------------------------------|
| 1 | Motor speed | 13 | Reserved | 25 | Reserved |
| 2 | Positional command speed | 14 | Regenerative load rate | 26 | Reserved |
| 3 | Velocity control command | 15 | Overload rate | 27 | Voltage across PN [V] |
| 4 | Actual torque | 16 | Inertia ratio | 28 | Drive serial number |
| 5 | Feedback pulse sum | 17 | Factor of no-motor running | 29 | Reserved |
| 6 | Command pulse sum | 18 | Encoder positional deviation [encoder unit] | 30 | Electromagnetic interference value |
| 8 | Max torque during operation | 20 | Encoder ID | 31 | Accumulated operation time |
| 9 | Position command frequency | 21 | Encoder initial angle | 32 | Reserved |
| 10 | Control mode | 22 | | 33 | drive temperature |
| 11 | I/O signal status | 23 | Number of abnormal communication of encoder | 36 | Reserved |

| | | | | | | | | |
|-----------------|-----------|-----------------------------------|--------|-----|---------|----------|----------|----------|
| Pr5.29 * | Name | Mode setup of RS485 communication | | | Mode | P | S | T |
| | Range | 0~255 | Unit | — | Default | 5 | | |
| | Data Type | 16bit | Access | R/W | Address | 053BH | | |
| | Repower | - | | | | | | |

| Value | Data bit | Parity-check | Stop bit |
|-------|----------|--------------|----------|
| 0 | 8 | Even Parity | 2 |
| 1 | 8 | Odd Parity | 2 |
| 2 | 8 | Even Parity | 1 |
| 3 | 8 | Odd Parity | 1 |
| 4 | 8 | None | 1 |
| 5 | 8 | None | 2 |

| | | | | | | | | |
|-----------------|-----------|--|--------|-----|---------|----------|----------|----------|
| Pr5.30 * | Name | Baud rate setup of RS485 communication | | | Mode | P | S | T |
| | Range | 0~6 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 053DH | | |
| | Repower | - | | | | | | |

Set up the communication baud rate of RS485.

| Setup value | Baud rate | Setup value | Baud rate |
|-------------|-----------|-------------|-----------|
| 0 | 2400bps | 4 | 38400bps |
| 1 | 4800bps | 5 | 57600bps |
| 2 | 9600bps | 6 | 115200bps |
| 3 | 19200bps | | |

| | | | | | | | | |
|---|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr5.31 * | Name | RS485 slave axis ID | | | Mode | P | S | T |
| | Range | 0~127 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 053FH | | |
| | Repower | - | | | | | | |
| <p>During communication with the host (e.g. PC) to control multiple shafts, the shaft being accessed by the host should be identified.</p> <p>Note: when using RS232/RS485, the maximum valid value is 31.</p> | | | | | | | | |

| | | | | | | | | |
|---|-----------|-----------------------------------|--------|-----|---------|-------|--|--|
| Pr5.32 | Name | Command pulse input maximum setup | | | Mode | P | | |
| | Range | 0~4000 | Unit | KHZ | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0541H | | |
| | Repower | - | | | | | | |
| <p>Set the maximum number of pulses to be used as command pulse input, if the number of the input pulse exceeds the setup value ,ERR1B0 command pulse input frequency error protection occurs</p> | | | | | | | | |

| Pr5.35 * | Name | Front panel lock setup | | | Mode | P | S | T | | | | | | |
|--|---------------------------------------|------------------------|--------|-----|---------|-------|---|---|-------------|---------|---|---------------------------------------|---|---------------------------------------|
| | Range | 0~1 | Unit | — | Default | 0 | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0547H | | | | | | | | |
| | Repower | - | | | | | | | | | | | | |
| <p>Lock the operation on the front panel.</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th>content</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No limit on the front panel operation</td> </tr> <tr> <td>1</td> <td>Lock the operation on the front panel</td> </tr> </tbody> </table> | | | | | | | | | Setup value | content | 0 | No limit on the front panel operation | 1 | Lock the operation on the front panel |
| Setup value | content | | | | | | | | | | | | | |
| 0 | No limit on the front panel operation | | | | | | | | | | | | | |
| 1 | Lock the operation on the front panel | | | | | | | | | | | | | |

| Pr5.36 | Name | 7 th setting parameters open | | | Mode | P | S | T | | | | | | |
|---|---|---|--------|-----|---------|-------|---|---|-------------|---------|---|--|-----|---|
| | Range | 0、102 | Unit | — | Default | 0 | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0549H | | | | | | | | |
| | Repower | - | | | | | | | | | | | | |
| <p>7th setting parameters open.</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th>content</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> </tr> <tr> <td>102</td> <td>Open 7th setting parameters modification authority.</td> </tr> </tbody> </table> | | | | | | | | | Setup value | content | 0 | | 102 | Open 7 th setting parameters modification authority. |
| Setup value | content | | | | | | | | | | | | | |
| 0 | | | | | | | | | | | | | | |
| 102 | Open 7 th setting parameters modification authority. | | | | | | | | | | | | | |

| Pr5.36 | Name | 7 th setting parameters open | | | Mode | P | S | T | | | | | | |
|---|---|---|--------|-----|---------|-------|---|---|-------------|---------|---|--|-----|---|
| | Range | 0、102 | Unit | — | Default | 0 | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0549H | | | | | | | | |
| | Repower | - | | | | | | | | | | | | |
| <p>7th setting parameters open.</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th>content</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> </tr> <tr> <td>102</td> <td>Open 7th setting parameters modification authority.</td> </tr> </tbody> </table> | | | | | | | | | Setup value | content | 0 | | 102 | Open 7 th setting parameters modification authority. |
| Setup value | content | | | | | | | | | | | | | |
| 0 | | | | | | | | | | | | | | |
| 102 | Open 7 th setting parameters modification authority. | | | | | | | | | | | | | |

5.2.7 【Class 6】 Special Setup

| | | | | | | | | |
|---|-----------|------------------------------|--------|-----|---------|-------|--|---|
| Pr6.03 | Name | JOG trial run command torque | | | Mode | | | T |
| | Range | 0~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0607H | | |
| | Repower | - | | | | | | |
| You can set up the command speed used for JOG trial run (torque control). | | | | | | | | |

| | | | | | | | | |
|---|-----------|-----------------------------|--------|-------|---------|-------|---|---|
| Pr6.04 | Name | JOG trial run command speed | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 300 | | |
| | Data Type | 16bit | Access | R/W | Address | 0609H | | |
| | Repower | - | | | | | | |
| You can set up the command speed used for JOG trial run (velocity control). | | | | | | | | |

| | | | | | | | | |
|---|-----------|--|--------|-------|---------|-------|--|--|
| Pr6.05 | Name | Position 3 rd gain valid time | | | Mode | P | | |
| | Range | 0~1000 | Unit | 0.1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060BH | | |
| | Repower | - | | | | | | |
| Set up the time at which 3 rd gain becomes valid. When not using this parameter, set PR6.05=0, PR6.06=100 This is valid for only position control/full-closed control. | | | | | | | | |

| | | | | | | | | |
|---|-----------|--|--------|------|---------|-------|--|--|
| Pr6.06 | Name | Position 3 rd gain multiplication | | | Mode | P | | |
| | Range | 0~1000 | Unit | 100% | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060DH | | |
| | Repower | - | | | | | | |
| Set up the 3 rd gain by multiplying factor of the 1 st gain 3rd gain= 1st gain * PR6.06/100. | | | | | | | | |

| | | | | | | | | |
|--------|-----------|------------------------------------|--------|-----|---------|-------|---|---|
| Pr6.07 | Name | Torque command additional value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060FH | | |
| | Repower | - | | | | | | |
| Pr6.08 | Name | Positive torque compensation value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0611H | | |
| | Repower | - | | | | | | |
| Pr6.09 | Name | Negative torque compensation value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |

| | | | | | | |
|---|-----------|-------|--------|-----|---------|-------|
| | Data Type | 16bit | Access | R/W | Address | 0613H |
| | Repower | - | | | | |
| This three parameters may apply feed forward torque superposition directly to torque command. | | | | | | |

| | | | | | | | | |
|---|-----------|-------------------------------|--------|-----|---------|-------|---|---|
| Pr6.13 | Name | 2 nd inertia ratio | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 061BH | | |
| | Repower | - | | | | | | |
| Set up 2 nd inertia ratio Set up the ratio of the load inertia against the rotor of the motor ratio. PR6.13= (load inertia/ rotor inertia) * 100 【%】 | | | | | | | | |

| | | | | | | | | |
|--|-----------|------------------------------|--------|-----|---------|-------|---|---|
| Pr6.14 | Name | Emergency stop time at alarm | | | Mode | P | S | T |
| | Range | 0~3000 | Unit | ms | Default | 200 | | |
| | Data Type | 16bit | Access | R/W | Address | 061DH | | |
| | Repower | - | | | | | | |
| Set up the time allowed to complete emergency stop in an alarm condition, exceeding this time puts this system in alarm state. | | | | | | | | |

| | | | | | | | | |
|--|-----------|--------------------|--------|--------|---------|-------|--|--|
| Pr6.20 | Name | Trial run distance | | | Mode | P | | |
| | Range | 0~1200 | Unit | 0.1rev | Default | 10 | | |
| | Data Type | 16bit | Access | R/W | Address | 0629H | | |
| | Repower | - | | | | | | |
| The distance of running each time in JOG run(position control) | | | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------|--------|-----|---------|-------|--|--|
| Pr6.21 | Name | Trial run waiting time | | | Mode | P | | |
| | Range | 0~30000 | Unit | Ms | Default | 100 | | |
| | Data Type | 16bit | Access | R/W | Address | 062BH | | |
| | Repower | - | | | | | | |
| The waiting time after running each time in JOG run(position control) | | | | | | | | |

| | | | | | | | | |
|--|-----------|-----------------------|--------|-----|---------|-------|--|--|
| Pr6.22 | Name | Trial run cycle times | | | Mode | P | | |
| | Range | 0~32767 | Unit | — | Default | 5 | | |
| | Data Type | 16bit | Access | R/W | Address | 062DH | | |
| | Repower | - | | | | | | |
| The cycling times of JOG run(position control) | | | | | | | | |

| | | | | | | | | |
|--|-----------|-------------------------------|--------|-----|---------|-------|---|--|
| Pr6.25 | Name | Acceleration of trial running | | | Mode | P | S | |
| | Range | 0~32767 | Unit | ms | Default | 100 | | |
| | Data Type | 16bit | Access | R/W | Address | 0633H | | |
| | Repower | - | | | | | | |
| Acceleration time from 0rpm~1000rpm of trial running | | | | | | | | |

| | | | | | | | | |
|--|-----------|--|--------|----------|---------|-------|---|---|
| Pr6.63 | Name | Absolute multi-turn position upper bound | | | Mode | P | S | T |
| | Range | 0~32766 | Unit | Rotation | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 067FH | | |
| | Repower | o | | | | | | |
| <p>While Pr0.15=2: Absolute position rotation mode: The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than 0~(Pr6.63+1)</p> | | | | | | | | |

5.2.8 【Class B】 Status Information

Note: This parameters class is only for RS485 communication.

| | | | | | | | | |
|----------------------------------|-----------|--------------------------|--------|---|---------|-------|---|---|
| PrB.00 | Name | Software version 1 (DSP) | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B00H | | |
| Display Software version 1 (DSP) | | | | | | | | |

| | | | | | | | | |
|-----------------------------------|-----------|---------------------------|--------|---|---------|-------|---|---|
| PrB.01 | Name | Software version 2 (CPLD) | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B01H | | |
| Display Software version 2 (CPLD) | | | | | | | | |

| | | | | | | | | |
|----------------------------|-----------|----------------------------|--------|---|---------|-------|---|---|
| PrB.02 | Name | Software version 3 (other) | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B02H | | |
| Display Software version 3 | | | | | | | | |

| | | | | | | | | |
|--------------------|-----------|------------|--------|---|---------|-------|---|---|
| PrB.03 | Name | Error code | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B03H | | |
| Display Error code | | | | | | | | |

| | | | | | | | | |
|----------------------------|-----------|----------------------------|--------|---|---------|-------|---|---|
| PrB.04 | Name | Factor of no-motor running | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B04H | | |
| Factor of no-motor running | | | | | | | | |

| | | | | | | | | |
|--------|------------|-----------------------|-------------------------|---|---------|-------|---|---|
| PrB.05 | Name | Drive operating state | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B05H | | |
| | Bit | Function | Details | | | | | |
| | 0 | RDY | Servo ready | | | | | |
| | 1 | RUN | Servo run | | | | | |
| | 2 | ERR | Servo error | | | | | |
| | 3 | HOME_OK | Homing process finished | | | | | |
| | 4 | INP | Positioning complete | | | | | |
| | 5 | AT-SPEED | At-speed | | | | | |
| | 6~15 | | Reserve | | | | | |

| | | | | | | | | |
|------------------------------|-----------|------------------------------|--------|-----|---------|-------|---|---|
| PrB.06 | Name | Actual velocity (unfiltered) | | | Mode | P | S | T |
| | Range | | Unit | RPM | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B06H | | |
| Actual velocity (unfiltered) | | | | | | | | |

| | | | | | | | | |
|---|-----------|------------------------|--------|---|---------|-------|---|---|
| PrB.07 | Name | Actual torque feedback | | | Mode | P | S | T |
| | Range | | Unit | % | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B07H | | |
| Actual torque feedback (Percentage of the rated torque) | | | | | | | | |

| | | | | | | | | |
|-------------------------|-----------|-------------------------|--------|-------|---------|-------|---|---|
| PrB.08 | Name | Actual current feedback | | | Mode | P | S | T |
| | Range | | Unit | 0.01A | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B08H | | |
| Actual current feedback | | | | | | | | |

| | | | | | | | | |
|----------------------------------|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| PrB.09 | Name | Actual velocity(After filtering) | | | Mode | P | S | T |
| | Range | | Unit | RPM | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B09H | | |
| Actual velocity(After filtering) | | | | | | | | |

| | | | | | | | | |
|----------------|-----------|----------------|--------|---|---------|-------|---|---|
| PrB.10 | Name | DC bus voltage | | | Mode | P | S | T |
| | Range | | Unit | V | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B0AH | | |
| DC bus voltage | | | | | | | | |

| | | | | | | | | |
|-------------------|-----------|-------------------|--------|----|---------|-------|---|---|
| PrB.11 | Name | Drive temperature | | | Mode | P | S | T |
| | Range | | Unit | °C | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B0BH | | |
| Drive temperature | | | | | | | | |

| | | | | | | | | |
|---------------------|-----------|-----------------|--------|---|---------|-------|---|---|
| PrB.15 | Name | Over-load ratio | | | Mode | P | S | T |
| | Range | | Unit | % | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B0FH | | |
| Over-load ratio (%) | | | | | | | | |

| | | | | | | | | |
|-----------------------------|-----------|-------------------------|--------|---|---------|-------|---|---|
| PrB.16 | Name | Regeneration load ratio | | | Mode | P | S | T |
| | Range | | Unit | % | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B10H | | |
| Regeneration load ratio (%) | | | | | | | | |

| PrB.17 | Name | Digital input signal status | | | Mode | P | S | T | | | | | | | | | | | | |
|--|-----------|-----------------------------|--------|---|---------|-------|---|---|-----|----------|---|-----|---|-----|---|-----|-----|-----|---|-----|
| | Range | | Unit | | Default | | | | | | | | | | | | | | | |
| | Data Type | 16bit | Access | R | Address | 0B11H | | | | | | | | | | | | | | |
| Digital input signal status: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Bit</th> <th>SI input</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>SI1</td> </tr> <tr> <td>1</td> <td>SI2</td> </tr> <tr> <td>2</td> <td>SI3</td> </tr> <tr> <td>...</td> <td>...</td> </tr> <tr> <td>8</td> <td>SI9</td> </tr> </tbody> </table> | | | | | | | | | Bit | SI input | 0 | SI1 | 1 | SI2 | 2 | SI3 | ... | ... | 8 | SI9 |
| Bit | SI input | | | | | | | | | | | | | | | | | | | |
| 0 | SI1 | | | | | | | | | | | | | | | | | | | |
| 1 | SI2 | | | | | | | | | | | | | | | | | | | |
| 2 | SI3 | | | | | | | | | | | | | | | | | | | |
| ... | ... | | | | | | | | | | | | | | | | | | | |
| 8 | SI9 | | | | | | | | | | | | | | | | | | | |
| Bit n=1, indicates SI(n+1)is at high level; Bitn=0,indacates SI(n+1)is at low level. | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | |
|-------------------------------|-----------|------------------------------|--------|---|---------|-------|---|---|
| PrB.18 | Name | Digital output signal status | | | Mode | P | S | T |
| | Range | | Unit | | Default | | | |
| | Data Type | 16bit | Access | R | Address | 0B11H | | |
| Digital output signal status: | | | | | | | | |

| Bit | SO output |
|-----|-----------|
| 0 | SO1 |
| 1 | SO2 |
| 2 | SO3 |

Bit n=1, indicates SO(n+1)is at high level; Bitn=0,indacates SO(n+1)is at low level.

| | | | | | | | | |
|--|-----------|--|--------|---|---------|-------------|--|--|
| PrB.20 | Name | Motor position feedback (Command unit) | | | Mode | P | | |
| | Range | | Unit | P | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B14H~0B15H | | |
| Motor position feedback (Command unit) . If the drive receives 8388608 pulse, and the drive's instruction unit is 10000pulse/ r, the encoder unit is 8388608 pulse/r, then the drive motor position feedback pulse number is 10000P | | | | | | | | |

| | | | | | | | | |
|----------------------------------|-----------|----------------------------------|--------|---|---------|-------------|--|--|
| PrB.21 | Name | Command pulse sum (Command unit) | | | Mode | P | | |
| | Range | | Unit | P | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B16H~0B17H | | |
| Command pulse sum (Command unit) | | | | | | | | |

| | | | | | | | | |
|---|-----------|-------------------------------------|--------|---|---------|-------------|--|--|
| PrB.22 | Name | Positional deviation (Command unit) | | | Mode | P | | |
| | Range | | Unit | P | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B18H~0B19H | | |
| Positional deviation (Command unit) ,refer to PrB.23 for details. | | | | | | | | |

| | | | | | | | | |
|---|-----------|---------------------------------|--------|---|---------|-------------|--|--|
| PrB.23 | Name | Position command (Encoder unit) | | | Mode | P | | |
| | Range | | Unit | | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B1AH~0B1BH | | |
| Position command (Encoder unit) If the drive's instruction unit is 10000pulse/ r, the encoder unit is 8388608 pulse/r, then the drive receive 10000pulse, the position command pulse number is 8388608 pulse | | | | | | | | |

| | | | | | | | | |
|-------------------------------|-----------|-------------------------------|--------|---|---------|-------------|--|--|
| PrB.24 | Name | Motor position (encoder unit) | | | Mode | P | | |
| | Range | | Unit | | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B1CH~0B1DH | | |
| Motor position (encoder unit) | | | | | | | | |

| | | | | | | | | |
|------------------------------------|-----------|------------------------------------|--------|---|---------|-------------|--|--|
| PrB.25 | Name | Positional deviation(encoder unit) | | | Mode | P | | |
| | Range | | Unit | | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B1EH~0B1FH | | |
| Positional deviation(encoder unit) | | | | | | | | |

| | | | | | | | | |
|--|-----------|--|--------|---|---------|--------------|--|--|
| PrB.26 | Name | Position feedback in rotation mode(encoder unit) | | | Mode | P | | |
| | Range | | Unit | | Default | | | |
| | Data Type | 32bit | Access | R | Address | 0B20H~0B21FH | | |
| Position feedback in rotation mode(encoder unit), refer to PrB.23 for details. | | | | | | | | |

Chapter 6 Alarm and Processing

6.1 Alarm List

Protection function is activated when an error occurs, the drive will stop the rotation of servo motor, and the front panel will automatically display the corresponding fault error code. The history of the error can be viewed on data monitoring mode. error logging submenu displays like: "d12Er".

Table 6.1 Error Code List

| Error code | | Content | Attribute | | |
|------------|-----|--|-----------|----------------|----------------|
| Main | Sub | | History | Immediate stop | Can be cleared |
| 09 | 0~F | FPGA communication error | ● | | |
| 0A | 0~1 | Current detection circuit error | ● | | |
| | 2、4 | Analog input circuit error | ● | | |
| | 3 | Power line (U、V、W) not connected | ● | | |
| | 5 | DC bus circuit error | ● | | |
| | 6 | Temperature detection circuit error | ● | | |
| 0b | 0 | Control power under-voltage | ● | | |
| 0c | 0 | DC bus over-voltage | ● | | ● |
| 0d | 0 | DC bus under-voltage | ● | | ● |
| | 2 | Power line (U、V、W) not connected | | | ● |
| 0E | 0 | Over-current | ● | | |
| | 1 | over-current of intelligent power module (IPM) | ● | | |
| 0F | 0 | Drive over-heat | ● | ● | |
| 10 | 0 | Motor over-load | ● | | ● |
| | 1 | Drive over-load | ● | | ● |
| | 2 | Motor stalling detection | ● | ● | ● |
| 12 | 0 | Resistor discharged circuit overload | ● | ● | |
| | 1 | Brake error | ● | | |
| 15 | 0 | Encoder wiring error | ● | | |
| | 1 | Encoder data error | ● | | |
| | 2 | Encoder initial position error | ● | | |
| | 3 | Encoder battery low-voltage error | ● | | ● |
| 17 | 0 | Encoder data error | ● | ● | |
| | 1 | Motor parameter error | | | |
| 18 | 0 | Too large position pulse deviation | ● | ● | ● |
| | 1 | Too large velocity deviation | ● | ● | ● |
| 19 | 0 | Vibration is too large | ● | ● | ● |
| 1A | 0 | Over-speed 1 | ● | ● | ● |
| | 1 | Speed out of control | ● | | ● |
| 1b | 0 | Incorrect input pulse format or over frequency | ● | ● | ● |
| | 1 | The electronic gear ratio is not set correctly | ● | ● | ● |
| 21 | 0 | I/F input interface allocation error | ● | | ● |
| | 1 | I/F input interface function set error | ● | | ● |
| | 2 | I/F output interface function set error | ● | | ● |
| 24 | 0 | CRC verification error when EEPROM parameter saved | ● | | |
| 26 | 0 | Positive/negative over-range input valid | ● | ● | ● |
| 57 | 0 | Compulsory alarm input valid | ● | ● | |

Save: save this error history record

Emergency: error, drive will stop immediately

Alarm clear: may through SI input/panel/configuration software remove alarm

6.2 Alarm Processing Method

When appear error, please clear error reason, renew power on

| | | | | |
|------------------------------|------|-------|--|---|
| Error code | Main | Extra | Display: “Er 090”--“Er 09F” | |
| | 09 | 0~F | Content: FPGA communication error | |
| Cause | | | Confirmation | Solution |
| L1,L2 terminal under-voltage | | | Check L1,L2 terminal voltage | Make sure voltage of L1,L2 terminal in proper range |
| Drive internal fault | | | / | replace the drive with a new one |

| | | | | |
|---|------|-------|---|--|
| Error code | Main | Extra | Display: “Er 0A0”--“Er 0A1” | |
| | 0A | 0~1 | Content: current detection circuit error | |
| Cause | | | Confirmation | Solution |
| Wiring error of motor output U,V,W terminal | | | Check wiring of motor output U,V,W terminal | Make sure motor U,V,W terminal wiring correctly |
| Main voltage L1,L2,L3 terminal voltage whether over-low | | | Check main voltage L1,L2,L3 terminal voltage | Make sure voltage of L1,L2,L3 terminal in proper range |
| Drive internal fault | | | / | replace the drive with a new one |

| | | | | |
|---------------------------|------|-------|--|---|
| Error code | Main | Extra | Display: “Er 0A2”、“Er 0A4” | |
| | 0A | 2、4 | Content: analog input circuit error | |
| Cause | | | Confirmation | Solution |
| Analog input Wiring error | | | Check wiring of analog input | Make sure analog input wiring correctly |
| Drive internal fault | | | / | replace the drive with a new one |

| | | | | |
|--|------|-------|--|----------------------------------|
| Error code | Main | Extra | Display: “Er 0A3” | |
| | 0A | 3 | Content: Power line (U、V、W) not connected | |
| Cause | | | Confirmation | Solution |
| Power line (U、V、W) not connected or broken | | | Check wiring of U、V、W | Make sure U、V、W wiring correctly |
| Motor internal fault | | | / | replace the motor with a new one |

| | | | | |
|--|------|-------|--------------------------------------|--|
| Error code | Main | Extra | Display: “Er 0A5” | |
| | 0A | 5 | Content: DC bus circuit error | |
| Cause | | | Confirmation | Solution |
| Main voltage L1,L2,L3 terminal under-voltage | | | Check L1,L2,L3 terminal voltage | Make sure voltage of L1,L2,L3 terminal in proper range |
| Drive internal fault | | | / | replace the drive with a new one |

| | | | | |
|---------------------------------|------|-------|---|--|
| Error code | Main | Extra | Display: “Er 0A6” | |
| | 0A | 6 | Content: temperature detection circuit error | |
| Cause | | | Confirmation | Solution |
| L1,L2,L3 terminal under-voltage | | | Check L1,L2,L3 terminal voltage | Make sure voltage of L1,L2,L3 terminal in proper range |
| Drive internal fault | | | / | replace the drive with a new one |

| | | | |
|---------------------------------|------|---------------------------------|--|
| Error code | Main | Extra | Display: "Er 0b0" |
| | 0b | 0 | Content: control power under-voltage |
| Cause | | Confirmation | Solution |
| L1,L2,L3 terminal under-voltage | | Check L1,L2,L3 terminal voltage | Make sure voltage of L1,L2,L3 terminal in proper range |
| Drive internal fault | | / | replace the drive with a new one |

| | | | |
|---|------|---------------------------------|-------------------------------------|
| Error code | Main | Extra | Display: "Er 0c0" |
| | 0c | 0 | Content: DC bus over-voltage |
| Cause | | Confirmation | Solution |
| Main power L1,L2,L3 terminal over-voltage | | Check L1,L2,L3 terminal voltage | decrease L1,L2,L3 terminal Voltage |
| Inner brake circuit damaged | | / | replace the drive with a new one |
| Drive inner fault | | / | replace the drive with a new one |

| | | | |
|--|------|---------------------------------|--------------------------------------|
| Error code | Main | Extra | Display: "Er 0d0" |
| | 0d | 0 | Content: DC bus under-voltage |
| Cause | | Confirmation | Solution |
| Main power L1,L2,L3 terminal under-voltage | | Check L1,L2,L3 terminal voltage | increase L1,L2 terminal Voltage |
| Drive inner fault | | / | replace the drive with a new one |

| | | | |
|---------------------------------------|------|---|---|
| Error code | Main | Extra | Display: "Er 0E0" |
| | 0E | 0 | Content: over-current |
| Cause | | Confirmation | Solution |
| Short of drive output wire | | Short of drive output wire, whether short circuit to PG ground or not | Assure drive output wire no short circuit, assure motor no damage |
| Abnormal wiring of motor | | Check motor wiring order | Adjust motor wiring sequence |
| Short of IGBT module | | Cut off drive output wiring, make srv_on available and drive motor, check whether over-current exists | replace the drive with a new one |
| abnormal setting of control parameter | | Modify the parameter | Adjust parameter to proper range |
| abnormal setting of control command | | Check control command whether command changes too violently or not | Adjust control command: open filter function |

| | | | |
|---------------------------------------|------|--|---|
| Error code | Main | Extra | Display: "Er 0E1" |
| | 0E | 1 | Content: IPM over-current |
| Cause | | Confirmation | Solution |
| Short of drive output wire | | Short of drive output wire, whether short circuit to PG ground or not | Assure drive output wire no short circuit, assure motor no damage |
| Abnormal wiring of motor | | Check motor wiring order | Adjust motor wiring sequence |
| Short of IGBT module | | Cut off drive output wiring, make srv_on available and drive motor, check whether over-current exists or not | replace the drive with a new one |
| Short of IGBT module | | / | replace the drive with a new one |
| abnormal setting of control parameter | | Modify the parameter | Adjust parameter to proper range |
| abnormal setting of control | | Check control command whether | Adjust control command: open filter |

| | | |
|---------|--------------------------------------|----------|
| command | command changes too violently or not | function |
|---------|--------------------------------------|----------|

| | | | |
|---|------|---|---|
| Error code | Main | Extra | Display: "Er 0F0" |
| | 0F | 0 | Content: drive over-heat |
| Cause | | Confirmation | Solution |
| the temperature of power module have exceeded upper limit | | Check drive radiator whether the temperature is too high or not | Strengthen cooling conditions, promote the capacity of drive and motor, enlarge acceleration/deceleration time, reduce load |

| | | | |
|-------------------------------|------|---|--|
| Error code | Main | Extra | Display: "Er 100" |
| | 10 | 0 | Content: motor over-load |
| Cause | | Confirmation | Solution |
| Load is too heavy | | Check actual load if the value of parameter exceed maximum or not | Decrease load, adjust limit parameter |
| Oscillation of machine | | Check the machine if oscillation exists or not | Modify the parameter of control loop; enlarge acceleration/deceleration time |
| wiring error of motor | | Check wiring if error occurs or not, if line breaks or not | Adjust wiring or replace encoder/motor for a new one |
| electromagnetic brake engaged | | Check brake terminal voltage | Cut off brake |

| | | | |
|----------------------------------|------|--|--|
| Error code | Main | Extra | Display: "Er 101" |
| | 10 | 1 | Content: Drive over-load |
| Cause | | Confirmation | Solution |
| wiring error of motor power line | | Check U、V、W wiring if error occurs or not, if line breaks or not | Check U、V、W wiring if error occurs or not, if line breaks or not |
| Motor dosen't match the drive | | Drive over-current | Motor current exceed drive current |

| | | | |
|------------------------|------|---|--|
| Error code | Main | Extra | Display: "Er 102" |
| | 10 | 2 | Content: Motor stalling detection |
| Cause | | Confirmation | Solution |
| Mechanically stalling. | | Check if there are something mechanically that stall the motor. | <ul style="list-style-type: none"> Investigate and eliminate the cause of motor stalling. Modify the parameter of Pr6.56 for version above 1.14, or increase the parameter of Pr6.57 for version below 1.14. |

| | | | |
|--|------|--|---|
| Error code | Main | Extra | Display: "Er 120" |
| | 12 | 0 | Content: Resistance discharge circuit over-load |
| Cause | | Confirmation | Solution |
| Regenerative energy has exceeded the capacity of regenerative resistor . | | Check the speed if it is too high. Check the load if it is too large or not. | lower motor rotational speed; decrease load inertia ,increase external regenerative resistor, improve the capacity of the drive and motor |
| Resistance discharge circuit damage | | / | Increase external regenerative resistor, replace the drive with a new one |

| | | | |
|------------------------|------|--------------------------------|-------------------------------|
| Error code | Main | Extra | Display: "Er 121" |
| | 12 | 1 | Content: braking error |
| Cause | | Confirmation | Solution |
| Braking circuit damage | | Braking resistor short circuit | Change a new braking resistor |
| | | Braking IGBT damaged | Repair IGBT |

| | | | |
|-----------------------------------|------|--|-------------------------------------|
| Error code | Main | Extra | Display: "Er 150" |
| | 15 | 0 | Content: encoder line broken |
| Cause | | Confirmation | Solution |
| Encoder line disconnected | | check wiring if it steady or not | Make encoder wiring steady |
| Encoder wiring error | | Check encoder wiring if it is correct or not | Reconnect encoder wiring |
| Encoder damaged | | / | replace the motor with a new one |
| Encoder measuring circuit damaged | | / | replace the drive with a new one |

| | | | |
|--------------------|------|------------------------|------------------------------------|
| Error code | Main | Extra | Display: "Er 151" |
| | 15 | 1 | Content: encoder data error |
| Cause | | Confirmation | Solution |
| Encoder data error | | Check for interference | Anti-interference treatment |

| | | | |
|-----------------------------------|------|--|--|
| Error code | Main | Extra | Display: "Er 152" |
| | 15 | 2 | Content: initialized position of encoder error |
| Cause | | Confirmation | Solution |
| Communication data abnormal | | Check encoder power voltage if it is DC5V \pm 5% or not; check encoder cable and shielded line if it is damaged or not; check encoder cable whether it is intertwined with other power wire or not | Ensure power voltage of encoder normally, ensure encoder cable and shielded line well with FG ground, ensure encoder cable separated with other power wire |
| Encoder damaged | | / | replace the motor with a new one |
| Encoder measuring circuit damaged | | / | replace the drive with a new one |

| | | | |
|---------------------------------------|------|--------------------|---|
| Error code | Main | Extra | Display: "Er 153" |
| | 15 | 3 | Content: encoder battery under voltage |
| Cause | | Confirmation | Solution |
| Multi-turn absolute encoder power off | | Check battery | Change a battery |
| | | /Check motor | Motor damaged, replace the motor with a new one |
| | | /Clear drive alarm | Clear alarm after changing battery |

| | | | |
|-----------------------------|------|---|--|
| Error code | Main | Extra | Display: "Er 170" |
| | 17 | 0 | Content: encoder data error |
| Cause | | Confirmation | Solution |
| Communication data abnormal | | Check encoder power voltage if it is DC5V \pm 5% or not ; check encoder cable and shielded line if it is damaged or not; check encoder cable whether it is intertwined with other power wire or not | Ensure power voltage of encoder normally, ensure encoder cable and shielded line well with FG ground, ensure encoder cable separated with other power wire |

| | | |
|-----------------------------------|---|----------------------------------|
| Encoder damaged | / | replace the motor with a new one |
| Encoder measuring circuit damaged | / | replace the drive with a new one |

| | | | |
|------------------------|------|--------------|--|
| Error code | Main | Extra | Display: "Er 171" |
| | 17 | 1 | Content: motor parameters error |
| Cause | | Confirmation | Solution |
| Motor parameters error | | | Input motor parameters to match with drive or replace the motor with a new one |

| | | | |
|--|------|---|--|
| Error code | Main | Extra | Display: "Er 180" |
| | 18 | 0 | Content: position error over-large error |
| Cause | | Confirmation | Solution |
| Unreasonable set of position error parameter | | Check parameter Pr0.14 value if it is too small or not | Enlarge the value of Pr0.14 |
| Gain set is too small | | Check parameter Pr1.00, Pr1.05 value if it is too small or not | Enlarge the value of Pr1.00, Pr1.05 |
| Torque limit is too small | | Check parameter Pr0.13, Pr5.22 value whether too small or not | Enlarge the value of Pr1.03, Pr5.22 |
| Outside load is too large | | Check acceleration/ deceleration time if it is too small or not , check motor rotational speed if it is too big or not ; check load if it is too large or not | Increase acceleration/ deceleration time decrease speed, decrease load |

| | | | |
|---|------|---|--|
| Error code | Main | Extra | Display: "Er 181" |
| | 18 | 1 | Content: velocity error over-large error |
| Cause | | Confirmation | Solution |
| The deviation of inner position command velocity is too large with actual speed | | Check the value of PA_602 if it is too small or not | Enlarge the value of PA_602, or set the value to 0, make position deviation over-large detection invalid |
| The acceleration/ decelerate time Inner position command velocity is too small | | Check the value of PA_312, PA_313 if it is too small or not | Enlarge the value of PA_312, PA_313. adjust gain of velocity control, improve trace performance. |

| | | | |
|----------------------------|------|----------------------------|------------------------------------|
| Error code | Main | Extra | Display: "Er 190" |
| | 19 | 0 | Content: motor vibration |
| Cause | | Confirmation | Solution |
| Current vibration | | Current vibration | Cut down the value of Pr003. Pr004 |
| Current loop is too strong | | Current loop is too strong | |

| | | | |
|---|------|--|---|
| Error code | Main | Extra | Display: "Er 1A0" |
| | 1A | 0 | Content: over-speed 1 |
| Cause | | Confirmation | Solution |
| Motor speed has exceeded the first speed limit (Pr3.21) | | Check speed command if it is too large or not; check the voltage of analog speed command if it is too large or not; check the value of Pr3.21 if it is too small or not; check input frequency and division frequency coefficient of command pulse if it is proper or not; check encoder if the wiring is correct or not | Adjust the value of input speed command, enlarge the value Pr3.21 value, modify command pulse input frequency and division frequency coefficient, assure encoder wiring correctly |

| | | | |
|-----------------------|------|---|---|
| Error code | Main | Extra | Display: "Er 1A1" |
| | 1A | 1 | Content: speed out of control |
| Cause | | Confirmation | Solution |
| Control maladjustment | | UVW wrong connection | |
| Encoder error | | Monitor D30 count increasing | Anti-interference treatment or change motor |
| Special application | | The rotation direction of the motor is opposite with motor force direction. | The special assessment of practical application, set 0 to 4 for PA137 to shield ERR1A1 alarm. |

| | | | |
|---------------------------------------|------|--------------------------|--|
| Error code | Main | Extra | Display: "Er 1b0" |
| | 1b | 0 | Content: input pulse format incorrect or out of frequency |
| Cause | | Confirmation | Solution |
| The input pulse frequency is too high | | Too high pulse frequency | To decrease pulse input frequency, less than 500K |

| | | | |
|-------------------|------|---|---|
| Error code | Main | Extra | Display: "Er 1b1" |
| | 1b | 1 | Content: incorrect electronic gear ratio |
| Cause | | Confirmation | Solution |
| Out of range | | Numerator denominator is zero, or setting values out of range | Reduce the number of pulses per revolution |

| | | | |
|---|------|--|--|
| Error code | Main | Extra | Display: "Er 210" |
| | 21 | 0 | Content: I/F input interface allocation error |
| Cause | | Confirmation | Solution |
| The input signal are assigned with two or more functions. | | Check the value of PA_400, PA_401, PA_402,PA_403,PA_404 if it is proper or not | Assure the value of PA_400, PA_401, PA_402, PA_403, PA_404 set correctly |
| The input signal aren't assigned with any functions. | | Check the value of PA_400, PA_401,PA_402,PA_403,PA_404 if it is proper or not | Assure parameter PA_400, PA_401, PA_402,PA_403,PA_404 set correctly |

| | | | |
|-------------------------|------|--|--|
| Error code | Main | Extra | Display: "Er 211" |
| | 21 | 1 | Content: I/F input interface function set error |
| Cause | | Confirmation | Solution |
| Signal allocation error | | Check the value of PA_400, PA_401, PA_402,PA_403,PA_404 if it is proper or not | Assure the value of PA_400, PA_401, PA_402, PA_403, PA_404 set correctly |

| | | | | |
|--|------|-------|---|---|
| Error code | Main | Extra | Display: "Er 212" | |
| | 21 | 2 | Content: I/F input interface function set error | |
| Cause | | | Confirmation | Solution |
| The input signal is assigned with two or more functions. | | | Check the value of PA_410, PA_411, PA_412, PA_413, if it is proper or not | Assure the value of PA_410, PA_411, PA_412,PA_413 set correctly |
| The input signal isn't assigned with any functions. | | | Check the value of PA_410, PA_411, PA_412, PA_413, if it is proper or not | Assure the value of PA_410, PA_411,PA_412,PA_413 set correctly |

| | | | | |
|---|------|-------|---|---|
| Error code | Main | Extra | Display: "Er 240" | |
| | 24 | 0 | Content: CRC verification error when EEPROM parameter is saved | |
| Cause | | | Confirmation | Solution |
| L1,L2,L3 terminal under-voltage | | | Check L1,L2,L3 terminal voltage | Assure L1,L2,L3 terminal voltage in proper range |
| Drive is damaged | | | save the parameters again | replace the drive with a new one |
| The setting of drive maybe default setting which isn't suitable for motor . | | | Check the setting of drive if it is suitable for your motor | Download the suitable project file to drive for motor |

| | | | | |
|--|------|-------|---|----------|
| Error code | Main | Extra | Display: "Er 260" | |
| | 26 | 0 | Content: positive negative over-travel input valid | |
| Cause | | | Confirmation | Solution |
| positive /negative over-travelling input signal has been conducted | | | Check the state of positive negative over-travel input signal | / |

| | | | | |
|--|------|-------|---|----------|
| Error code | Main | Extra | Display: "Er 260" | |
| | 26 | 0 | Content: positive negative over-travel input valid | |
| Cause | | | Confirmation | Solution |
| positive /negative over-travelling input signal has been conducted | | | Check the state of positive negative over-travel input signal | / |

| | | | | |
|---------------------------|------|-------|---|---|
| Error code | Main | Extra | Display: "Er 270~ Er 272" | |
| | 27 | 0~2 | Content: analog input out of range | |
| Cause | | | Confirmation | Solution |
| Analog input out of range | | | | Try to adjust analog input within limited range |

| | | | | |
|--|------|-------|--|--------------------------------------|
| Error code | Main | Extra | Display: " Er 570" | |
| | 57 | 0 | Content: forced alarm input valid | |
| Cause | | | Confirmation | Solution |
| Forced-alarm input signal has been conducted | | | Check forced-alarm input signal | Assure input signal wiring correctly |

6.3 Alarm clear

For alarm can be cleared:

- 1、 Use auxiliary function “AF_ACL”
 - a. Press M to select auxiliary function
 - b. Press SET to enter into “AF_ACL”
 - c. Press and hold ◀ to clear the alarm
- 2、 Set IO input function as Alarm clear input “(A-CLR)”, refer to switch input interface connection to clear the alarm

For alarm cannot be cleared:

- 1、 Restart the power-supply to clear the alarm.

Chapter 7 Display and Operation

7.1 Introduction

The operation interface of servo drive consists of six LED nixie tubes and five key , which are used for servo drive's status display and parameter setting. The inter face layout is as follows :



Figure 7-1 front panel

Table 7.1 The name and function of keys

| Name | Key | Function |
|----------|------------|--|
| Display | / | There are 5 LED nixie tubes to display monitor value, parameter value. |
| Mode key | M | Press this key to switch among 4 modes: 1.data monitor mode 2.parameter setting mode 3.auxiliary function mode 4.EEPROM written mode |
| Set key | SET | Entrance for submenu, confirming the current setting |
| Up key | ▲ | Press this key to increase the current setup value |
| Down key | ▼ | Press this key to decrease the current setup value |
| Left key | ◀ | Press this key to shift to the next digit on the left |

7.2 Panel Display and Operation

7.2.1 Panel Operation Flow Figure

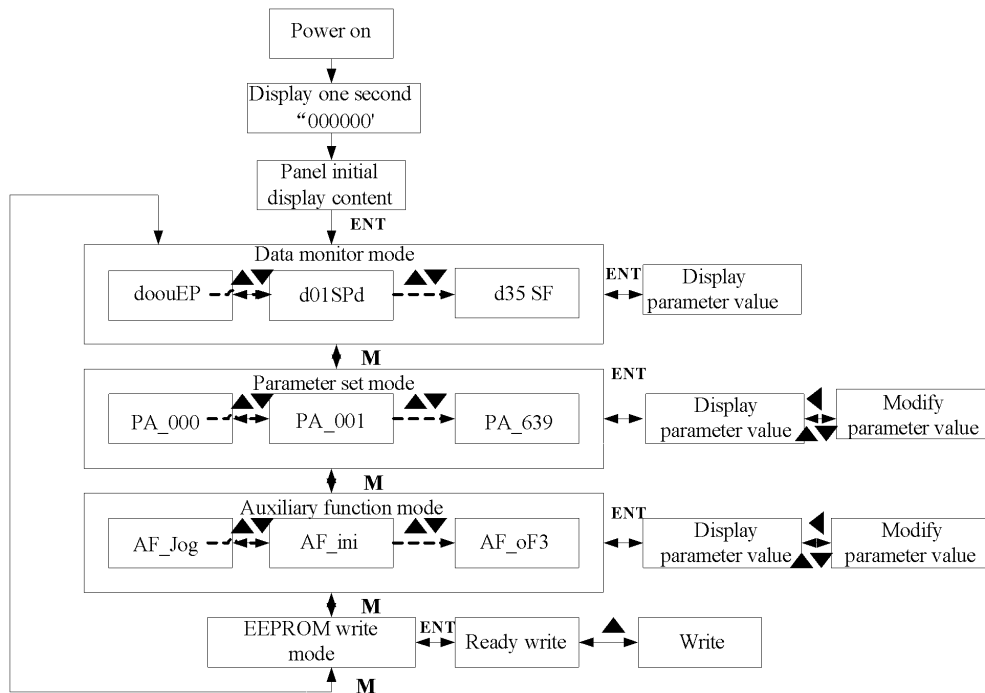


Figure 7-1 the flow diagram of panel operation

- (1) The front panel display **rEAdY** for about one second firstly after turning on the power of the drive. Then if no abnormal alarm occurs, monitor mode is displayed with the value of initial parameter ; otherwise, abnormal alarm code is displayed.
- (2) Press M key to switch the data monitor mode → parameter setting mode → auxiliary function mode → EEPROM written mode.
- (3) If new abnormal alarm occurs, the abnormal alarm will be displayed immediately in abnormal mode no matter what the current mode is, press M key to switch to the other mode.
- (4) In data monitor mode, press ▲ or ▼ to select the type of monitor parameter; Press ENT to enter the parameter type , then press ◀ to display the high 4 bits “H” or low 4 bits “L” of some parameter values.
- (5) In parameter setting mode, press ◀ to select current editing bit of parameter No, press ▲ or ▼ to change current editing bit of parameters No. Press ENT key to enter the parameter setting mode of corresponding parameters No. Press ◀ to select current bit of parameter value when editing it, press ▲ or ▼ to change the value of the bit. Press ENT to save it and switch to the interface of parameter No.

7.2.2 Drive Operating Data Monitor

Table 7.2 Function List of Drive Monitor

| Serial Number | Name | Specification | Display | Unit | Data Format (x, y is numerical value) |
|---------------|--------|---|---------|-------|--|
| 0 | d00uE | Positional command deviation | d00uE | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 1 | d01SP | Motor speed | d01SP | r/min | "r xxxx" |
| 2 | d02cS | Positional command speed | d02CS | r/min | "r xxxx" |
| 3 | d03cu | Velocity command | d03Cu | r/min | "r xxxx" |
| 4 | d04tr | Actual Torque feedback | d04tr | % | "r xxxx" |
| 5 | d05nP | Feedback pulse sum | d05nP | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 6 | d06cP | Command pulse sum | d06CP | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 7 | d07 | Maximum torque feedback | d07 | / | "xxxx" |
| 8 | d08FP | Frequency of pulse signal | d08FP | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 9 | d09cn | Control mode | d09Cn | / | Position: "PoScn" Speed: "SPdcn" Torque: "trqcn" Composite mode "cnt" |
| 10 | d10lo | Digital input/output status | d10 lo | / | Refer instructions for details |
| 11 | d11Ai | / | d11Ai | | |
| 12 | d12Er | Error factor and reference of history | d12Er | / | "Er xxx" |
| 13 | d13 rn | / | d13rn | / | "m xxx" |
| 14 | d14 r9 | Regeneration load factor | d14r9 | % | "rg xxx" |
| 15 | d15 oL | Over-load factor | d15oL | % | "oL xxx" |
| 16 | d16Jr | Inertia ratio | d16Jr | % | "J xxx" |
| 17 | d17ch | Factor of no-motor running | d17Ch | / | "cP xxx" |
| 18 | d18ic | No. of changes in I/O signals | d18ic | / | "n xxx" |
| 19 | d19 | / | d19 | / | "xxxx" |
| 20 | d20Ab | Absolute encoder data | d20Ab | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 21 | d21AE | Absolute external scale position | d21AE | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 22 | d22rE | No of Encoder/external scale communication errors monitor | d22rE | times | "n xxx" |
| 23 | d23 id | Communication axis ID | d23id | / | "id xxx" "Fr xxx" |
| 24 | d24PE | / | d24PE | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 25 | d25PF | / | d25PF | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 26 | d26hy | / | d26hy | pulse | Low-bit "L xxxx" High-bit "H xxxx" |
| 27 | d27 Pn | Voltage across PN [V] | d27Pn | V | "u xxx" |
| 28 | d28 no | Software version | d28no | / | "d xxx" "F xxx" |

| | | | | | |
|----|--------|--|-------|----|---------------------------------------|
| | | | | | "P xxx" |
| 29 | d29AS | / | d29AS | / | "n xxx" |
| 30 | d30NS | Times of encoder communication anomaly | d30sE | / | Low-bit "L xxxx" High-bit "H xxxx" |
| 31 | d31 tE | Accumulated operation time | d31tE | / | Low-bit "L xxxx" High-bit "H xxxx" |
| 32 | d32Au | Automatic motor identification | d32Au | / | "r xxx" |
| 33 | d33At | Drive temperature | d33At | °C | "th xxx" |
| 34 | d34 | / | d34 | / | "t xxx" |
| 35 | d35 SF | / | d35SF | / | "xxxxxx" |


Instructions:

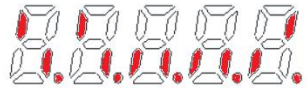
1、d01SP Motor speed


Drive display s 0 after power on, in disable state. While in enable state, display r 0. Motor speed display r xxx. So users can distinguish in disable state or in enable state by display s 0 or r 0 .

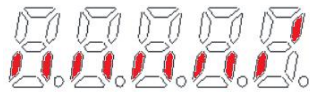
2、d10 Io I/O signal status

The upper half of the nixie tube is valid, the lower half is invalid, the decimal point represents the input and output state, lit represents the input, not bright represents the output

Input: , from low to high, the order is SI1, SI2...SI10. The next figure represents SI1、SI8、SI10 input are valid, other inputs are invalid.



Output: , from low to high, the order is SO1, SO2...SO10. The next figure represents SO1 output are valid, other inputs are invalid.



3、Parameter high and low bit, positive and negative Numbers.

The highest and lowest digits of data and the signs are shown as follows. The first and second decimal points on the right are bright, indicating the data of high order. The two decimal points are not lit, indicating the data of low order. The fourth and fifth decimal places on the right indicate negative Numbers, otherwise positive Numbers

Users can choose to set the initial display state of power supply to any of the below:

| | | | | | | | | |
|-----------------|-----------|--------------------|--------|-----|---------|----------|----------|----------|
| Pr5.28 * | Name | LED initial status | | | Mode | P | S | T |
| | Range | 0~35 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 0539H | | |
| | Repower | - | | | | | | |

You can select the type of data to be displayed on the front panel LED (7-segment) at the initial status after power-on.

| Setup value | content | Setup value | content | Setup value | content |
|-------------|------------------------------|-------------|---|-------------|------------------------------------|
| 0 | Positional command deviation | 12 | I/O signal status | 24 | Reserved |
| 1 | Motor speed | 13 | Reserved | 25 | Reserved |
| 2 | Positional command speed | 14 | Regenerative load rate | 26 | Reserved |
| 3 | Velocity control command | 15 | Overload rate | 27 | Voltage across PN [V] |
| 4 | Actual torque | 16 | Inertia ratio | 28 | Drive serial number |
| 5 | Feedback pulse sum | 17 | Factor of no-motor running | 29 | Reserved |
| 6 | Command pulse sum | 18 | Encoder positional deviation [encoder unit] | 30 | Electromagnetic interference value |
| 8 | Max torque during operation | 20 | Encoder ID | 31 | Accumulated operation time |
| 9 | Position command frequency | 21 | Encoder initial angle | 32 | Reserved |
| 10 | Control mode | 22 | | 33 | drive temperature |
| 11 | I/O signal status | 23 | Number of abnormal communication of encoder | 36 | Reserved |

Table 7.3 “d17 ch” Motor No Rotate Reason Code Definition

| Code | Display Code | Specification | Content |
|------|--------------|---|---|
| 0 | cP 0 | Working normally | |
| 1 | cP 1 | DC bus under-voltage | / |
| 2 | cP 2 | Servo-Enable signal not active | Servo-Enable signal not active |
| 3 | cP 3 | POT/NOT input is valid | PA_504=0,POT is open , speed command is positive direction NOT is open , speed command is negative direction |
| 4 | cP 4 | Drive fault | / |
| 5 | cP 5 | The relay inside the drive isn't closed | / |
| 6 | cP 6 | Pulse input prohibited (INH) | PA_518=0,INH is open |
| 8 | cP 8 | CL is valid | PA_517=0,deviation counter clear is connected to COM- |
| 9 | cP 9 | speed zero-clamp is valid | PA_315=1, speed zero-clamp is open |

7.2.3 Auxiliary Function

Table 7.4 setting interface System parameter

| No | Name | Specification | Display Code | Operation Flow |
|----|-------|------------------------------|--------------|--|
| 0 | AFjog | Trial run | AFjog | Please refer to the chapter of“trial run” |
| 1 | AFInI | Initialization of parameter | AFInI | 1. press SET to enter operation, display “InI -”。 2.press ▲ once to display “InI---”, indicated initialization; after finishing it, display“FinSh”。 |
| 2 | AFunL | Release of front panel lock | AFunL | 1. press SET to enter operation, display “unL -”。 2. press ▲ button one time , display “FinSh”,indicated unlock the panel successfully |
| 3 | AFAcL | Alarm clear | AFAcL | 1. press SET to enter operation, display“Acl -”。 2. press ▲once , display “FinSh”, indicated alarm clear successfully |
| 4 | AFEnc | Motor Angle correction | AFEnc | 1. Press SET once to enter operation, display “Enc -” 2. press ▲once , display “StArt”, indicated start to correct the angle, then display“FiniSh”indicated correction finished |
| 5 | AF_GL | Inertia ratio identification | AF_GL | 1. Press SET once to enter operation, display “G---” 2. Press ◀ once, display “StUon” 3. Press ▲, motor running, indicated start to identification 4. Finishing, display G xxx, xxx indicated Inertia ratio value |
| 6 | AFrSt | Soft reset | AFrSt | 1. Press SET once to enter operation, display “rSt -” 2. Press ▲ and hold on, display “StArt” Then, finished |

Table 7.5 The Locked panel conditions

| Mode | The Locked panel conditions |
|-------------------------|---|
| Monitor mode | No limitation: all monitored data can be checked. |
| Parameter set up mode | No parameter can be changed but setting can be checked. |
| Auxiliary function mode | Cannot be run except for” release of front panel lock” |
| EEPROM writing mode | No limitation |

7.2.4 Saving parameter

Operation procedure:

1. press M to select EEPROM writing mode, display “EESet”;
2. Press ENT to enter into writing mode operation:
3. Press and hold ▲, display LED from” EP -” to” EP--”, then it becomes” EP---”, finally it becomes” StArt”, indicated EEPROM writing operation have been began;
4. “Error” means that writing is unsuccessful, while “Finish” show that the writing is successful; Follow steps 3 and 4 to repeat the operation; the drive may be damaged if repeat of several times still fails. The drive need to repair.
5. The drive need to power off and restart again if writing is successful.

NOTE: Don't turn off the power if EEPROM writing operation goes on, otherwise it may cause a writing wrong data; If this happens, please reset all the parameters ,then do EEPROM writing operation again.

7.2.5 Abnormal Alarm

The front panel will automatically enter the abnormal alarm display mode if drive error occurs while it displays the corresponding error code. Please refer to Chapter 6 of alarm processing about the detail of error code.

7.3 Trial Run

Attention

- Ground the earth terminal of the motor and drive without fail. the PE terminal of drive must be reliably connected with the grounding terminal of equipment.
- The drive power need with isolation transformer and power filter in order to guarantee the security and anti-jamming capability.
- Check the wiring to make sure correctness before power on.
- Install a emergency stop protection circuit externally, the protection can stop running immediately to prevent accident happened and the power can be cut off immediately.
- If drive alarm occurs, the cause of alarm should be excluded and Svon signal must be invalid before restarting the drive.
- The high voltage also will contain in several minutes even if the servo drive is powered off, please don't touch terminal strip or separate the wiring.
-

Note: there are two kinds of trial run: trial run without load and trial run with load. The user needs to test the drive without load for safety first.

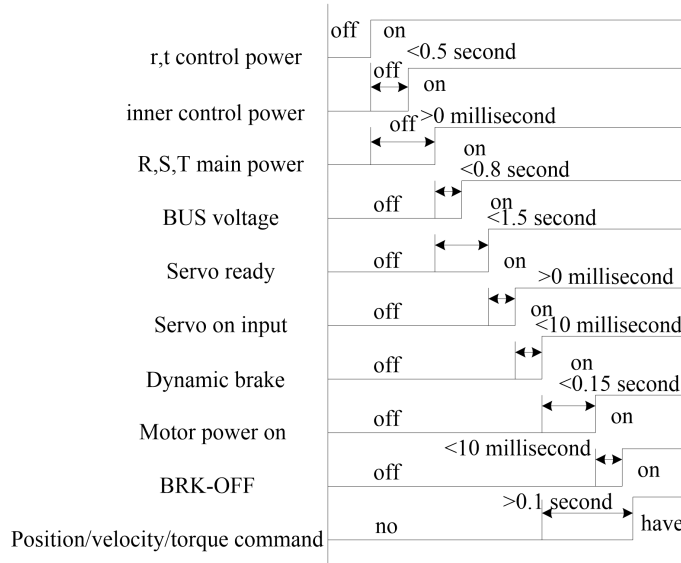
Contact oyostepper.com@gmail.com if you need more technical service.

7.3.1 Inspection Before trial Run

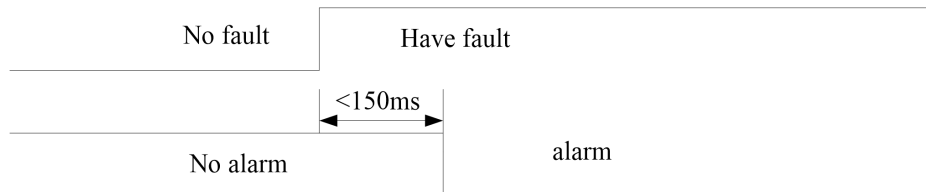
Table7.6 inspection Item before Run

| No | Item | Content |
|----|------------------------------|---|
| 1 | Inspection on wiring | 1. Ensure the following terminals are properly wired and securely connected : the input power terminals, motor output power terminal ,encoder input terminal CN2, control signal terminal CN1, communication terminal CN4(it is unnecessary to connect CN1 andCN4 in Jog run mode) 2.short among power input lines and motor output lines are forbidden , and no short connected with PG ground. |
| 2 | Confirmation of power supply | 1. The range of control power input r, t must be in the rated range. 2. The range of the main power input R, S, T must be in the rated range. 3. Single phase 220VAC input is sufficient if the power of drive is no more 1.5kw. |
| 3 | Fixing of position | the motor and drive must be firmly fixed |
| 4 | Inspection without load | The motor shaft must not be with a mechanical load. |
| 5 | Inspection on control signal | 1, all of the control switch must be placed in OFF state. 2, servo enables input Srv on must be in OFF state. |

7.3.2 Timing chart on power-up



7.3.3 Timing chart on fault



7.3.4 Trial Run by operation interface

After installation and connection is completed, check the following items before turning on the power:

Wiring ? (Especially power input and motor output)







- Short or grounded?
- Loose connection?
- Unstable mounting?
- Separation from the mechanical system ?

It is unnecessary to connect control signal terminal CN1 and communication terminal CN4 in Jog run mode. It is recommended that motor runs at low speed for safety, while the speed depends on the parameters below:

Table 7.7 Parameter Setup of Position JOG

| No | parameter | name | value | unit |
|----|-----------|-------------------------------|----------------|------------|
| 1 | Pr0.01 | Control mode setting | 0 | / |
| 2 | Pr6.04 | JOG trial run command speed | User-specified | rpm |
| 3 | Pr6.25 | Acceleration of trial running | User-specified | ms/1000rpm |

◆ JOG trial run operation process

1. set all parameters above corresponding to velocity JOG or position JOG ;
 2. Enter EEPROM writing mode, and save the value of modified parameters ;
 3. The drive need to restart after the value is written successfully;
 4. Enter auxiliary function mode, and go to "AFJog "sub-menu;
 5. Press ENT once, and display Jog - ";
 6. Press  once, and display " Srvon " if no exception occurs; press  once again if "Error " occurs, it should display "Srvon "; If "Error " still occurs, please switch to data monitoring mode "d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;
 7. In position JOG mode, the motor will rotate directly; if motor doesn't rotate, switch to data monitoring mode d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;
- In speed JOG mode, press  once, the motor rotates once (hold  will make motor rotating to value of Pr6.04); press  once, the motor rotates once (hold  will make motor rotating to value of Pr6.04); if motor doesn't rotate, switch to data monitoring mode d17 Ch "sub-menu, find the cause why motor doesn't rotate, fix the trouble and try again;
8. Press SET will exit JOG control in JOG run mode.

Chapter 8 Application Case

Operation Mode Selection

T6 series AC servo drives support the position, speed, torque three basic modes of operation, and can switch freely between the three basic modes of operation by switch or modify parameters.

Table 8.1 Parameter setup of Operation Mode Selection

| No | Mode | Parameter | Specification |
|----|--|-----------|---|
| 1 | Position mode | Pr0.01=0 | The position control is performed based on the positional command (pulse train) from the host controller or the command set in the servo drive. |
| 2 | Velocity mode | Pr0.01=1 | The velocity control is performed according to the analog speed command from the host controller or the speed command set in the servo drive. |
| 3 | Torque mode | Pr0.01=2 | The torque control is performed according to the torque command specified in the form of analog voltage or the command set in the servo drive. |
| 4 | 1st mode: position mode 2nd mode: speed mode | Pr0.01=3 | The control mode is switched through external input. |
| 5 | 1st mode: position mode 2nd Mode: torque mode | Pr0.01=4 | The control mode is switched through external input. |
| 6 | 1st mode: speed mode 2nd Mode: torque mode | Pr0.01=5 | The control mode is switched through external input. |

The step of changing the operation mode:

- 1, Switch the drive to Servo Off status.
 - 2, Modify the corresponding parameters of control mode to EEPROM.
- Turn off/on the power to make the new mode works after setup completed.

8.1 Position Control

Notice : You must do inspection before position control test run.

Table 8.2 Parameter Setup of Position Control

| No | parameter | name | input | value | unit |
|----|-----------|--|--------|----------------|-------------|
| 1 | Pr0.01 | control mode setup | / | 0 | / |
| 2 | Pr0.06 | command pulse rotational direction setup | | 0 | |
| 3 | Pr0.07 | command pulse input mode setup | | 0~3 | |
| 4 | Pr0.08 | Command pulse per one motor revolution | | User-specified | Pulse |
| 5 | Pr0.09 | 1st numerator of electronic gear | | 1 | |
| 6 | Pr0.10 | denominator of electronic gear | | 1 | |
| 7 | Pr2.22 | positional command smoothing filter | | User-specified | 0.1ms |
| 8 | Pr2.23 | positional command FIR filter | | User-specified | 0.1ms |
| 9 | Pr3.12 | Acceleration time setup | / | User-specified | millisecond |
| 10 | Pr3.13 | Deceleration time setup | / | User-specified | millisecond |
| 11 | Pr3.14 | Sigmoid acceleration/deceleration time setup | / | User-specified | millisecond |
| 12 | Pr4.00 | S11 input select: servo-enable | Srv_on | Hex:0003 | / |

◆ Wiring Diagram

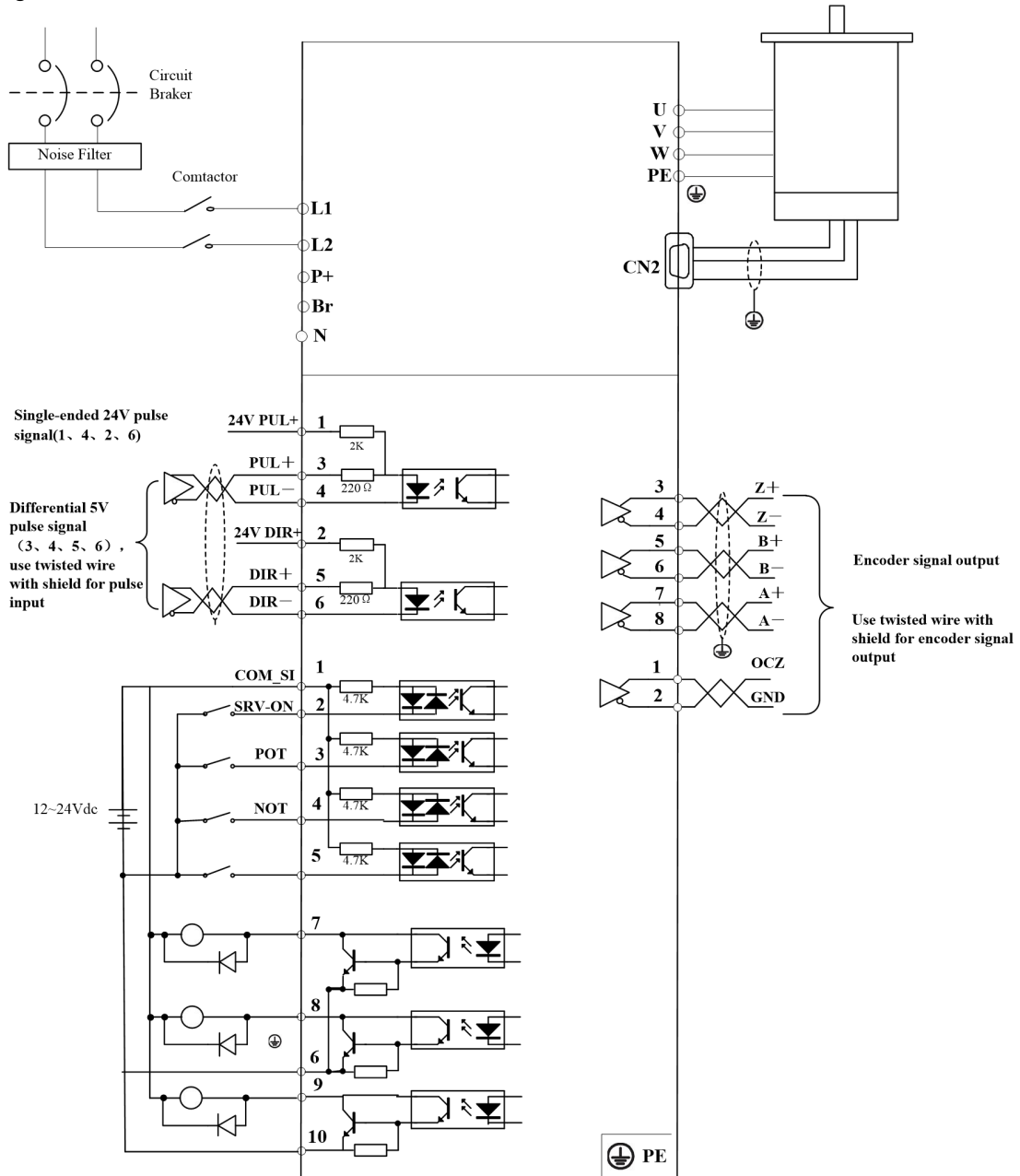
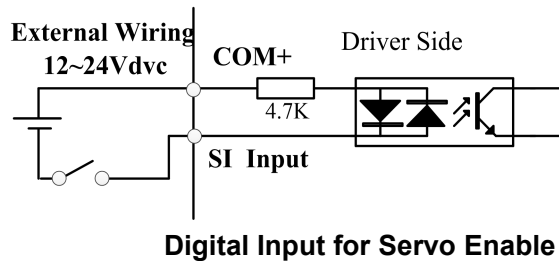


Figure 8-1 Position Mode Typical Wiring Diagram



Digital Input for Servo Enable

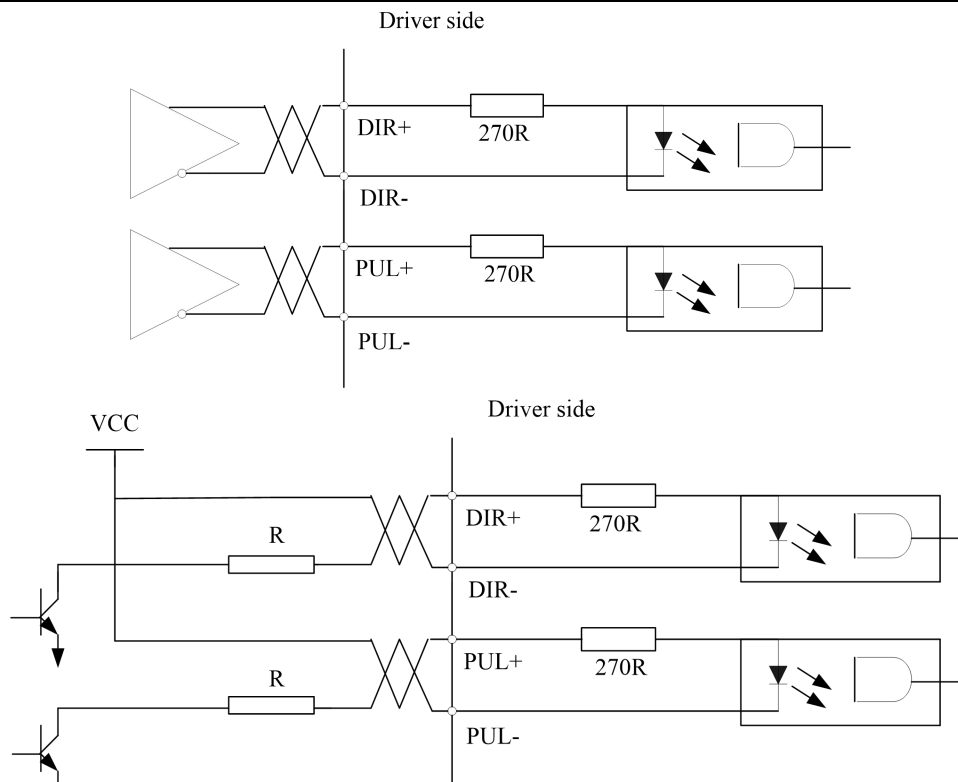


Figure 8-2 CN1 and CN2 Signal Wiring in Position Control Mode

◆ Operation Steps

1. Connect terminal CN1.
2. Connect DC12V to 24V to digital input SI1 to ENABLE drive (the COM + and SI1).
3. Power on the drive.
4. Confirm the value of the parameters, and write to the EEPROM and turn off/on the power (of the drive)
5. Connect the Srv_on input to bring the drive to servo-on status and energize the motor.
6. Enter low-frequency pulse and direction signal to run the motor at low speed.
7. Check the motor rotational speed at monitor mode whether, ("d01SP "),
Rotational speed is as per the setup or not, and
The motor stops by stopping the command (pulse) or not
if the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch ").

The drive is widely used for precise positioning in position control mode.

Related parameters setup of position mode

8.1.1 Pulse command and rotation direction

The positional commands of the following 3 types (pulse train) are available.

- ◆ A, B phase pulse
- ◆ Positive direction pulse/negative direction pulse
- ◆ Pulse + direction

| | | | | | | | |
|--|-----------|--|--------|-----|---------|----------|--|
| Pr0.06* | Name | Command Pulse Rotational Direction Setup | | | Mode | P | |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Data Type | 16bit | Access | R/W | Address | 000DH | |
| | Repower | o | | | | | |
| Set command pulse input rotate direction, command pulse input type | | | | | | | |
| Pr0.07* | Name | Command Pulse Input Mode Setup | | | Mode | P | |
| | Range | 0~3 | Unit | — | Default | 1 | |
| | Data Type | 16bit | Access | R/W | Address | 000FH | |

| Repower | | o | | | | | | | |
|--|-------------------------|---|---------------------|----------------------------|----------------------------|-----|-----|-----|--|
| Pr0.06 | Pr0.07 | Command Pulse Format | Signal | Positive Direction Command | Negative Direction Command | | | | |
| 0 | 0 or 2 | 90 phase difference 2-phase pulse(A phase +B phase) | Pulse sign | | | | | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | | | | | |
| | 3 | Pulse + sign | Pulse sign | | | | | | |
| 1 | 0 or 2 | 90 phase difference 2 phase pulse(A phase +B phase) | Pulse sign | | | | | | |
| | 1 | Positive direction pulse + negative direction pulse | Pulse sign | | | | | | |
| | 3 | Pulse + sign | Pulse sign | | | | | | |
| Command pulse input signal allow largest frequency and smallest time width | | | | | | | | | |
| PULS/SIGN Signal Input I/F | | Permissible Max. Input Frequency | Smallest Time Width | | | | | | |
| | | | t1 | t2 | t3 | t4 | t5 | t6 | |
| Pulse series interface | Long distance interface | 500kpps | 2 | 1 | 1 | 1 | 1 | 1 | |
| | Open-collector output | 200kpps | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | |

8.1.2 Electronic gear function

The function multiplies the input pulse command from the host controller by the predetermined dividing or multiplying factor and applies the result to the position control section as the positional command. By using this function, desired motor rotations or movement distance per unit input command pulse can be set.

| | | | | | | | | |
|--------|-----------|---|--------|-----|---------|----------------|---|---|
| Pr0.08 | Name | Command pulse counts per one motor revolution | | | Mode | P | S | T |
| | Range | 0-8388608 | Unit | P | Default | 0 | | |
| | Data Type | 32bit | Access | R/W | Address | 0010H 0011H | | |
| | Repower | o | | | | | | |

Set the command pulse that causes single turn of the motor shaft.

- 1) If Pr008≠0 , the actual motor rotation turns = pulse number / Pr0.08
- 2) If Pr008 = 0, Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic gear valid.

| | | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|----------------|--|--|
| Pr0.09 | Name | 1st numerator of electronic gear | | | Mode | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Data Type | 32bit | Access | R/W | Address | 0012H 0013H | | |
| | Repower | o | | | | | | |

Set the numerator of division/multiplication operation made according to the command pulse input.

| | | | | | | |
|---------------|-----------|------------------------------------|--------|-----|---------|----------------|
| Pr0.10 | Name | 1st denominator of electronic gear | | | Mode | P |
| | Range | 1~1073741824 | Unit | — | Default | 1 |
| | Data Type | 32bit | Access | R/W | Address | 0014H 0015H |
| | Repower | o | | | | |

Set the denominator of division/multiplication operation made according to the command pulse input.

| | | |
|------------------|------------------|---|
| Pr0.09 | Pr0.10 | Command division/multiplication operation |
| 1-10737 41824 | 1-10737 41824 | |

1. Settings:
 - 1)The drive input command pulse number is X
 - 2)The pulse number of encoder after frequency division and frequency doubling is Y
 - 3)The number of pulses per revolution of the motor encoder is Z
 - 4)Number of turns of motor is W
2. Calculations:
 - 1)Y=X* Pr0.09 / Pr0.10
 - 2)17Bit encoder: Z=2¹⁷ = 131072
 - 23Bit encoder: Z=2²³ = 8388608

8.1.3 Position command filter

To make the positional command divided or multiplied by the electronic gear smooth, set the command filter.

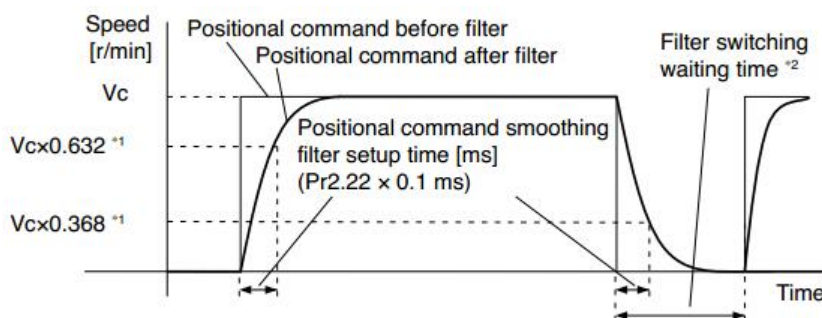
In the following situations, it is necessary to consider adding position command filtering:

- (1) The position instruction output by the controller is not accelerated or decelerated;
- (2) Low command pulse frequency;
- (3) when the electronic gear ratio is more than 10 times.

The position command filter can make the position command smoother and the motor rotation more stable.

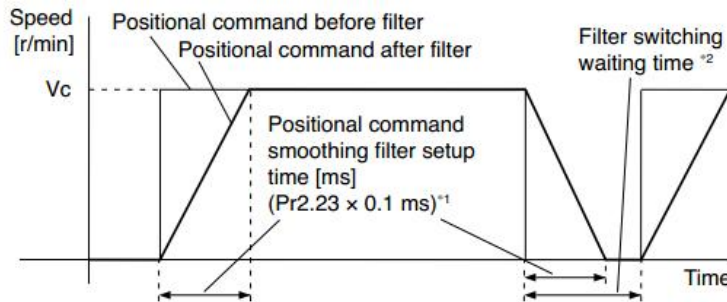
| | | | | | | |
|---------------|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr2.22 | Name | positional command smoothing filter | | | Mode | P |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022DH |
| | Repower | o | | | | |

- Set up the time constant of the 1st delay filter in response to the positional command.
- When a square wave command for the target speed Vc is applied ,set up the time constant of the 1st delay filter as shown in the figure below



| | | | | | | |
|---------------|-----------|-------------------------------|--------|-------|---------|----------|
| Pr2.23 | Name | positional command FIR filter | | | Mode | P |
| | Range | 0~10000 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022FH |
| | Repower | o | | | | |

- Set up the time constant of the 1st delay filter in response to the positional command.
- When a square wave command for the target speed V_c is applied, set up the V_c arrival time as shown in the figure below.



8.1.4 Motor encoder pulse output

The information on the amount of movement can be sent to the host controller in the form of A and B phase pulses from the servo drive.

| | | | | | | | | |
|-----------------|-----------|--|--------|-----|---------|----------|----------|----------|
| Pr0.11 * | Name | Output pulse counts per one motor revolution | | | Mode | P | S | T |
| | Range | 1~2500 | Unit | P/r | Default | 2500 | | |
| | Data Type | 16bit | Access | R/W | Address | 0017H | | |
| | Repower | o | | | | | | |

For example, if this parameter is set to 1000, it means that the frequency division output signal of the encoder outputs 4000 pulses per turn.

| | | | | | | | | |
|-----------------|-----------|--------------------------------|--------|-----|---------|----------|----------|----------|
| Pr0.12 * | Name | reversal of pulse output logic | | | Mode | P | S | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0019H | | |
| | Repower | o | | | | | | |

You can set up the B phase logic and the output source of the pulse output. With this parameter, you can reverse the phase relation between the A-phase pulse and B-phase pulse by reversing the B-phase logic.

< reversal of pulse output logic >

| Pr0.12 | B-phase Logic | CCW Direction Rotation | CW Direction Rotation |
|--------|---------------|------------------------|------------------------|
| 0 | Standard | A phase B phase | A phase B phase |
| 1 | Reverse | A phase B phase | A phase B phase |

8.1.5 Position complete output (INP)

The completion of positioning can be verified by the positioning complete output (INP). When the absolute value of the positional deviation counter at the position control is equal to or below the positioning complete

Range by the parameter, the output is ON. Presence and absence of positional command can be specified as one of judgment conditions.

| | | | | | | |
|--|-----------|----------------------------|--------|-----------|---------|-------|
| Pr4.31 | Name | Positioning complete range | | | Mode | P |
| | Range | 0~10000 | Unit | 0.0001rev | Default | 10 |
| | Data Type | 16bit | Access | R/W | Address | 043FH |
| | Repower | - | | | | |
| Set up the timing of positional deviation at which the positioning complete signal (INP1) is output. | | | | | | |

| | | | | | | |
|--------|-----------|-----------------------------------|--------|--------------|---------|-------|
| Pr4.32 | Name | Positioning complete output setup | | | Mode | P |
| | Range | 0~3 | Unit | command unit | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0441H |
| | Repower | - | | | | |

Select the condition to output the positioning complete signal (INP1).

| Setup value | Action of positioning complete signal |
|-------------|--|
| 0 | The signal will turn on when the positional deviation is smaller than Pr4.31 [positioning complete range]. |
| 1 | The signal will turn on when there is no position command and position deviation is smaller than Pr4.31 [positioning complete range]. |
| 2 | The signal will turn on when there is no position command, the zero-speed detection signal is ON and the positional deviation is smaller than Pr4.31 [positioning complete range]. |
| 3 | The signal will turn on when there is no position command and the positional deviation is smaller than Pr4.31 [positioning complete range]. Then holds "ON" states until the next position command is entered. Subsequently, ON state is maintained until Pr4.33 INP hold time has elapsed. After the hold time, INP output will be turned ON/OFF according to the coming positional command or condition of the positional deviation. |

| | | | | | | |
|--------|-----------|---------------|--------|-----|---------|-------|
| Pr4.33 | Name | INP hold time | | | Mode | P |
| | Range | 0~30000 | Unit | 1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0443H |
| | Repower | - | | | | |

Set up the hold time when Pr 4.32 positioning complete output setup=3

| Setup value | State of Positioning complete signal |
|-------------|--|
| 0 | The hold time is maintained definitely, keeping ON state until next positional command is received. |
| 1-30000 | ON state is maintained for setup time (ms) but switched to OFF state as the positional command is received during hold time. |

And the output port should be assigned for "INP", for details of these parameters, refer to PA_410 – PA415.

8.2 Multi-turn absolute encoder

The absolute encoder remember position, When the absolute encoder is used for the first time, user need to move to the home position, and clear the absolute position value of multiple turns through the drive to set the home position. It is unnecessary to return to home position in the future (except for the absolute encoder alarm and other situations). It is recommended that the motor is stationary when reading the position to prevent dynamic data jump.

Notice: This function is only available for T6-RS***Z version.

8.2.1 Parameters setting

| Pr0.15 | Name | Absolute Encoder Setup | | | Mode | P | S | T |
|--------|-----------|------------------------|--------|-----|---------|-------|---|---|
| | Range | 0~15 | Unit | | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 001FH | | |
| | Repower | o | | | | | | |

How to use:

0: Incremental position mode:

The encoder is used as a incremental encoder, and the position retentive at power failure is not supported.

1: Absolute position linear mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is applicable to the scenario where the travel range of device load is fixed and the encoder multi-turn data dose not overflow.

2: Absolute position rotation mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported.. It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than $0 \sim (\text{Pr}6.63+1)$

5: Clean multi-turn alarm, and open multi-turn absolute function.

It will become 1 when normal clearance, if it's still 5 after 3seconds, please deal with according to 153 alarm processing.

9: Clear multi-turn position and reset multi-turn alarm, open multi-turn absolute function.

It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.

Notes: Set to 9 after homing process finished and servo disabled. valid after repower.

| Pr6.63 | Name | Absolute multi-turn position upper bound | | | Mode | P | S | T |
|--------|-----------|--|--------|----------|---------|-------|---|---|
| | Range | 0~32766 | Unit | Rotation | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 067FH | | |
| | Repower | o | | | | | | |

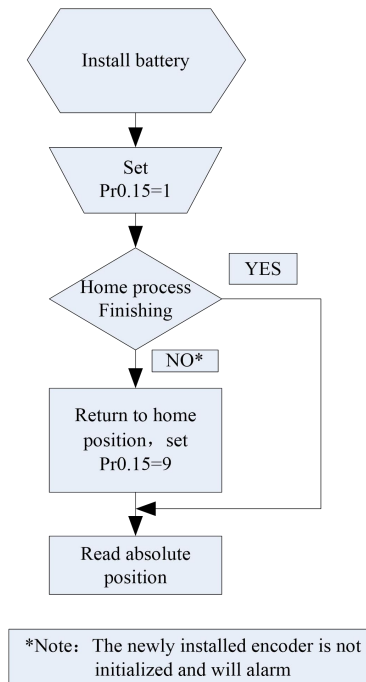
While Pr0.15=2: Absolute position rotation mode:

The encoder is used as an absolute encoder, and the position retentive at power failure is supported..

It is mainly applicable to the scenario where the load travel range is not limited and the number of motor single-direction revolution is less than $0 \sim (\text{Pr}6.63+1)$

8.2.2 Read absolute position

1、Steps:



(1) Firstly, select the multi-turns absolute encoder motor, install the battery, and confirm whether the drive version supports multi-turns absolute encoder motor;

(2) Set Pr0.15=1 to open absolute encoder. If it is the first time of installation, the drive will alarm Err153. The reason is that the multi-turn position is invalid due to the newly installed battery of the motor. At this time, it is necessary to return to the home position of the machine and perform the multi-turn position reset operation (see multi-turn position reset).

(3) When the absolute value origin is set and there is no battery fault, the alarm will be cancelled

(4) Finally, the user can read the absolute position, even if the power off the position will not lost.

2、Read absolute position

The absolute encoder counting mode is that when the motor rotates clockwise, the number of turns is defined as negative; while motor rotates counterclockwise the number of turns is defined as positive. The maximum rotation number is -32768 to +32767. After the number of turns is out of range, if the number of turns is 32767 counterclockwise, it will reverse to -32768, -32767... ; If the number of turns clockwise -32768, it will reverse to 32767, 32766...

Absolute encoder read mode: read 6064h data object

3、Clear absolute position

Before clear absolute position, the machine needs to return to the home point. After clear absolute position, the absolute position =0, the single-turn position remains unchanged, and the absolute value of the encoder is cleared to alarm

Set Pr0.15=9: multi-turn zero clearing and reset multi-turn alarm, open multi-turn absolute function. It will become 1 when normal clearance, if it's still 9 after 3seconds, please deal with according to 153 alarm processing. Please remember to do mechanical homing.

8.2.3 Alarm

1、Introductions

The multi-turns absolute encoder alarm function can determine whether the absolute encoder is valid or not, such

as battery under voltage or power failure, encoder fault, etc., users can judge the absolute encoder alarm through bus alarm output, IO alarm output, and drive operation panel alarm. At this time, the controller should stop operation immediately, and the absolute motion operation can only be carried out after the alarm is eliminated

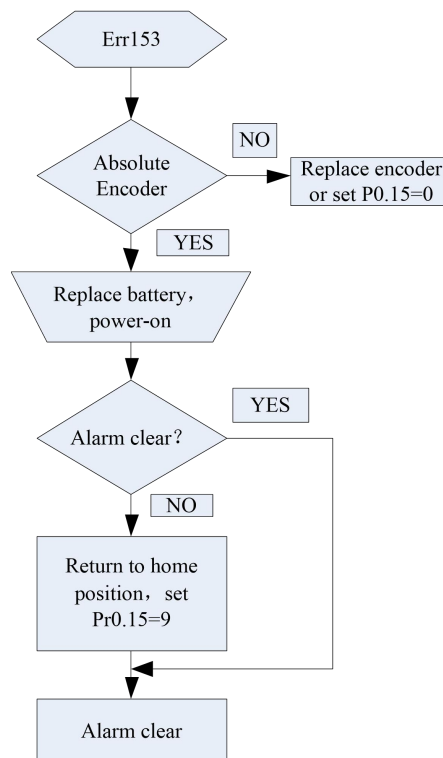
2、 Alarm output

Absolute encoder alarm can be displayed by the panel Err153, IO output alarm signal, or read alarm information by communication

3、 The drive sends an absolute encoder alarm Err153, the main situation is as follows:

- (1) When the absolute encoder is used for the first time, absolute encoder alarm will be generated due to the new battery of the motor. At this time, it is necessary to return to the home point and perform multi-turn zero clearing operation
- (2) When the battery under voltage is lower than 3.2v, absolute encoder alarm will be generated by the drive. At this time, the alarm will be automatically eliminated after the battery is recharged by replacing the battery
- (3) When the battery voltage is lower than 2.5v, or the battery has a power failure, the absolute encoder alarm will be generated. Even if the battery is replaced, the alarm cannot be eliminated. At this time, the return to the home point and multi-turn zero clearing operation should be performed

4、 Alarm processing flow chart



8.3 Security Features

8.3.1 Speed limit

| | | | | | | | | |
|-----------------|-----------|----------------------------------|--------|-------|---------|----------|----------|----------|
| Pr3.24 * | Name | Motor rotate maximum speed limit | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 3000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0331H | | |
| | Repower | - | | | | | | |

Set up motor running max rotate speed, but can't be exceeded motor allowed max rotate speed.

8.3.2 BRK-OFF output

This function can be configured by set digital SO output functions allocation. refer to IO Pr4.10 parameter description. When the enable and time meet the set conditions, the digital output IO port can output ON.

| | | | | | | | | |
|---------------|-----------|---|--------|-----|---------|----------|----------|----------|
| Pr4.37 | Name | Mechanical brake action setting when stopping | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044BH | | |
| | Repower | - | | | | | | |

Motor brake delay time setup, mainly used to prevent servo on “galloping “phenomenon. Set up the time from when the brake release signal(BRK-OFF) turns off to when the motor is de-energized (servo-free),when the motor turns to servo-off while the motor is at stall

- Set up to prevent a micro-travel/drop motor (work) due to the action delay (tb) of the brake.
- Ni After setting up Pr4.37>=tb, then compose the sequence so as the turns to servo-off after the brake is actually activated.

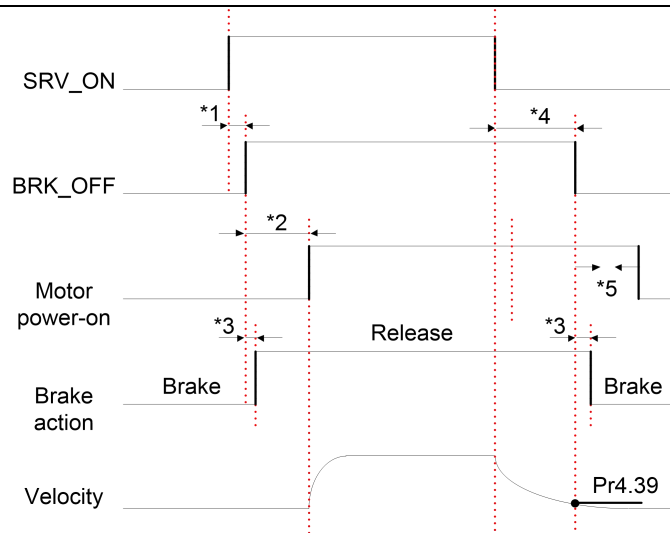
| | | | | | | | | |
|---------------|-----------|---------------------------------|--------|-----|---------|----------|----------|----------|
| Pr4.38 | Name | Mechanical brake action setting | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044DH | | |
| | Repower | - | | | | | | |

Mechanical brake start delay time setup, mainly used to prevent servo off “galloping “phenomenon. Set up time from when detecting the off of servo-on input signal(SRV-ON)is to when external brake release signal(BRK-OFF)turns off, while the motor turns to servo off during the motor in motion

- Set up to prevent the brake deterioration due to the motor
- At servo-OFF during the motor is running , tb of the right fig will be a one of either Pr4.38 setup time, or lapse till the motor speed falls below setup speed

| | | | | | | | | |
|---------------|-----------|---------------------------|--------|-----|---------|----------|----------|----------|
| Pr4.39 | Name | Brake release speed setup | | | Mode | P | S | T |
| | Range | 30~3000 | Unit | 1ms | Default | 30 | | |
| | Data Type | 16bit | Access | R/W | Address | 044FH | | |
| | Repower | - | | | | | | |

Set up the speed timing of braking output checking during operation



Notice:

- *1: The delay time between SRV_ON and BRK_OFF is less than 500ms;
- *2: Time setting in Pr4.38;
- *3: The delay time between the BRK_OFF signal output and the actual brake release action, which depends on the hardware characteristics of the motor brake;
- *4: The smaller value of Pr4.37 and Pr4.39;

8.3.3 Servo stop mode

| | | | | | | | | |
|---|-----------|--|--------|-----|---------|----------|----------|----------|
| Pr5.06 | Name | Servo stop mode | | | Mode | P | S | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 050DH | | |
| | Repower | - | | | | | | |
| Specify the status during deceleration and after stop, after servo-off. | | | | | | | | |
| Setup value | | Servo stop mode | | | | | | |
| 0 | | When servo-disable signal active, servo-disable after the speed reduced less than Pr4.39 | | | | | | |
| 1 | | When servo-disable signal active, servo-disable right away, motor in free-run mode. | | | | | | |

8.3.4 Emergency stop function

| | | | | | | | | |
|---|-----------|---------------------------------|--------|-----|---------|----------|----------|----------|
| Pr5.11 * | Name | Torque setup for emergency stop | | | Mode | P | S | T |
| | Range | 0~500 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 051H | | |
| | Repower | - | | | | | | |
| Set up the torque limit at emergency stop When setup value is 0, the torque limit for normal operation is applied. | | | | | | | | |

8.4 Inertia ratio identification

| | | | | | | | | |
|---------------|-----------|---------------|--------|-----|---------|----------|----------|----------|
| Pr0.04 | Name | Inertia ratio | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | % | Default | 250 | | |
| | Data Type | 16bit | Access | R/W | Address | 0009H | | |
| | Repower | - | | | | | | |

You can set up the ratio of the load inertia against the rotor(of the motor)inertia.

Pr0.04=(load inertia/rotate inertia)×100%

Notice:

If the inertia ratio is correctly set, the setup unit of Pr1.01 and Pr1.06 becomes (Hz). When the inertia ratio of Pr0.04 is larger than the actual value, the setup unit of the velocity loop gain becomes larger, and when the inertia ratio of Pr0.04 is smaller than the actual value, the setup unit of the velocity loop gain becomes smaller..

8.4.1 On-line inertia ratio identification

The motor is operated by the controller, and the motor speed is above 400rpm. The running stroke has obvious acceleration, uniform speed and deceleration process, and the load inertia ratio can be tested by running 2-3 times continuously. The inertia ratio of the test is viewed in Drive Operating Data Monitor-> d16Jr. Set the monitor value minus 100 into Pr0.04..

8.4.2 Off-line inertia ratio identification

Pre-conditions: 1、 servo disable. 2、 Positive limit and negative limit invalid

Steps:

- 1、 Set the trial running speed Pr6.04, and the setting of Pr6.04 should not be too large
- 2、 Enter auxiliary inertia ratio identification function on the drive panel, AF_GL
- 3、 Press ENT once to enter operation, display “G---”
- 4、 Press ◀ once, display “StUon”
- 5、 Press ▲ once, motor start running to identification
- 6、 After finishing, display G XXX, which represents the measured inertia ratio value
- 7、 Set the monitor value minus 100 into Pr0.04.

8.4.3 Motion Studio inertia ratio identification

This inertia ratio identification function also added in Motion Studio configuration software.

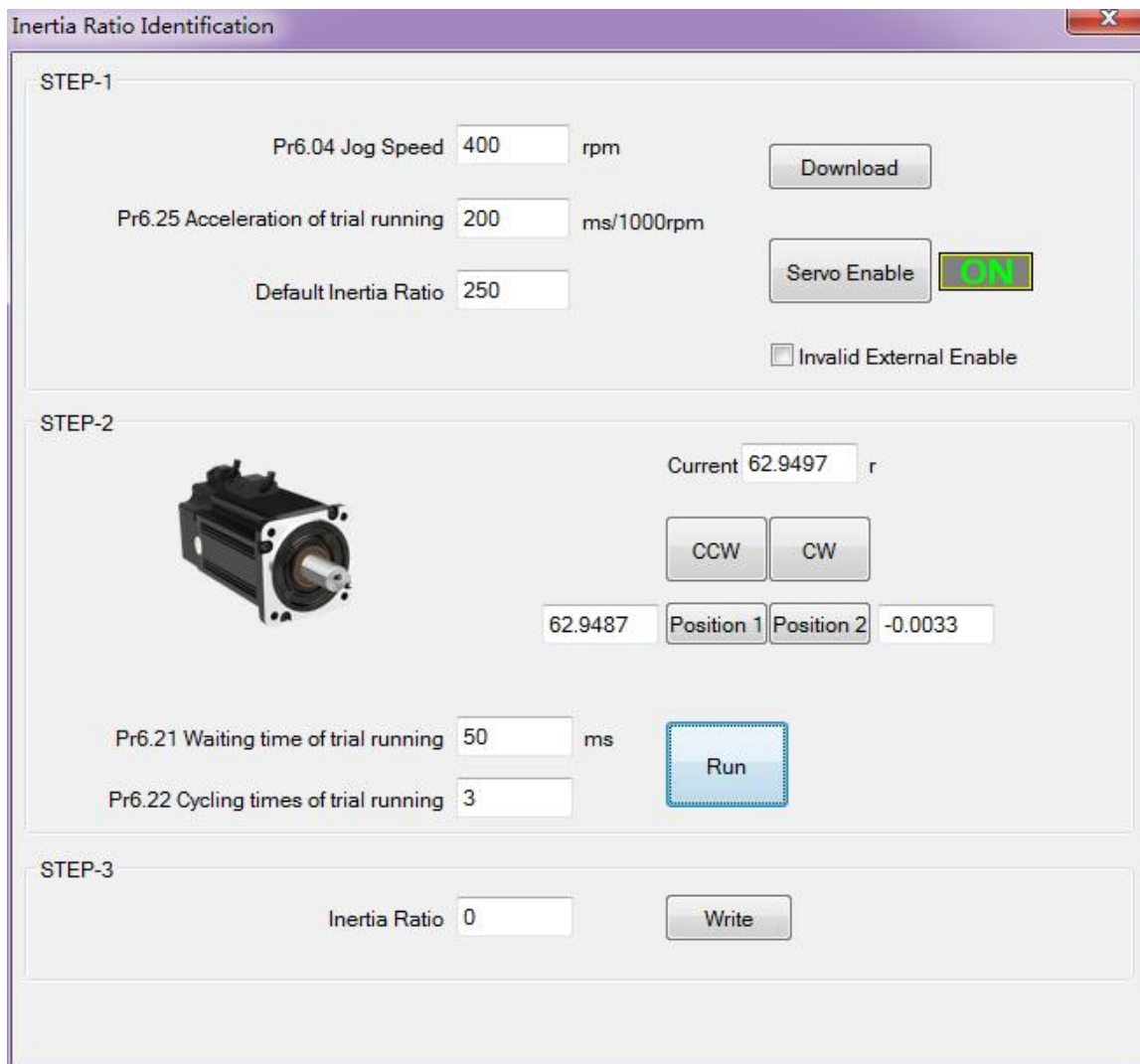
Pre-conditions: 1、 Servo disable. 2、 Positive limit and negative limit invalid

Steps:

- 1、 Set the Jog speed Pr6.04, and the setting should not be too large(600~1000rpm is recommend)
Set the Acc Pr6.25(50~100 ms/1000rpm is recommend)
Set the Default Inertia Ratio.

Download these settings, then **Servo Enable**.

- 2、 Click “CCW” to make motor run to CCW direction, click “Position 1” to save the position limit 1
Click “CW” to make motor run to CW direction, click “Position 2” to save the position limit 2
Click “Run” to start Inertia ratio identification.



3、 After finishing, Click“Write”to save the Inertia ratio identification result.

8.5 Vibration Suppression

Specific resonance frequency can be obtained from PC configuration software according to waveform monitoring, and filter frequency can be set to effectively suppress the oscillation ripple of a certain frequency in the current instruction.

The width of the notch is the ratio of the frequency of the notch center at a depth of 0 to the frequency range width of the attenuation rate of -3db.

The depth of the trap is: when the set value is 0, the input of the center frequency is completely disconnected; when the set value is 100, it represents the ratio of input and output that are completely passed

How to use:

1. Set Pr2.00=1
2. Decrease Pr0.03 to get higher stiffness, higher position loop gain and velocity loop gain. Decrease Pr0.03 gradually, while abnormal sound or oscillation occurred, decreases the current value by 2.
3. Execute movement by controller or Motion Studio, drive will record notch frequency automatically.
4. Upload the drive parameters, the record notch frequency saved in Pr2.07.
Read the value of Pr2.07, and set this value into Pr2.01. Then reset Pr2.07 to 2000.
5. Saving parameters setting.

| Pr2.00 | Name | Adaptive filter mode setup | | | Mode | P | S | | | | | | | | | | | | | | | | |
|--|---|---|--------|-----|---------|-------|---|--|-------------|---------|--|---|--------------------------|--|---|--|---|---|---|--|-----|----------|---|
| | Range | 0~4 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 0201H | | | | | | | | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | | | | | | | | |
| <p>Set up the resonance frequency to be estimated by the adaptive filter and the special the operation after estimation.</p> <table border="1"> <thead> <tr> <th>Setup value</th> <th colspan="2">Details</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Adaptive filter: invalid</td> <td>Parameters related to the 3rd and 4th notch filter hold the current value.</td> </tr> <tr> <td>1</td> <td>Adaptive filter, 1 filter is valid, one time</td> <td>One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation.</td> </tr> <tr> <td>2</td> <td>Adaptive filter, 1 filter is valid, It will be valid all the time</td> <td>One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance.</td> </tr> <tr> <td>3-4</td> <td>Reserved</td> <td>-</td> </tr> </tbody> </table> | | | | | | | | | Setup value | Details | | 0 | Adaptive filter: invalid | Parameters related to the 3rd and 4th notch filter hold the current value. | 1 | Adaptive filter, 1 filter is valid, one time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation. | 2 | Adaptive filter, 1 filter is valid, It will be valid all the time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance. | 3-4 | Reserved | - |
| Setup value | Details | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Adaptive filter: invalid | Parameters related to the 3rd and 4th notch filter hold the current value. | | | | | | | | | | | | | | | | | | | | | |
| 1 | Adaptive filter, 1 filter is valid, one time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated based on adaptive performance. After updated, Pr2.00 returns to 0, stop self-adaptation. | | | | | | | | | | | | | | | | | | | | | |
| 2 | Adaptive filter, 1 filter is valid, It will be valid all the time | One adaptive filter is valid, parameters related to the 3rd notch filter will be updated all the time based on adaptive performance. | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | Reserved | - | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | |
|--------|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr2.01 | Name | 1st notch frequency | | | Mode | P | S | T |
| | Range | 50~2000 | Unit | Hz | Default | 2000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0203H | | |
| | Repower | - | | | | | | |

Set the center frequency of the 1st notch filter
Notice: the notch filter function will be invalid by setting up this parameter to “2000”.

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.02 | Name | 1st notch width selection | | | Mode | P | S | T |
| | Range | 0~20 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 0205H | | |
| | Repower | - | | | | | | |

Set the width of notch at the center frequency of the 1st notch filter.
Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation.

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.03 | Name | 1st notch depth selection | | | Mode | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0207H | | |
| | Repower | - | | | | | | |

Set the depth of notch at the center frequency of the 1st notch filter.
Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.

| | | | | | | | | |
|--|-----------|---------------------------|--------|-----|---------|-------|---|---|
| Pr2.04 | Name | 2nd notch frequency | | | Mode | P | S | T |
| | Range | 50~2000 | Unit | Hz | Default | 2000 | | |
| | Data Type | 16bit | Access | R/W | Address | 0209H | | |
| | Repower | - | | | | | | |
| Set the center frequency of the 2nd notch filter Notice: the notch filter function will be invalid by setting up this parameter to “2000”. | | | | | | | | |
| Pr2.05 | Name | 2nd notch width selection | | | Mode | P | S | T |
| | Range | 0~20 | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 020BH | | |
| | Repower | - | | | | | | |
| Set the width of notch at the center frequency of the 2nd notch filter. Notice: Higher the setup, larger the notch width you can obtain. Use with default setup in normal operation. | | | | | | | | |
| Pr2.06 | Name | 2nd notch depth selection | | | Mode | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 020DH | | |
| | Repower | - | | | | | | |
| Set the depth of notch at the center frequency of the 2nd notch filter. Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain. | | | | | | | | |

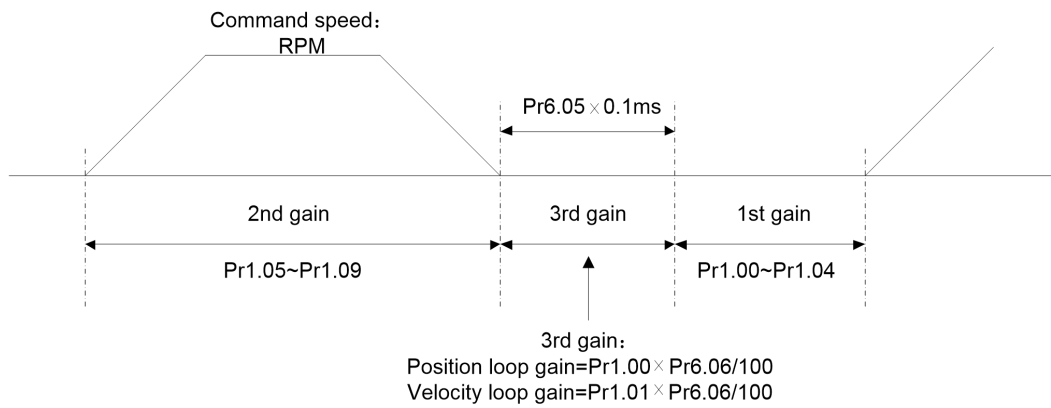
8.6 Third gain switching

In addition to the conventional switch between the first and second gain, add the third gain switch function to shorten the positioning and setting time.

| | | | | | | | | |
|---|-----------|--|--------|-------|---------|-------|--|--|
| Pr6.05 | Name | Position 3 rd gain valid time | | | Mode | P | | |
| | Range | 0~1000 | Unit | 0.1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060BH | | |
| | Repower | - | | | | | | |
| Set up the time at which 3 rd gain becomes valid. When not using this parameter, set PR6.05=0, PR6.06=100 This is valid for only position control/full-closed control. | | | | | | | | |

| | | | | | | | | |
|---|-----------|--|--------|------|---------|-------|--|--|
| Pr6.06 | Name | Position 3 rd gain multiplication | | | Mode | P | | |
| | Range | 0~1000 | Unit | 100% | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060DH | | |
| | Repower | - | | | | | | |
| Set up the 3 rd gain by multiplying factor of the 1 st gain $3\text{rd gain} = 1\text{st gain} * \text{Pr6.06}/100.$ | | | | | | | | |

This function is only effective for position control. When Pr6.06 is set to non-0 value, the third gain function will be turned on. Pr6.05 is set to specify the value of the third gain. When switching from the second gain to the first gain, there will be a transition from the third gain. The switching time is set as Pr1.19. Take Pr1.15=7(with or without position instruction as the first and second gain of conditional switching) as an example to illustrate the figure below:



8.7 Friction torque compensation

| | | | | | | | | |
|--|-----------|------------------------------------|--------|-----|---------|-------|---|---|
| Pr6.07 | Name | Torque command additional value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 060FH | | |
| | Repower | - | | | | | | |
| Pr6.08 | Name | Positive torque compensation value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0611H | | |
| | Repower | - | | | | | | |
| Pr6.09 | Name | Negative torque compensation value | | | Mode | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0613H | | |
| | Repower | - | | | | | | |
| These three parameters may apply feed forward torque superposition directly to torque command. | | | | | | | | |

8.8 Regenerative resistor setting

When the torque of the motor is opposite to the direction of rotation (such as deceleration, z-axis falling down, etc.), energy will feedback to the drive. At this time, the energy feedback received by the capacitor in the drive, which makes the voltage of the capacitor rise. When it rises to a certain voltage value, the excess energy needs to be consumed by the regenerative resistance.

| | | | | | | | | |
|--|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| Pr0.16 | Name | External regenerative resistance | | | Mode | P | S | T |
| | Range | 10~50 | Unit | Ω | Default | 100 | | |
| | Data Type | 16bit | Access | R/W | Address | 0021H | | |
| | Repower | - | | | | | | |
| Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current. | | | | | | | | |

| | | | | | | | | |
|--|-----------|--|--------|-----|---------|-------|---|---|
| Pr0.17 | Name | External regenerative resistor power value | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | W | Default | 20 | | |
| | Data Type | 16bit | Access | R/W | Address | 0023H | | |
| | Repower | - | | | | | | |
| Set Pr.0.16 and Pr.0.17 to confirm the threshold value of the discharge loop to give alarm for over current. | | | | | | | | |

8.9 Velocity Control

The drive is widely used for accuracy speed control in velocity control mode. You can control the speed according to the speed command set in servo drive.

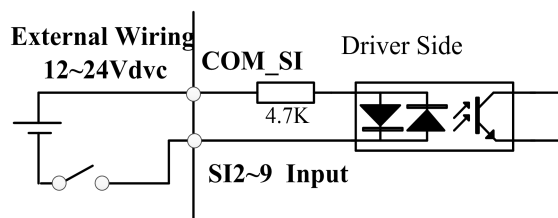
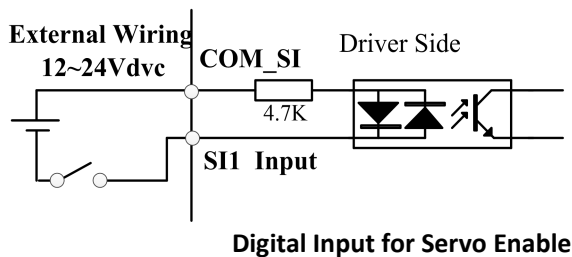
Notice: You must do inspection before position control test run.

8.9.1 Velocity mode control by internal speed command

Table 8.3 Parameter Setup of Velocity Controlled by analog input

| No | Parameter | Name | input | Setup value | Unit |
|----|-----------|--|-------|----------------|-------------|
| 1 | Pr0.01 | Control mode setup | / | 1 | / |
| 2 | Pr3.12 | Acceleration time setup | / | User-specified | millisecond |
| 3 | Pr3.13 | Deceleration time setup | / | User-specified | millisecond |
| 4 | Pr3.14 | Sigmoid acceleration/deceleration time setup | / | User-specified | millisecond |
| 7 | Pr3.01 | Speed Command direction selection | / | User-specified | / |

Wiring Diagram



You can control the speed by using the internal speed command set to the parameter. By using the internal speed command selection 1, 2, 3(INTSPD 1, 2, 3), you can select best appropriate one

| | | | | | | |
|---------------|-----------|---|--------|-----|---------|----------|
| Pr3.00 | Name | Speed setup, Internal /External switching | | | Mode | S |
| | Range | 0~3 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0301H |
| | Repower | - | | | | |

This drive is equipped with internal speed setup function so that you can control the speed with contact inputs only.

| Setup value | Speed setup method |
|-------------|--|
| 1 | Internal speed command 1st to 4th speed(PR3.04-PR3.07) |
| 2 | Internal speed command 1st to 3rd speed (PR3.04-PR3.06), Analog speed command(SPR) |
| 3 | Internal speed command 1st to 8th speed (PR3.04-PR3.11) |

<relationship between Pr3.00 Internal/External switching speed setup and the internal command speed selection 1-3 and speed command to be selected>

| Setup value | 1 st selection of internal command speed (INTSPD1) | 2 nd selection of internal command speed (INTSPD2) | 3 rd selection of internal command speed (INTSPD3) | selection of Speed command |
|-------------|---|---|---|----------------------------|
| 1 | OFF | OFF | NO effect | 1st speed |
| | ON | OFF | | 2nd speed |
| | OFF | ON | | 3rd speed |
| | ON | ON | | 4th speed |
| 2 | OFF | OFF | NO effect | 1st speed |
| | ON | OFF | | 2nd speed |
| | OFF | ON | | 3rd speed |
| | ON | ON | | Analog speed command |
| 3 | The same as [Pr3.00=1] | | OFF | 1st to 4th speed |
| | OFF | OFF | ON | 5th speed |
| | ON | OFF | ON | 6th speed |
| | OFF | ON | ON | 7th speed |
| | ON | ON | ON | 8th speed |

| | | | | | | |
|--------|-----------|--------------------------|--------|-------|---------|-------|
| Pr3.04 | Name | 1st speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0309H |
| | Repower | - | | | | |
| Pr3.05 | Name | 2nd speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030BH |
| | Repower | - | | | | |
| Pr3.06 | Name | 3rd speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 030DH |
| | Repower | - | | | | |
| Pr3.07 | Name | 4th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 030FH |
| | Repower | - | | | | |
| Pr3.08 | Name | 5th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0311H |

| | | | | | | |
|--|-----------|--------------------------|--------|-------|---------|-------|
| | Repower | - | | | | |
| Pr3.09 | Name | 6th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0313H |
| | Repower | - | | | | |
| Pr3.10 | Name | 7th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Data Type | 16bit | Access | R/W | Address | 0315H |
| | Repower | - | | | | |
| Pr3.11 | Name | 8th speed of speed setup | | | Mode | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0317H |
| | Repower | - | | | | |
| Set up internal command speeds, 1st to 8th | | | | | | |

8.9.2 Speed command acceleration and deceleration

On the basis of speed command input, acceleration and deceleration are added as internal speed commands to control the speed. This function can be used when entering the ladder-like speed command and internal speed setting. In addition, the acceleration and deceleration function can also be used when the vibration is reduced by the change of acceleration

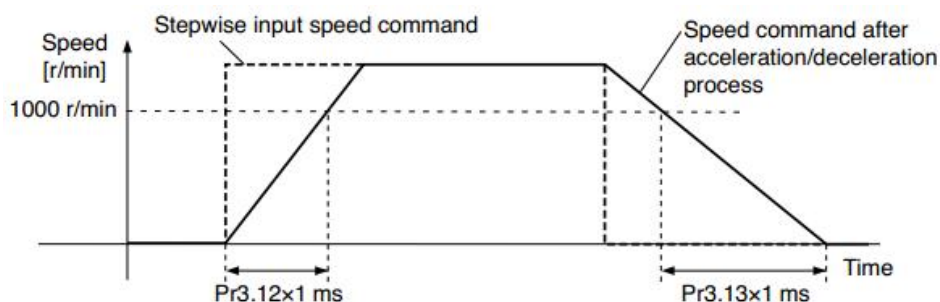
| | | | | | | |
|--------|-----------|-------------------------|--------|--------------------|---------|-------|
| Pr3.12 | Name | time setup acceleration | | | Mode | S |
| | Range | 0~10000 | Unit | Ms/ (1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 0319H |
| | Repower | - | | | | |
| Pr3.13 | Name | time setup deceleration | | | Mode | S |
| | Range | 0~10000 | Unit | Ms/ (1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 031BH |
| | Repower | - | | | | |

Set up acceleration/deceleration processing time in response to the speed command input. Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12 Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration time setup.

Assuming that the target value of the speed command is V_c (r/min), the time required for acceleration/deceleration can be computed from the formula shown below.

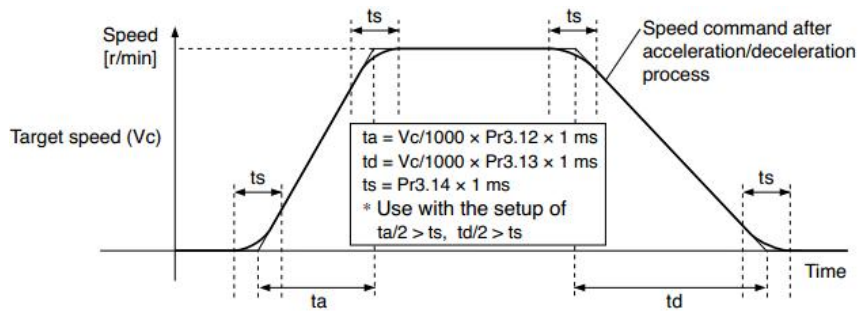
$$\text{Acceleration time (ms)} = V_c / 1000 * \text{Pr3.12} * 1\text{ms}$$

$$\text{Deceleration time (ms)} = V_c / 1000 * \text{Pr3.13} * 1\text{ms}$$



| | | | | | | |
|---------------|-----------|---|--------|-----|---------|-------|
| Pr3.14 | Name | Sigmoid acceleration /deceleration time setup | | | Mode | S |
| | Range | 0~1000 | Unit | ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 031DH |
| | Repower | o | | | | |

Set S-curve time for acceleration/deceleration process when the speed command is applied. According to Pr3.12 Acceleration time setup and Pr3.13 Deceleration time setup, set up sigmoid time with time width centering the inflection point of acceleration/deceleration.



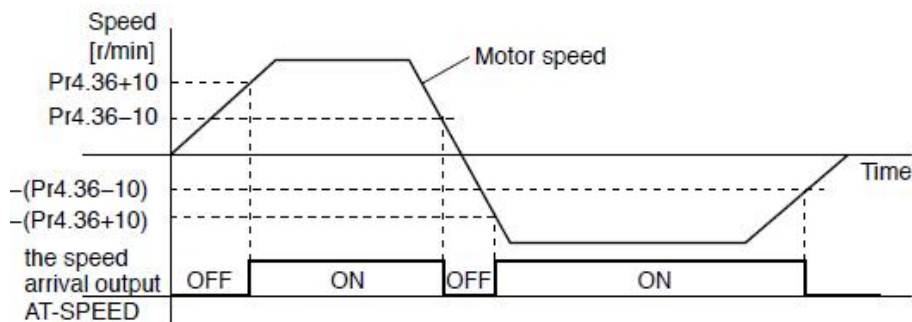
8.9.3 Attained Speed signal AT-SPEED output

When the motor speed reaches the speed set by the parameter PA_436 (setting of arrival speed), the output speed reaches the output (AT-SPEED) signal.

This function can be configured by IO output function parameters, as described in IO Pr4.10 parameters. When the speed meets the set conditions, the set corresponding output IO port can output ON.

| | | | | | | |
|---------------|-----------|-------------------------|--------|-------|---------|-------|
| Pr4.36 | Name | At-speed(Speed arrival) | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 1000 |
| | Data Type | 16bit | Access | R/W | Address | 0449H |
| | Repower | - | | | | |

Set the detection timing of the speed arrival output (AT-SPEED). When the motor speed exceeds this setup value, the speed arrive output (AT-SPEED) is output. Detection is associated with 10r/min hysteresis .



8.9.4 Speed coincidence output (V-COIN)

When the speed command (before acceleration and deceleration processing) is consistent with the motor speed, the output speed is consistent (V-COIN). If the difference between the speed command and the motor speed before acceleration and deceleration processing in the drive is within the parameter PA_435 (setting the same speed range), it is judged to be consistent.

This function can be configured by IO output function parameters, as described in IO Pr4.10 parameters. When the speed difference meets the setting conditions, the corresponding output IO port set can output ON.

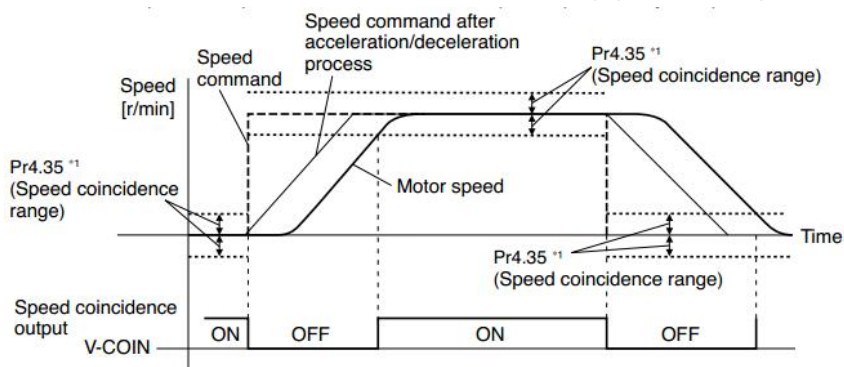
Among them, the in place signal of PV mode is synchronized with the v-coin signal

| | | | | | | |
|---------------|-----------|-------------------------|--------|-------|---------|-------|
| Pr4.35 | Name | Speed coincidence range | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 50 |
| | Data Type | 16bit | Access | R/W | Address | 0447H |
| | Repower | - | | | | |

Set the speed coincidence (V-COIN) output detection timing.
Output the speed coincidence (V-COIN) when the difference between the speed command and the motor speed is equal to or smaller than the speed specified by this parameter.

Because the speed coincidence detection is associated with 10 r/min hysteresis, actual detection range is as shown below.

- Speed coincidence output OFF -> ON timing (Pr4.35 -10) r/min
- Speed coincidence output ON -> OFF timing (Pr4.35 +10) r/min

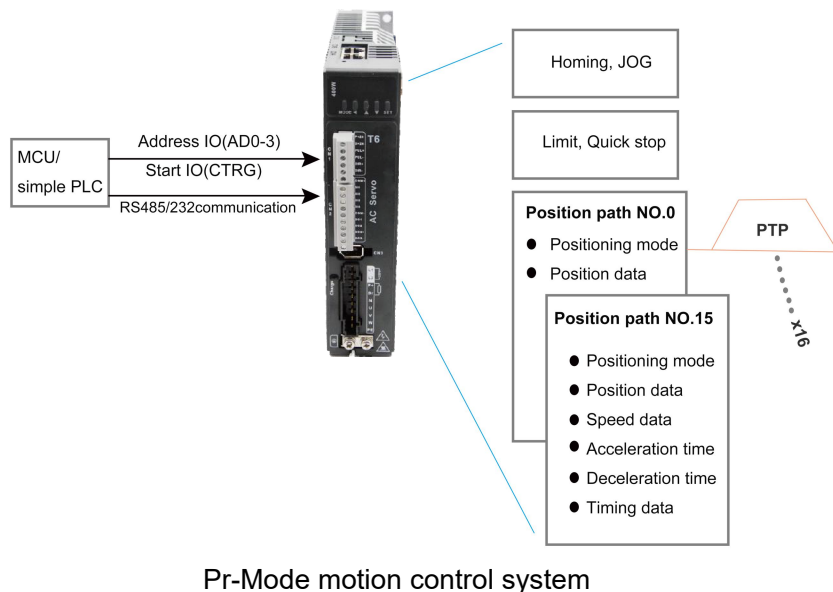
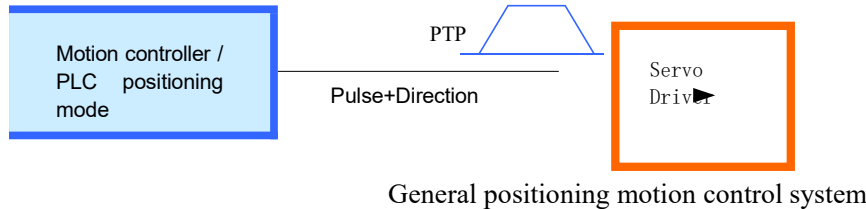


Chapter 9 Pr-Mode

9.1 Overview

PR is uniaxial motion control function which is controlled by procedure software. Mainly uniaxial motion command control, save the motion control function of the controller.

Notice: This function is only available for T6-RS***Z version.



9.1.1 Main function

Main function as below:

| PR function | Specification |
|---------------|--|
| Homing | <p>Set the homing position by homing process.</p> <ol style="list-style-type: none"> Homing method selectable. Limit switch homing, home switch homing, and manual homing all selectable, Homing direction settable Home deviation position settable. <p>Can be positioned to the specified position after homing.</p> <ol style="list-style-type: none"> Homing acceleration and deceleration settable <p>Remark: Cannot input external pulse during homing process!</p> |
| JOG | Trigger positive/negative movement by digital input, for debugging. |

| | |
|--|--|
| | <ul style="list-style-type: none"> 1、 Positive move, Negative move 2、 JOG speed and acceleration selectable |
| Position limit | <p>Protect machine by position limit.</p> <ul style="list-style-type: none"> 1、 Positive and negative limit switch. 2、 Software position limit setting. 3、 Position limit deceleration settable. <p>Remark: Software position limit effective after homing process finished.</p> |
| E-stop | Digital input E-stop signal, stop positioning movement. |
| Execute movement by digital input | <p>Select 16 motion path by digital input(ADD0~ADD3 allocation to digital input)</p> <p>Execute select motion path by digital input (CTRG allocation to digital input)</p> <ul style="list-style-type: none"> 1、 Motion path can be set as position mode, speed mode and homing mode. 2、 Digital input rising edge / double edge.. 3、 Support continuous positioning 4、 Up to 16 motion path 5、 Position, speed, acceleration/deceleration are settable. 6、 Pause time settable <p>Remark: Double edge trigger only effective for CTRG!</p> |
| Execute movement by RS485 | Execute movement by RS485 communication. |

Remark: (1) For PR mode, position command adopt unit: 10000P/r.

(2) PR position control mode, Pr0.01=6.

9.1.2 Installation wiring

485 communication terminal connection diagram:

| Port | | Pin | Signal |
|------------|--|-------|--------------|
| CN4 CN5 | | 1, 9 | RDO+(RS485+) |
| | | 2, 10 | RDO-(RS485-) |
| | | 3, 11 | / |
| | | 4, 12 | / |
| | | 5, 13 | / |
| | | 6, 14 | TXD(RS232) |
| | | 7, 15 | RXD(RS232) |
| | | 8, 16 | GND(RS232) |
| | | | PE |

IO terminal wiring and parameter configuration: Newly added IO of PR on the base of standard IO Relevant parameters:

| Parameters | Name | Specification |
|---------------|---------------------|--|
| Pr4.00-Pr4.08 | SI input selection | Specific of the 9 input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.15 | SO output selection | Specific of the 6 output terminals' function distribution, refer to functional allocation table. |

IO terminal functional allocation table:

| Input | | | | Output | | | |
|-----------------|--------|---------------|-----------------|---------------------|---------|---------------|-----------------|
| Signal name | Symbol | setup value | | Signal name | Symbol | setup value | |
| | | Normally open | Normally closed | | | Normally open | Normally closed |
| Trigger command | CTRG | 20h | A0h | Accomplish commands | CMD_OK | 20h | A0h |
| Homing signal | HOME | 21h | A1h | Accomplish path | MC_OK | 21h | A1h |
| Forced to stop | STP | 22h | A2h | Homing | HOME_OK | 22h | A2h |
| PositiveJOG | JOG+ | 23h | A3h | Torque limit | TQL | 06h | 86h |
| NegativeJOG | JOG- | 24h | A4h | | | | |
| Forward limit | PL | 25h | A5h | | | | |
| Reverse limit | NL | 26h | A6h | | | | |
| Home signal | ORG | 27h | A7h | | | | |
| Path address 0 | ADD0 | 28h | A8h | | | | |
| Path address 1 | ADD1 | 29h | A9h | | | | |
| Path address 2 | ADD2 | 2ah | Aah | | | | |
| Path address 3 | ADD3 | 2bh | Abh | | | | |
| Torque switch | TC-SEL | 09h | 89h | | | | |

Remark: CMD_OK means PR instruction is sent, maybe motor is not yet in place.

MC_OK means PR instruction is sent and motor is in place.

CTRG、HOME is edge triggering, but effective level need to last more than 1ms.

9.2 Pr-Mode Parameters

Pr-Mode parameters contain 8th and 9th parameters, 8th parameter is e-stop and control parameter, 9th parameters is store path table.

9.2.1 8th parameters specification

| Parameters | Name | Definition | RS485 address |
|------------|---------------------------|--|---------------|
| Pr8.00 | Pr control setting | Pr-Mode control function Bit0: 0: CTRG rising edge trigger 1: CTRG double edge trigger Bit1: 0: software limit invalid 1: software limitvalid Bit2: 0: not execute homing after power on 1: execute homing after power on Bit3: 0: Absolute encoder functioninvalid 1: Absolute encoder function valid | 0X6000 |
| Pr8.01 | Pr motion path number | Up to 16 paths | 0X6001 |
| Pr8.02 | Control register | Write 0x1P, P path movement Write 0x20, Homing Write 0x21, set current position as homing position Write 0x40, e-stop Read 0x00P, positioning finished, can receive new data Read 0x10P, In operation Read 0x20P, In positioning | 0X6002 |
| Pr8.06 | Positive software limit H | | 0X6006 |
| Pr8.07 | Positive software limit L | | 0X6007 |
| Pr8.08 | Negative software limit H | | 0X6008 |
| Pr8.09 | Negative software limit L | | 0X6009 |
| Pr8.10 | Homing method | Homing method Bit0: homing direction =0: Negative direction =1: Positive direction. Bit1: Whether go to the set position after homing =0: no =1: yes. Bit2-7: Homing mode 0: homing with limit switch detect 1: homing with homing switch detect 2: homing with single turn Z signal detect 3: homing with torque detect 8: set current position as homing position Bit8: 0: homing process without Z signal detect 1: homing process with Z signal detect | 0X600A |

| | | | |
|--------|--|---|--------|
| Pr8.11 | Homing position H | | 0X600B |
| Pr8.12 | Homing position L | | 0X600C |
| Pr8.13 | Homing stop positionH | | 0X600D |
| Pr8.14 | Homing stop position L | | 0X600E |
| Pr8.15 | Homing high speed | | 0X600F |
| Pr8.16 | Homing low speed | | 0X6010 |
| Pr8.17 | Homing acceleration | | 0X6011 |
| Pr8.18 | Homing deceleration | | 0X6012 |
| Pr8.19 | Holding time of homing with torque detect | | 0X6013 |
| Pr8.20 | Torque value of homing with torque detect | | 0X6014 |
| Pr8.21 | Overpass distance setting while homing | | 0X6015 |
| Pr8.22 | Deceleration of E-stop while position limit active | | 0X6016 |
| Pr8.23 | Deceleration of E-stop | | 0X6017 |
| Pr8.26 | IO combined trigger mode | 0: invalid, CTRG signal trigger 1: valid after homing process finished 2: valid without homing process | 0X601A |
| Pr8.27 | IO combined filtering | | 0X601B |
| Pr8.28 | Output value of S code | | 0X601C |
| Pr8.29 | PR alarm | =0x100: Homing overpass limit switch =0x101: Homing process not complete and stop urgently =0x20x: Path X overpass the limit switch | 0X601D |
| Pr8.39 | JOG speed | | 0X6027 |
| Pr8.40 | Acceleration of JOG | | 0X6028 |
| Pr8.41 | Deceleration of JOG | | 0X6029 |
| Pr8.42 | Command position H | | 0X602A |
| Pr8.43 | Command position L | | 0X602B |
| Pr8.44 | Motor position H | | 0X602C |
| Pr8.45 | Motor position L | | 0X602D |

9.2.2 9th parameters specification

| Parameters | Name | Definition | RS485 address |
|------------|------|------------|---------------|
|------------|------|------------|---------------|

| | | | |
|--------|--------------------|--|--------|
| Pr9.00 | Path0 Mode | <p>The motion mode of Path0 motion</p> <p>Bit0-3: TYPE:</p> <p>0 No Action</p> <p>1 position mode</p> <p>2 velocity mode</p> <p>3 homing mode</p> <p>4 stop</p> <p>Bit4: INS,</p> <p>0 do not interrupt</p> <p>1 interrupt (All interrupt now)</p> <p>Bit5: OVLP,</p> <p>0 do not overlap</p> <p>1 overlap</p> <p>Bit6-7:</p> <p>0 absolute position</p> <p>1 relative to command</p> <p>2 relative to motor</p> <p>Bit8-13:</p> <p>0-15 Jump to the corresponding path</p> <p>Bit14: JUMP:</p> <p>0 do not jump</p> <p>1 jump</p> | 0X6200 |
| Pr9.01 | Path0 position H | | 0X6201 |
| Pr9.02 | Path0 position L | | 0X6202 |
| Pr9.03 | Path0 speed | rpm | 0X6203 |
| Pr9.04 | Path0 acceleration | ms/1000rpm | 0X6204 |
| Pr9.05 | Path0 deceleration | ms/1000rpm | 0X6205 |
| Pr9.06 | Path0 Pause time | The pause of path, delay time parameter etc, | 0X6206 |
| Pr9.07 | Special Parameters | Path 0 is mapped to Pr8.02 parameters | 0X6207 |

9.3 Pr-Mode motion control

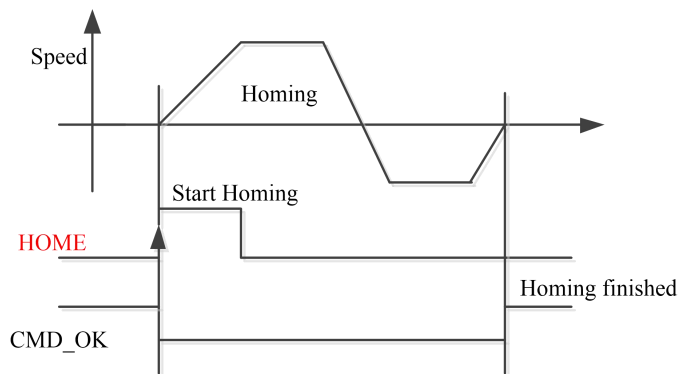
9.3.1 Homing

Homing method include homing with single turn Z signal detect、homing with limit switch detect、homing with homing switch detect、homing with torque detect、set current position as homing position.

Related parameters:

| Parameters | Name | Definition | RS485 addresses |
|------------|---------------------------|--|-----------------|
| Pr8.00 | Pr control setting | Pr-Mode control function Bit0: 0: CTRG rising edge trigger 1: CTRG double edge trigger Bit1: 0: software limit invalid 1: software limit valid Bit2: 0: not execute homing after power on 1: execute homing after power on Bit3: 0: Absolute encoder function invalid 1: Absolute encoder function valid | 0X6000 |
| Pr8.01 | Pr motion path number | Up to 16 paths | 0X6001 |
| Pr8.02 | Control register | Write 0x1P, P path movement Write 0x20, Homing Write 0x21, set current position as homing position Write 0x40, e-stop Read 0x00P, positioning finished, can receive new data Read 0x10P, In operation Read 0x20P, In positioning | 0X6002 |
| Pr8.06 | Positive software limit H | | 0X6006 |
| Pr8.07 | Positive software limit L | | 0X6007 |
| Pr8.08 | Negative software limit H | | 0X6008 |
| Pr8.09 | Negative software limit L | | 0X6009 |
| Pr8.10 | Homing method | Homing method Bit0: homing direction =0: Negative direction =1: Positive direction. Bit1: Whether go to the set position after homing =0: no =1: yes. Bit2-7: Homing mode 0: homing with limit switch detect 1: homing with homing switch detect 2: homing with single turn Z signal detect 3: homing with torque detect 8: set current position as homing position Bit8: 0: homing process without Z signal detect 1: homing process with Z signal detect | 0X600A |
| Pr8.11 | Homing position H | | 0X600B |
| Pr8.12 | Homing position L | | 0X600C |
| Pr8.13 | Homing stop positionH | | 0X600D |
| Pr8.14 | Homing stop position L | | 0X600E |

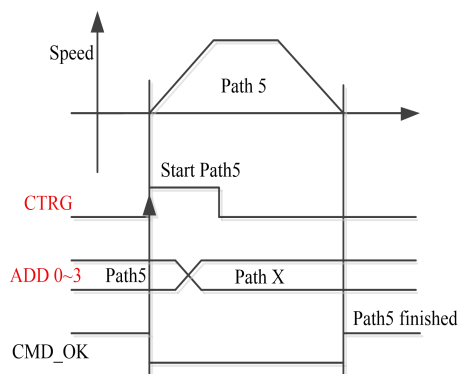
| | | | |
|--------|---|--|--------|
| Pr8.15 | Homing high speed | | 0X600F |
| Pr8.16 | Homing low speed | | 0X6010 |
| Pr8.17 | Homing acceleration | | 0X6011 |
| Pr8.18 | Homing deceleration | | 0X6012 |
| Pr8.19 | Holding time of homing with torque detect | | 0X6013 |
| Pr8.20 | Torque value of homing with torque detect | | 0X6014 |
| Pr8.21 | Overpass distance setting while homing | | 0X6015 |



CMD_OK and MC_OK Both of them can be used to represent action is complete, after the signal effective, there will have a delay within 1 ms.

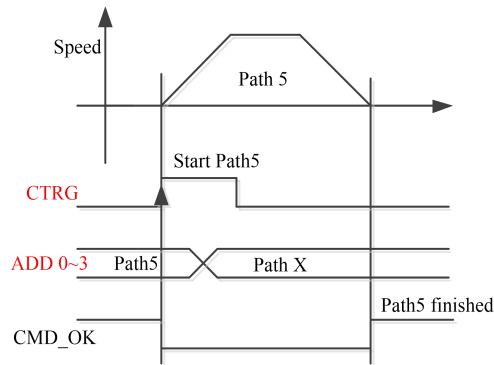
9.3.2 Position limit and E-stop

Position limit and E-stop



9.3.3 JOG

JOG



9.3.4 Path Motion

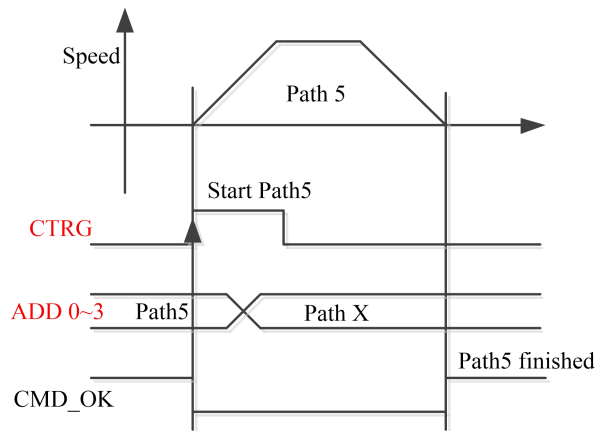
There are three modes of positioning path: Position mode, Velocity mode and homing mode.

Related parameters:

| Parameters | Name | Definition | RS485 address |
|------------|--------------------|---|---------------|
| Pr9.00 | Path0 Mode | The motion mode of Path0 motion Bit0-3: TYPE: 0 No Action 1 position mode 2 velocity mode 3 homing mode 4 stop Bit4: INS, 0 do not interrupt 1 interrupt (All interrupt now) Bit5: OVLP, 0 do not overlap 1 overlap Bit6-7: 0 absolute position 1 relative to command 2 relative to motor Bit8-13: 0-15 Jump to the corresponding path Bit14: JUMP: 0 do not jump 1 jump | 0X6200 |
| Pr9.01 | Path0 position H | | 0X6201 |
| Pr9.02 | Path0 position L | | 0X6202 |
| Pr9.03 | Path0 speed | rpm | 0X6203 |
| Pr9.04 | Path0 acceleration | ms/1000rpm | 0X6204 |
| Pr9.05 | Path0 deceleration | ms/1000rpm | 0X6205 |
| Pr9.06 | Path0 Pause time | The pause of path, delay time parameter etc, | 0X6206 |
| Pr9.07 | Special Parameters | Path 0 is mapped to Pr8.02 parameters | 0X6207 |

9.3.4.1 Single path motion

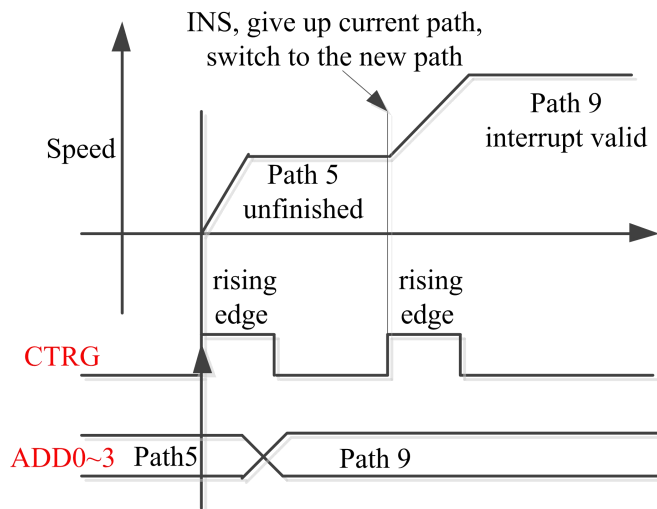
CTRG rising edge /double edge trigger the motion(Pr8.00), take CTRG rising edge signal to trigger path5 as example:



9.3.4.2 Multi path interrupt motion

Interrupt function means a higher path's priority. Interrupt the current valid path, give up the current path and run the new path directly. Similar to the interrupt priority of functions.

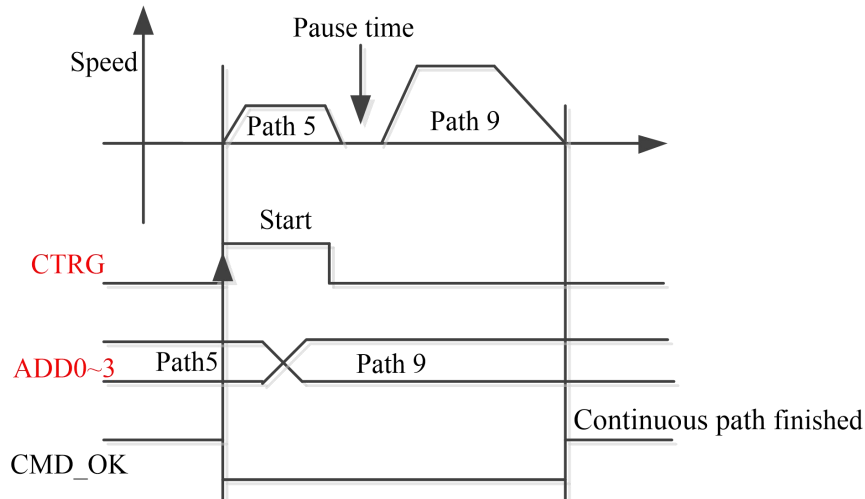
Pr9.00 bit4 = 0, interrupt



9.3.4.3 Continuous path motion without overlap

After the first path motion finished and pause time delay, start another path motion automatically without trigger signal.

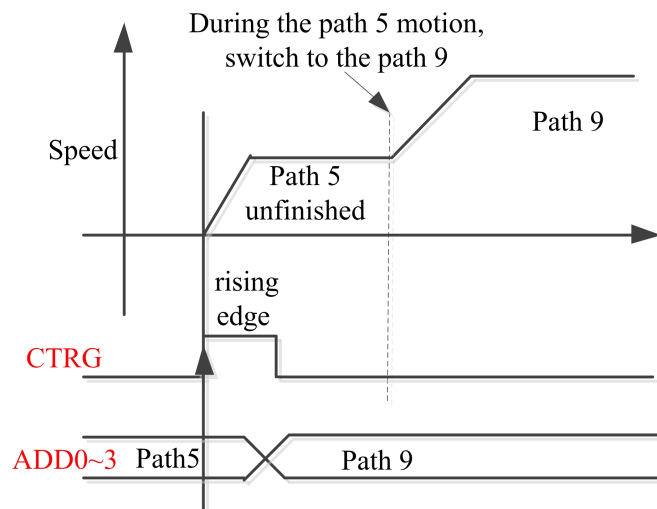
Pr9.00 bit5 = 0, continuous path motion without overlap



9.3.4.4 Continuous path motion with overlap

During the first path motion in process, start another path motion automatically without trigger signal.

Pr9.00 bit5 = 1, continuous path motion with overlap



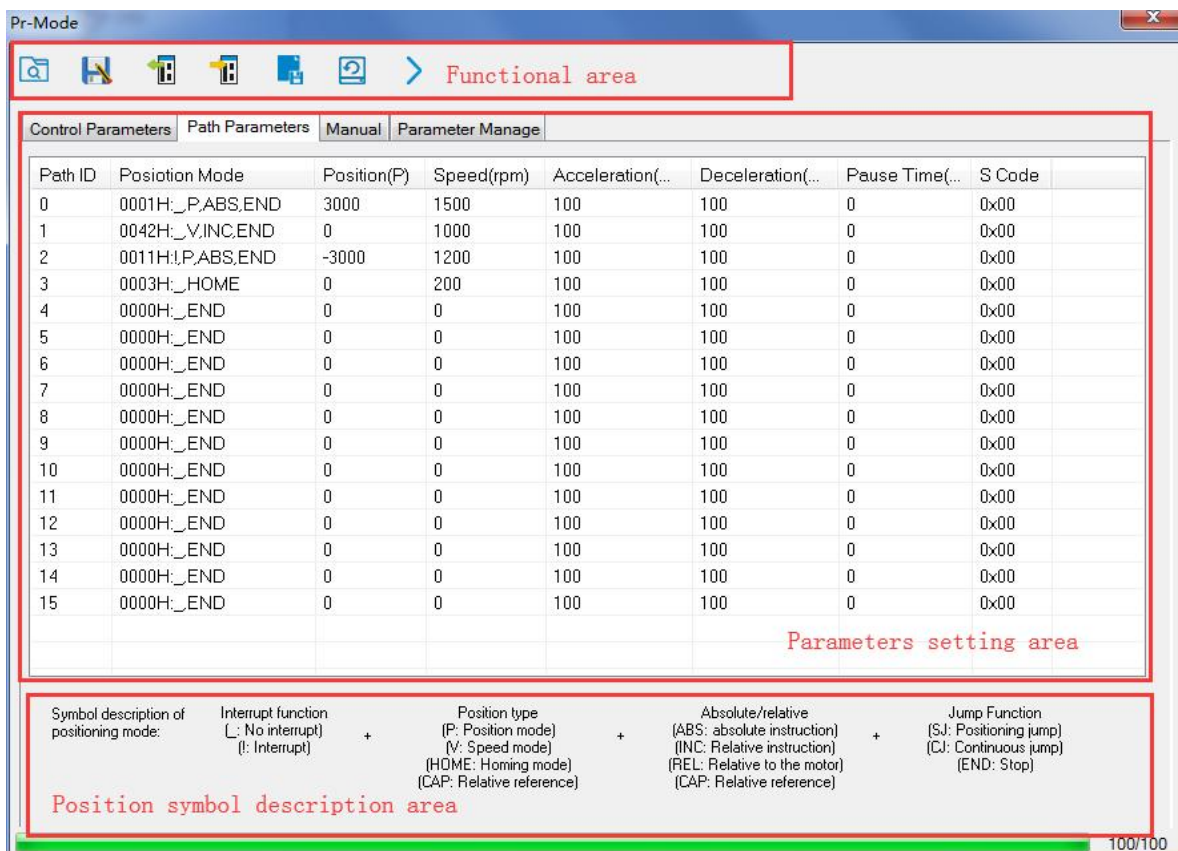
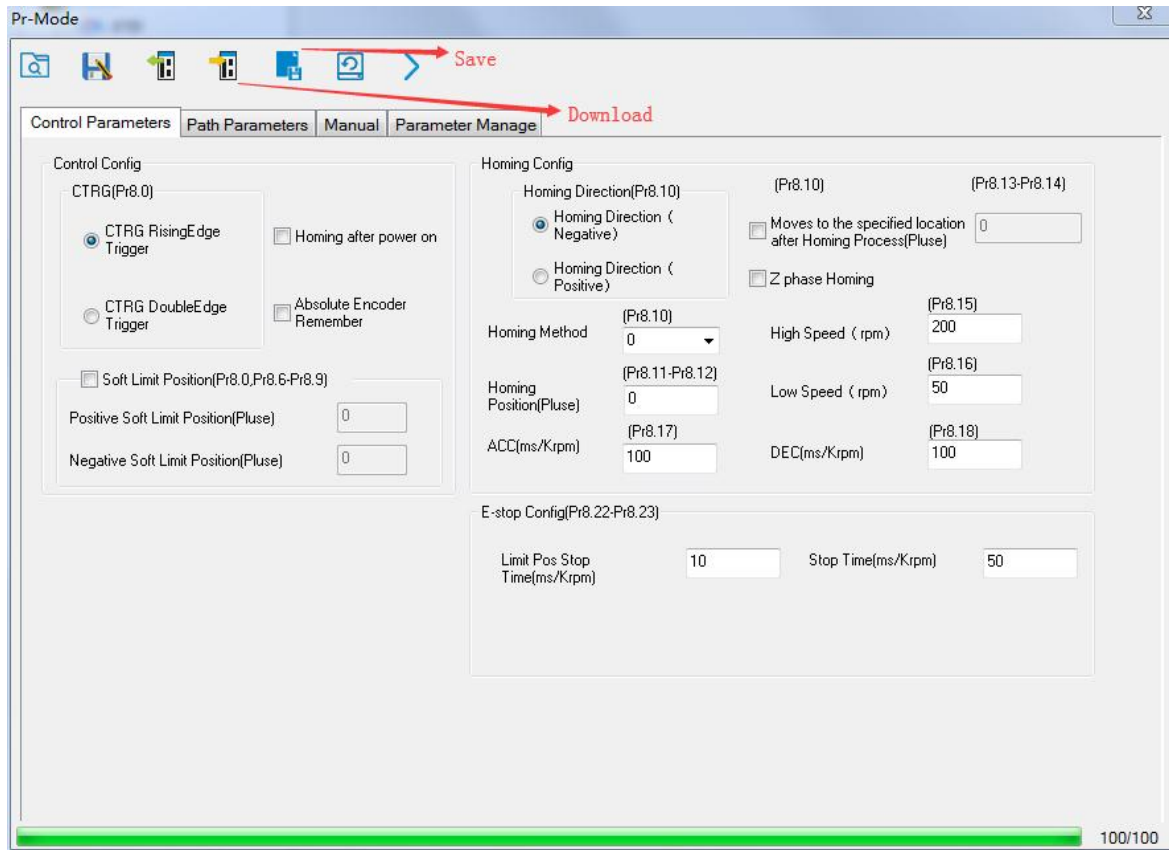
9.4 Execute movement of Pr-Mode

9.4.1 Execute movement by Configuration software

Configuration software is used for drive parameter setting and save, debugging steps are:

1. Check the wirings.
2. Set the work mode to be PR mode (Pr0.01=6), Internal SERVO-enabled (Pr4.00=83), set the distribution of IO register Pr4.00-Pr4.13) Confirm the running direction and so on.
3. Setting up the PR basic control parameters through upper computer's "Pr-Mode" interface. Include: trigger setting, software limit, JOG function, homing function, e-stop function and so on.

4. Setting up the PR positioning path parameters in configuration software " Pr-Mode " interface, include:

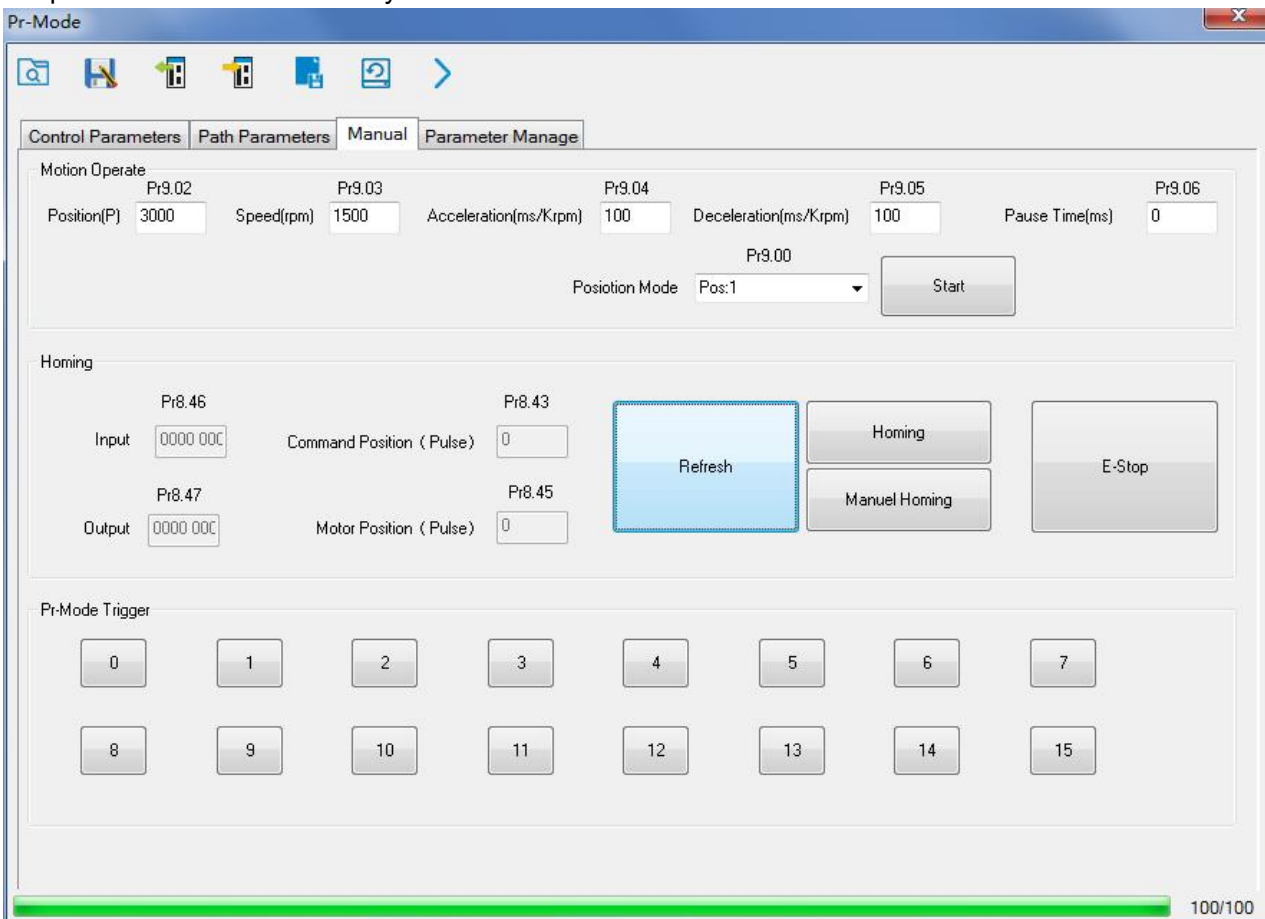


For the convenience of the positioning model expressing, use mnemonic symbol to express, such as: _P, ABS, SJ1 means that path is position addressing, position value is absolute position, jump to No.1 path with delay, and cannot interrupt running.

! V, ABS , SJ1 means that path is speed running, jump to No.1 path with delay, and can interrupt running.
 _HOME means that path is homing movement.
 _END means that path is E-stop.

5. Test run

After confirming that the parameters are set correctly, the test begins. The interface is shown below
 Click the number marked red in the figure and click start to run according to the speed in the path parameter configuration diagram. Click the corresponding number and click to run at the configured speed. If not, check that the parameters are set correctly



9.4.2 Execute movement by digital signal

Pr-Mode motion can be triggered by IO signal.

| Parameters | Name | Specification |
|---------------|---------------------|--|
| Pr4.00-Pr4.08 | SI input selection | Specific of the digital input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.15 | SO output selection | Specific of the digital output terminals' function distribution, refer to functional allocation table. |

IO terminal functional allocation table:

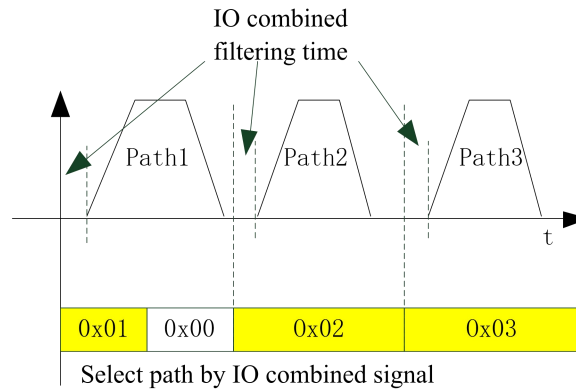
| Input | | | | Output | | | |
|-----------------|--------|---------------|----------------|---------------------|---------|---------------|----------------|
| Signal name | Symbol | set value | | signal name | Symbol | set value | |
| | | Normally open | Normally close | | | Normally open | Normally close |
| Trigger command | CTRG | 20h | A0h | Accomplish commands | CMD_OK | 20h | A0h |
| Homing signal | HOME | 21h | A1h | Accomplish path | MC_OK | 21h | A1h |
| Forced to stop | STP | 22h | A2h | Accomplish homing | HOME_OK | 22h | A2h |
| PositiveJOG | JOG+ | 23h | A3h | Torque limit | TQL | 06h | 86h |
| NegativeJOG | JOG- | 24h | A4h | | | | |
| Forward limit | PL | 25h | A5h | | | | |
| Reverse limit | NL | 26h | A6h | | | | |
| Home signal | ORG | 27h | A7h | | | | |
| Path address 0 | ADD0 | 28h | A8h | | | | |
| Path address 1 | ADD1 | 29h | A9h | | | | |
| Path address 2 | ADD2 | 2ah | Aah | | | | |
| Path address 3 | ADD3 | 2bh | Abh | | | | |
| Torque switch | TC-SEL | 09h | 89h | | | | |

Execute movement by digital signal

The trigger mode of path motion is divided into edge trigger and IO combination trigger. Determined by control parameter Pr8.26; The edge trigger selects the motion path by the combination of paths, and then triggers the edge event of IO CTRG signal to start a motion. The IO combination trigger means that the combination of IO path select signal is directly used to trigger the motion without IO CTRG signal, the path 0 is invalid. When the IO combination signal turns into a non-zero path, the path will run once triggered after IO filtering. The timing diagram is shown below:

| Parameters | Name | Range | Default Value | Definition |
|------------|--------------------------|---------|---------------|--|
| Pr8.26 | IO combined trigger mode | 0~65535 | 0 | 0: invalid, CTRG signal trigger 1: valid after homing process finished 2: valid without homing process |
| Pr8.27 | IO combined filtering | 0~65535 | 10 | IO combined filtering time |

Notes: The path 0 is invalid, so the path 0 cannot be triggered by the IO combined signal, so the IO combined signal will trigger the motion from path 1 to path 15.



IO combined signal trigger sequence

Notes 1: The path 0 is invalid, so the path 0 cannot be triggered by the IO combined signal. If users want to trigger incremental position, the IO combined signal should be as follow:

Path X IO combined signal → Path 0 IO combined signal → Path Y IO combined signal, trigger incremental position multiple times by these 3 steps.

Notes 2: If the IO combined trigger mode=2 (Pr8.26=2), when the drive is powered on, the motion will be triggered while the IO combined signal select path≠0.

9.4.3 Execute movement by RS485 Communication

Communication control mode can realize same function as IO operation, users can modify parameters and trigger action to run, can control more than one drive by field bus, save the wiring and obtain good flexibility.

Communications control includes two modes: Fixed trigger mode and immediately trigger mode.

9.4.3.1 Parameters setting

| Parameters | Name | Specification | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|--|---|-------------|-----------|--------------|-----------|---|---------|-------------|----------|---|---------|------------|----------|---|---------|-------------|-----------|---|----------|------------|---|---|---|------|---|---|---|------|---|
| Pr0.01 | Control Mode Setup | Set Pr0.01=6 for Pr-Mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr4.00 | SI1 Input selection | Set 83 for internal Servo-Enable Set 03 for external Servo-Enable (Digital input for Servo-Enable) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.29 | Mode setup of RS485 communication | <table border="1"> <thead> <tr> <th>Setup Value</th> <th>Data bit</th> <th>Parity-check</th> <th>Stop bit</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>8</td> <td>Even Parity</td> <td>2</td> </tr> <tr> <td>1</td> <td>8</td> <td>Odd Parity</td> <td>2</td> </tr> <tr> <td>2</td> <td>8</td> <td>Even Parity</td> <td>1</td> </tr> <tr> <td>3</td> <td>8</td> <td>Odd Parity</td> <td>1</td> </tr> <tr> <td>4</td> <td>8</td> <td>None</td> <td>1</td> </tr> <tr> <td>5</td> <td>8</td> <td>None</td> <td>2</td> </tr> </tbody> </table> | Setup Value | Data bit | Parity-check | Stop bit | 0 | 8 | Even Parity | 2 | 1 | 8 | Odd Parity | 2 | 2 | 8 | Even Parity | 1 | 3 | 8 | Odd Parity | 1 | 4 | 8 | None | 1 | 5 | 8 | None | 2 |
| Setup Value | Data bit | Parity-check | Stop bit | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 8 | Even Parity | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 8 | Odd Parity | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 8 | Even Parity | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 8 | Odd Parity | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 8 | None | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 8 | None | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.30 | Baud rate setup of RS485 communication | <table border="1"> <thead> <tr> <th>Setup value</th> <th>Baud rate</th> <th>Setup value</th> <th>Baud rate</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>2400bps</td> <td>4</td> <td>38400bps</td> </tr> <tr> <td>1</td> <td>4800bps</td> <td>5</td> <td>57600bps</td> </tr> <tr> <td>2</td> <td>9600bps</td> <td>6</td> <td>115200bps</td> </tr> <tr> <td>3</td> <td>19200bps</td> <td></td> <td></td> </tr> </tbody> </table> | Setup value | Baud rate | Setup value | Baud rate | 0 | 2400bps | 4 | 38400bps | 1 | 4800bps | 5 | 57600bps | 2 | 9600bps | 6 | 115200bps | 3 | 19200bps | | | | | | | | | | |
| Setup value | Baud rate | Setup value | Baud rate | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 2400bps | 4 | 38400bps | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 4800bps | 5 | 57600bps | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 9600bps | 6 | 115200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 19200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.31 | RS485 slave axis ID | Modbus sub-station address number(Slave ID) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr8.02 | PR trigger | <p>(16bit, 485 address..0x6002)</p> <p>Write 0x1P, P path movement</p> <p>Write 0x20, Homing</p> <p>Write 0x21, set current position as homing position</p> <p>Write 0x40, e-stop</p> <p>Read 0x00P, positioning finished, can receive new data</p> <p>Read 0x10P, In operation</p> <p>Read 0x20P, In positioning</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

9.4.3.2 Pr-Mode parameters address

8th parameters: 0x6000+(Parameters NO - 800)

The address of Pr8.06: 0x6000+(806-800)=0x6006

9th parameters: 0x6200+(Parameters NO - 900)

The address of Pr9.06: 0x6200+(906-900)=0x6206

Pr-Mode parameters address

| RS485 address | Parameter | Name | Specification |
|-----------------------------|----------------------|---|---------------|
| 0x6000 | Pr8.00 | Pr control setting | HEX |
| 0x6002 | Pr8.02 | Control register | HEX |
| 0x6006 | Pr8.06 | Positive software limit H | Pulse |
| 0x6007 | Pr8.07 | Positive software limit L | Pulse |
| 0x6008 | Pr8.08 | Negative software limit H | Pulse |
| 0x6009 | Pr8.09 | Negative software limit L | Pulse |
| 0x600a | Pr8.10 | Homing method | HEX |
| 0x600c | Pr8.12 | Homing position H | Pulse |
| 0x600d | Pr8.13 | Homing stop positionH | Pulse |
| 0x600e | Pr8.14 | Homing stop position L | Pulse |
| 0x600f | Pr8.15 | Homing high speed | r/min |
| 0x6010 | Pr8.16 | Homing low speed | r/min |
| 0x6011 | Pr8.17 | Homing acceleration | ms/Krpm |
| 0x6012 | Pr8.18 | Homing deceleration | ms/Krpm |
| 0x6016 | Pr8.22 | Deceleration of E-stop while position limit | r/min |
| 0x6017 | Pr8.23 | Deceleration of E-stop | r/min |
| 0x602a | Pr8.42 | Command positionH | Read only |
| 0x602b | Pr8.43 | Command positionL | Read only |
| 0x602c | Pr8.44 | Motor position H | Read only |
| 0x602d | Pr8.45 | Motor position L | Read only |
| 0x602e | Pr8.46 | Input IO status | Read only |
| 0x602f | Pr8.47 | Output IO status | Read only |
| | Pr9.00~Pr9.07 | Path 0 parameters | |
| 0x6200 | Pr9.00 | Path0 Mode | HEX |
| 0x6201 | Pr9.01 | Path0 position H | Pulse |
| 0x6202 | Pr9.02 | Path0 position L | Pulse |
| 0x6203 | Pr9.03 | Path0 speed | r/min |
| 0x6204 | Pr9.04 | Path0 acceleration | ms/Krpm |
| 0x6205 | Pr9.05 | Path0 deceleration | ms/Krpm |
| 0x6206 | Pr9.06 | Path0 Pause time | ms |
| 0x6207 | Pr9.07 | Special Parameters | |
| 0x6208~0x620f | Pr9.08~Pr9.15 | Path 1 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6210~0x6217 | Pr9.16~Pr9.23 | Path 2 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6218~0x621f | Pr9.24~Pr9.31 | Path 3 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6220~0x6227 | Pr9.32~Pr9.39 | Path 4 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6228~0x622f | Pr9.40~Pr9.47 | Path 5 parameters | |
| The same with Pr9.00~Pr9.07 | | | |

| | | | |
|-----------------------------|-----------------|--------------------|--|
| 0x6230~0x6237 | Pr9.48~Pr9.55 | Path 6 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6238~0x623f | Pr9.56~Pr9.63 | Path 7 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6240~0x6247 | Pr9.64~Pr9.71 | Path 8 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6248~0x624f | Pr9.72~Pr9.79 | Path 9 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6250~0x6257 | Pr9.80~Pr9.87 | Path 10 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6258~0x625f | Pr9.88~Pr9.95 | Path 11 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6260~0x6267 | Pr9.96~Pr9.103 | Path 12 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6268~0x626f | Pr9.104~Pr9.111 | Path 13 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6270~0x6277 | Pr9.112~Pr9.119 | Path 14 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6278~0x627f | Pr9.120~Pr9.127 | Path 15 parameters | |
| The same with Pr9.00~Pr9.07 | | | |

9.4.4 Fixed trigger method

Fixed trigger mode: Setup motion parameters. Then, replace CTRG and HOME signal with Pr8.02 (trigger register) to trigger the path. This mode apply to fixed motion and simple operation system.

As below procedure:

1. Firstly, setup homing and path 0~ path 15 which need to run, can transmit parameter configuration temporarily after power on, also can configured to save with upper computer.

2. Enable drive.

3. Implement choice and start of actions by write corresponding instructions into 0x6002 (Pr8.02) .

Write 0x01P, P path motion (write 0x011 to run path 1, write 0x013 to run path 3)

Write 0x020, homing

Write 0x021, set current position as homing position.

Write 0x040, E-stop.

Read 0x000p, means positioning accomplished, can receive new data

Read 0x01P, 0x020, 0x040 means still does not response to instructions.

Read 0x10P, means path is running.

Read 0x200, means instruction accomplished and wait for positioning.

Set path 0 parameters as the table showing , path 1~path15 parameters are the same as path 0

| Parameters | Name | Definition | RS485 address |
|------------|--------------------|--|---------------|
| Pr9.00 | Path0 Mode | <p>The motion mode of Path0 motion</p> <p>Bit0-3: TYPE:</p> <ul style="list-style-type: none"> 0 No Action 1 position mode 2 velocity mode 3 homing mode 4 stop <p>Bit4: INS,</p> <ul style="list-style-type: none"> 0 do not interrupt 1 interrupt (All interrupt now) <p>Bit5: OVLP,</p> <ul style="list-style-type: none"> 0 do not overlap 1 overlap <p>Bit6-7:</p> <ul style="list-style-type: none"> 0 absolute position 1 relative to command 2 relative to motor <p>Bit8-13:</p> <ul style="list-style-type: none"> 0-15 Jump to the corresponding path <p>Bit14: JUMP:</p> <ul style="list-style-type: none"> 0 do not jump 1 jump | 0X6200 |
| Pr9.01 | Path0 position H | | 0X6201 |
| Pr9.02 | Path0 position L | | 0X6202 |
| Pr9.03 | Path0 speed | rpm | 0X6203 |
| Pr9.04 | Path0 acceleration | ms/1000rpm | 0X6204 |
| Pr9.05 | Path0 deceleration | ms/1000rpm | 0X6205 |
| Pr9.06 | Path0 Pause time | The pause of path, delay time parameter etc, | 0X6206 |
| Pr9.07 | Special Parameters | Path 0 is mapped to Pr8.02 parameters | 0X6207 |

Set path 1~ path15 as same as path 0 .

Implement choice and start of actions by write corresponding instructions into 0x6002 (Pr8.02), to select which path to run.

9.4.5 Immediately trigger method

Compared with fixed trigger is limited by 16 path, immediately trigger method is more flexible. It is written to the current path at each time, at the same time trigger the operation of this path. Trigger position, speed, homing by a data frame.

This method adopt path0 to implement, path0 has 8 data in total, the last data Pr9.07 mapped to Pr8.02, write 0x10 to Pr8.02 can trigger path0 motion immediately.

As below procedure:

1. Firstly, configure homing and path which need to run, set these parameters by communication or set these parameters and save with upper computer. (Homing must be configured)
2. Enable drive.
3. Trigger fixed path by Pr8.02
4. Or write in immediate data into Pr9.00-9.07, set Pr9.07=0x10, implement immediately running path 0.

For example:

| Sending orders (Master->Slave) | | | | Return command (Slave->Master) | | |
|--------------------------------|---------------|--------------------|--------|--------------------------------|--------------------------------|------|
| 1 | ID | Sub-station No. | 0~31 | ID | Sub-station No. | 0~31 |
| 2 | FC | Function code | 0x10 | FC | Function code | 0x10 |
| 3 | ADDR | Address | 0x62 | ADDR | Address | 0x62 |
| 4 | | | 0x00 | | | 0x00 |
| 5 | NUM1 | Data quantity Word | 0x00 | NUM | Actually written data quantity | 0x00 |
| 6 | | | 0x08 | | | 0x08 |
| 7 | NUM2 | Data quantity Byte | 0x10 | CRC | check code | L |
| | | | | | | H |
| 8-9 | Pr9.00 | Mode | XXXX | | | |
| 10-11 | Pr9.01 | High position | XXXX | | | |
| 12-13 | Pr9.02 | Low position | XXXX | | | |
| 14-15 | Pr9.03 | Speed | XXXX | | | |
| 16-17 | Pr9.04 | Acceleration | XXXX | | | |
| 18-19 | Pr9.05 | Deceleration | XXXX | | | |
| 20-21 | Pr9.06 | Delay time | XXXX | | | |
| 22-23 | Pr9.07 | Trigger control | 0x0010 | | | |
| 24 | CRC | Check code | L | | | |
| 25 | | | H | | | |

Please refer to parameter specification for specific data setting.

9.5 Operation examples

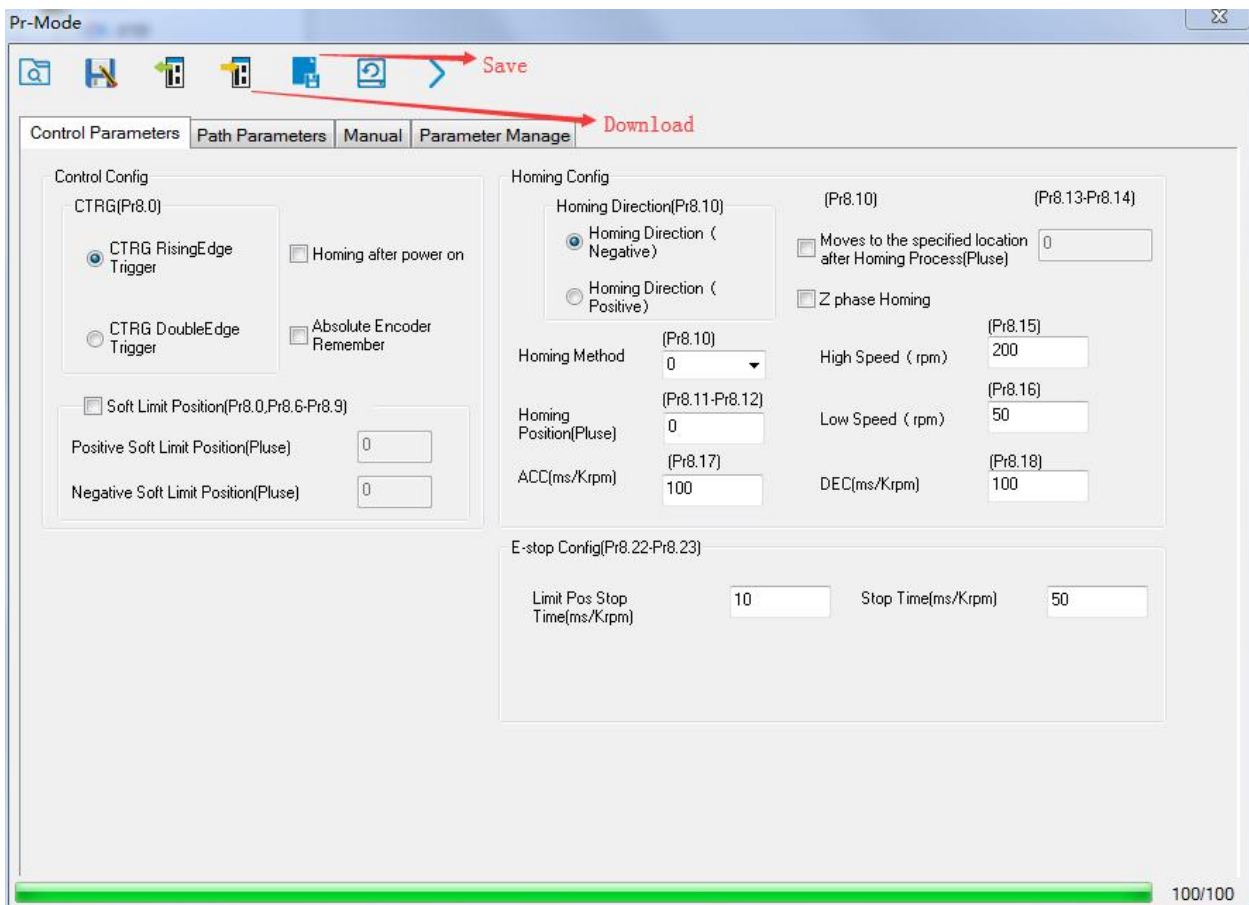
9.5.1 Execute movement by digital signal

Pr-Mode motion can be triggered by IO signal.

- 1、Parameters setting as follows:

| Parameters | Name | Specification |
|---------------|---------------------|---|
| Pr0.01 | Control Mode Setup | Set Pr0.01=6 for Pr-Mode |
| Pr4.00 | SI1 Input selection | Set Pr4.00=83 for internal Servo-Enable Set Pr4.00=03 for external Servo-Enable (Digital input for Servo-Enable) |
| Pr4.00-Pr4.08 | SI input selection | Specific of the 9 input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.15 | SO output selection | Specific of the 6 output terminals' function distribution, refer to functional allocation table. |

2、 Setup control parameters, such as: Trigger mode, Homing process, E-stop speed etc. The setting window as follow:



Notes: After the control parameter setting is completed, click the Download button of the toolbar to make the parameters valid. Click Save button to save the parameter to drive permanently.

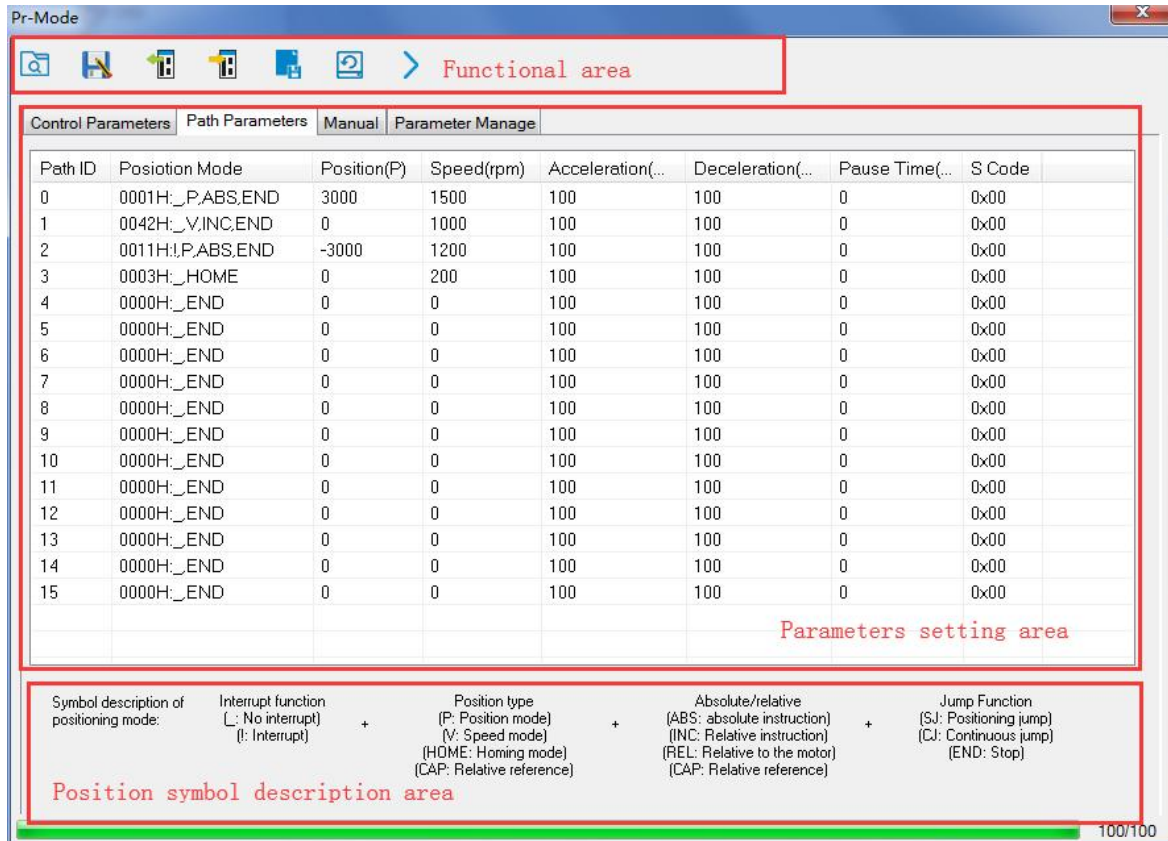
3、 Setup path parameters, such as: Position mode, speed, ACC/DEC, etc.

Functional area: Read file, Upload, Download, save, etc.

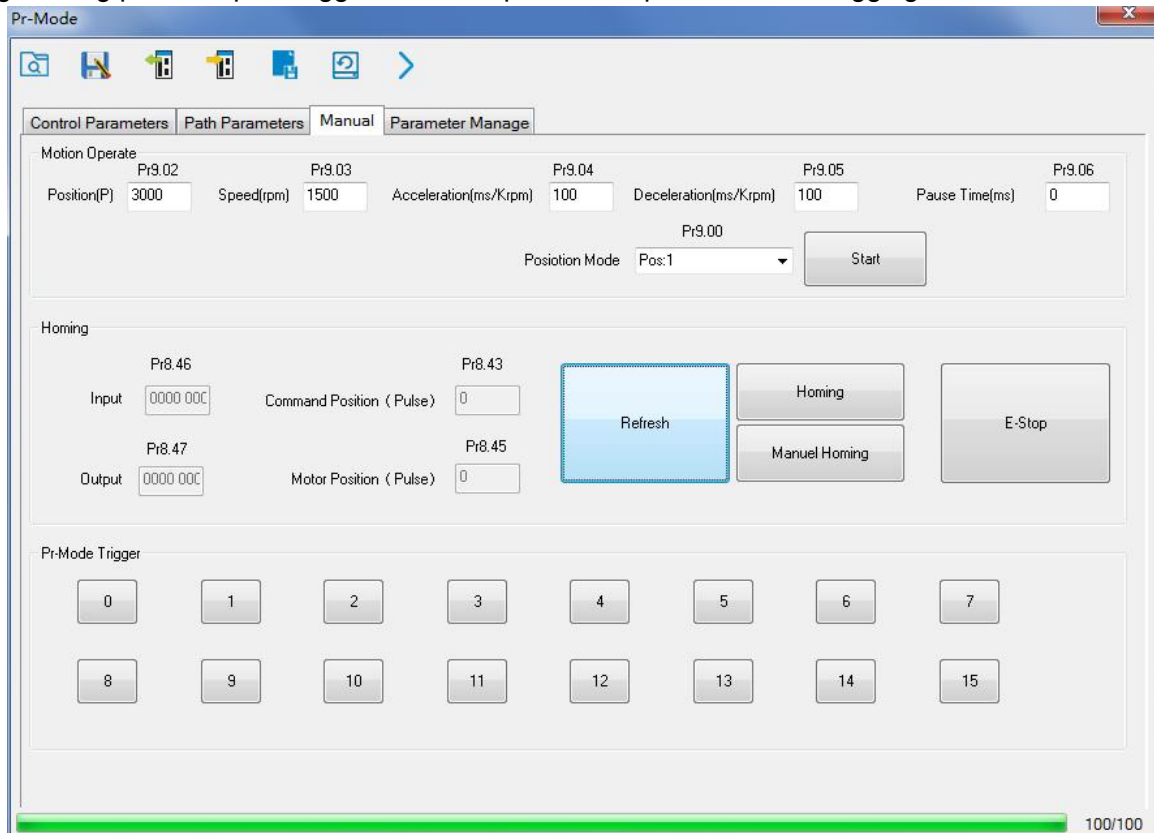
Parameters setting area: Position mode, speed, ACC/DEC, etc.

Position symbol description area: Explains the meaning of the path position symbol.

Notes: After the path parameter setting is completed, click the Download button of the toolbar to make the parameters valid. Click Save button to save the parameter to drive permanently.



4、 Debug homing process, path trigger motion, input and output, etc. Its debugging interface is shown as follow:



Notes 1: Before using IO CTRG edge signal trigger path motion, select path number by IO combined signal, and then use IO CTRG edge signal to trigger the corresponding path motion

Notes 2: If IO combined trigger mode valid, the IO combined filtering time must be set to ensure that all the IO combined signal changes finished within the filtering time range.

9.5.2 Execute movement by RS485 Communication

9.5.2.1 Write single data 0x06

| NO | Send | | | | Receive | | |
|----|------|-------------------------|----------|------|-----------------------------------|------|----------|
| | 1 | ID | Slave ID | | 0x01 | ID | Slave ID |
| 2 | FC | Function code | 0x06 | FC | Function code | 0x06 | |
| 3 | ADDR | Address | H | ADDR | Address | H | |
| 4 | | | L | | | L | |
| 5 | DATA | Data quantity (Word) | H | DATA | Actually written data quantity | H | |
| 6 | | | L | | | L | |
| 7 | CRC | Check code | L | CRC | Check code | L | |
| 8 | | | H | | | H | |

Notes: The number of receive frame is the same as the send frame.

(1) Path 0 (Absolute position mode, 200000pulse, 600rpm, 50ms/1000rpm)

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 62 00 00 01 57 B2 | Absolute position mode |
| 2 | 01 06 62 01 00 03 87 B3 | 200000pulse, 16 bit H |
| 3 | 01 06 62 02 0D 40 32 D2 | 200000pulse, 16 bit L |
| 4 | 01 06 62 03 02 58 66 E8 | 600rpm |
| 5 | 01 06 62 04 00 32 56 66 | ACC: 50ms/1000rpm |
| 6 | 01 06 62 05 00 32 07 A6 | DEC: 50ms/1000rpm |
| 7 | 01 06 60 02 00 10 37 C6 | Trigger Path0 motion |
| 8 | 01 06 60 02 00 40 37 FA | E-stop |
| 9 | 01 06 20 09 00 00 52 08 | Servo disable |

(2) Path 0 (Relative position mode, 10000pulse, 600rpm, 50ms/1000rpm)

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 62 00 00 41 56 42 | Relative position mode |
| 2 | 01 06 62 01 00 00 C7 B2 | 10000pulse, 16 bit H |
| 3 | 01 06 62 02 27 10 2D 8E | 10000pulse, 16 bit L |
| 4 | 01 06 62 03 02 58 66 E8 | 600rpm |
| 5 | 01 06 62 04 00 32 56 66 | ACC: 50ms/1000rpm |
| 6 | 01 06 62 05 00 32 07 A6 | DEC: 50ms/1000rpm |
| 7 | 01 06 60 02 00 10 37 C6 | Trigger Path0 motion |
| 8 | 01 06 60 02 00 40 37 FA | E-stop |
| 9 | 01 06 20 09 00 00 52 08 | Servo disable |

(3) Path 0 (Velocity mode, 600rpm, 50ms/1000rpm)

| NO | RS485 communication data frame | Details |
|----|--------------------------------|-------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 62 00 00 02 17 B3 | Velocity mode |
| 2 | 01 06 62 03 02 58 66 E8 | 600rpm |
| 3 | 01 06 62 04 00 32 56 66 | ACC: 50ms/1000rpm |

| | | |
|---|-------------------------|----------------------|
| 4 | 01 06 62 05 00 32 07 A6 | DEC: 50ms/1000rpm |
| 5 | 01 06 60 02 00 10 37 C6 | Trigger Path0 motion |
| 6 | 01 06 60 02 00 40 37 FA | E-stop |
| 7 | 01 06 20 09 00 00 52 08 | Servo disable |

(4) Path 1 (Absolute position mode, -200000pulse, 600rpm, 50ms/1000rpm)

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 62 08 00 01 D6 70 | Absolute position mode |
| 2 | 01 06 62 09 FF FC 07 C1 | -200000pulse, 16 bit H |
| 3 | 01 06 62 0A F2 C0 F3 40 | -200000pulse, 16 bit L |
| 4 | 01 06 62 0B 02 58 E7 2A | 600rpm |
| 5 | 01 06 62 0C 00 32 D7 A4 | ACC: 50ms/1000rpm |
| 6 | 01 06 62 0D 00 32 86 64 | DEC: 50ms/1000rpm |
| 7 | 01 06 60 02 00 11 F6 06 | Trigger Path1 motion |
| 8 | 01 06 60 02 00 40 37 FA | E-stop |
| 9 | 01 06 20 09 00 00 52 08 | Servo disable |

(5) Path 1 (Velocity mode, 300rpm, 50ms/1000rpm)

| NO | RS485 communication data frame | Details |
|----|--------------------------------|----------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 62 08 00 02 96 71 | Velocity mode |
| 2 | 01 06 62 0B 01 2C E7 FD | 300rpm |
| 3 | 01 06 62 0C 00 32 D7 A4 | ACC: 50ms/1000rpm |
| 4 | 01 06 62 0D 00 32 86 64 | DEC: 50ms/1000rpm |
| 5 | 01 06 60 02 00 11 F6 06 | Trigger Path1 motion |
| 6 | 01 06 60 02 00 40 37 FA | E-stop |
| 7 | 01 06 20 09 00 00 52 08 | Servo disable |

(6) Homing

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 60 0A 00 00 B7 C8 | Homing Method |
| 2 | 01 06 60 0F 00 64 A6 22 | High speed for homing |
| 3 | 01 06 60 10 00 1E 16 07 | Low speed for homing |
| 4 | 01 06 60 02 00 20 37 D2 | Trigger Homing process |
| 5 | 01 06 60 02 00 40 37 FA | E-stop |
| 7 | 01 06 20 09 00 00 52 08 | Servo disable |

9.5.2.2 Write multiple data 0x10

Fixed trigger is limited by 16 segment position, but immediately trigger method is flexible. It is written to the current path at each time, at the same time trigger the operation of this path. Realize position, speed, homing and such actions by a data frame.

This method adopt PR0 to implement, PR0 has 8 data in total, the last data Pr9.07 of it will mapped to Pr8.02, write in 0x10 can trigger Path0 operation immediately, realize data trigger running immediately.

Operating steps:

1. Firstly, configure homing and path which need to run, can power on and send parameter configuration temporarily also can configure and save with upper computer. (Homing must be configured)
2. Servo Enable.

| NO | RS485 communication data frame | Details |
|----|--------------------------------|---------------|
| 0 | 01 06 20 09 00 01 93 C8 | Servo enable |
| 1 | 01 06 20 09 00 00 52 08 | Servo disable |

3. Operate fixed path by Pr8.02
4. write in immediate data by Pr9.00-9.07, and Pr9.07=0x10, implement immediately running path 0.
Demonstrate with immediately trigger method

An example of 485 communication data frame operation is shown below:

| Sending orders (Master->Slave) | | | | Return command (Slave->Master) | | |
|--------------------------------|-------|--------------------|--------|--------------------------------|--------------------------------|------|
| 1 | ID | Sub-station No. | 0~31 | ID | Sub-station No. | 0~31 |
| 2 | FC | Function code | 0x10 | FC | Function code | 0x10 |
| 3 | ADDR | Address | 0x62 | ADDR | Address | 0x62 |
| 4 | | | 0x00 | | | 0x00 |
| 5 | NUM1 | Data quantity Word | 0x00 | NUM | Actually written data quantity | 0x00 |
| 6 | | | 0x08 | | | 0x08 |
| 7 | NUM2 | Data quantity Byte | 0x10 | CRC | check code | L |
| | | | | | | H |
| 8-9 | P9.00 | Mode | XXXX | | | |
| 10-11 | P9.01 | High position | XXXX | | | |
| 12-13 | P9.02 | Low position | XXXX | | | |
| 14-15 | P9.03 | Speed | XXXX | | | |
| 16-17 | P9.04 | Acceleration | XXXX | | | |
| 18-19 | P9.05 | Deceleration | XXXX | | | |
| 20-21 | P9.06 | Delay time | XXXX | | | |
| 22-23 | P9.07 | Trigger control | 0x0010 | | | |
| 24 | CRC | Check code | L | | | |
| 25 | | | H | | | |

- Absolute position mode:** 01 10 62 00 00 08 10 00 01 00 01 86 A0 01 F4 00 64 00 64 00 00 00 10 AA BF
- 01 slave ID 01
 - 10 function code, write multi data
 - 62 00 first address mapped to Pr9.00
 - 00 08 8 consecutive operating addresses from 62 00 to 62 07, mapped to Pr9.00~Pr9.07
 - 10 Hexadecimal data of the number of data, 8 register, each address data is divided into high and low bits, 8*2=16
 - 00 01 data written down to the first addresses of 6200 mapped to Pr9.00.
Motion Mode, absolute position mode
 - 00 01 86 A0 data written down to the second and third addresses of 6201 mapped to Pr9.01; 6202 mapped to Pr9.02.
Hexadecimal data of position=100000plus. All positions in PR mode are in units of 10000P/r, 00 01 86 A0 represents 10 turns of motor rotation.
 - 01 F4 data written down to the 4th addresses of 6203 mapped to Pr9.03

- Hexadecimal data of Speed=500r/min
00 64 data written down to the 5th addresses of 6204 mapped to Pr9.04
 Hexadecimal data of acceleration time=100ms
00 64 data written down to the 6th addresses of 6205 mapped to Pr9.05
 Hexadecimal data of deceleration time=100ms
00 00 data written down to the 7th addresses of 6206 mapped to Pr9.06
 Hexadecimal data of the delay time=0ms
00 10 data written down to the 8th addresses of 6207 mapped to Pr9.07, to trigger the action, immediately trigger method (1P, Immediately trigger path P)
AA BF the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed is 500r/min, acceleration and deceleration time is 100ms, and the position of absolute positioning is 10 rotations.

01 10 62 00 00 08 10 00 01 **00 00 00 00** 01 F4 00 64 00 64 00 00 00 10 A0 4A

The final analysis was performed at a speed of 500r/min, acceleration and deceleration time of 100ms, and the position of absolute positioning 0 rotations.

- Relative position mode:** 01 10 62 00 00 08 10 00 41 00 01 86 A0 01 F4 00 64 00 64 00 00 00 10 EA 8F
01 slave ID 01
10 function code, write multi data
62 00 first address mapped to Pr9.00
00 08 8 consecutive operating addresses from 62 00 to 62 07, mapped to Pr9.00~Pr9.07
10 Hexadecimal data of the number of data, 8 register, each address data is divided into high and low bits, $8*2=16$
00 41 data written down to the first addresses of 6200 mapped to Pr9.00.
 Motion Mode, relative position mode
00 01 86 A0 data written down to the second and third addresses of 6201 mapped to Pr9.01; 6202 mapped to Pr9.02.
 Hexadecimal data of position=100000plus. All positions in PR mode are in units of 10000P/r, 00 01 86 A0 represents 10 turns of motor rotation.
01 F4 data written down to the 4th addresses of 6203 mapped to Pr9.03
 Hexadecimal data of Speed=500r/min
00 64 data written down to the 5th addresses of 6204 mapped to Pr9.04
 Hexadecimal data of acceleration time=100ms
00 64 data written down to the 6th addresses of 6205 mapped to Pr9.05
 Hexadecimal data of deceleration time=100ms
00 00 data written down to the 7th addresses of 6206 mapped to Pr9.06
 Hexadecimal data of the delay time=0ms
00 10 data written down to the 8th addresses of 6207 mapped to Pr9.07, to trigger the action, immediately trigger method (1P, Immediately trigger path P)
EA 8F the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed is 500r/min, acceleration and deceleration time is 100ms, and the position of relative positioning is 10 rotations.

Homing mode: 01 06 60 02 00 21 F6 12 (Back to origin high-speed, low-speed, and back to zero mode can be set in the eighth set of parameters, using default values this time)

Caution: In Pr mode, the origin induction switch is connected to the drive, which is different from the impulse control. Limited by conditions, only the current position can be demonstrated to the customer: Write 0x021, The current location manually set to zero.

The frame format function is:

01 slave ID 01

06 function code, write single data

| NO | Send | | | Receive | | |
|----|------|----------------------|------|---------|--------------------------------|------|
| 1 | ID | Slave ID | 0~31 | ID | Slave ID | 0~31 |
| 2 | FC | Function code | 0x06 | FC | Function code | 0x06 |
| 3 | ADDR | Address | H | ADDR | Address | H |
| 4 | | | L | | | L |
| 5 | DATA | Data quantity (Word) | H | DATA | Actually written data quantity | H |
| 6 | | | L | | | L |
| 7 | CRC | check code | L | CRC | check code | L |
| 8 | | | H | | | H |

60 02 register address, mapped to Pr8.02

00 21 the data write into the register, Write 0x021, The current location manually set to zero.

Write 0x01P, P section positioning

Write 0x020, homing

Write 0x021, set current position as homing point

Write 0x040, e-stop

F6 12 the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

After the current position is set to zero manually, you can click absolute positioning again to send it manually, indicating that the current position is set to zero manually

JOG is IO input, there is no communication control method, you can push users to write relative positioning data in real time, and trigger inching motion immediately instead.

Velocity mode: 0110 62 00 00 08 10 00 02 00 00 00 00 03 E8 00 64 00 64 00 00 00 10 DA 41

01 slave ID 01

10 function code, write multi data

62 00 first address mapped to Pr9.00

00 08 8 consecutive operating addresses from 62 00 to 62 07, mapped to Pr9.00~Pr9.07

10 Hexadecimal data of the number of data, 8 register, each address data is divided into high and low bits, $8 \times 2 = 16$

00 02 data written down to the first addresses of 6200 mapped to Pr9.00, speed mode

00 00 00 00 data written down to the second and third addresses of 6201 mapped to Pr9.01; 6202 mapped to Pr9.02. Hexadecimal data of position=0plus. All positions in PR mode are in units of 10000P/r, 00 00 represents 0 turns of motor rotation in Speed mode

03 E8 data written down to the fourth addresses of 6203 mapped to Pr9.03
Hexadecimal data of Speed=1000r/min

00 64 data written down to the five addresses of 6204 mapped to Pr9.04
Hexadecimal data of acceleration time=100ms

00 64 data written down to the six addresses of 6205 mapped to Pr9.05
Hexadecimal data of deceleration time=100ms

00 00 data written down to the seven addresses of 6206 mapped to Pr9.06
Hexadecimal data of the delay time=0ms

00 10 data written down to the eight addresses of 6207 mapped to Pr9.07, to trigger the action, Immediately trigger method (1P, Immediately trigger path-P, The sample Pr9.00~9.07 is the positioning related data of path-0)

DA 41 the verification code, do not have to directly input, click the corresponding send area verification button automatically generated

The final analysis is as follows: speed=1000r/min, acceleration and deceleration time is 100ms, velocitymode

E-stop: 01 06 60 02 00 40 37 FA

Servo enable: 01 06 20 09 00 01 93 C8

Servo disable: 01 06 20 09 00 00 52 08

Chapter 10 Order Guidance

10.1 Capacity Selection

To determine the capacity of servo system, we must consider the inertia of load, torque of load, the positioning accuracy, the requirement of the highest speed; consider the selection according to the following steps:

1) Calculate Inertia of Load and Torque

You can refer to relative information to calculate inertia of load, torque of load, acceleration/deceleration torque as the next step basis.

2) Identify Mechanical Gear Ratio

According to the maximum speed and the highest speed of the motor ,you can calculate the maximum of mechanical reduction ratio, by using it and minimum of motor turning unit ,to calculate if they can meet the requirements of the smallest position unit or not. If the positional precision is high, you can increase the mechanical reduction ratio or select motor with higher capacity.

3) Calculate Inertia and Torque.

Convert mechanical reduction ratio of the load inertia and load torque to the motor shaft, while the result shall be not 5 times more than motor inertia. If the requirements can't be matched, you can increase the mechanical reduction ratio (the actual maximum speed reducing) or select larger capacity motor.

10.2 Electronic Gear Ratio

In position control mode, the actual speed = command pulse velocity× G ×mechanical reduction ratio.

In position control mode, the actual load minimum displacement = minimum command pulse travel ×G ×mechanical reduction ratio.

【Note】 If the electronic gear ratio of G is not 1, gear ratio division may have the remainder, then there will be position deviation existed, the maximum deviation is the minimum of rotation (minimum resolution).

Appendix

A、Modbus Communication

There are two kinds of Modbus communication methods of drives: RS485 and RS232. RS232 belongs to point-to-point communication, which is used for PC protocol and cannot realize multi-network. RS485 belongs to a single master and multi slave communication mode and can realize multi network control.

A.1 Wiring

- (1) The shorter the connection between each node is the better. The recommend connection should no more than 3m;
- (2) Connect one terminal resistor to each end of the node. The recommended resistance value is 120 ohms;
- (3) Shielded twisted pair is recommended for RS485 communication wirings;
- (4) Connect GND is essential for communication;
- (5) When using the shield wire, the two ends of the shield should connect PE, not GND, otherwise the port will be damaged;
- (6) In order to reduce interference, RS485 communication cables should installed separately from other cables;

A.2 Parameters and interface for communication

A.2.1 Parameters setting

| Pr5.29 * | Name | Mode setup of RS485 communication | | | Mode | P | S | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-----------|--|----------|-----|---------|----------|----------|----------|-------------|----------|--------------|----------|---|---|-------------|---|---|---|------------|---|---|---|-------------|---|---|---|------------|---|---|---|------|---|---|---|------|---|
| | Range | 0~255 | Unit | — | Default | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 053BH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Setup Value</th> <th>Data bit</th> <th>Parity-check</th> <th>Stop bit</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>8</td> <td>Even Parity</td> <td>2</td> </tr> <tr> <td>1</td> <td>8</td> <td>Odd Parity</td> <td>2</td> </tr> <tr> <td>2</td> <td>8</td> <td>Even Parity</td> <td>1</td> </tr> <tr> <td>3</td> <td>8</td> <td>Odd Parity</td> <td>1</td> </tr> <tr> <td>4</td> <td>8</td> <td>None</td> <td>1</td> </tr> <tr> <td>5</td> <td>8</td> <td>None</td> <td>2</td> </tr> </tbody> </table> | | | | | | | | | Setup Value | Data bit | Parity-check | Stop bit | 0 | 8 | Even Parity | 2 | 1 | 8 | Odd Parity | 2 | 2 | 8 | Even Parity | 1 | 3 | 8 | Odd Parity | 1 | 4 | 8 | None | 1 | 5 | 8 | None | 2 |
| Setup Value | Data bit | Parity-check | Stop bit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 8 | Even Parity | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 8 | Odd Parity | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 8 | Even Parity | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 8 | Odd Parity | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 8 | None | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 8 | None | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.30 * | Name | Baud rate setup of RS485 communication | | | Mode | P | S | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0~6 | Unit | — | Default | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Data Type | 16bit | Access | R/W | Address | 053DH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Repower | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Set up the communication baud rate of RS485.

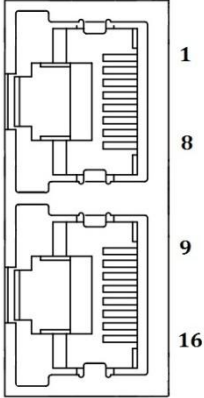
| Setup value | Baud rate | Setup value | Baud rate |
|-------------|-----------|-------------|-----------|
| 0 | 2400bps | 4 | 38400bps |
| 1 | 4800bps | 5 | 57600bps |
| 2 | 9600bps | 6 | 115200bps |
| 3 | 19200bps | | |

| Pr5.31 * | Name | RS485 slave axis address | | | Mode | P | S | T |
|----------|-----------|--------------------------|--------|-----|---------|-------|---|---|
| | Range | 0~127 | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 053FH | | |
| | Repower | - | | | | | | |

During communication with the host (e.g. PC) to control multiple shafts, the shaft being accessed by the host should be identified.

Note: when using RS232/RS485, the maximum valid value is 31.

A.2.2 RS232/RS485 Communication Port

| Port | | Pin | Signal |
|------------|---|-------|--------------|
| CN4 CN5 |  | 1, 9 | RDO+(RS485+) |
| | | 2, 10 | RDO-(RS485-) |
| | | 3, 11 | / |
| | | 4, 12 | / |
| | | 5, 13 | / |
| | | 6, 14 | TXD(RS232) |
| | | 7, 15 | RXD(RS232) |
| | | 8, 16 | GND(RS232) |
| | | | PE |

A.3 Modbus Protocol

The drive supports 16bit data read and write of Modbus-RTU protocol, and its function codes include 0x03, 0x06 and 0x10. 0x03 read data function code, 0x06 write single data function code and 0x10 write multiple data function code.

Notes: 1word=2byte=16bit

A.3.1 Function code of read data 0x03

The function code of read data is 0x03. It can read 1~100 16bit data. Now take slave ID 1, read 2 data as an example: (H is 8bit high for 16bit, L is 8bit low for 16bit)

| NO | Send frame | | | Receive frame | | |
|----|-------------|-------------------------|----------|---------------|-------------------------|----------|
| | 1 | ID | Slave ID | 0x01 | ID | Slave ID |
| 2 | FC | Function code | 0x03 | FC | Function code | 0x03 |
| 3 | ADDR | Address | H | NUM | Data quantity (Byte) | 0x00(H) |
| 4 | | | L | | | 0x04(L) |
| 5 | NUM | Data quantity (Word) | 0x00(H) | DATA1 | Data1 | H |
| 6 | | | 0x02(L) | | | L |
| 7 | CRC | Check code | L | DATA2 | Data2 | H |
| 8 | | | H | | | L |
| 9 | | | | CRC | Check code | L |
| 10 | | | | | | |

Notes: The number of receive data is twice the number of send data quantity.

The communication data is shown as below:

[Send frame] 01 03 00 04 00 02 85 CA

[Receive frame] 01 03 04 00 00 00 02 7B F2

Send frame: The sent frame represents that the master reads the data from slave ID 1, the starting address is 0x0004, the length is 2 Word (16bit). The CRC check code is 0xCA85.

Receive frame: The receive frame represents that the receive data is 4 byte (8bit) and the data is 00 00 00 02. The CRC check code is 0xF27B.

A.3.2 Function code of write single data 0x06

The function code of write single data is 0x06. Now take slave ID 1, write 1 data as an example: (H is 8bit high for 16bit, L is 8bit low for 16bit)

| NO | Send frame | | | Receive frame | | |
|----|-------------|-------------------------|----------|---------------|-----------------------------------|----------|
| | 1 | ID | Slave ID | 0x01 | ID | Slave ID |
| 2 | FC | Function code | 0x06 | FC | Function code | 0x06 |
| 3 | ADDR | Address | H | ADDR | Address | H |
| 4 | | | L | | | L |
| 5 | DATA | Data quantity (Word) | H | DATA | Actually written data quantity | H |
| 6 | | | L | | | L |
| 7 | CRC | Check code | L | CRC | Check code | L |
| 8 | | | H | | | H |

Notes: The number of receive frame is the same as the send frame.

The communication data is shown as below:

[Send frame] 01 06 00 04 00 02 49 CA

[Receive frame] 01 06 00 04 00 02 49 CA

Send frame: The send frame represents that the master write the data into slave ID 1, the starting address is 0x0004, the length is 2 Word (16bit). The data is 0x0002. The CRC check code is 0xCA49.

Receive frame: The receive frame represents that write data into slave ID 1 finished successfully.

A.3.3 Function code of write multiple data 0x10

The function code of write multiple data is 0x10. In this case, 16 bits of multiple data are written. Now take slave ID 1, write 2 data as an example: (H is 8bit high for 16bit, L is 8bit low for 16bit)

| NO | Send frame | | | Receive frame | | |
|----|------------|----------------------|----------------|---------------|--------------------------------|----------|
| | 1 | ID | Slave ID | 0x01 | ID | Slave ID |
| 2 | FC | Function code | 0x10 | FC | Function code | 0x10 |
| 3 | ADDR | Address | H | ADDR | Address | H |
| 4 | | | L | | | L |
| 5 | NUM1 | Data quantity (Word) | 0x00 (H) | NUM | Actually written data quantity | 0x00 (H) |
| 6 | | | 0x02 (L) | | | 0x02 (L) |
| 7 | NUM2 | Data quantity (Byte) | 0x04 (2* NUM1) | CRC | Check code | L |
| 8 | DATA1 | DATA1 | H | | | H |
| 9 | | | L | | | |
| 10 | DATA2 | DATA2 | H | | | |
| 11 | | | L | | | |
| 12 | CRC | Check code | L | | | |
| 13 | | | H | | | |

The communication data is shown as below:

[Send frame] 01 10 00 04 00 02 04 01 00 00 00 F3 A0

[Receive frame] 01 10 00 04 00 02 00 09

Send frame: The send frame represents that the master write the data into slave ID 1, the starting address is 0x0004, the length is 2 Word (16bit). The data is 0x01000 and 0x0000. The CRC check code is 0xA0F3.

Receive frame: The receive frame represents that write data into slave ID 1 finished successfully.

A.3.4 Error response

When there is a mistake in the format of the send frame data, the slave feeds back the wrong reply frame data to the master station. The format is as follows:

| NO | Error response frame data (Slave-->Master) | | |
|----|--|---------------|-----------------------|
| 1 | ID | Slave ID | 0~31 |
| 2 | FC | Function code | (0x03/0x06/0x10)+0x80 |
| 3 | Error code | Error code | 0x01/0x02/0x03/0x08 |
| 4 | CRC | Check code | L |
| 5 | | | H |

The error code and its meaning are as follows:

| Error code | Meaning |
|------------|--|
| 0x01 | Function code error |
| 0x02 | Access address error |
| 0x03 | Data error, such as write data exceeding the limit |
| 0x08 | CRC check error |

The communication data is shown as below:

[Send frame] 01 11 00 04 00 02 04 01 00 00 00 F3 A0

[Receive frame] 01 91 08 4C 56

Receive: CRC check error in the send data frame sent by the master station

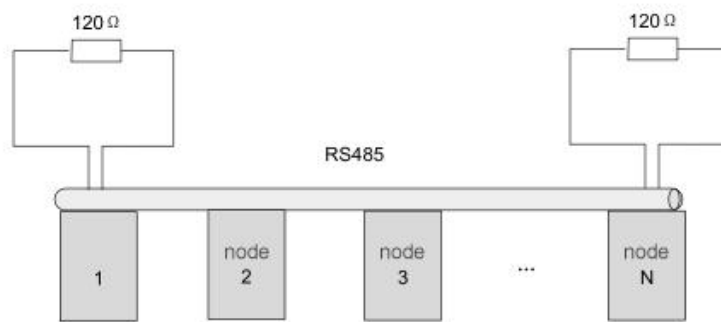
[Send frame] 01 11 00 04 00 02 04 01 00 00 00 A2 65

[Receive frame] 01 91 01 8C 50

Receive: Function code error in the send data frame sent by the master station

A.4 RS485 common problems and solutions

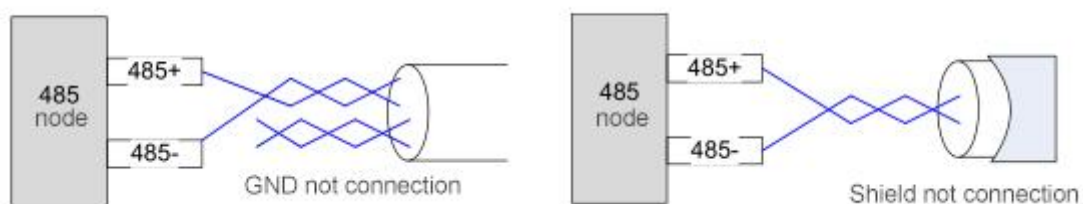
A.4.1 Common problems



1、 Terminal resistance

The correct connection of terminal resistance is shown in the above figure, a 120 ohm terminal resistance need to connect in the head end and the end of the communication bus.

2、 Wiring error



Firstly, confirm that the signal line of RS485 is connected correctly. Secondly, confirm whether the communication reference ground is connected correctly. If the node has no communication reference ground, it will be suspended, as shown in figure above. The shielding is connected the same way.

3、 Signal interference

When there is an external interference signal in communication, magnetic rings can be placed at 1 and 2 in above figure to suppress the incoming external interference signal into the bus.

When there is an internal interference signal in communication, magnetic rings can be placed at 1 and 2 in above figure to suppress the incoming internal interference signal into the bus. Loop the UVW line around the magnetic ring three times. Be careful not to connect PE to the magnetic ring.

A.4.2 Problem solving procedure

1. Whether the communication parameters are set correctly (Slave ID no repetition, baud rate is set the same, data format is consistent).
2. Whether the terminal resistance connection is correct?
3. Whether the wiring is standard for anti-interference?
4. PE connection between ground and ground wire.
5. Whether the communication lines are installed separately from other wirings