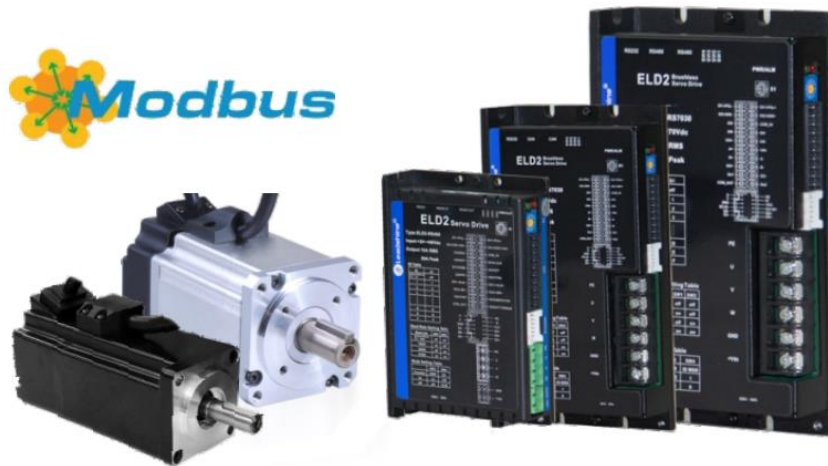


User Manual Of ELD2-RS Series Servo



www.leadshine.com

Introduction

Thanks for purchasing Leadshine ELD2-series low-voltage DC servo drive, this instruction manual provides knowledge and attention for using this driver.

Contact tech@leadshine.com for more technical support .

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.

Be attention to the following warning symbol:



Warning indicates that the error operation could result in loss of life or serious injury.



Caution indicates that the error operation could result in operator injured, also make equipment damaged.



Attention indicates that the error use may damage product and equipment.

Safety precautions



Warning

- 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.

Transportation



Caution

- The storage and transportation must be in normal condition.
- 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 Driver 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.
- Ground the earth terminal of the motor and driver without fail.
- The wiring should be connected after servo driver 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.
- We mustn't connect capacitors, inductors or filters between servo motor and servo driver.
- The wire and temperature-resistant object must not be close to radiator of servo driver 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.



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 driver 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



Caution

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

System selection



Attention

- The rate torque of servo motor should be larger than effective continuous load torque.
- The ratio of load inertia and motor inertia should be smaller than recommended value.
- The servo driver should be matched with servo motor.

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Chapter 1 Introduction

1.1 Product Introduction

ELD2 low-voltage DC servo is a DC 24-70vdc input , special motion control product designed for machines and applications that request a best balance between outstanding and reasonable cost.

Talent feature:

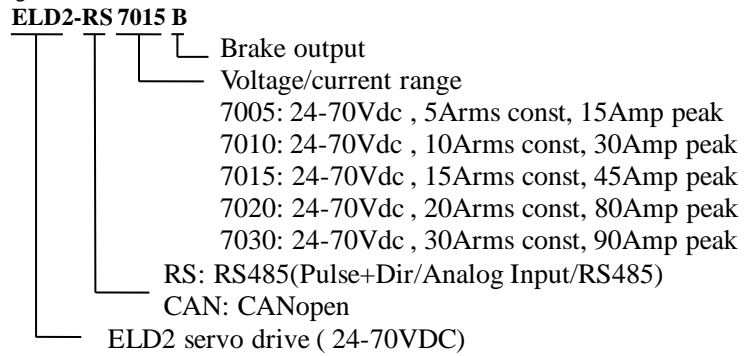
- ◆ Brushed motor supported (only with incremental encoder feedback)
- ◆ Position/velocity/Torque control
- ◆ 24-70Vdc
- ◆ Up to 90Amp peak current
- ◆ Up to 1200Watt
- ◆ Pulse + Dir /Analog input/Modbus
- ◆ Compact size/high power density

1.1.1 Specification and feature

| Specification | | | | | |
|-------------------------|--------------------------------|--|--|---|--|
| Driver model | ELD2-RS7005 | ELD2-RS7010 | ELD2-RS7015B | ELD2-RS7020B | ELD2-RS7030B |
| Size(mm) | 118*79.5*25.5 | 118*79.5*25.5 | 175*100.5*31 | 175*100.5*31 | 175*100.5*31 |
| Rated power(kw) | 0.2 | 0.4 | 0.6 | 0.75 | 1.2 |
| Rated current(Arms) | 5 | 10 | 15 | 20 | 30 |
| Peak current(A), 2 secs | 15 | 30 | 45 | 60 | 90 |
| Power | Voltage(V) | DC24-70(recommended 24-60Vdc) | | | |
| | Current(A) | 48-60Vdc: 3.5Amp 60-70Vdc: 3Amp | 48-60Vdc: 7Amp 60-70Vdc: 6Amp | 48-60Vdc: 11Amp 60-70Vdc: 9Amp | 48-60Vdc: 14Amp 60-70Vdc: 12Amp |
| Control method | IGBT PWM sinusoidal Wave Drive | | | | |
| Overload | 300% | | | | |
| Brake resistor | External connection | | | | |
| Protection rank | IP20 | | | | |

| Feature | | | | | |
|----------------------|--|-------------|--------------|--------------|--------------|
| Driver model | ELD2-RS7005 | ELD2-RS7010 | ELD2-RS7015B | ELD2-RS7020B | ELD2-RS7030B |
| Pulse input | 2 fast pulse input, 5V only, 500kHz | | | | |
| Modes of operation | Position/Velocity/Torque | | | | |
| Command source | Pulse+Direction / ± 10 V Analog / RS485 | | | | |
| Inputs/Outputs | 2 programmable differential inputs(5V-24V); 4 programmable single-end inputs(12-24V); 2 programmable differential outputs; 1 analog input(± 10 V). | | | | |
| Brake Output (24vdc) | -- | | √ | | |
| Motor Supported | Brushless、 Brushed | | | | |
| Feedback Supported | 1000. 2500ppr incremental encoder (Encoder(ABZ)+Hall(UVW)) 17bit/23bit serial signal encoder | | | | |
| Communication | RS485/ RS232 | | | | |

1.1.2 Part Numbering Information



1.2 Inspection of product

1. **Check the following thing before using the products :**
 - a. Check if the product is damaged or not during transportation.
 - b. Check if the servo driver & motor are complete or not.
 - c. Check the packing list if the accessories are complete or not

The ELD2 series DC servo driver can be matched with ELDM Low-voltage DC servo motor

| Matched Motors | |
|-----------------------|---|
| Power Range | Up to 1200W |
| Motor Supported | Brushless, Brushed |
| Voltage Range | 24 - 70V |
| Feedback supported | 1000, 2500ppr incremental encoder (Encoder(ABZ)+Hall(UVW)) 17bit/23bit serial signal encoder |
| Motor Size | 40mm,42mm,57mm,60mm,80mm frame or other size |
| Other Requirements | Brake, oil-seal, protection level, shaft&connector can be customized |

Chapter 2 Installation

2.1 Storage and Installation Circumstance

Table 2.1 Servo Driver, Servo Motor Storage Circumstance Requirement

| Item | ELD2 series driver | ELDM low voltage servo motor |
|-------------------------|--|--|
| Temperature | -20-80°C | -25-70°C |
| 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 | IP00(no protection) | IP54 |

Table 2.2 Servo Driver, Servo Motor Installation Circumstance Requirement

| Item | ELD2 series driver | ELDM low voltage servo motor |
|-------------------------|--|--|
| Temperature | 0-55°C | -25-40°C |
| 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 | IP00(no protection) | IP54 |

2.2 Servo Driver Installation

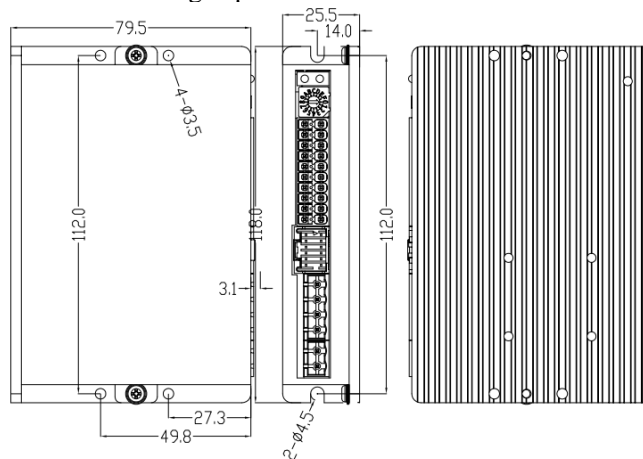


Notice

- 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.

2.2.1 Installation Method

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


Figure 2.1(A) installation method of driver ELD2-RS7005/ ELD2-RS7010

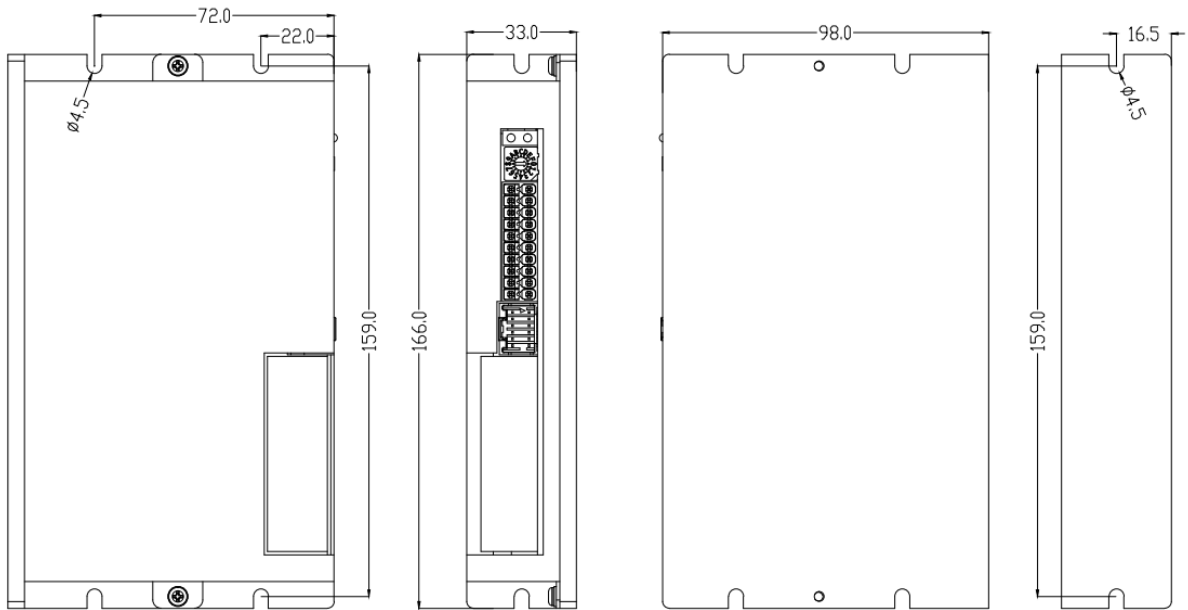


Figure 2.1(B) installation method of driver ELD2-RS7015B /ELD2-RS7020B/ ELD2-RS7030B

2.2.2 Installation Space

Reserve enough surrounding space for effective cooling.

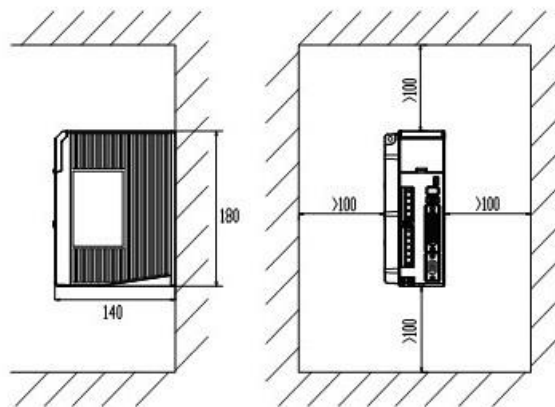


Figure 2.2 Installation Space for Single Driver

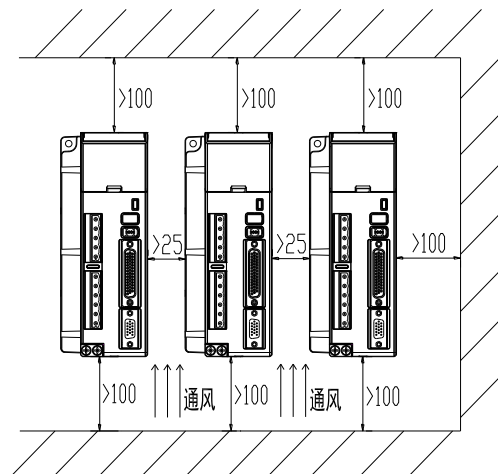


Figure 2.3 Installation Space for several Drivers

2.3 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 3 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 driver without fail.
- The wiring should be connected after servo driver and servo motor installed correctly

3.1 Wiring

3.1.1 Wire Gauge

(1) Power supply terminal TB

- Diameter:

| Driver | Wire diameter (mm ² /AWG) | | |
|--------------|--------------------------------------|---------|-------|
| | Vdc, GND | U, V, W | PE |
| ELD2-RS7005 | AWG18 | AWG18 | AWG18 |
| ELD2-RS7010 | AWG16 | AWG16 | AWG16 |
| ELD2-RS7015B | AWG16 | AWG16 | AWG16 |
| ELD2-RS7020B | AWG14 | AWG14 | AWG14 |
| ELD2-RS7030B | AWG12 | AWG12 | AWG12 |

- 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 driver.

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

(2) The control signal CN1 feedback signal CN2

- **Diameter:** shielded cable (twisting shield cable is better), the diameter $\geq 0.14\text{mm}^2$ (AWG24-26), 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 CN2 cable length of the feedback signal is no more than 20 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 ELD2 series are as follows:

| Drive | Recommend resistor value (Ω) | Recommend resistor power (W) |
|--------------|------------------------------|------------------------------|
| ELD2-RS7005 | 10 | 30 |
| ELD2-RS7010 | 10 | 50 |
| ELD2-RS7015B | 10 | 50 |
| ELD2-RS7020B | 10 | 100 |
| ELD2-RS7030B | 10 | 100 or 150 |

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.

The recommended regenerative resistance specifications for most application of ELD2 are as follows:

$10\Omega \pm 5\%$, 100w,

Part number : RXFB-1, Code : 10100469

**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.

3.1.2 Position Control Mode

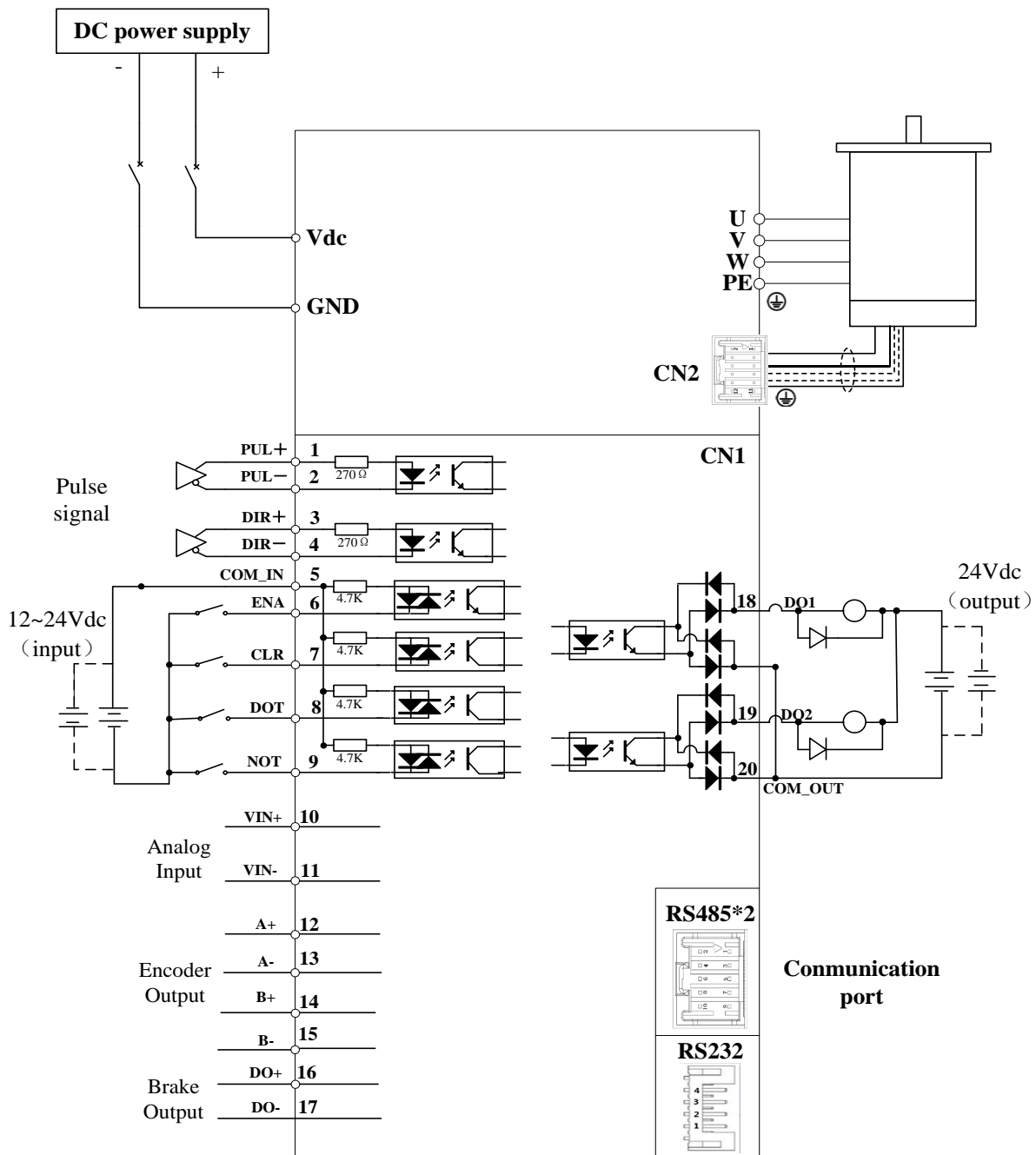


Figure 3-1 Position Mode Wiring

Notes:

1. Only support 5V pulse and direction signal, 2KΩ resistor must installed with 24V pulse and direction signal.
2. 4 digital inputs DI3~DI6, support NPN and PNP connection, recommend 12~24V input signal.
3. 2 digital outputs DO1~DO2, support NPN and PNP connection, recommend 24V output signal.
4. Analog input is available for :
ELD2-RS7005 / ELD2-RS7010 / ELD2-RS7015B / ELD2-RS7020B / ELD2-RS7030B.
5. Brake output(Pin16 and Pin17) is available for :
ELD2-RS7015B/ ELD2-RS7020B/ ELD2-RS7030B.

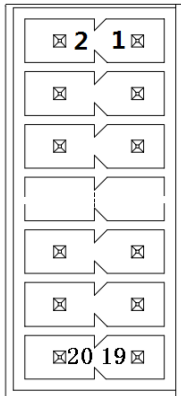
3.2 Driver Terminals Function

| Port | Function |
|-------|---------------------------------------|
| CN1 | Control Signal Port |
| CN2 | Encoder Input Port |
| CN3 | Power Port |
| CN4 | Regenerative resistor Port |
| CN5 | RS232 Communication Port |
| CN6 | RS485 Communication Port |
| S1 | RS485 slave axis ID |
| SW1~4 | RS485 Baud rate \ Terminal resistance |

3.2.1 Control Signal Port-CN1 Terminal

The CN1 of ELD2 servo drive with Molex-20 connector.

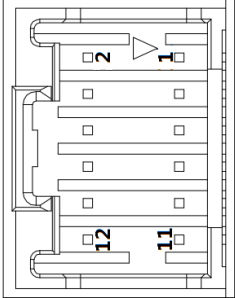
Table 3.1 Signal Explanation of Control Signal Port-CN1

| CN1 | Pin | Signal | IO | Detail | |
|---|-----|--------|--------|--|--|
|  | 1 | DI1+ | Input | Pulse + direction , 2KΩ resistor is needed if the voltage is 24Vdc | |
| | 2 | DI1- | Input | | Negative differential pulse input, 5-24V, 500KHz |
| | 3 | DI2+ | Input | | Positive differential pulse input, 5-24V, 500KHz |
| | 4 | DI2- | Input | | Negative differential pulse input, 5-24V, 500KHz |
| | 5 | COMI | Input | Power supply positive terminal of the external input control signal, 12V ~ 24V | |
| | 6 | DI3 | Input | Digital input signal 3, default value is forward enable signal, low level available in default, max voltage is 24V input 20KHz | |
| | 7 | DI4 | Input | Digital input signal 4, default value is alarm clear signal, low level available in default, max voltage is 24V input 20KHz | |
| | 8 | DI5 | Input | Digital input signal 5, default value is forward run prohibited (POT)signal in position mode, low level available in default, max voltage is 24V input 20KHz | |
| | 9 | DI6 | Input | Digital input signal 6, default value is reverse run prohibited (NOT) signal in position mode, low level available in default, max voltage is 24V input 20KHz | |
| | 10 | Vin+ | Input | Analog input, voltage input range : -10VDC~+10VDC, input resistor 20KΩ. | |
| | 11 | Vin- | Input | | |
| | 12 | A+ | Output | Differential output terminal of motor encoder A phase | |
| | 13 | A- | Output | | |
| | 14 | B+ | Output | Differential output terminal of motor encoder B phase | |
| | 15 | B- | Output | | |
| | 16 | DO+ | Output | Brake-OFF output only, can not programed for other function. The current of this digital output is enough to release motor brake. *only available for ELD2-RS7015B\ ELD2-RS7020B\ELD2-RS7030B *The output current is 800mA for ELD2-RS7015B\ ELD2-RS7020B\ ELD2-RS7030B | |
| | 17 | DO- | Output | | |

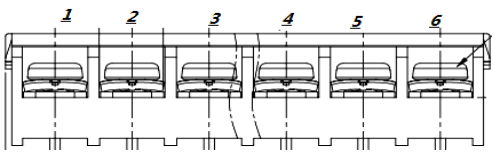
| | | | | | |
|--|--|----|------|--------|--|
| | | 18 | DO1 | Output | Digital output signal 1, default value is alarm output, 24V, 8mA |
| | | 19 | DO2 | Output | Digital output signal 2, default value is servo-ready output, 24V, 8mA |
| | | 20 | COMO | Output | Digital output signal commonality ground, 24V |

3.2.2 Encoder Input Port-CN2 Terminal

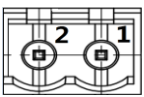
Table 3.2 Encoder Input Port-CN2 Terminal Signal for ELD2-RS series

| CN2 | | Pin | Signal | IO | Detail |
|---------|--|-----|--------|-------|------------------------------|
| Encoder |  | 1 | SHIELD | Input | Ground terminal for shielded |
| | | 2 | HU | Input | Hall sensor U input |
| | | 3 | HW | Input | Hall sensor W input |
| | | 4 | HV | Input | Hall sensor V input |
| | | 5 | VCC | Input | +5V for encoder power supply |
| | | 6 | GND | Input | |
| | | 7 | EZ+ | Input | Encoder channel Z+ input |
| | | 8 | EZ- | Input | Encoder channel Z- input |
| | | 9 | EB+ | Input | Encoder channel B+ input |
| | | 10 | EB- | Input | Encoder channel B- input |
| | | 11 | EA+ | PE | Encoder channel A+ input |
| | | 12 | EA- | Input | Encoder channel A- input |

3.2.3 Power Port

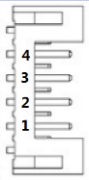
| CN3 | | Pin | Signal | Detail |
|----------------|---|-----|--------|-------------------------------|
| Power terminal |  | 1 | VCC | Power for Drive , 24-70vdc |
| | | 2 | GND | |
| | | 3 | W | Power for motor |
| | | 4 | V | |
| | | 5 | U | |
| | | 6 | PE | |

3.2.4 Regenerative resistor Port

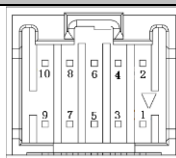
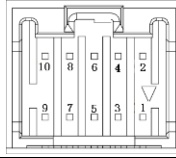
| CN4 | | Pin | Signal | Detail |
|-----------------------|---|-----|--------|-------------------------|
| Regenerative resistor |  | 1 | RBR+ | Regenerative resistor + |
| | | 2 | RBR- | Regenerative resistor - |

The recommend resistor for most application is $10\Omega \pm 5\%$, 100watt
 Leadshine can provide resistor : **RXFB-1, Part num Code : 10100469**

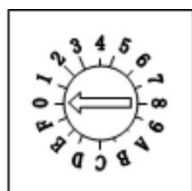
3.2.5 Communication Port

| CN5 | | Pin | Detail |
|-------|---|-----|--------|
| RS232 |  | 1 | 5V |
| | | 2 | TX |
| | | 3 | GND |
| | | 4 | RX |

3.2.6 Bus connector

| CN6 | | Pin | Signal | Detail |
|---------|--|-------|--------|-----------|
| 485 IN |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |
| CN6 | | Pin | Signal | Detail |
| 485 OUT |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |

3.2.7 Dip switch

| S1 | | NO | 485 Slave ID | NO | 485 Slave ID |
|----|---|----|----------------------|----|--------------|
| S1 |  | 0 | Pr5.31 Default=16 | 8 | 8 |
| | | 1 | 1 | 9 | 9 |
| | | 2 | 2 | A | 10 |
| | | 3 | 3 | B | 11 |
| | | 4 | 4 | C | 12 |
| | | 5 | 5 | D | 13 |
| | | 6 | 6 | E | 14 |
| | | 7 | 7 | F | 15 |

If switch S1=0, then Pr5.31 is valid.

If switch S1=1~F, S1 is valid in higher priority than Pr5.31

| RS485 Baud rate | SW1 | SW2 |
|-------------------------|-----|-----|
| Pr5.30 Default =9600 | off | off |
| 19200 | on | off |
| 38400 | off | on |
| 57600 | on | on |

If SW1 and SW2 are OFF, then Pr5.30 is valid

If SW1 or SW2 ON, then these switches are all valid in higher priority than Pr5.30

- SW3:** RS485 terminal resistance
 SW3=off, disconnect the terminal resistance
 SW3=on, connect the terminal resistance
- SW4:** When PR6.33=0, this switch is defined as Rotation direction
 SW4=off, CCW
 SW4=on, CW
- When PR6.33=8, this switch is defined as 485 Slave ID (High Bit)
 SW4=off, High Bit =0, 485 Slave ID=S1
 SW4=on, High Bit =1, 485 Slave ID=16+S1

3.3 I/O Interface Principle

3.3.1 Digital Input Interface

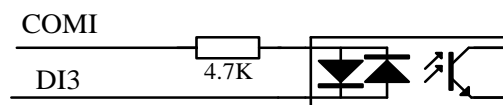


Figure 3-2 Digital Input Interface

- (1) The user provide power supply, DC12-24V, current \geq 100mA
- (2) **Notice:** if the polar of current is connected reversely, servo driver doesn't run.

3.3.2 Digital Output Interface

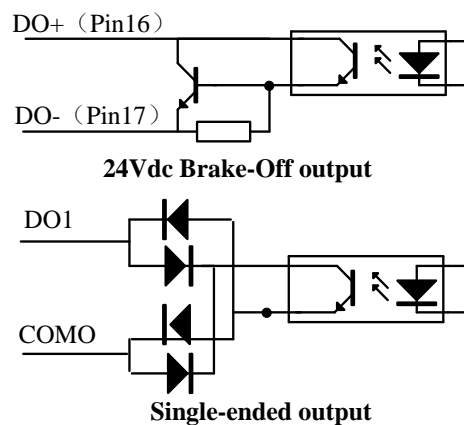


Figure 3-3 Switch Output Interface

- (1) 2 digital single-ended outputs DO1~DO2, both NPN and PNP connection are supported, recommend 24V output signal.
- (2) If the load is inductive load, for example, relays, etc., there must be anti-parallel freewheeling diode across the load. If the freewheeling diode is connected reversely, the servo drive is damaged.

3.3.3 Pulse Input Interface

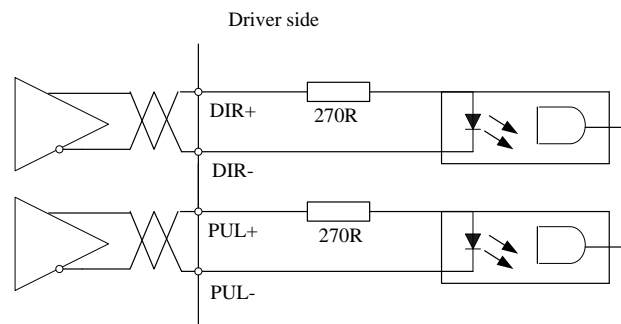
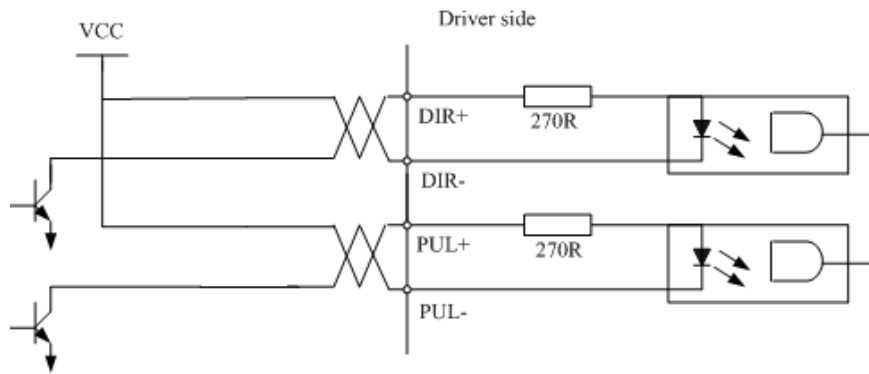
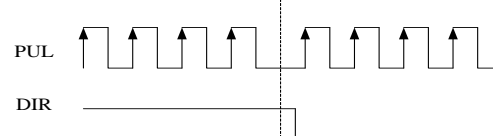
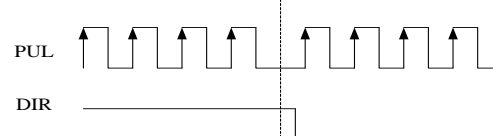


Figure 3-4 Pulse Input Interface Differential Drive Mode


Figure3-5 Pulse Input Interface Single Terminal Drive Mode

- (1) In order to transmit pulse data properly , 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.
- (4) The user provide external power supply for single-ended drive. However, if current polarity connect reversely, servo driver is damaged.
- (5) The form of pulse input is the following form 3.7 below, while the arrows indicates the count .

Table 3.3 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 3.8 below. The 4 times pulse frequency $\leq 500\text{kHz}$ if 2-phase input form is used.

Table 3.4 the parameters of pulse input time sequence

| parameter | Differential drive input | Single-ended drive input |
|-----------|--------------------------|--------------------------|
| t_{ck} | $> 2\mu\text{s}$ | $> 5\mu\text{s}$ |
| t_h | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |
| t_l | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |
| t_{rh} | $< 0.2\mu\text{s}$ | $< 0.3\mu\text{s}$ |
| t_{rl} | $< 0.2\mu\text{s}$ | $< 0.3\mu\text{s}$ |
| t_s | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |
| t_{qck} | $> 8\mu\text{s}$ | $> 10\mu\text{s}$ |
| t_{qh} | $> 4\mu\text{s}$ | $> 5\mu\text{s}$ |
| t_{ql} | $> 4\mu\text{s}$ | $> 5\mu\text{s}$ |
| t_{qrh} | $< 0.2\mu\text{s}$ | $< 0.3\mu\text{s}$ |
| t_{qrl} | $< 0.2\mu\text{s}$ | $< 0.3\mu\text{s}$ |
| t_{qs} | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |

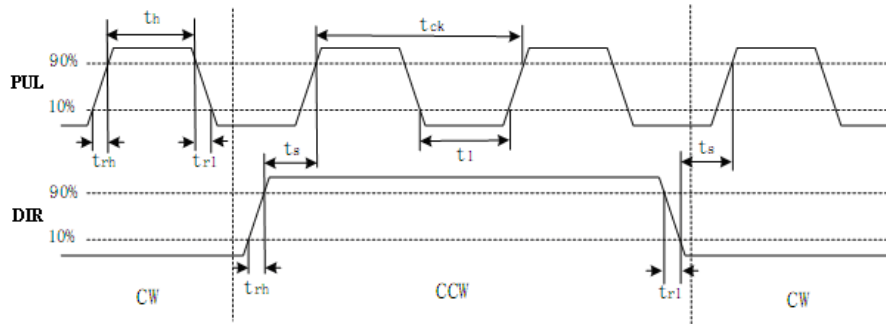


Figure 3.6 pulse + direction input interface timing (the maximum of pulse frequency : 500KHZ)

3.3.4 Analog Input Interface

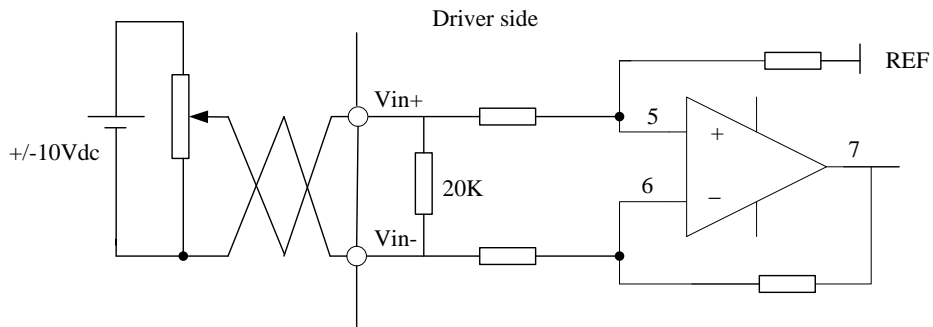


Figure 3-7 Analog Input Interface

Chapter 4 Parameter

4.1 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 | Model following control | 1 | — | √ | — | — | 16bit | R/W | 0001H |
| | 01 | Control mode setup | 0 | √ | √ | √ | √ | 16bit | R/W | 0003H |
| | 02 | Real-time auto-gain tuning | 2 | — | √ | √ | √ | 16bit | R/W | 0005H |
| | 03 | Selection of machine stiffness at real-time auto-gain tuning | 70 | — | √ | √ | √ | 16bit | R/W | 0007H |
| | 04 | Inertia ratio | 250 | — | √ | √ | √ | 16bit | R/W | 0009H |
| | 06 | Command pulse rotational direction setup | 0 | √ | √ | — | — | 16bit | R/W | 000DH |
| | 07 | Command pulse input mode setup | 3 | √ | √ | — | — | 16bit | R/W | 000FH |
| | 08 | Command pulse per one motor revolution | 10000 | √ | √ | — | — | 32bit | R/W | 0010H 0011H |
| | 09 | 1st numerator of electronic gear | 1 | √ | √ | — | — | 32bit | R/W | 0012H 0013H |
| | 10 | Denominator of electronic gear | 1 | √ | √ | — | — | 32bit | R/W | 0014H 0015H |
| | 11 | Output pulse counts per one motor revolution | 2500 | √ | √ | √ | √ | 16bit | R/W | 0017H |
| | 12 | Reverse of pulse output logic | 0 | √ | √ | √ | √ | 16bit | R/W | 0019H |
| | 13 | 1st torque limit | 300 | — | √ | √ | √ | 16bit | R/W | 001BH |
| | 14 | Position deviation excess setup | 200 | — | √ | — | — | 16bit | R/W | 001DH |
| | 15 | Absolute encoder setup | 0 | — | √ | √ | √ | 16bit | R/W | 001FH |
| | 16 | External regenerative resistance value | 100 | — | √ | √ | √ | 16bit | R/W | 0021H |
| | 17 | External regenerative resistance power value | 50 | — | √ | √ | √ | 16bit | R/W | 0023H |
| 25 | Auxiliary function | 0 | — | √ | √ | √ | 16bit | R/W | 0033H | |

| 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 | — | √ | — | — | 16bit | R/W | 0101H |
| | 01 | 1st gain of velocity loop | 180 | — | √ | √ | √ | 16bit | R/W | 0103H |
| | 02 | 1st time constant of velocity loop integration | 310 | — | √ | √ | √ | 16bit | R/W | 0105H |
| | 03 | 1st filter of velocity detection | 15 | — | √ | √ | √ | 16bit | R/W | 0107H |
| | 04 | 1st time constant of torque filter | 126 | — | √ | √ | √ | 16bit | R/W | 0109H |
| | 05 | 2nd gain of position loop | 380 | — | √ | — | — | 16bit | R/W | 010BH |

| | | | | | | | | | |
|----|--|-------|---|---|----|---|-------|-----|-------|
| 06 | 2nd gain of velocity loop | 180 | — | √ | √ | √ | 16bit | R/W | 010DH |
| 07 | 2nd time constant of velocity loop integration | 10000 | — | √ | √ | √ | 16bit | R/W | 010FH |
| 08 | 2nd filter of velocity detection | 15 | — | √ | √ | √ | 16bit | R/W | 0111H |
| 09 | 2nd time constant of torque filter | 126 | — | √ | √ | √ | 16bit | R/W | 0113H |
| 10 | Velocity feed forward gain | 300 | — | √ | — | — | 16bit | R/W | 0115H |
| 11 | Velocity feed forward filter | 50 | — | √ | — | — | 16bit | R/W | 0117H |
| 12 | Torque feed forward gain | 0 | — | √ | √ | — | 16bit | R/W | 0119H |
| 13 | Torque feed forward filter | 0 | — | √ | √ | — | 16bit | R/W | 011BH |
| 15 | Control switching mode | 0 | — | √ | -- | — | 16bit | R/W | 011FH |
| 17 | Control switching level | 50 | — | √ | — | — | 16bit | R/W | 0123H |
| 18 | Control switch hysteresis | 33 | — | √ | — | — | 16bit | R/W | 0125H |
| 19 | Gain switching time | 33 | — | √ | — | — | 16bit | R/W | 0127H |
| 35 | Positional command filter setup | 0 | √ | √ | — | — | 16bit | R/W | 0147H |
| 36 | Encoder feedback pulse digital filter setup | 0 | — | √ | √ | √ | 16bit | R/W | 0149H |
| 37 | Special register | 0 | — | √ | √ | √ | 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 | — | √ | √ | — | 16bit | R/W | 0201H |
| | 01 | 1st notch frequency | 2000 | — | √ | √ | √ | 16bit | R/W | 0203H |
| | 02 | 1st notch width selection | 2 | — | √ | √ | √ | 16bit | R/W | 0205H |
| | 03 | 1st notch depth selection | 0 | — | √ | √ | √ | 16bit | R/W | 0207H |
| | 04 | 2nd notch frequency | 2000 | — | √ | √ | √ | 16bit | R/W | 0209H |
| | 05 | 2nd notch width selection | 2 | — | √ | √ | √ | 16bit | R/W | 020BH |
| | 06 | 2nd notch depth selection | 0 | — | √ | √ | √ | 16bit | R/W | 020DH |
| | 07 | 3rd notch frequency | 2000 | — | √ | √ | √ | 16bit | R/W | 020FH |
| | 08 | 3rd notch width selection | 2 | — | √ | √ | √ | 16bit | R/W | 0211H |
| | 09 | 3rd notch depth selection | 0 | — | √ | √ | √ | 16bit | R/W | 0213H |
| | 14 | 1st damping frequency | 0 | — | √ | — | — | 16bit | R/W | 021DH |
| | 16 | 2nd damping frequency | 0 | — | √ | — | — | 16bit | R/W | 0221H |
| | 22 | Positional command smooth filter | 0 | √ | √ | — | — | 16bit | R/W | 022DH |
| | 23 | Positional command FIR filter | 0 | √ | √ | — | — | 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 | — | — | √ | — | 16bit | R/W | 0301H |
| | 01 | Speed command rotational direction selection | 0 | — | — | √ | — | 16bit | R/W | 0303H |
| | 02 | Input gain of speed command | 500 | — | — | √ | — | 16bit | R/W | 0305H |
| | 03 | Speed command reversal input | 0 | — | — | √ | — | 16bit | R/W | 0307H |
| | 04 | 1st speed setup | 0 | — | — | √ | — | 16bit | R/W | 0309H |

| | | | | | | | | | | |
|--|----|---|-----|---|---|---|---|-------|-----|-------|
| | 05 | 2nd speed setup | 0 | — | — | √ | — | 16bit | R/W | 030BH |
| | 06 | 3rd speed setup | 0 | — | — | √ | — | 16bit | R/W | 030DH |
| | 07 | 4th speed setup | 0 | — | — | √ | — | 16bit | R/W | 030FH |
| | 08 | 5th speed setup | 0 | — | — | √ | — | 16bit | R/W | 0311H |
| | 09 | 6th speed setup | 0 | — | — | √ | — | 16bit | R/W | 0313H |
| | 10 | 7th speed setup | 0 | — | — | √ | — | 16bit | R/W | 0315H |
| | 11 | 8th speed setup | 0 | — | — | √ | — | 16bit | R/W | 0317H |
| | 12 | time setup acceleration | 100 | — | — | √ | — | 16bit | R/W | 0319H |
| | 13 | time setup deceleration | 100 | — | — | √ | — | 16bit | R/W | 031BH |
| | 14 | Sigmoid acceleration /deceleration time setup | 0 | √ | — | √ | — | 16bit | R/W | 031DH |
| | 15 | Speed zero-clamp function selection | 0 | — | — | √ | — | 16bit | R/W | 031FH |
| | 16 | Speed zero-clamp level | 30 | — | — | √ | — | 16bit | R/W | 0321H |
| | 17 | Torque command selection | 0 | — | — | — | √ | 16bit | R/W | 0323H |
| | 18 | Torque command direction selection | 0 | — | — | — | √ | 16bit | R/W | 0325H |
| | 19 | Torque command input gain | 30 | — | — | — | √ | 16bit | R/W | 0327H |
| | 20 | Torque command input reversal | 0 | — | — | — | √ | 16bit | R/W | 0329H |
| | 21 | Speed limit value 1 | 0 | — | — | — | √ | 16bit | R/W | 032BH |
| | 22 | 2nd torque limit | 0 | — | √ | √ | √ | 16bit | R/W | 032DH |
| | 23 | Speed mode stop time | 0 | — | — | √ | — | 16bit | R/W | 032FH |
| | 24 | Maximum speed of motor rotation | 0 | — | √ | √ | √ | 16bit | R/W | 0331H |

| Classify | Parameter Number | Name | Default value | Repower | Mode | | | Communication | | |
|----------------------------------|---------------------------|---|---------------|---------|------|---|-------|---------------|--------|---------|
| | | | | | P | V | T | Data Type | Access | Address |
| 【Class 4】 I/F Monitor Setting | NO | | | | | | | | | |
| | 00 | input selection SI1 | 0 | √ | √ | √ | √ | 16bit | R/W | 0401H |
| | 01 | input selection SI2 | 0 | √ | √ | √ | √ | 16bit | R/W | 0403H |
| | 02 | input selection SI3 | 3 | √ | √ | √ | √ | 16bit | R/W | 0405H |
| | 03 | input selection SI4 | 4 | √ | √ | √ | √ | 16bit | R/W | 0407H |
| | 04 | input selection SI5 | 1 | √ | √ | √ | √ | 16bit | R/W | 0409H |
| | 05 | input selection SI6 | 2 | √ | √ | √ | √ | 16bit | R/W | 040BH |
| | 10 | output selection DO1 | 1 | √ | √ | √ | √ | 16bit | R/W | 0415H |
| | 11 | output selection DO2 | 2 | √ | √ | √ | √ | 16bit | R/W | 0417H |
| | 12 | output selection DO3 | 3 | √ | √ | √ | √ | 16bit | R/W | 0419H |
| | 31 | Positioning complete range | 10 | — | √ | — | — | 16bit | R/W | 043FH |
| | 32 | Positioning complete output setup | 0 | — | √ | — | — | 16bit | R/W | 0441H |
| | 33 | INP hold time | 0 | — | √ | — | — | 16bit | R/W | 0443H |
| | 34 | Zero-speed | 50 | — | √ | √ | √ | 16bit | R/W | 0445H |
| | 35 | Speed coincidence range | 50 | — | — | √ | — | 16bit | R/W | 0447H |
| | 36 | At-speed | 1000 | — | — | √ | — | 16bit | R/W | 0449H |
| | 37 | Mechanical brake action setting when stopping | 0 | — | √ | √ | √ | 16bit | R/W | 044BH |
| | 38 | Mechanical brake action setting | 0 | — | √ | √ | √ | 16bit | R/W | 044DH |
| 39 | Brake release speed setup | 30 | — | √ | √ | √ | 16bit | R/W | 044FH | |
| 43 | E-stop function active | 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 | √ | √ | — | — | 32bit | R/W | 0500H 0501H |
| | 01 | 3rd numerator of electronic gear | 1 | √ | √ | — | — | 32bit | R/W | 0502H 0503H |
| | 02 | 4th numerator of electronic gear | 1 | √ | √ | — | — | 32bit | R/W | 0504H 0505H |
| | 04 | Drive inhibit input setup | 0 | — | √ | √ | √ | 16bit | R/W | 0509H |
| | 06 | Sequence at servo-off | 0 | — | √ | √ | √ | 16bit | R/W | 050DH |
| | 09 | Main power off detection time | 70 | — | √ | √ | √ | 16bit | R/W | 0513H |
| | 10 | Dynamic braking mode | 0 | √ | √ | √ | √ | 16bit | R/W | 0515H |
| | 11 | Torque setup for emergency stop | 0 | — | √ | √ | √ | 16bit | R/W | 0517H |
| | 12 | Over-load level setup | 0 | — | √ | √ | √ | 16bit | R/W | 0519H |
| | 13 | Over-speed level setup | 0 | — | √ | √ | √ | 16bit | R/W | 051BH |
| | 15 | I/F reading filter | 0 | √ | √ | √ | √ | 16bit | R/W | 051FH |
| | 17 | Counter clear up input mode | 3 | — | √ | — | — | 16bit | R/W | 0523H |
| | 20 | Position setup unit select | 2 | — | √ | — | — | 16bit | R/W | 0529H |
| | 21 | Selection of torque limit | 0 | — | √ | √ | √ | 16bit | R/W | 052BH |
| | 22 | 2nd torque limit | 300 | — | √ | √ | √ | 16bit | R/W | 052DH |
| | 23 | Torque limit switching setup 1 | 0 | — | √ | √ | √ | 16bit | R/W | 052FH |
| | 24 | Torque limit switching setup 2 | 0 | — | √ | √ | √ | 16bit | R/W | 0531H |
| | 29 | RS485 mode selection | 21 | — | √ | √ | √ | 16bit | R/W | 053BH |
| 30 | RS485 baud rate setup | 2 | — | √ | √ | √ | 16bit | R/W | 053DH | |
| 31 | RS485 slave ID | 1 | — | √ | √ | √ | 16bit | R/W | 053FH | |
| 32 | Command pulse input maximum setup | 0 | — | √ | — | — | 16bit | R/W | 0541H | |

| 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 | √ | √ | √ | √ | 16bit | R/W | 0603H |
| | 03 | JOG trial run command torque | 0 | — | √ | — | — | 16bit | R/W | 0607H |
| | 04 | JOG trial run command speed | 400 | — | √ | — | — | 16bit | R/W | 0609H |
| | 05 | Position 3rd gain valid time | 0 | — | √ | — | — | 16bit | R/W | 060BH |
| | 06 | Position 3rd gain scale factor | 100 | — | √ | — | — | 16bit | R/W | 060DH |
| | 07 | Torque command additional value | 0 | — | √ | √ | √ | 16bit | R/W | 060FH |
| | 08 | Positive direction torque compensation value | 0 | — | √ | √ | √ | 16bit | R/W | 0611H |
| | 09 | Negative direction torque compensation value | 0 | — | √ | √ | √ | 16bit | R/W | 0613H |
| | 10 | Function expansion setup | 0 | √ | √ | √ | √ | 16bit | R/W | 0615H |
| | 11 | Current response setup | 100 | — | √ | √ | √ | 16bit | R/W | 0617H |
| | 14 | Emergency stop time at alarm | 0 | — | √ | √ | √ | 16bit | R/W | 061DH |

| | | | | | | | | | | |
|--|----|--|-----|---|---|---|---|-------|-----|-------|
| | 20 | distance of trial running | 10 | — | √ | — | — | 16bit | R/W | 0629H |
| | 21 | waiting time of trial running | 100 | — | √ | — | — | 16bit | R/W | 062BH |
| | 22 | cycling times of trial running | 5 | — | √ | — | — | 16bit | R/W | 062DH |
| | 25 | Acceleration of trial running | 200 | — | √ | — | — | 16bit | R/W | 0633H |
| | 63 | Position upper Limit of multi-turn ABS encoder | 0 | √ | √ | √ | √ | 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) | | — | √ | √ | √ | 16bit | R | 0B00H |
| | 01 | Software version 2 (CPLD) | | — | √ | √ | √ | 16bit | R | 0B01H |
| | 02 | Software version 3 (other) | | — | √ | √ | √ | 16bit | R | 0B02H |
| | 03 | Error code | | — | √ | √ | √ | 16bit | R | 0B03H |
| | 04 | Factor of no-motor running | | — | √ | √ | √ | 16bit | R | 0B04H |
| | 05 | Drive operating state | | — | √ | √ | √ | 16bit | R | 0B05H |
| | 06 | Actual velocity (unfiltered) | | | √ | √ | √ | 16bit | R | 0B06H |
| | 07 | Actual torque feedback | | — | √ | √ | √ | 16bit | R | 0B07H |
| | 08 | Actual current feedback | | — | √ | √ | √ | 16bit | R | 0B08H |
| | 09 | Actual velocity(After filtering) | | — | √ | √ | √ | 16bit | R | 0B09H |
| | 10 | DC bus voltage | | — | √ | √ | √ | 16bit | R | 0B0AH |
| | 11 | Drive temperature | | — | √ | √ | √ | 16bit | R | 0B0BH |
| | 15 | Over-load ratio | | — | √ | √ | √ | 16bit | R | 0B0FH |
| | 16 | Regeneration load ratio | | — | √ | √ | √ | 16bit | R | 0B10H |
| | 17 | Digital input signal status | | — | √ | √ | √ | 16bit | R | 0B11H |
| | 18 | Digital output signal status | | — | √ | √ | √ | 16bit | R | 0B12H |
| | 20 | Motor position feedback (Command unit) | | — | √ | √ | √ | 32bit | R | 0B14H 0B15H |
| 21 | Command pulse sum (Command unit) | | — | √ | - | - | 32bit | R | 0B16H 0B17H | |
| 22 | Positional deviation (Command unit) | | — | √ | √ | √ | 32bit | R | 0B18H 0B19H | |
| 23 | Position command (Encoder unit) | | — | √ | √ | √ | 32bit | R | 0B1AH 0B1BH | |
| 24 | Motor position (encoder unit) | | — | √ | - | - | 32bit | R | 0B1CH 0B1DH | |
| 25 | Positional deviation (encoder unit) | | — | √ | √ | √ | 32bit | R | 0B1EH 0B1FH | |
| 26 | Position feedback in rotation mode(encoder unit) | | — | √ | - | - | 32bit | R | 0B20H 0B21H | |

Notes:

- (1) The "√" in the repower bar indicates that the new value is valid after restarting the power, and the "-" indicates that the new value is valid immediately;
- (2) The "√" in the mode bar indicates this parameter is related to this mode, "—" indicates this parameter isn't related to this mode;
- (3) 32bit data, high data in front, low data after.

4.2 Parameter Function

Here is the explanation of parameters, you can check them or modify the value using configuration software.
Contact tech@leadshine.com if you need more technical service.

4.2.1 【Class 0】 Basic Setting

| | | | | | | | | |
|--------|-----------|-------------------------|--------|-------|---------|-------|---|---|
| Pr0.00 | Name | Model following control | | | 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 | Details |
|-------------|---|
| 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 | √ | | | | | | |

Control mode:

| Setup value | Content | |
|-------------|----------------------|----------|
| | 1st mode | 2nd mode |
| 0 | Position/ Pr-Mode | - |
| 1 | Velocity | - |
| 2 | Torque | - |
| 3 | Position | Velocity |
| 4 | Position | Torque |
| 5 | Velocity | Torque |

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 , 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

| |
|------------------------------|
| 81.80.....70.69.68.....51.50 |
|------------------------------|

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, a normal 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.

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



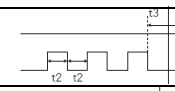
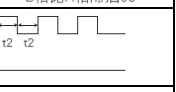
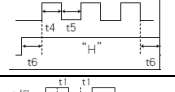
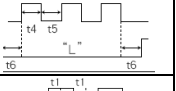


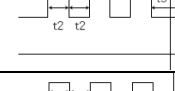
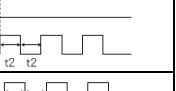

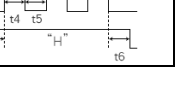
Notice:

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 | √ | | | | | |

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 | √ | | | | | |

| 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 | √ | | | | | | |

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

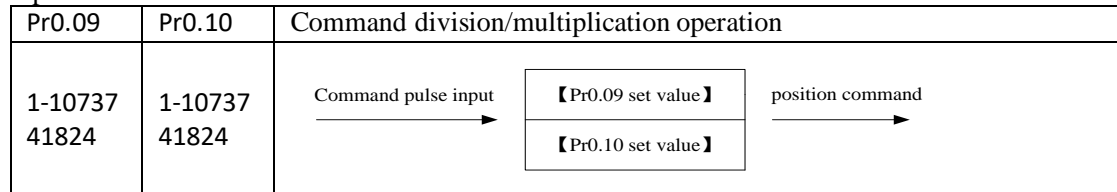
- 1) If Pr008≠0 , the actual motor rotation turns = pulse number / Pr008
- 2) If Pr008 = 0 , Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic gear valid.

| | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|----------------|--|
| 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 | √ | | | | | |

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 | √ | | | | | |

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



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: $Z = 2^{17} = 131072$
- 23Bit encoder: $Z = 2^{23} = 8388608$

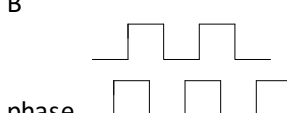
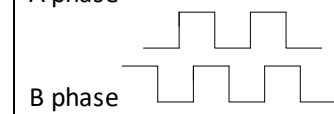
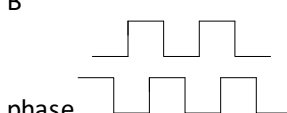
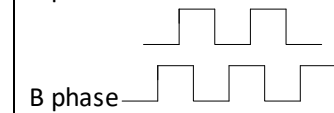
| | | | | | | | | |
|----------|-----------|--|--------|-----|---------|-------|---|---|
| Pr0.11 * | Name | Output pulse counts per one motor revolution | | | Mode | P | S | T |
| | Range | 1~2500 | Unit | P/r | Default | 2500 | | |
| | Data Type | 16bit | Access | R/W | Address | 0017H | | |
| | Repower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

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 | √ | | | | | | |

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 B  | A phase B phase  |
| 1 | Reversal | A phase B  | A phase B 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 | √ | | | | |

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 value | | | 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 resistance 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_Positive (50ms time period) | | | | | | |
| | 0X4002 | JOG_Negative (50ms time period) | | | | | | |
| | 0x6666 | Soft reset | | | | | | |

4.2.2 【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 | - | | | | | | |
| 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. | | | | | | | | |

| | | | | | | | | |
|---------------|-----------|---------------------------|--------|-------|---------|-------|---|---|
| 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 | - | | | | | | |

This parameter is used to 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.

| | | | | | | | | |
|--------|-----------|--|--------|-------|---------|-------|---|---|
| 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 | - | | | | | | |

This parameter is used to 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".

| | | | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|-------|---|---|
| Pr1.03 | Name | 1st Filter of Velocity Detection | | | Mode | P | S | T |
| | Range | 50~81 | Unit | — | Default | 70 | | |
| | 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 add 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 | - | | | | | | |

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

| | | | | | | | | |
|--------|------|--------------------------|--|--|------|---|---|--|
| 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 :encoderpulse 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.

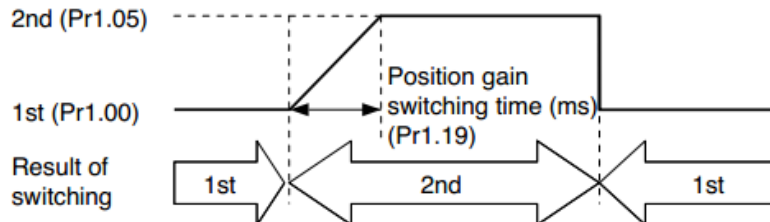
| | | | | | | | | |
|---------|-----------|------------------------------|--------|-------|---------|-------|--|--|
| Pr1. 19 | Name | position gain switching time | | | Mode | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 33 | | |
| | Data Type | 16bit | Access | R/W | Address | 0127H | | |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

4.2.3 【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.

| 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.

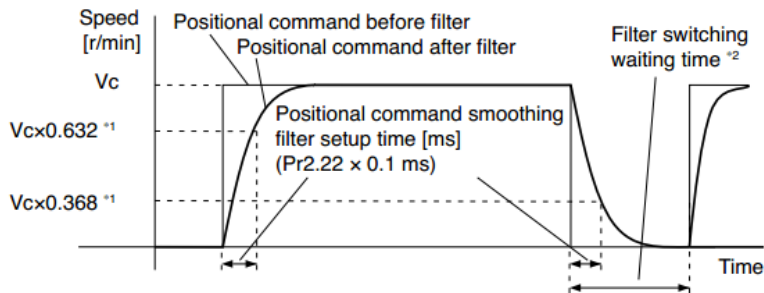
Notice: Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.

| | | | | | | | | |
|---------|-----------|-----------------------|--------|-------|---------|-------|--|--|
| 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 | | | | | | |

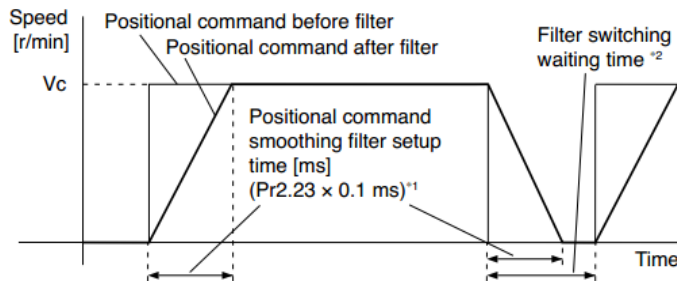
| | | | | | | |
|--------|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr2.22 | Name | Positional command smoothing filter | | | Mode | P |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022DH |
| | Repower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



4.2.4 【Class 3】 Velocity/ Torque Control

| | | | | | | |
|--------|-------|---|------|---|---------|---|
| Pr3.00 | Name | Speed setup, Internal /External switching | | | Mode | S |
| | Range | 0~3 | Unit | — | Default | 0 |

| | | | | | | |
|---------------|-----------|-------|--------|-----|---------|-------|
| Pr3.00 | 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 |
|-------------|---|
| 0 | Analog speed command(SCR) |
| 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(SCR) |
| 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 |

| | | | | | | |
|---------------|-----------|--|--------|-----|---------|-------|
| Pr3.01 | Name | Speed command rotational direction selection | | | Mode | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0303H |
| | Repower | - | | | | |

Select the Positive /Negative direction specifying method

| Setup value | Velocity value | Velocity command signal(VC-SIGN) | Velocity command direction |
|-------------|----------------|----------------------------------|----------------------------|
| 0 | + | No effect | Positive direction |
| | - | No effect | Negative direction |
| 1 | No effect | OFF | Positive direction |
| | No effect | ON | Negative direction |

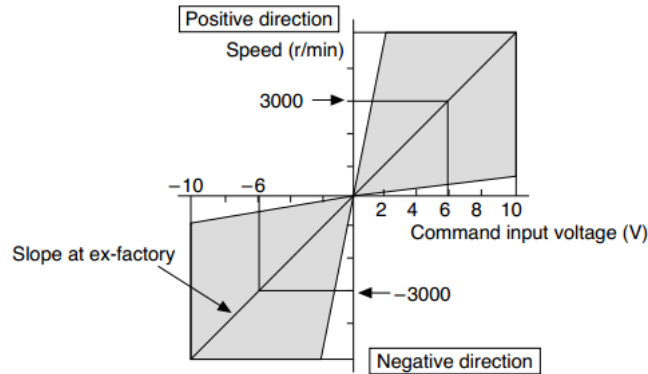
| | | | | | | |
|---------------|-----------|-----------------------------|--------|-----------|---------|-------|
| Pr3.02 | Name | Input gain of speed command | | | Mode | S |
| | Range | 10~2000 | Unit | (r/min)/V | Default | 500 |
| | Data Type | 16bit | Access | R/W | Address | 0305H |
| | Repower | - | | | | |

Based on the voltage applied to the analog speed command (SPR), set up the conversion gain to motor command speed.

You can set up “slope” of relation between the command input voltage and motor speed, with Pr3.02. Default is set to Pr3.02=500(r/min)/V, hence input of 6V becomes 3000r/min.

Notice:

1. Do not apply more than $\pm 10V$ to the speed command input (SPR).
2. When you compose a position loop outside of the drive while you use the drive in velocity control mode, the setup of Pr3.02 gives larger variance to the overall servo system.
3. Pay an extra attention to oscillation caused by larger setup of Pr3.02



| | | | | | | |
|--------|-----------|---------------------------------|--------|-----|---------|---------------------------------------|
| Pr3.03 | Name | Reversal of speed command input | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | 0~1 | Unit | — | Default | 1 |
| | Data Type | 16bit | Access | R/W | Address | 0307H |
| | Repower | - | | | | |

Specify the polarity of the voltage applied to the analog speed command (SPR).

| Setup value | Motor rotating direction | |
|-------------|--------------------------|--|
| 0 | Standard | [+ voltage] → [+ direction] \ [- voltage] → [-direction] |
| 1 | Reversed | [+ voltage] → [- direction] \ [- voltage] → [+direction] |

Caution: When you compose the servo drive system with this drive set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.

| | | | | | | |
|--------|-----------|--------------------------|--------|-------|---------|---------------------------------------|
| Pr3.04 | Name | 1st speed of speed setup | | | Mode | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030DH |
| | Repower | - | | | | |
| Pr3.07 | Name | 4th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |

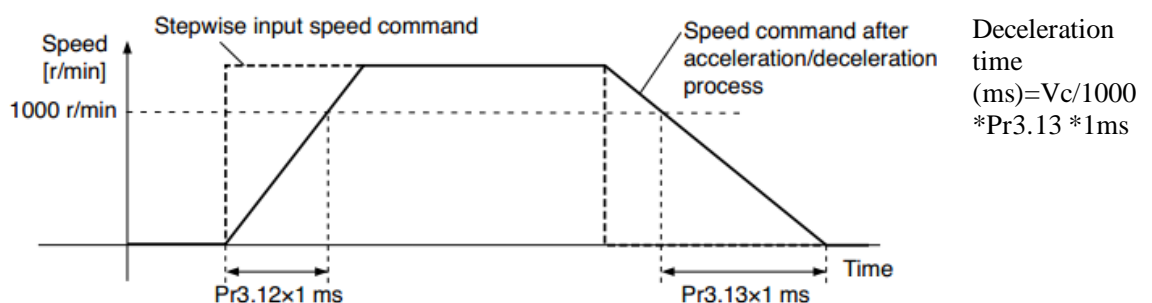
| | | | | | | |
|--|-----------|--------------------------|--------|-------|---------|---------------------------------------|
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030FH |
| | Repower | - | | | | |
| Pr3.08 | Name | 5th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0311H |
| | Repower | - | | | | |
| Pr3.09 | Name | 6th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0313H |
| | Repower | - | | | | |
| Pr3.10 | Name | 7th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0315H |
| | Repower | - | | | | |
| Pr3.11 | Name | 8th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> S |
| | Range | 0~10000 | Unit | Ms/(1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 031BH |
| | Repower | - | | | | |

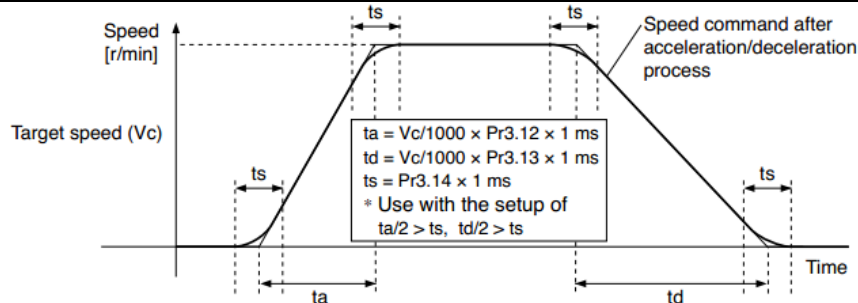
Set up acceleration/deceleration processing time in response to the speed command input. Set the time required for the speed command(stepwise input)to reach 1000r/min to Pr3.12 Acceleration time setup. Also set the time required for the speed command to reach from 1000r/min to 0 r/min, to Pr3.13 Deceleration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

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



| | | | | | | |
|--------|-----------|---|--------|-----|---------|-------|
| 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 | √ | | | | |



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.

| | | | | | | |
|--------|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr3.15 | Name | Speed zero-clamp function selection | | | Mode | S |
| | Range | 0~3 | Unit | 0.1HZ | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 031FH |
| | Repower | - | | | | |

- If Pr3.15=0, the function of zero clamp is forbidden. It means the motor rotates with actual velocity which is controlled by the analog voltage input 1 even if the velocity is less than 10 rpm. The motor runs no matter what the value of Pr3.16 is. The actual velocity is controlled by external the analog voltage input.
- If Pr3.15=1 and the input signal of Zero Speed is available in the same time, the function of zero clamp works. It means motor will stop rotating in servo-on condition no matter what the velocity of motor is, and motor stop rotating no matter what the value of Pr3.16 is.
- If Pr3.15=2, the function of zero clamp belongs to the value of Pr3.16. If the actual velocity is less than the value of Pr3.16, the motor will stop rotating in servo-on condition.

| | | | | | | |
|--------|-----------|------------------------|--------|-------|---------|-------|
| Pr3.16 | Name | Speed zero-clamp level | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 30 |
| | Data Type | 16bit | Access | R/W | Address | 0321H |
| | Repower | - | | | | |

When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.

| | | | | | | |
|--------|-----------|-----------------------------|--------|-----|---------|-------|
| 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 |
|-------------|-------------------------|--------------------------------|
| 0 | Analog input 3 | Parameter value (P3.21) |
| 1 | Analog input 3 | Analog input 1 for Speed limit |
| 2 | Parameter value (P3.22) | Parameter value (P3.21) |
| 3 | Analog input 3 | Speed limit 0 |

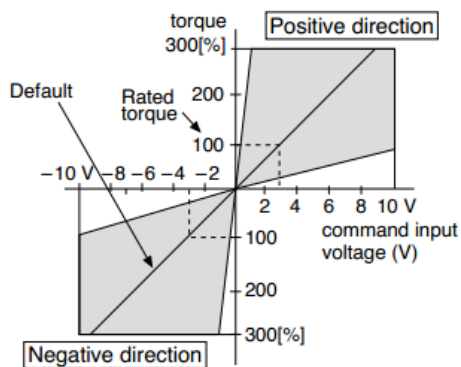
| | | | | | | | | |
|---------|-----------|------------------------------------|--------|-----|---------|-------|--|---|
| Pr3. 18 | Name | Torque command direction selection | | | Mode | | | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0325H | | |
| | 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. 19 | Name | Torque command input gain | | | Mode | | | T |
| | Range | 10~100 | Unit | 0.1V/100% | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0327H | | |
| | Repower | - | | | | | | |

- Based on the voltage (V) applied to the analog torque command (TRQR), set up the conversion gain to torque command(%) Unit of the setup value is 0.1V/100% and set up input voltage necessary to produce the rated torque.
- Default setup of 30 represents 3V/100%



| | | | | | | | | |
|---------|-----------|-------------------------------|--------|-----|---------|-------|--|---|
| Pr3. 20 | Name | Torque command input reversal | | | Mode | | | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0329H | | |
| | Repower | - | | | | | | |

Set up the polarity of the voltage applied to the analog torque command(TRQR).

| Setup value | Direction of motor output torque | |
|-------------|----------------------------------|--|
| 0 | Non-reversal | [+ voltage] → [+ direction] [- voltage] → [-direction] |
| 1 | reversal | [+ voltage] → [- direction] [- voltage] → [+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. | | | | | | | | |

4.2.5 【Class 4】 I/F Monitor Setting

| | | | | | | | | |
|---------|-----------|---------------------|--------|-----|---------|-------|---|---|
| Pr4.00* | Name | Input selection DI1 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0401H | | |
| | Repower | √ | | | | | | |
| Pr4.01* | Name | Input selection DI2 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0403H | | |
| | Repower | √ | | | | | | |
| Pr4.02* | Name | Input selection DI3 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 3 | | |
| | Data Type | 16bit | Access | R/W | Address | 0405H | | |
| | Repower | √ | | | | | | |
| Pr4.03* | Name | Input selection DI4 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 4 | | |
| | Data Type | 16bit | Access | R/W | Address | 0207H | | |
| | Repower | √ | | | | | | |
| Pr4.04* | Name | Input selection DI5 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 1 | | |
| | Data Type | 16bit | Access | R/W | Address | 0409H | | |
| | Repower | √ | | | | | | |
| Pr4.05* | Name | Input selection DI6 | | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 2 | | |
| | Data Type | 16bit | Access | R/W | Address | 040BH | | |
| | Repower | √ | | | | | | |

Set digital DI 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 |
| 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 1 or Err21.1 I/F input multiple assignment error 2

Pr-Mode related input setup as below:

| Input | | | |
|-------------------------|--------|---------------|-----------------|
| Signal name | Symbol | 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 DO1 | | Mode | P | S | T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 1 | |

| | | | | | | |
|---------|-----------|----------------------|--------|-----|---------|-------|
| | Data Type | 16bit | Access | R/W | Address | 0415H |
| | Repower | √ | | | | |
| Pr4.11* | Name | Output selection DO2 | | | Mode | P S T |
| | Range | 0~00FFFFFFh | Unit | — | Default | 2 |
| | Data Type | 16bit | Access | R/W | Address | 0417H |
| | Repower | √ | | | | |

Set digital 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.

| | | | | | | |
|--------|-----------|-----------------------------------|--------|-----|---------|-------|
| Pr4.22 | Name | Analog input 1 (AI1) offset setup | | | Mode | S |
| | Range | -5578~5578 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 042DH |
| | Repower | - | | | | |

Set up the offset correction value applied to the voltage fed to the analog input 1.

| | | | | | | |
|--------|-----------|-----------------------------|--------|--------|---------|-------|
| Pr4.23 | Name | Analog input 1 (AI1) filter | | | Mode | S |
| | Range | 0~6400 | Unit | 0.01ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 042FH |
| | Repower | - | | | | |

Set up the time constant of 1st delay filter that determines the lag time behind the voltage applied to the analog input 1.

| | | | | | | |
|--------|------|--|--|--|------|---|
| Pr4.24 | Name | Analog input 1 (AI1) over -voltage setup | | | Mode | S |
|--------|------|--|--|--|------|---|

| | | | | | | |
|--|-----------|-------|--------|------|---------|-------|
| | Range | 0~100 | Unit | 0.1v | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0431H |
| | Repower | - | | | | |

Set up the excessive level of the input voltage of analog input 1 by using the voltage associated with offset

| | | | | | | |
|--------|-----------|----------------------------|--------|-----------|---------|----------|
| 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

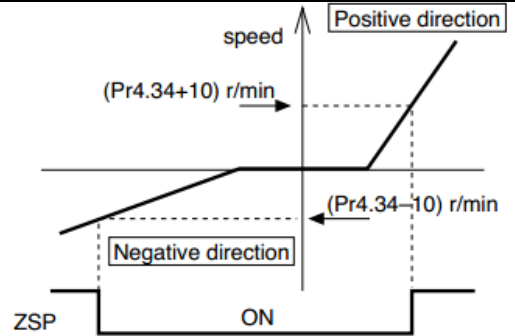
| Setup value | State of Positioning complete signal |
|-------------|--|
| 0 | The hold time is maintained definitely, keeping ON state until next positional command is received. |
| 1-30000 | ON state is maintained for setup time (ms) but switched to OFF state as the positional command is received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

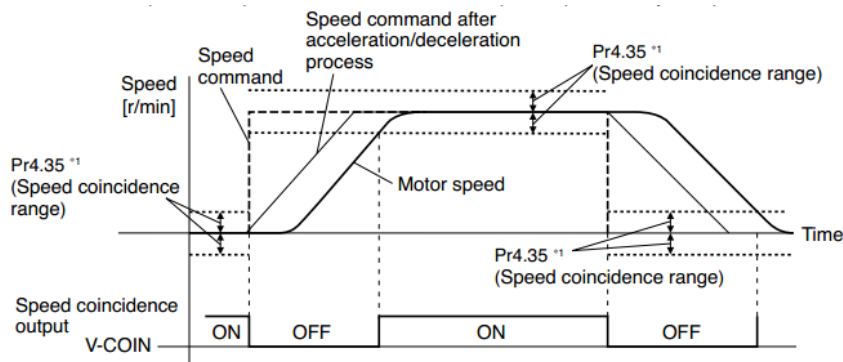
Set the speed coincidence (V-COIN) output detection timing.

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.

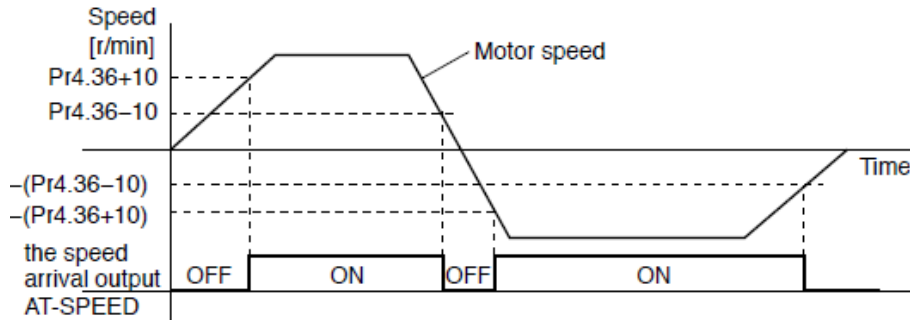
Speed coincidence output OFF -> ON timing (Pr4.35 -10) r/min

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 | - | | | | |

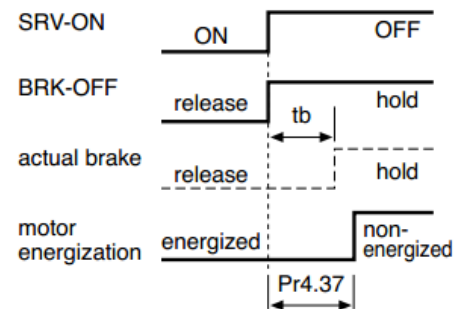
Set the detection timing of the speed arrival output (AT-SPEED).
 When the motor speed exceeds this setup value, the speed arrive output (AT-SPEED) is output.
 Detection is associated with 10r/min hysteresis .



| | | | | | | | | |
|---------------|-----------|---|--------|-----|---------|-------|---|---|
| Pr4.37 | Name | Mechanical brake action at stalling setup | | | 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 (t_b) of the brake.
- After setting up $Pr4.37 \geq t_b$, then compose the sequence so as the drive turns to servo-off after the brake is actually activated

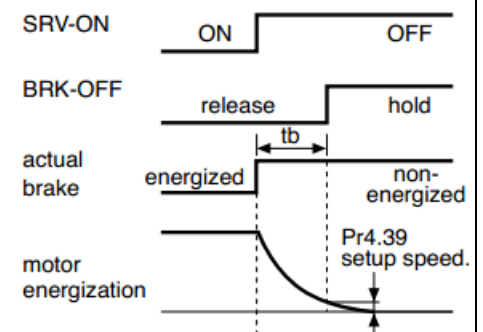


| | | | | | | | | |
|---------------|-----------|--|--------|-----|---------|-------|---|---|
| Pr4.38 | Name | Mechanical brake action at running setup | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044DH | | |
| | Repower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

Mechanical brake start delay time setup, it is mainly used to prevent the phenomenon of "Z-axis falling down" when the servo starts up.

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 running.
- At servo-OFF during the motor is running, t_b of the right fig will be a shorter one of either Pr4.38 setup time, or time lapse till the motor speed falls below Pr4.39 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 brake output checking during operation . | | | | | | | | |

4.2.6 【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 | √ | | | | | | |
| Set the command pulse that causes single turn of the motor shaft. Select Pr0.08 1st or Pr5.00 2nd by IO signal. 1) If Pr5.00≠0 , the actual turns = pulse number / Pr5.00 2) If Pr5.00 = 0 , Pr5.01 2nd numerator of electronic gear and Pr5.02 2nd Denominator of electronic Gear become valid. | | | | | | | | |

| | | | | | | | | |
|---------------|-----------|----------------------------------|--------|-----|---------|----------------|--|--|
| 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 | √ | | | | | | |

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

| | | | | | | | | |
|---------------|-----------|------------------------------------|--------|-----|---------|----------------|--|--|
| 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 | | | | | | |

Set the denominator of division/multiplication operation made according to the command pulse input.
Instructions refer to Pr0.09 and Pr0.10 and select by IO signal

| | | | | | | | | |
|--|-----------|---------------------------------|--------|-----|---------|----------|----------|----------|
| 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 | - | | | | | | |
| 0: positive and negative limit effective, no alarm output; 1: positive and negative limit effective invalid; 2: positive and negative limit effective, alarm output; | | | | | | | | |

| | | | | | | | | |
|---------------|-------|-----------------|------|---|---------|----------|----------|----------|
| 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. | | | |

| | | | | | | |
|---|-----------|-----------------------------------|--------|-----|---------|----------------------------|
| 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 | √ | | | | |
| 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. | | | | | | |

| | | | | | | |
|---|-----------|---------------------------------|--------|-----|---------|----------------------------|
| Pr5.11 * | 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 | - | | | | |
| 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. | | | | | | |

| | | | | | | |
|--|-----------|------------------------|--------|-------|---------|----------------------------|
| 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 | - | | | | |
| 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. | | | | | | |

| | | | | | | |
|---|-----------|--------------------|--------|-------|---------|----------------------------|
| 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 | √ | | | | |
| I/O input digital filtering; higher setup will arise control delay. | | | | | | |

| | | | | | | |
|--------|-----------|--------------------------|--------|-----|---------|----------|
| Pr5.17 | Name | Counter clear input mode | | | Mode | P |
| | Range | 0~4 | Unit | — | Default | 3 |
| | Data Type | 16bit | Access | R/W | Address | 0523H |

| | | | | | |
|--|--------------------|------------------------|--|--|--|
| Repower | - | | | | |
| Set up the clearing conditions of the counter clear input signal | | | | | |
| | 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 | - | | | | | | |
| Specify the unit to determine the range of positioning complete and excessive positional deviation | | | | | | | | |
| | 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 | - | | | | | | |
| <ul style="list-style-type: none"> ● 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 | - | | | | |

| 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 ID | | | 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. | | | | | | | | |

| | | | | | | | | |
|--|-----------|-----------------------------------|--------|-----|---------|-------|--|--|
| 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 | - | | | | | | |
| 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 | | | | | | | | |

4.2.7 【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. | | | | | | | | |

| | | | | | | | | |
|--|-----------|------------------------|--------|-----|---------|-------|---|---|
| Pr6.11 | Name | Current response setup | | | Mode | P | S | T |
| | Range | 50~100 | Unit | % | Default | 100 | | |
| | Data Type | 16bit | Access | R/W | Address | 0617H | | |
| | Repower | - | | | | | | |
| Sets the RMS ratio of the relevant parameters of the driver current loop | | | | | | | | |

| | | | | | | | | |
|---|-----------|-------------------------------|--------|-----|---------|-------|---|---|
| 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 | Position upper Limit of multi-turn ABS encoder | | | 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~(Pr6.63+1)

4.2.8 【Class 7】 Factory setting

| | | | | | | |
|--------|-------|-------------------|------|----|---------|-------|
| Pr7.15 | Name | Motor model input | | | Mode | P S T |
| | Range | 0~7FFF | Unit | -- | Default | 0 |
| Pr7.16 | Name | Encoder selection | | | Mode | P S T |
| | Range | 0~30000 | Unit | -- | Default | 0 |

| Motor Model | Pr7.15 | Pr7.16 |
|------------------|--------|--------|
| ACM602V36-1000 | 0x8001 | 0x201 |
| ACM602V36-2500 | 0x8001 | 0x204 |
| 57BL180D-1000 | 0x8003 | 0x201 |
| ACM604V60-1000 | 0x8002 | 0x201 |
| ACM604V60-2500 | 0x8002 | 0x204 |
| ELDM6020V36HL-A5 | 0x8004 | 0x201 |

| | | | |
|--|---------------------|--------|-------|
| | ACM602V36-T-2500 | 0x8006 | 0x204 |
| | ACM602V24-T-2500 | 0x8007 | 0x204 |
| | ELDM4005V24HL-B5 | 0x8008 | 0x204 |
| | ELDM4010V24HL-B5 | 0x8009 | 0x204 |
| | ELDM6020V48HL-A5 | 0x800B | 0x201 |
| | ELDM6040V48HL-A5 | 0x800C | 0x201 |
| | ELDM6040V60HL-A5 | 0x800D | 0x201 |
| | ELDM6060V48HL-A5-HD | 0x800E | 0x201 |
| | ELDM8075V48HM-A4-HD | 0x8010 | 0x201 |

| | | | | | | | | |
|---------------|-------|--|--|----|---------|---|---|---|
| Pr7.31 | Name | Regenerative resistance control mode setting | | | Mode | P | S | T |
| | Range | 0~2 | Unit | -- | Default | 0 | | |
| | | Setup value | Details | | | | | |
| | | 0 | Disable regenerative resistance discharge | | | | | |
| | | 1 | Enable reactive pump lift suppression function | | | | | |
| | | 2 | Enable regenerative resistance discharge | | | | | |
| Notice: | | | | | | | | |

| | | | | | | | | |
|---|-------|--|------|---|---------|----|---|---|
| Pr7.32 | Name | Regenerative resistance open threshold setting | | | Mode | P | S | T |
| | Range | 20~90 | Unit | V | Default | 80 | | |
| The external resistance is activated when the actual bus voltage is higher than Pr7.32 plus Pr7.33 and is deactivated when the actual bus voltage is lower than Pr7.32 minus Pr7.33 | | | | | | | | |
| Notice: | | | | | | | | |

| | | | | | | | | |
|---|-------|--|------|---|---------|---|---|---|
| Pr7.33 | Name | Regenerative resistance control hysteresis | | | Mode | P | S | T |
| | Range | 1~50 | Unit | V | Default | 5 | | |
| The external resistance is activated when the actual bus voltage is higher than Pr7.32 plus Pr7.33 and is deactivated when the actual bus voltage is lower than Pr7.32 minus Pr7.33 | | | | | | | | |
| Notice: | | | | | | | | |

4.2.8 【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 | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Bit</th> <th>Function</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>RDY</td> <td>Servo ready</td> </tr> <tr> <td>1</td> <td>RUN</td> <td>Servo run</td> </tr> <tr> <td>2</td> <td>ERR</td> <td>Servo error</td> </tr> <tr> <td>3</td> <td>HOME_OK</td> <td>Homing process finished in Pr-Mode</td> </tr> <tr> <td>4</td> <td>INP</td> <td>Positioning complete</td> </tr> <tr> <td>5</td> <td>AT-SPEED</td> <td>At-speed</td> </tr> <tr> <td>6~15</td> <td></td> <td>Reserve</td> </tr> </tbody> </table> | | | | | | | Bit | Function | Details | 0 | RDY | Servo ready | 1 | RUN | Servo run | 2 | ERR | Servo error | 3 | HOME_OK | Homing process finished in Pr-Mode | 4 | INP | Positioning complete | 5 | AT-SPEED | At-speed | 6~15 | | Reserve |
| Bit | Function | Details | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | RDY | Servo ready | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | RUN | Servo run | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | ERR | Servo error | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | HOME_OK | Homing process finished in Pr-Mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 |
| Speed (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:

| Bit | SI input |
|-----|----------|
| 0 | SI1 |
| 1 | SI2 |
| 2 | SI3 |
| ... | ... |
| 8 | SI9 |

Bit n=1, indicates SI(n+1) is at high level;
 Bit n=0, indicates 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 | DO output |
|-----|-----------|
| 0 | DO1 |
| 1 | DO2 |

| | |
|---|-----|
| 2 | DO3 |
|---|-----|

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

| | | | | | | | | |
|--|-----------|--|--------|---|---------|-------------|---|--|
| PrB. 20 | Name | Motor position feedback (Command unit) | | | Mode | P | R | |
| | 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 encoderunit 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 5 Alarm and Processing

5.1 Alarm List

Protection function is activated when an error occurs, the drive will make servo motor stop running, and the configuration software will automatically display the error code in alarm display window. The history of the error can be also viewed on alarm window from the configuration software.

Table 5.1 Error Code List

| Error code | | Content | Attribute | | |
|------------|-----|---|-----------|----------------|----------------|
| Main | Sub | | History | Immediate stop | Can be cleared |
| 09 | 0~8 | FPGA communication error | • | | |
| 0A | 0~8 | Current detection circuit error | • | | |
| | 2~4 | Analog input circuit error | • | | |
| | 3 | Power line break | • | | |
| | 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 | • | | • |
| 0E | 0 | Over-current | • | | |
| | 0 | over-current of intelligent power module(IPM) | • | | |
| 0F | 0 | Driver over-heat | • | • | |
| 10 | 0 | Motor over-load | • | | • |
| | 0 | Motor overload/driver overload | | | |
| 12 | 0 | Resistor discharged circuit overload | • | • | |
| | 0 | over-current of intelligent power module(IPM) | | | |
| 15 | 0 | Encoder wiring error | • | | |
| | 0 | Encoder communication error | | | |
| | 2 | Encoder initial position error | • | | |
| 17 | 0 | Encoder data error | • | • | |
| 18 | 0 | Too large position pulse deviation | • | • | • |
| | 0 | Too large velocity deviation | • | • | • |
| 19 | 0 | Excessive vibration | • | • | • |
| 1A | 0 | Over-speed 1 | • | • | • |

| | | | | | |
|----|---|--|---|---|---|
| | 8 | Motor speed out of control | | | |
| 8b | 8 | Electronic gear ratio error | | | |
| 28 | 0 | I/F input interface allocation error | • | | • |
| | 8 | I/F input interface function set error | • | | • |
| | 2 | I/F output interface function set error | • | | • |
| 29 | 0 | CRC verification error when EEPROM parameter saved | | | |
| 26 | 0 | Positive/negative over-range input valid | • | • | • |
| 27 | 0 | Analog value 1 input error limit | | | |
| 58 | 0 | Compulsory alarm input valid | • | • | |
| 5E | 0 | Motor code error | | | |

Save: save this error history record

Emergency: error, driver will stop immediately

May remove: may through SI input/panel/software ACH Series remove alarm

5.2 Alarm Processing Method

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

| Error code | Main | Extra | Display: "888090"_"88809F" |
|-----------------------|------|---------------------------------------|--|
| | 09 | 0~F | Content: FPGA communication error |
| Cause | | Confirmation | Solution |
| Vdc/GND under-voltage | | Check the voltage of Vdc/GND terminal | Make sure voltage of Vdc/GND in proper range |
| Driver internal fault | | / | replace the driver with a new one |

| Error code | Main | Extra | Display: '8880A0'_"8880A8" |
|---|------|---|---|
| | 0A | 0~8 | 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 |
| Vdc/GND under-voltage | | Check the voltage of Vdc/GND terminal | Make sure voltage of Vdc/GND in proper range |
| Driver inner fault | | / | replace the driver with a new one |

| Error code | Main | Extra | Display: "8880A2"_"8880A4" |
|---------------------------|------|------------------------------|---|
| | 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 |
| Driver inner fault | | / | replace the driver with a new one |

| Error | Main | Extra | Display: "8880A3" |
|-------|------|-------|-------------------|
|-------|------|-------|-------------------|

| | | | |
|--------------------|----|---|--|
| code | 0A | 3 | Content: Power line break |
| Cause | | | Confirmation |
| Power line break | | | Check wiring of analog input |
| | | | Use a multimeter to measure the resistance between the winding wires. If the three-phase resistance is inconsistent, the winding may be open or the motor may be damaged |
| Driver inner fault | | | / |
| | | | replace the motor with a new one |

| | | | |
|-----------------------|------|-------|--|
| Error code | Main | Extra | Display: "EE0005" |
| | 0A | 5 | Content: DC bus circuit error |
| Cause | | | Confirmation |
| Vdc/GND under-voltage | | | Check the voltage of Vdc/GND terminal |
| | | | Make sure voltage of Vdc/GND in proper range |
| Driver inner fault | | | / |
| | | | replace the driver with a new one |

| | | | |
|-----------------------|------|-------|---|
| Error code | Main | Extra | Display: "EE0006" |
| | 0A | 6 | Content: temperature detection circuit error |
| Cause | | | Confirmation |
| Vdc/GND under-voltage | | | Check the voltage of Vdc/GND terminal |
| | | | Make sure voltage of Vdc/GND in proper range |
| Driver inner fault | | | / |
| | | | replace the driver with a new one |

| | | | |
|-----------------------|------|-------|--|
| Error code | Main | Extra | Display: "EE0000" |
| | 0B | 0 | Content: control power under-voltage |
| Cause | | | Confirmation |
| Vdc/GND under-voltage | | | Check the voltage of Vdc/GND terminal |
| | | | Make sure voltage of Vdc/GND in proper range |
| Driver inner fault | | | / |
| | | | replace the driver with a new one |

| | | | |
|-----------------------------|------|-------|--|
| Error code | Main | Extra | Display: "EE0000" |
| | 0E | 0 | Content: DC bus over-voltage |
| Cause | | | Confirmation |
| Vdc/GND over-voltage | | | Check the voltage of Vdc/GND terminal |
| | | | Make sure voltage of Vdc/GND in proper range |
| Inner brake circuit damaged | | | / |
| Driver inner fault | | | / |
| | | | replace the driver with a new one |

| | | | |
|-----------------------|------|-------|--|
| Error code | Main | Extra | Display: "EE0000" |
| | 0D | 0 | Content: DC bus under-voltage |
| Cause | | | Confirmation |
| Vdc/GND under-voltage | | | Check the voltage of Vdc/GND terminal |
| | | | Make sure voltage of Vdc/GND in proper range |
| Driver inner fault | | | / |
| | | | replace the driver with a new one |

| | | | |
|---------------------------------------|-----------------------------------|--|--|
| Error code | Main | Extra | Display: “ EE ” |
| | EE | E | Content: over-current |
| Cause | | Confirmation | Solution |
| Short of driver output wire | | Short of driver output wire, whether short circuit to PG ground or not | Assure driver 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 driver output wiring, make srv_on available and drive motor, check whether over-current exists | replace the driver 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: “ EF ” |
| | EF | F | Content: IPM over-current |
| Cause | | Confirmation | Solution |
| Short of driver output wire | | Short of driver output wire, whether short circuit to PG ground or not | Assure driver 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 driver output wiring, make srv_on available and drive motor, check whether over-current exists or not | replace the driver with a new one |
| Short of IGBT module | | / | replace the driver 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: “ FF ” |
| | FF | F | Content: driver over-heat |
| Cause | | Confirmation | Solution |
| the temperature of power module have exceeded upper limit | | Check driver radiator whether the temperature is too high or not | Strengthen cooling conditions, promote the capacity of driver and motor, enlarge acceleration/deceleration time, reduce load |

| | | | |
|------------------------|-----------------------------------|---|--|
| Error code | Main | Extra | Display: “ HO ” |
| | HO | O | 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: "E20001" |
| | E20 | 1 | Content: Motor overload/driver overload |
| Cause | | Confirmation | Solution |
| Powerline connection error | | UVW connection error | Check connection of UVW |
| Over current | | Over current | Use another driver with higher rated power |

| | | | |
|--|------|--|--|
| Error code | Main | Extra | Display: "E20020" |
| | E22 | 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 driver and motor |
| Resistance discharge circuit damage | | / | Increase external regenerative resistor, replace the driver with a new one |

| | | | |
|-----------------------|------|--------------------------------|--|
| Error code | Main | Extra | Display: "E20021" |
| | E22 | 1 | Content: Leakage triode malfunction |
| Cause | | Confirmation | Solution |
| Brake circuit failure | | Brake resistance short circuit | repair |
| | | IGBT damaged | repair |

| | | | |
|-----------------------------------|------|--|-------------------------------------|
| Error code | Main | Extra | Display: "E20050" |
| | E25 | 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 driver with a new one |

| | | | |
|-----------------------------|------|---------------------------------|---|
| Error code | Main | Extra | Display: "E20051" |
| | E25 | 1 | Content: Encoder communication error |
| Cause | | Confirmation | Solution |
| Encoder communication error | | Interference is caused by noise | |

| | | | |
|-----------------------------------|------|--|--|
| Error code | Main | Extra | Display: "E2E2E2E2" |
| | E5 | 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 driver with a new one |

| | | | |
|-----------------------------------|------|---|--|
| Error code | Main | Extra | Display: "E2E2E2E0" |
| | E7 | 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 driver with a new one |

| | | | |
|--|------|---|--|
| Error code | Main | Extra | Display: "E2E2E2E0" |
| | E8 | 0 | Content: position error over-large error |
| Cause | | Confirmation | Solution |
| Unreasonable set of position error parameter | | Check parameter PA_014 value if it is too small or not | Enlarge the value of PA_014 |
| Gain set is too small | | Check parameter PA_100, PA_105 value if it is too small or not | Enlarge the value of PA_100, PA_105 |
| Torque limit is too small | | Check parameter PA_013, PA_522 value whether too small or not | Enlarge the value of PA_103, PA_522 |
| 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: "E2E2E2E1" |
| | E8 | 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: "E288190" |
| | 19 | 0 | Content: excessive vibration |
| Cause | | Confirmation | Solution |
| Current vibration | | Current vibration | Cut down the value of Pr003. Pr004 |
| Stiffness is too strong | | Stiffness is too strong | |

| | | | |
|---|------|--|---|
| Error code | Main | Extra | Display: "E2881A0" |
| | 1A | 0 | Content: over-speed 1 |
| Cause | | Confirmation | Solution |
| Motor speed has exceeded the first speed limit (PA_321) | | 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 PA_321 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 PA_321 value, modify command pulse input frequency and division frequency coefficient, assure encoder wiring correctly |

| | | | |
|----------------------|------|----------------------|--|
| Error code | Main | Extra | Display: "E2881B1" |
| | 1A | 1 | Content: Motor speed out of control |
| Cause | | Confirmation | Solution |
| UVW connection error | | UVW connection error | |
| Encoder error | | Encoder error | Replace motor |
| Special function | | | Set Pr1.37=4 |

| | | | |
|-----------------------------|------|---------------------|---|
| Error code | Main | Extra | Display: "E2881B0" |
| | 1B | 0 | Content: Wrong pulse input frequency |
| Cause | | Confirmation | Solution |
| Wrong pulse input frequency | | | |

| | | | |
|-----------------------------------|------|-----------------------------------|---|
| Error code | Main | Extra | Display: "E2881B1" |
| | 1B | 1 | Content: Electronic gear ratio error |
| Cause | | Confirmation | Solution |
| Pulse input frequency is too high | | Pulse input frequency is too high | Make sure the pulse frequency is below 500K |

| | | | |
|-------------------------------|------|----------------------------|--|
| Error code | Main | Extra | Display: "E288200" |
| | 20 | 0 | Content: I/F input interface allocation error |
| Cause | | Confirmation | Solution |
| The input signal are assigned | | Check the value of PA_400, | Assure the value of PA_400, PA_401, |

| | | |
|--|--|---|
| with two or more functions. | PA_401, PA_402, PA_403, PA_404 if it is proper or not | 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: "E88288" |
| | 28 | 8 | 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: "E88282" |
| | 28 | 2 | Content: I/F input interface function set error |
| Cause | | Confirmation | Solution |
| The input signal are 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 aren'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: "E88240" |
| | 24 | 0 | Content: CRC verification error when EEPROM parameter is saved |
| Cause | | Confirmation | Solution |
| Vdc/GND under-voltage | | Check the voltage of Vdc/GND terminal | Make sure voltage of Vdc/GND in proper range |
| Driver is damaged | | save the parameters for several times | replace the driver with a new one |
| The setting of driver maybe default setting which isn't suitable for motor . | | Check the setting of driver if it is suitable for your motor | Download the suitable project file to driver for motor |

| | | | |
|--|------|---|---|
| Error code | Main | Extra | Display: "E88260" |
| | 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: "E88270" |
| | 27 | 0 | Content: Analog value 1 input error limit |
| Cause | | Confirmation | Solution |
| Analog value 1 input error limit | | Analog value 1 input error limit | |

| | | | |
|--|-----------|---------------------------------|--|
| Error code | Main | Extra | Display: “ EE8500 ” |
| | 50 | 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 |

| | | | |
|-------------------|-----------|---------------------|-----------------------------------|
| Error code | Main | Extra | Display: “ EE85E0 ” |
| | 5F | 0 | Content: Motor code error |
| Cause | | Confirmation | Solution |
| Motor code error | | Motor code error | Set Pr7.15 correctly |

Chapter 6 Trial Run



Attention

- Ground the earth terminal of the motor and driver without fail. the PE terminal of driver must be reliably connected with the grounding terminal of equipment.
- The driver 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 driver.
- 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 need to test the driver without load for safety first.

Contact tech@leadshine.com for more technical support .

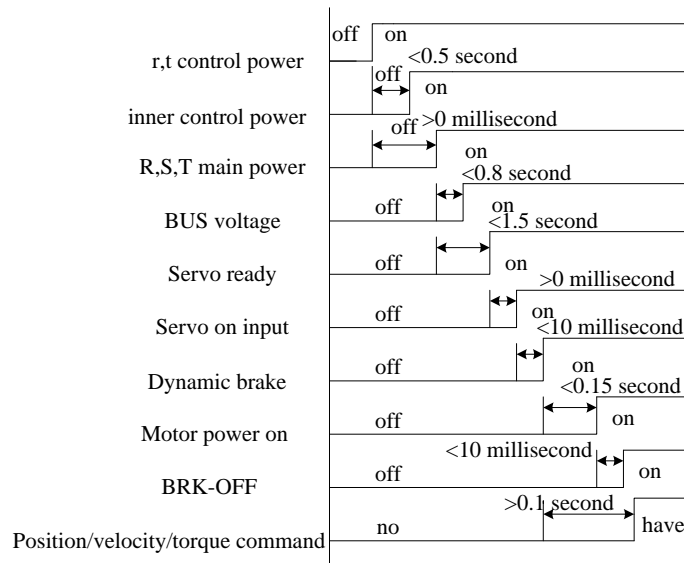
6.1 Inspection Before trial Run

6.1.1 Inspection on wiring

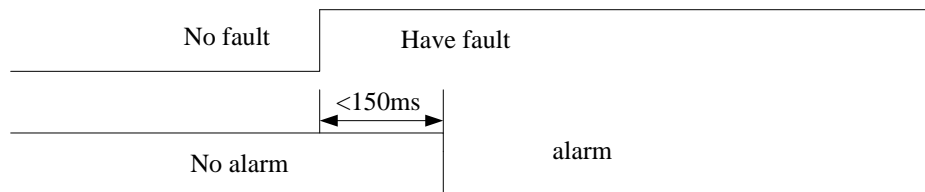
Table 6.1 Inspection Item Before Run

| No | Item | Content |
|----|------------------------------|---|
| 1 | Inspection on wiring | <ul style="list-style-type: none"> • Ensure the following terminals are properly wired and securely connected : <ul style="list-style-type: none"> ✓ the input power terminals, ✓ motor output power terminal , ✓ encoder input terminal CN2, ✓ control signal terminal CN1, ✓ communication terminal CN3(no need to connect CN1&CN3 in Jog mode) • short circuit among power input lines and motor output lines are forbidden , and no short circuit connected with PG ground. |
| 2 | Confirmation of power supply | The range of control power input Vdc, GND must be in the rated range(24-70Vdc). |
| 3 | Fixing of position | the motor and driver 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 enable input Srv_on must be in OFF state. |

6.1.2 Timing chart on power-up



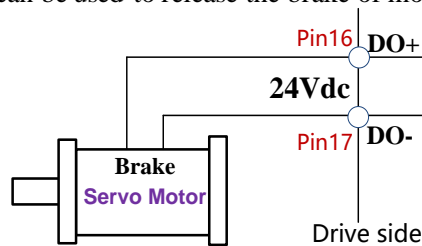
6.1.3 Timing chart on fault



6.1.4 Holding brake

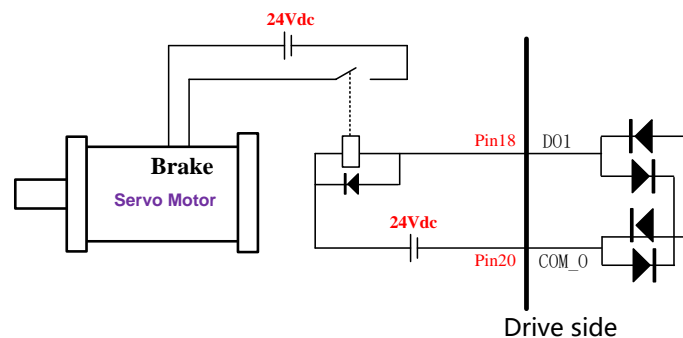
In applications where the motor drives the vertical axis, this brake would be used to hold and prevent the work (moving load) from falling gravity while the power to the servo is shut off.

- ✓ **For ELD2-RS7015B/-RS7020B/-RS7030B :**
Pin16/17 (DO+/DO-) can be used to release the brake of motor directly.



- ✓ **For ELD2-RS7005 and ELD2-RS7010 :**
There is no direct "brake output" from these two drives, so DO1 or DO2 can be used to provide a "control signal" for releasing the brake.

The diagram about the wiring with DO1/COMO for brake signal is as below :



About the wire of brake, there should be an 24VDC for brake, the brake will be released with the 24VDC input, and the drive provide an output signal to control the connection or disconnection of the 24VDC, and it is forbidden to connect these signal directly for the power of 24VDC, it will destroy the hardware of servo driver.

6.2 Position Control

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

Table 6.2 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 | Pr4.02 | DI3 input select: servo-enable | Srv_on | Hex:0003 | / |

◆ Wiring Diagram

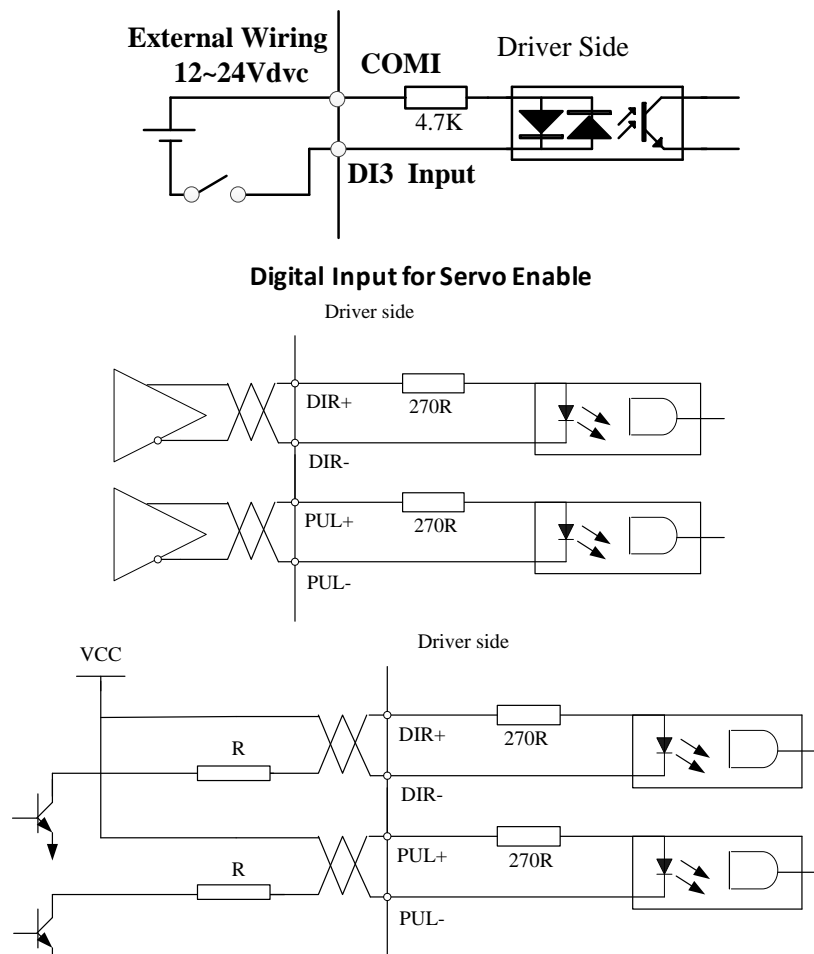
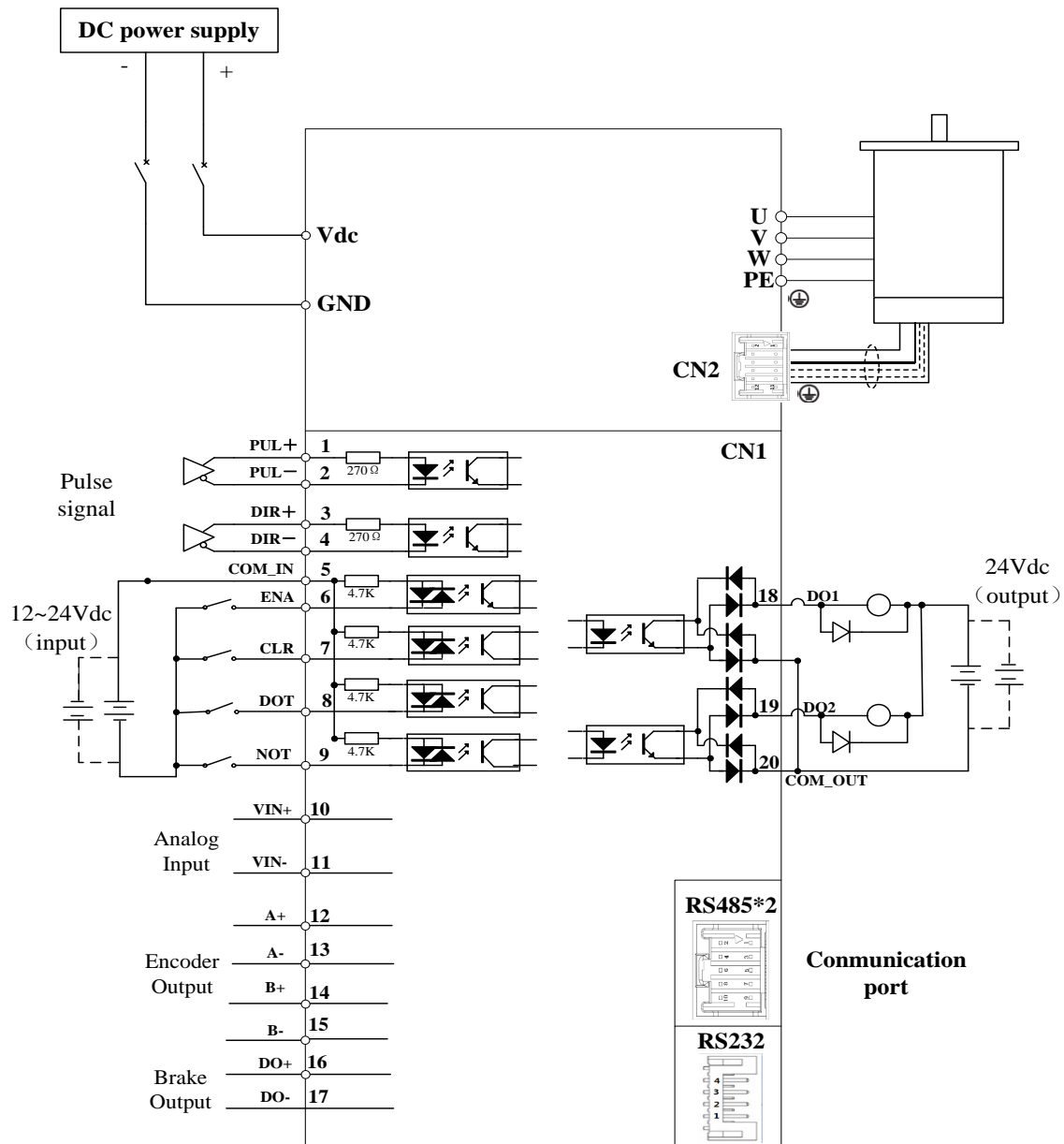


Figure 6-1 CN1 and CN2 Signal Wiring in Position Control Mode


Figure 6-2 Position Mode Wiring
Notes:

1. Only support 5V pulse and direction signal, 2KΩ resistor must installed with 24V pulse and direction signal.
2. 4 digital inputs DI3~DI6, support NPN and PNP connection, recommend 12~24V input signal.
3. 2 digital outputs DO1~DO2, support NPN and PNP connection, recommend 24V output signal.

◆ Operation Steps

1. Connect terminal CN1.
2. Connect DC12V to 24V to digital input DI3 to ENABLE drive (the COMI and DI3).
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 enable drive 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"),


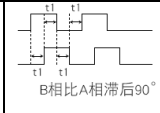
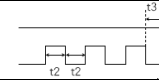
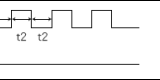
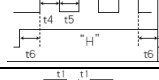
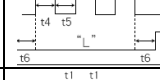



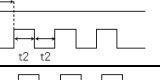
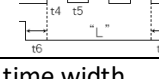
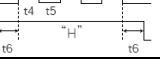

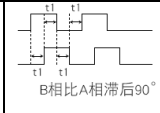
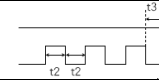
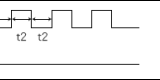
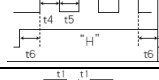
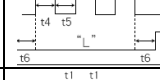



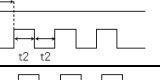
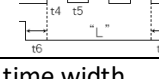
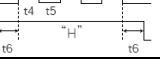

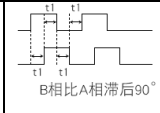
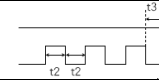
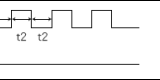
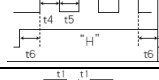
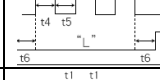



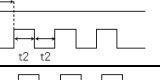
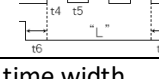
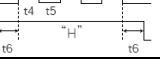
Rotational speed is as setup or not, and the motor stops by stopping the command (pulse) or not
 If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode
 ("d17Ch").

Related parameters setup of position mode

6.2.1 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 | √ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | √ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Pr0.06</th> <th style="width: 10%;">Pr0.07</th> <th style="width: 25%;">Command Pulse Format</th> <th style="width: 10%;">Signal</th> <th style="width: 15%;">Positive Direction Command</th> <th style="width: 15%;">Negative Direction Command</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">0</td> <td style="text-align: center;">0 or 2</td> <td>90 phase difference 2-phase pulse(A phase +B phase)</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td>Positive direction pulse + negative direction pulse</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td>Pulse + sign</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> <tr> <td rowspan="3" style="text-align: center;">1</td> <td style="text-align: center;">0 or 2</td> <td>90 phase difference 2 phase pulse(A phase +B phase)</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td>Positive direction pulse + negative direction pulse</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td>Pulse + sign</td> <td style="text-align: center;">Pulse sign</td> <td></td> <td></td> </tr> </tbody> </table> | | | | | | | | | 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 |  |  |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

6.2.2 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 | √ | | | | |

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

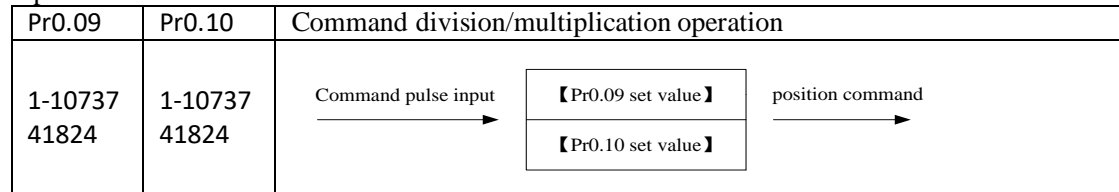
- 1) If Pr008≠0 , the actual motor rotation turns = pulse number / Pr0.08
- 2) If Pr008 = 0 , Pr0.09 1st numerator of electronic gear and Pr0.10 Denominator of electronic gear valid.

| | | | | | | |
|--------|-----------|----------------------------------|--------|-----|---------|----------------|
| 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 | √ | | | | |

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 | √ | | | | |

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



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

6.2.3 Position command filter

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

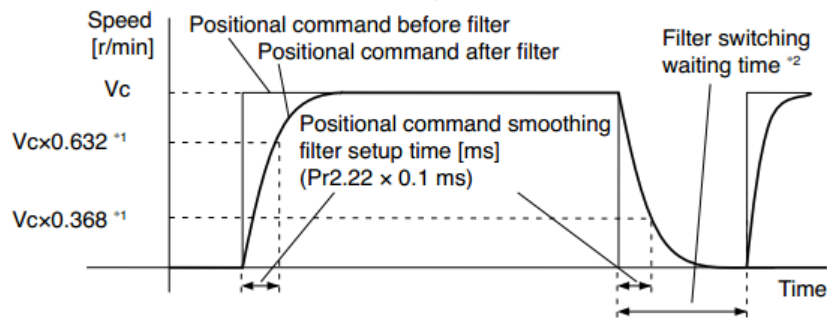
In the following situations, it is necessary to consider adding position command filtering:

- 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.

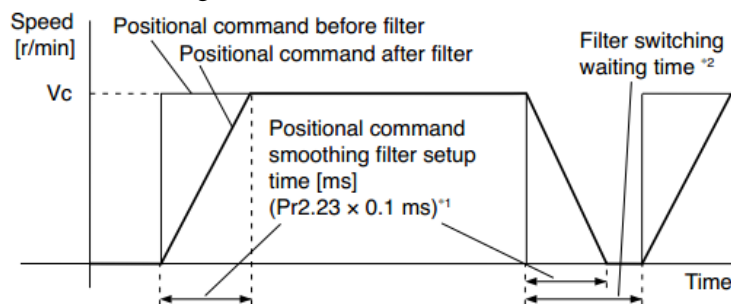
| | | | | | | |
|--------|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr2.22 | Name | positional command smoothing filter | | | Mode | P |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 022DH |
| | Repower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

- 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 | √ | | | | | |

- 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.



6.2.4 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.

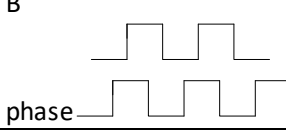
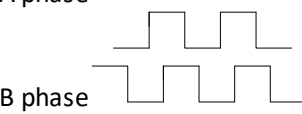
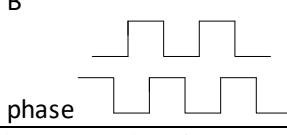
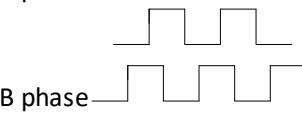
| | | | | | | | | |
|---------|-----------|--|--------|-----|---------|-------|---|---|
| Pr0.11* | Name | Output pulse counts per one motor revolution | | | Mode | P | S | T |
| | Range | 1~2500 | Unit | P/r | Default | 2500 | | |
| | Data Type | 16bit | Access | R/W | Address | 0017H | | |
| | Repower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

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 | √ | | | | | | |

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  | A phase B phase  |
| 1 | Reverse | A phase B  | A phase B phase  |

Notes: ELD2 series encoder has no Z signal output and no frequency division function.

6.2.5 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 Pr410 – Pr415.

6.3 Velocity Control

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

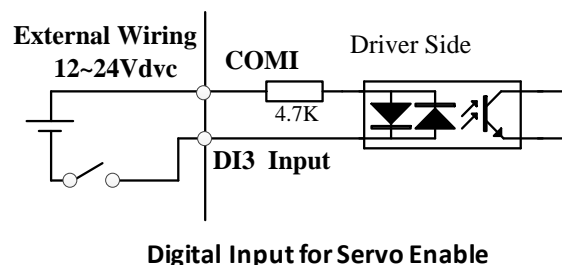
Notice : You must do inspection before position control test run.

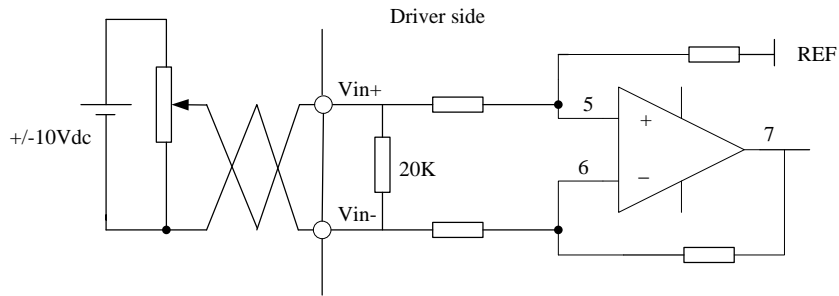
6.3.1 Velocity mode control by analog command

Table 6.3 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 |
| 5 | Pr3.15 | Zero speed clamping function select | / | 2 | / |
| 6 | Pr3.00 | Velocity setup internal and external switching | / | 0 | / |
| 7 | Pr3.01 | Speed Command direction selection | / | User-specified | / |
| 8 | Pr3.02 | Speed command input gain | / | User-specified | Rpm/V |
| 9 | Pr3.03 | Speed setting input reversal | / | User-specified | / |
| 10 | Pr4.22 | Analog input I(AI1) offset setup | / | User-specified | 0.359mv |
| 11 | Pr4.23 | Analog input I(AI1) filter | / | User-specified | 0.01ms |
| 12 | Pr4.02 | DI3 input select: servo-enable | | Hex:0003 | / |

◆ Wiring Diagram




Analog Input for Velocity Control
◆ Operation steps

1. Connect terminal CN1.
2. Enter the power (DC12V to 24V) to control signal (the COMI and DI3).
3. Enter the power to 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 enabledrive and energize the motor.
6. Input DC voltage between velocity command input , VIN+ and VIN-, and increase input voltage.
7. Check the motor rotational speed at monitor mode , ("d01SP ")

Whether rotational speed is as setup or not, and whether the motor stops with zero command or not

8. When you want to change the rotational speed and direction, set up the following parameters again.

Pr3.00. Pr3.01. Pr3.03

If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch ").

Related parameters setup of velocity control mode

The analog speed command input voltage is converted to equivalent speed command. You can set the filter to eliminate noise or adjust the offset.

| | | | | | | |
|--------|-----------|--|--------|-----|---------|-------|
| 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 |
|-------------|---|
| 0 | Analog speed command(SPR) |
| 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 | selection 1 of internal command speed (INTSPD1) | selection 2 of internal command speed (INTSPD2) | selection 3 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 |

| | | | | | | |
|--------|-----------|--|--------|-----|---------|-------|
| Pr3.01 | Name | Speed command rotational direction selection | | | Mode | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0303H |
| | Repower | - | | | | |

Select the Positive /Negative direction specifying method

| Setup value | Select speed command sign (1st to 8th speed) | Speed command direction (VC-SIGN) | Position command direction |
|-------------|--|-----------------------------------|----------------------------|
| 0 | + | No effect | Positive direction |
| | - | No effect | Negative direction |
| 1 | Sign has no effect | OFF | Positive direction |
| | Sign has no effect | ON | Negative direction |

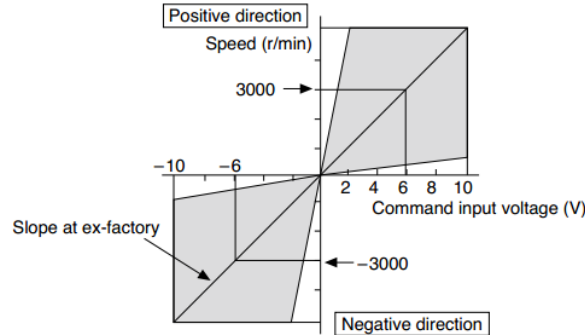
| | | | | | | |
|--------|-----------|-----------------------------|--------|-----------|---------|-------|
| Pr3.02 | Name | Input gain of speed command | | | Mode | S |
| | Range | 10~2000 | Unit | (r/min)/V | Default | 500 |
| | Data Type | 16bit | Access | R/W | Address | 0305H |
| | Repower | - | | | | |

Based on the voltage applied to the analog speed command (SPR), set up the conversion gain to motor command speed.

You can set up “slope” of relation between the command input voltage and motor speed, with Pr3.02. Default is set to Pr3.02=500(r/min)/V, hence input of 6V becomes 3000r/min.

Notice:

1. Do not apply more than $\pm 10V$ to the speed command input(SPR).
2. When you compose a position loop outside of the drive while you use the drive in velocity control mode, the setup of Pr3.02 gives larger variance to the overall servo system.
3. Pay an extra attention to oscillation caused by larger setup of Pr3.02



| | | | | | |
|---------------|------------------|---------------------------------|---------------|-------------|----------------------|
| Pr3.03 | Name | Reversal of speed command input | | Mode | S |
| | Range | 0~1 | Unit | — | Default 1 |
| | Data Type | 16bit | Access | R/W | Address 0307H |
| | Repower | - | | | |

Specify the polarity of the voltage applied to the analog speed command (SPR).

| Setup value | Motor rotating direction | |
|-------------|--------------------------|--|
| 0 | Non-reversal | [+ voltage] → [+ direction] [- voltage] → [-direction] |
| 1 | reversal | [+ voltage] → [- direction] [- voltage] → [+direction] |

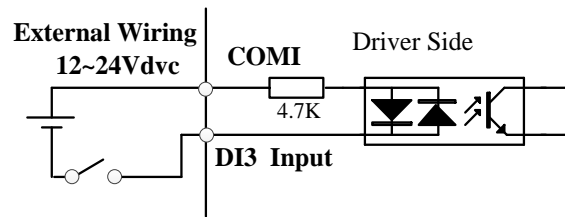
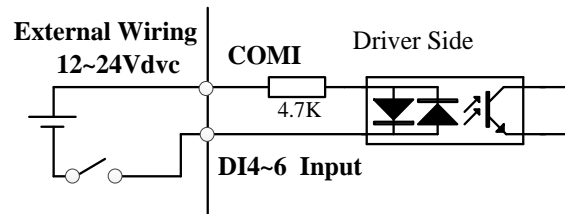
Caution: When you compose the servo drive system with this drive set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed command signal from the unit and the polarity of this parameter setup does not match.

6.3.2 Velocity mode control by internal speed command

Table 6.4 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 |
| 5 | Pr3.15 | Zero speed clamping function select | / | 2 | / |
| 6 | Pr3.00 | Velocity setup internal and external switching | / | 3 | / |
| 7 | Pr3.01 | Speed Command direction selection | / | User-specified | / |
| 10 | Pr4.22 | Analog input I(AI1) offset setup | / | User-specified | 0.359mv |
| 11 | Pr4.23 | Analog input I(AI1) filter | / | User-specified | 0.01ms |
| 12 | Pr4.02 | DI3 input select: servo-enable | | Hex:0003 | / |

◆ Wiring Diagram


Digital Input for Servo Enable

Digital Input for Velocity Control_ INTSPD1/ INTSPD2/ INTSPD3/ VC-SIGN

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 |
|-------------|---|
| 0 | Analog speed command(SCR) |
| 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(SCR) |
| 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 | selection 1 of internal command speed (INTSPD1) | selection 2 of internal command speed (INTSPD2) | selection 3 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 |

| | | | | | | |
|--------|-----------|--|--------|-----|---------|-------|
| Pr3.01 | Name | Speed command rotational direction selection | | | Mode | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0303H |
| | Repower | - | | | | |

Select the Positive /Negative direction specifying method

| Setup value | Select speed command sign (1st to 8th speed) | Speed command direction (VC-SIGN) | Position command direction |
|-------------|--|-----------------------------------|----------------------------|
| 0 | + | No effect | Positive direction |
| | - | No effect | Negative direction |
| 1 | Sign has no effect | OFF | Positive direction |
| | Sign has no effect | ON | Negative direction |

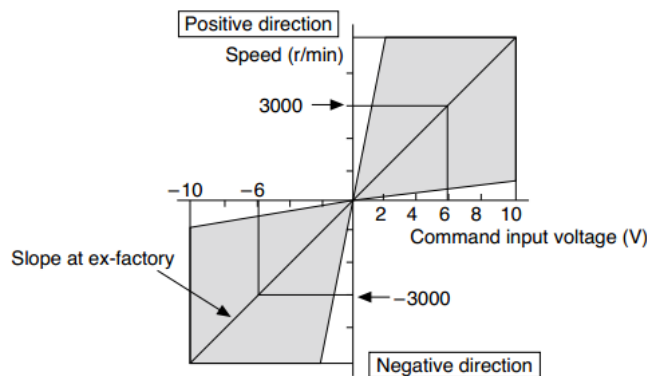
| | | | | | | |
|--------|-----------|-----------------------------|--------|-----------|---------|-------|
| Pr3.02 | Name | Input gain of speed command | | | Mode | S |
| | Range | 10~2000 | Unit | (r/min)/V | Default | 500 |
| | Data Type | 16bit | Access | R/W | Address | 0305H |
| | Repower | - | | | | |

Based on the voltage applied to the analog speed command (SPR), set up the conversion gain to motor command speed.

You can set up “slope” of relation between the command input voltage and motor speed, with Pr3.02. Default is set to Pr3.02=500(r/min)/V, hence input of 6V becomes 3000r/min.

Notice:

1. Do not apply more than $\pm 10V$ to the speed command input (SPR).
2. When you compose a position loop outside of the drive while you use the drive in velocity control mode, the setup of Pr3.02 gives larger variance to the overall servo system.
3. Pay an extra attention to oscillation caused by larger setup of Pr3.02



| | | | | | | |
|--------|-----------|---------------------------------|--------|-----|---------|-------|
| Pr3.03 | Name | Reversal of speed command input | | | Mode | S |
| | Range | 0~1 | Unit | — | Default | 1 |
| | Data Type | 16bit | Access | R/W | Address | 0307H |
| | Repower | - | | | | |

Specify the polarity of the voltage applied to the analog speed command (SPR).

| Setup value | Motor rotating direction | |
|-------------|--------------------------|--|
| 0 | Non-reversal | [+ voltage] → [+ direction] [- voltage] → [-direction] |
| 1 | reversal | [+ voltage] → [- direction] [- voltage] → [+direction] |

Caution: When you compose the servo drive system with this drive set to velocity control mode and external positioning unit, the motor might perform an abnormal action if the polarity of the speed

command signal from the unit and the polarity of this parameter setup does not match.

| | | | | | | |
|--|-----------|--------------------------|--------|-------|---------|---------------------------------------|
| Pr3.04 | Name | 1st speed of speed setup | | | Mode | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> 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 | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030DH |
| | Repower | - | | | | |
| Pr3.07 | Name | 4th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 030FH |
| | Repower | - | | | | |
| Pr3.08 | Name | 5th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0311H |
| | Repower | - | | | | |
| Pr3.09 | Name | 6th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0313H |
| | Repower | - | | | | |
| Pr3.10 | Name | 7th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0315H |
| | Repower | - | | | | |
| Pr3.11 | Name | 8th speed of speed setup | | | Mode | <input checked="" type="checkbox"/> 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 | | | | | | |

6.3.3 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.

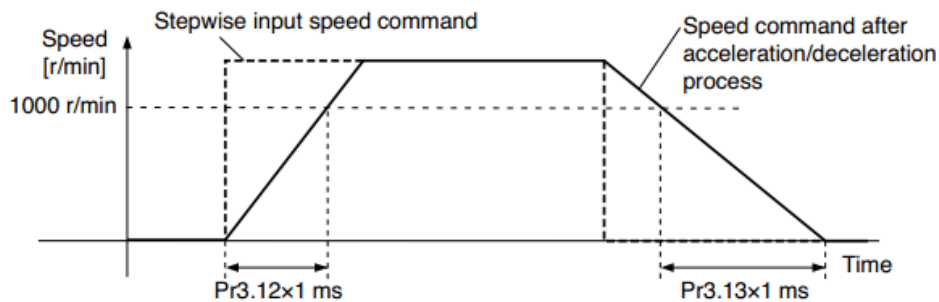
| | | | | | | |
|--------|-----------|-------------------------|--------|----------------|---------|-------|
| Pr3.12 | Name | time setup acceleration | | | Mode | S |
| | Range | 0~10000 | Unit | Ms/(1000r/min) | Default | 100 |
| | Data Type | 16bit | Access | R/W | Address | 0319H |
| | Repower |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

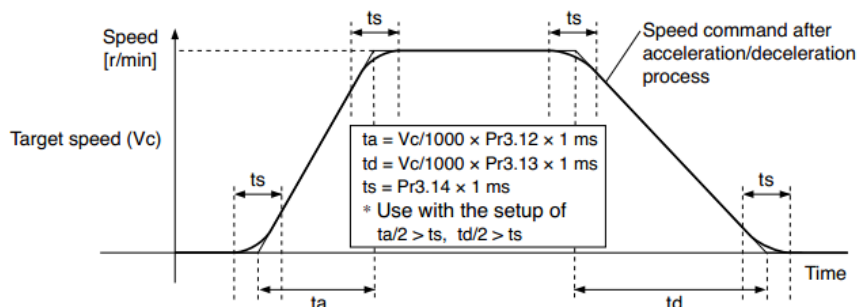
$$\text{Acceleration time (ms)} = V_c / 1000 * \text{Pr3.12} * 1 \text{ms}$$

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



| | | | | | | |
|--------|-----------|---|--------|-----|---------|-------|
| 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.



6.3.4 Attained Speed signal AT-SPEED output

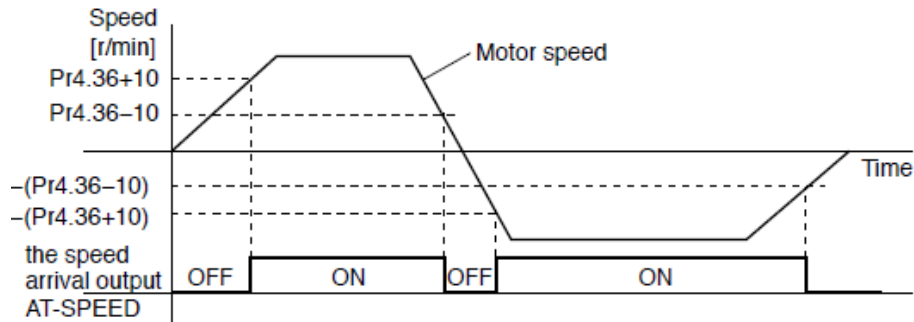
When the motor speed reaches the speed set by the parameter PA_436 (setting of arrival speed), the output speed reaches the output (AT-SPEED) signal.

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 .



6.3.5 Velocity 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 Pr435 (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 | - | | | | |

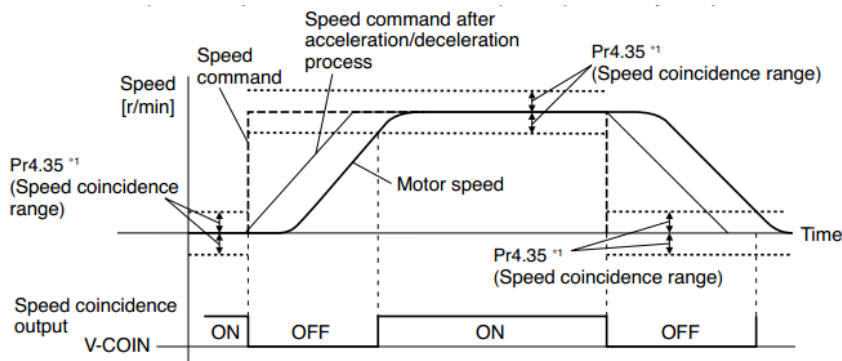
Set the speed coincidence (V-COIN) output detection timing.

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



6.3.6 Speed zero clamp (ZEROSPD)

You can forcibly set the speed command to 0 by using the speed zero clamp input.

| | | | | | | |
|--|-----------|-------------------------------------|--------|-------|---------|-------|
| Pr3.15 | Name | Speed zero-clamp function selection | | | Mode | S |
| | Range | 0~3 | Unit | 0.1HZ | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 031FH |
| | Repower | - | | | | |
| <p>1. If Pr3.15=0, the function of zero clamp is forbidden. It means the motor rotates with actual velocity which is controlled by the analog voltage input 1 even if the velocity is less than 10 rpm. The motor runs no matter what the value of Pr3.16 is. The actual velocity is controlled by external the analog voltage input .</p> <p>2. If Pr3.15=1 and the input signal of Zero Speed is available in the same time, the function of zero clamp works. It means motor will stop rotating in servo-on condition no matter what the velocity of motor is, and motor stop rotating no matter what the value of Pr3.16 is.</p> <p>3. If Pr3.15=2 , the function of zero clamp belongs to the value of Pr3.16. If the actual velocity is less than the value of Pr3.16, the motor will stop rotating in servo-on condition.</p> | | | | | | |

| | | | | | | |
|---|-----------|------------------------|--------|-------|---------|-------|
| Pr3.16 | Name | Speed zero-clamp level | | | Mode | S |
| | Range | 10~2000 | Unit | r/min | Default | 30 |
| | Data Type | 16bit | Access | R/W | Address | 0321H |
| | Repower | - | | | | |
| <p>When analog speed given value under speed control mode less than zero speed clamp level setup, speed command will set to 0 strongly.</p> | | | | | | |

Other setup for DI/DO function

For details of SI input function, refer to Pr4.00 – Pr4.09.

For details of DO output function, refer to Pr4.10 – Pr4.15.

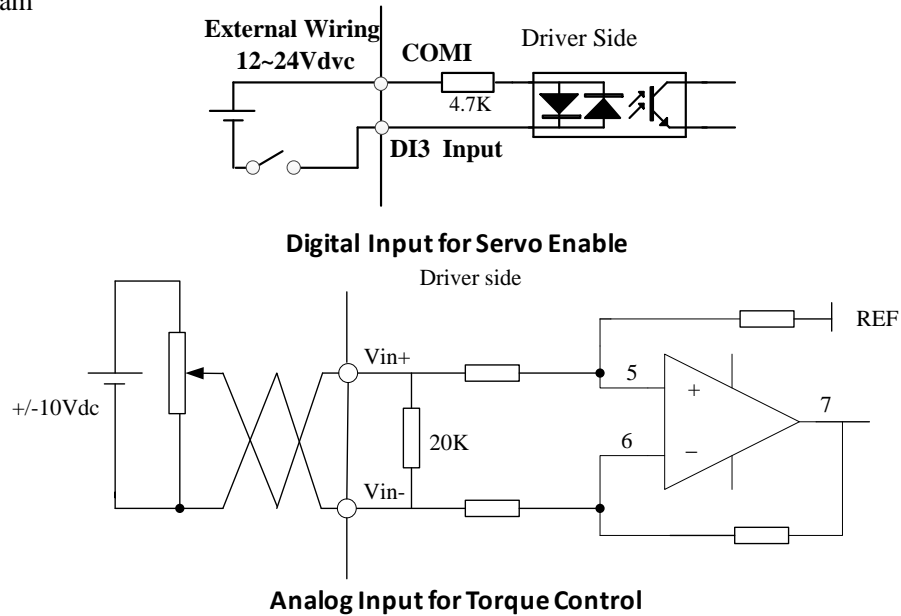
6.4 Torque Control

The analog torque command input voltage is converted to equivalent digital torque command. You can set the filter to eliminate noise or adjust the offset. The torque control is performed according to the torque command specified in the form of analog voltage. For controlling the torque, the speed limit input is required in addition to the torque command to maintain the motor speed within the speed limit.

6.4.1 Torque mode control by Analog command input

Table 6.4 Parameter Setup of Torque Control

| No | Parameter | Name | input | Setup value | Unit |
|----|-----------|--|--------|----------------|-----------|
| 1 | Pr0.01 | Control mode setup | / | 2 | / |
| 6 | Pr3.17 | Selection of torque command | / | 0 | / |
| | Pr3.18 | Torque command direction selection | | | |
| 7 | Pr3.19 | Torque command direction input gain | / | User-specified | 0.1V/100% |
| 8 | Pr3.20 | Torque setup input reversal | / | User-specified | / |
| 9 | Pr3.21 | Speed limit value 1 | / | User-specified | r/min |
| | Pr3.22 | Torque limit value in torque mode control. | / | | % |
| 10 | Pr4.02 | DI3 input select: servo-enable | Srv_on | hex:030000 | / |

◆ Wiring Diagram

◆ Operation Steps

1. Connect terminal CN1.
2. Enter the power (DC12V to 24V) to control signal (the COMI and DI1).
3. Enter the power to 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 enable drive and energize the motor.
6. Input DC voltage between torque command input, VIN+ and VIN-, and increase input voltage.
7. Check the motor torque at monitor mode ("d04tr"), Whether actual torque as setup or not
8. When you want to change the torque magnitude, direction and velocity limit value against the command voltage, set up the following parameters : Pr3.19. Pr3.20. Pr3.21

If the motor does not run correctly, refer to the Factor of No-Motor running in data monitor mode ("d17Ch").

Related parameters setup of torque control mode.

| 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 | - | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #D3D3D3;">Setup value</th> <th style="background-color: #D3D3D3;">Torque command input</th> <th style="background-color: #D3D3D3;">Velocity limit input</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Analog input 3</td> <td>Parameter value (P3.21)</td> </tr> <tr> <td>1</td> <td>Analog input 3</td> <td>Analog input 1 for Speed limit</td> </tr> <tr> <td>2</td> <td>Parameter value (P3.22)</td> <td>Parameter value (P3.21)</td> </tr> <tr> <td>3</td> <td>Analog input 3</td> <td>Speed limit 0</td> </tr> </tbody> </table> | | | | | | | Setup value | Torque command input | Velocity limit input | 0 | Analog input 3 | Parameter value (P3.21) | 1 | Analog input 3 | Analog input 1 for Speed limit | 2 | Parameter value (P3.22) | Parameter value (P3.21) | 3 | Analog input 3 | Speed limit 0 |
| Setup value | Torque command input | Velocity limit input | | | | | | | | | | | | | | | | | | | |
| 0 | Analog input 3 | Parameter value (P3.21) | | | | | | | | | | | | | | | | | | | |
| 1 | Analog input 3 | Analog input 1 for Speed limit | | | | | | | | | | | | | | | | | | | |
| 2 | Parameter value (P3.22) | Parameter value (P3.21) | | | | | | | | | | | | | | | | | | | |
| 3 | Analog input 3 | Speed limit 0 | | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|---------------|-----------|------------------------------------|--------|-----|---------|-------|
| Pr3.18 | Name | Torque command direction selection | | | Mode | T |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Data Type | 16bit | Access | R/W | Address | 0325H |
| | Repower | - | | | | |

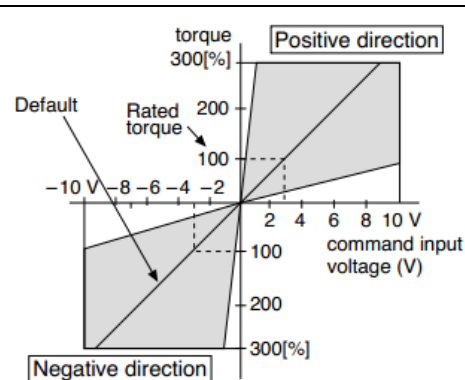
Select the direction positive/negative direction of torque command

| 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 |

| | | | | | | | | |
|--------|-----------|---------------------------|--------|-----------|---------|-------|--|---|
| Pr3.19 | Name | Torque command input gain | | | Mode | | | T |
| | Range | 10~100 | Unit | 0.1V/100% | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0327H | | |
| | Repower | - | | | | | | |

Based on the voltage (V) applied to the analog torque command (TRQR), set up the conversion gain to torque command(%)

- Unit of the setup value is 0.1V/100%] and set up input voltage necessary to produce the rated torque.
- Default setup of 30 represents 3V/100%



| | | | | | | | | |
|--------|-----------|-------------------------------|--------|-----|---------|-------|--|---|
| Pr3.20 | Name | Torque command input reversal | | | Mode | | | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0329H | | |
| | Repower | - | | | | | | |

Set up the polarity of the voltage applied to the analog torque command(TRQR).

| Setup value | Direction of motor output torque | | |
|-------------|----------------------------------|-------------|--|
| 0 | Non-reversal | [+ voltage] | → [+ direction] [- voltage] → [-direction] |
| 1 | reversal | [+ voltage] | → [- direction] [- voltage] → [+direction] |

6.4.2 Torque limit function

The speed limit is one of protective functions used during torque control.

This function regulates the motor speed so that it doesn't exceed the speed limit while the torque is controlled.

| | | | | | | | | |
|--------|-----------|-------------------------------|--------|-----|---------|-------|--|---|
| Pr3.20 | Name | Torque command input reversal | | | Mode | | | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 0329H | | |
| | Repower | - | | | | | | |

Set up the polarity of the voltage applied to the analog torque command(TRQR).

| Setup value | Direction of motor output torque | |
|-------------|----------------------------------|--|
| 0 | Non-reversal | [+ voltage] → [+ direction] [- voltage] → [-direction] |
| 1 | reversal | [+ voltage] → [- direction] [- voltage] → [+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.

Other setup for DI/DO function

For details of DI input function, refer to Pr400 – Pr409.

For details of DO output function, refer to Pr410 – Pr415.

6.5 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.

6.5.1 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 | √ | | | | | | |

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 travelrange 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.

| | | | | | | |
|--------|------|--|------|---|---|---|
| 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 | √ | | | | |

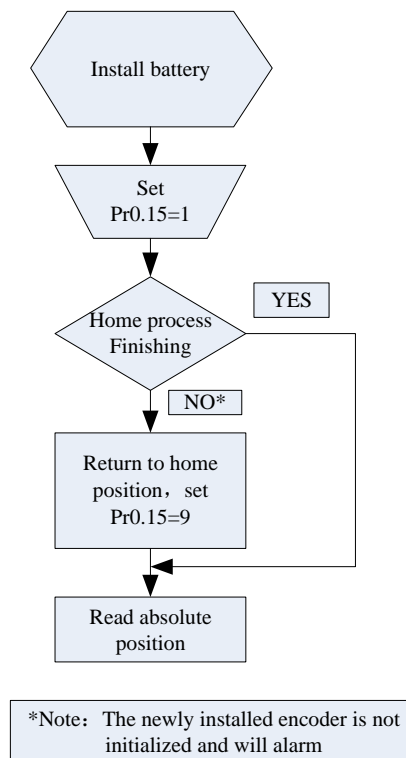
While Pr0.15=2: Absolute position rotation mode:

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 $0 \sim (\text{Pr}6.63+1)$

6.5.2 Reading absolute position

1. Steps:



1) Firstly, select the motor with multi-turns absolute encoder which includes battery, and confirm if the drive version supports the function about multi-turns absolute encoder;

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, the position will not be lost even if the power is off.

2. Read absolute position

The absolute encoder counting mode :

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

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.

6.5.3 Alarm

1. Introductions

The multi-turn 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

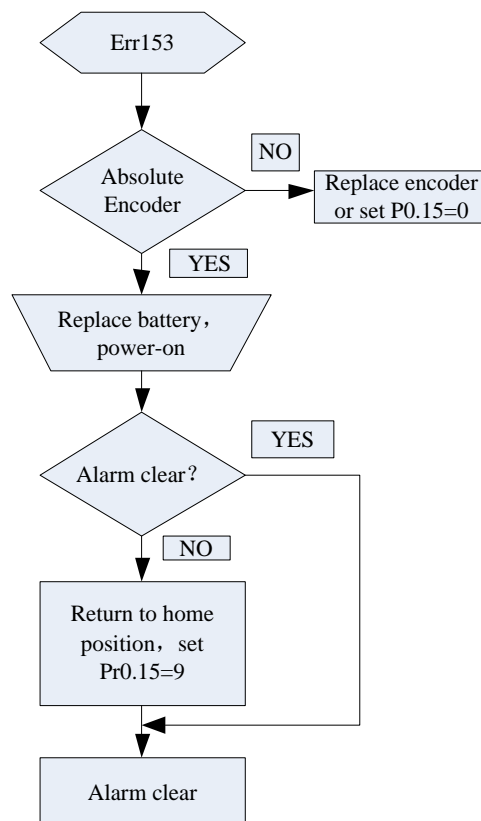
3. The drive sends an absolute encoder alarm Err153, the main situation is as follows:

(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



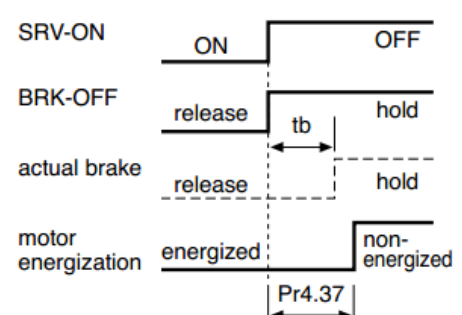
6.6 Security Features

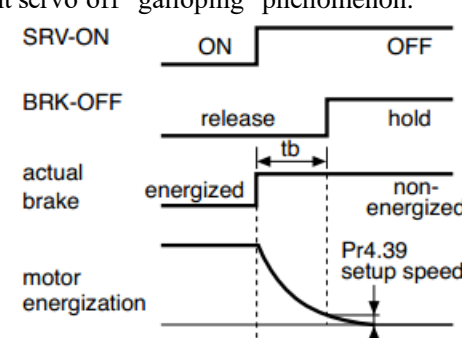
6.6.1 Speed limit

| | | | | | | | | |
|--|-----------|----------------------------------|--------|-------|---------|----------|----------|----------|
| 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. | | | | | | | | |

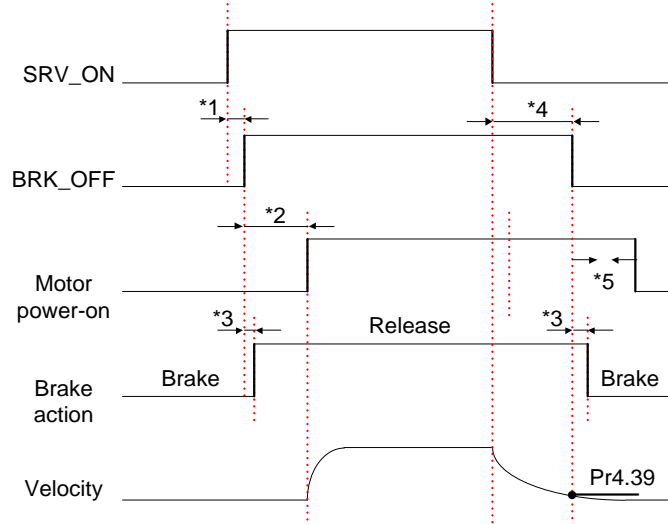
6.6.2 BRK-OFF output

This function can be configured by set digital DO 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 at stalling setup | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044BH | | |
| | Repower | - | | | | | | |
| <p>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</p> <ul style="list-style-type: none"> ● Set up to prevent a micro-travel/drop of the motor (work) due to the action delay time(tb) of the brake. ● After setting up $Pr4.37 \geq tb$, then compose the sequence so as the drive turns to servo-off after the brake is actually activated | | | | | | | | |
| | | | | | |  | | |

| | | | | | | | | |
|---|-----------|--|--------|-----|---------|---|----------|----------|
| Pr4.38 | Name | Mechanical brake action at running setup | | | Mode | P | S | T |
| | Range | 0~10000 | Unit | 1ms | Default | 0 | | |
| | Data Type | 16bit | Access | R/W | Address | 044DH | | |
| | Repower | - | | | | | | |
| <p>Mechanical brake start delay time setup, it is mainly used to prevent the phenomenon of "Z-axis falling down" when the servo starts up. 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.</p> <ul style="list-style-type: none"> ● Set up to prevent the brake deterioration due to the motor running. ● At servo-OFF during the motor is running , tb of the right fig will be a shorter one of either Pr4.38 setup time, or time lapse till the motor speed falls below Pr4.39 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 brake 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;

6.6.3 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. | | | | | | |

6.6.4 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. | | | | | | | | |

6.7 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.. | | | | | | | | |

6.7.1 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..

6.7.2 Motion Studio inertia ratio identification

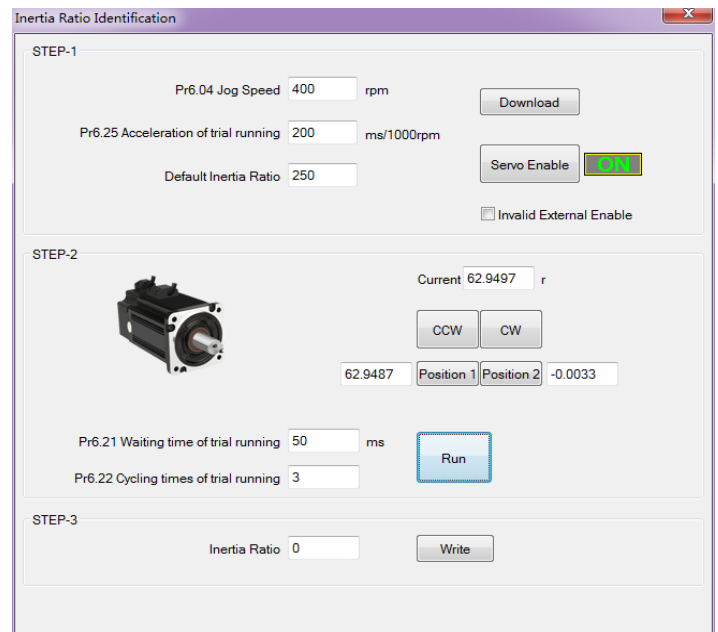
This inertia ratio identification function also added in Motion Studio configuration software.

Pre-conditions: 1. Servo disable.

2. Positive and negative limit invalid

Steps:

- 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.
- Click "Download" these settings, then **Servo Enable**.
Click "CCW" to run motor to CCW direction, click "Position 1" to save the position limit 1.
Click "CW" to run motor to CW direction, click "Position 2" to save the position limit 2.
Click "Run" to start Inertia ratio identification.
- After finishing, Click "Write" to save the Inertia ratio identification result.



6.8 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

- 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, decrease 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.
4. 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 | - | | | | | | |
| Set up the resonance frequency to be estimated by the adaptive filter and the special the operation after estimation. | | | | | | | | |
| 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 | | |

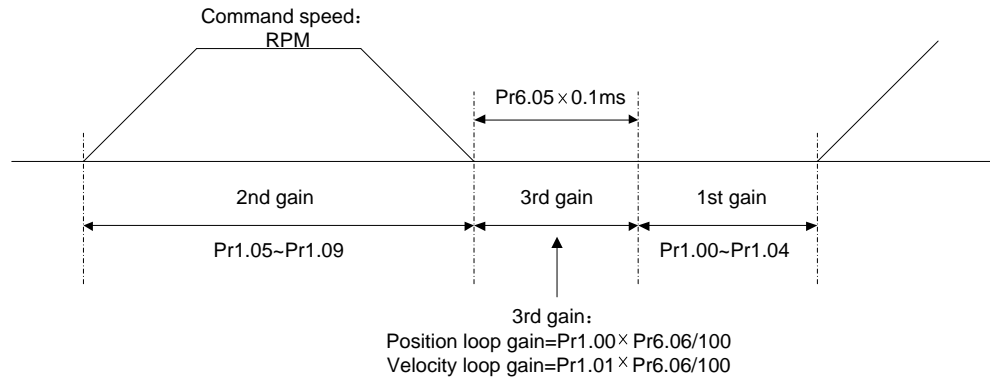
| | | | | | | |
|--|-----------|---------------------------|--------|-----|---------|-------|
| | Data Type | 16bit | Access | R/W | Address | 0209H |
| | Repower | - | | | | |
| Set the center frequency of the 2nd notch filter Notice: the notch filter function will be invalid by setting up this parameter 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. | | | | | | |

6.9 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 3rd gain= 1st gain * 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:



6.10 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 | - | | | | | | |

This three parameters may apply feed forward torque superposition directly to torque command.

6.11 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 be turn back to the drive. At this time, the energy feedback received by the capacitor in the drive, which makes the voltage of the capacitor rising. When it rises to a certain voltage value, the excess energy needs to be consumed by the regenerative resistor.

| | | | | | | | | |
|--------|-----------|--|--------|-----|---------|-------|---|---|
| Pr0.16 | Name | External regenerative resistance value | | | 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 resistance 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.

| | | | | | | | | |
|---------|-------|--|--|----|---------|---|---|---|
| Pr7.31 | Name | Regenerative resistance control mode setting | | | Mode | P | S | T |
| | Range | 0~2 | Unit | -- | Default | 0 | | |
| | | Setup value | Details | | | | | |
| | | 0 | Disable regenerative resistance discharge | | | | | |
| | | 1 | Enable reactive pump lift suppression function | | | | | |
| | | 2 | Enable regenerative resistance discharge | | | | | |
| Notice: | | | | | | | | |

| | | | | | | | | |
|---|-------|--|------|---|---------|----|---|---|
| Pr7.32 | Name | Regenerative resistance open threshold setting | | | Mode | P | S | T |
| | Range | 20~90 | Unit | V | Default | 80 | | |
| The external resistance is activated when the actual bus voltage is higher than Pr7.32 plus Pr7.33 and is deactivated when the actual bus voltage is lower than Pr7.32 minus Pr7.33 | | | | | | | | |
| Notice: | | | | | | | | |

| | | | | | | | | |
|---|-------|--|------|---|---------|---|---|---|
| Pr7.33 | Name | Regenerative resistance control hysteresis | | | Mode | P | S | T |
| | Range | 1~50 | Unit | V | Default | 5 | | |
| The external resistance is activated when the actual bus voltage is higher than Pr7.32 plus Pr7.33 and is deactivated when the actual bus voltage is lower than Pr7.32 minus Pr7.33 | | | | | | | | |

Recommendation : leadshine can provide regenerative resistor :

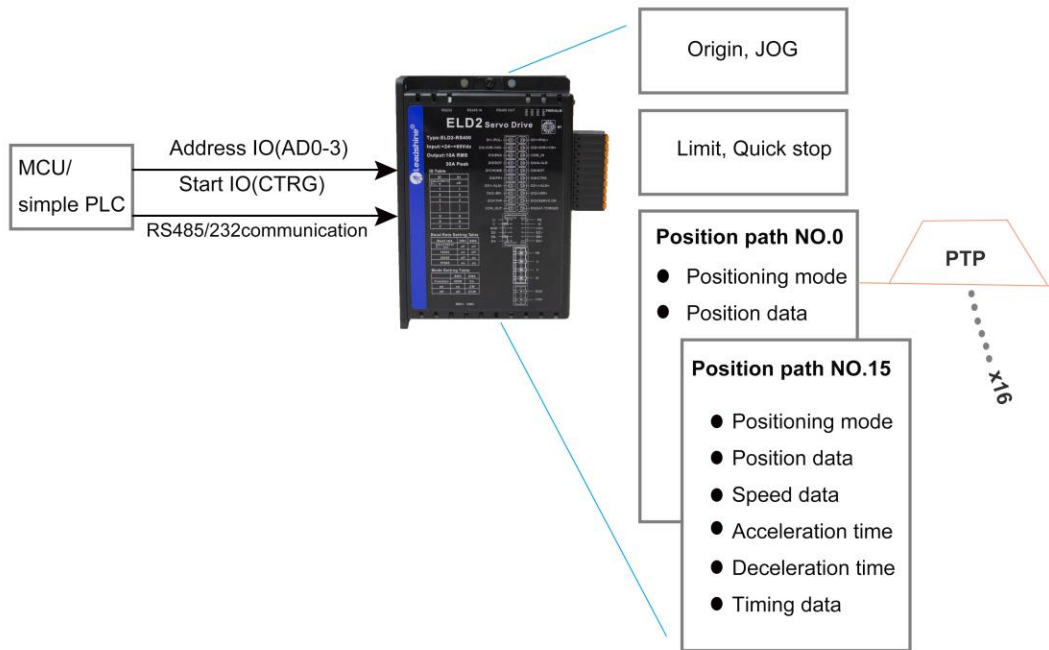
10Ω \pm 5%, 100w,

Part number : RXFB-1, Code : 10100469

Chapter7 Pr-Mode

7.1 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.



Pr-Mode motion control system

7.1.1 Main function

Main function as below:

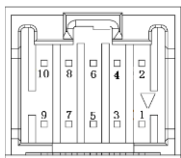
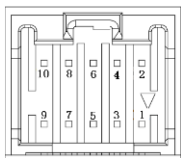
| PR function | Specification |
|---------------|--|
| Homing | Set the homing position by homing process. <ol style="list-style-type: none"> Homing method selectable. Limit switch homing, home switch homing, and manual homing all selectable, Homing direction settable Home deviation position settable.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

| | |
|--|--|
| Position limit | Protect machine by position limit. <ol 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 | Select 16 motion path by digital input(ADD0~ADD3 allocation to digital input) Execute select motion path by digital input (CTRG allocation to digital input) <ol 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 for ELD2-RS series, Pr0.01=0.

7.1.2 Installation wiring

RS485 communication terminal:

| CN6 | | Pin | Signal | Detail |
|------------|---|-------|--------|-----------|
| 485 IN |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |
| CN6 | | Pin | Signal | Detail |
| 485 OUT |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |

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

Relevant parameters:

| Parameters | Name | Specification |
|---------------|--------------------------|--|
| Pr4.02-Pr4.05 | Digital input selection | Specific of the digital input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.12 | Digital 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 | 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 | Accomplish homing | HOME_OK | 22h | A2h |
| Positive JOG | JOG+ | 23h | A3h | Torque limit | TQL | 06h | 86h |
| Negative JOG | 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.

7.2 Pr-Mode Parameters

Pr-Mode parameters contain 8th and 9th parameters, 8th parameters is e-stop and control parameters, 9th

parameters is store path table.

7.2.1 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 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 position H | | 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 |

7.2.2 9th parameters specification

| 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 | 0X6200 |

| | | | |
|--------|--------------------|---|--------|
| | | 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 | |
| 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 |

7.3 Pr-Mode motion control

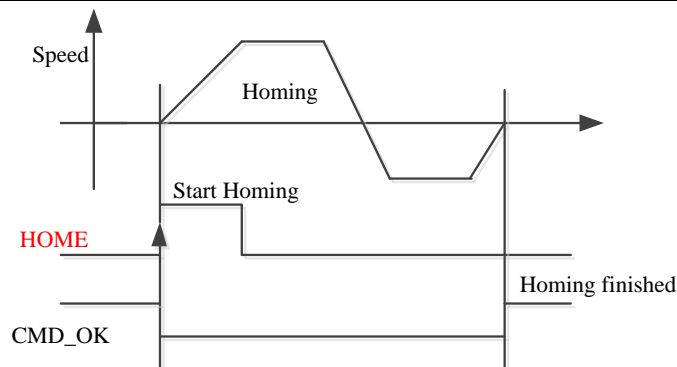
7.3.1 Homing

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 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 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 | 0X600A |

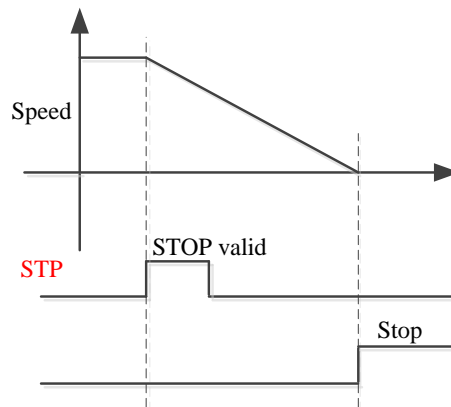
| | | | |
|---------|---|--|--------|
| | | =0: Negative direction =1: Positive direction. Bit1: Whether go to the set position after homing =0: no =1: yes. Bit2-7: Homing mode 0: homing with limit switch detect 1: homing with homing switch detect 2: homing with single turn Z signal detect 3: homing 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 | |
| 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.

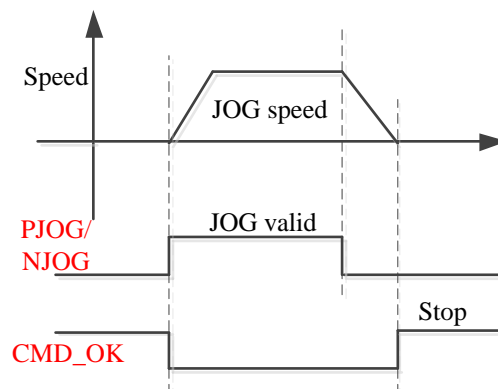
7.3.2 Position limit and E-stop

Position limit and E-stop



7.3.3 JOG

JOG



7.3.4 Path Motion

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

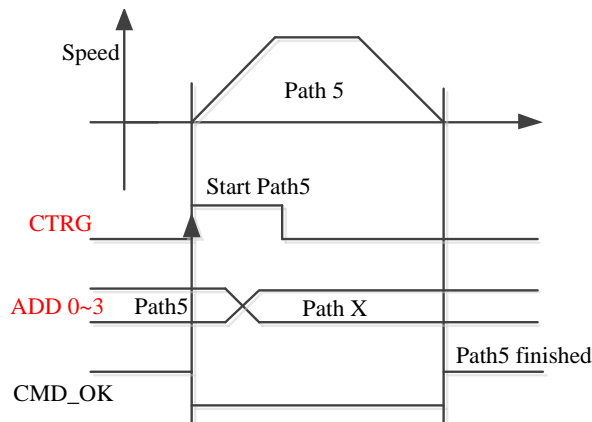
Related parameters:

| 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) | 0X6200 |

| | | | |
|--------|--------------------|--|--------|
| | | 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 | |
| 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 |

7.3.4.1 Single path motion

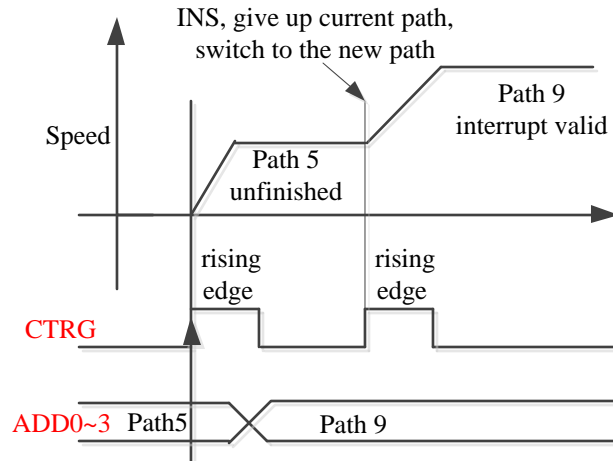
CTRG rising edge /double edge trigger the motion(Pr8.00), take CTRG rising edge signal to trigger path5 as example:



7.3.4.2 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.

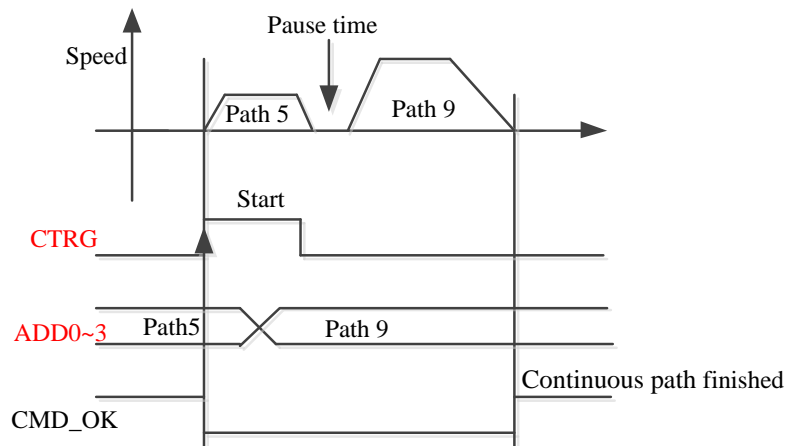
Pr9.00 bit4 = 0, interrupt



7.3.4.3 Continuous path motion without overlap

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

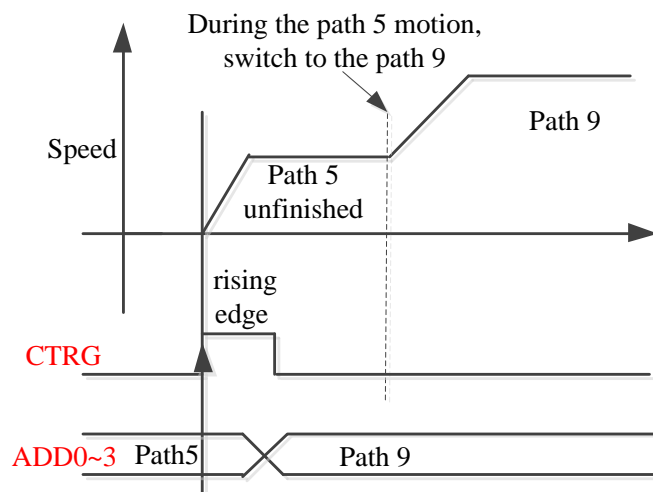
Pr9.00 bit5 = 0, continuous path motion without overlap



7.3.4.4 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

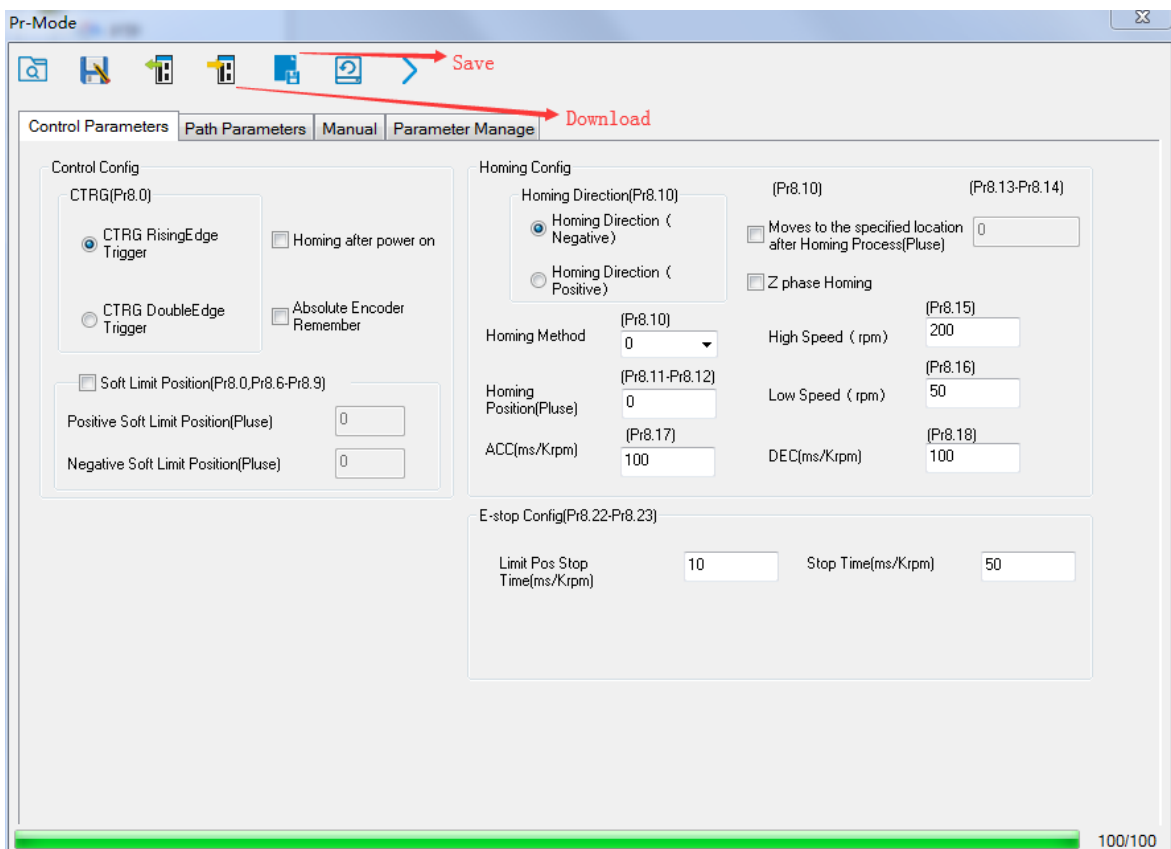


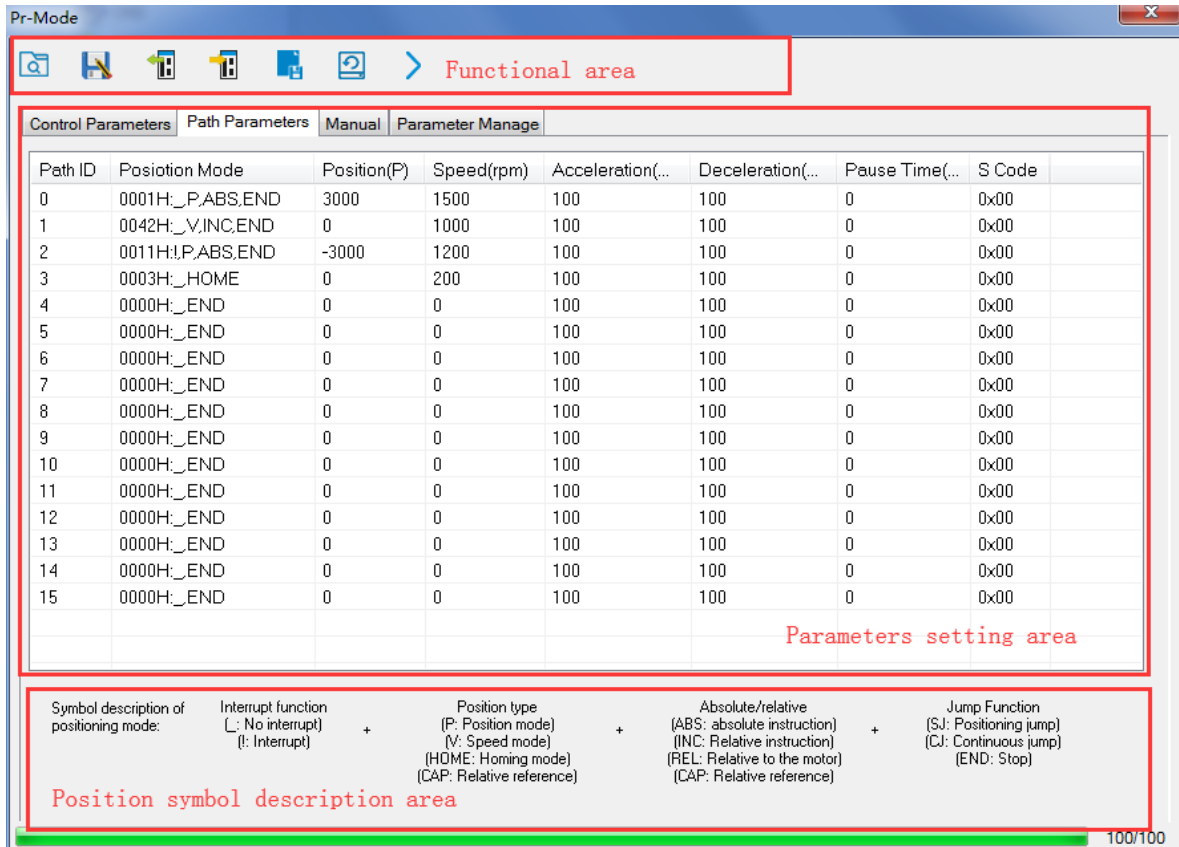
7.4 Execute Movement of Pr-Mode

7.4.1 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 ($Pr0.01=0$), Internal SERVO-enabled ($Pr4.02=83$), set the distribution of IO register Pr4.03-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 can not interrupt running.

!V , ABS , SJ1 means that path is speed running, jump to No.1 path with delay, and can interrupt running.

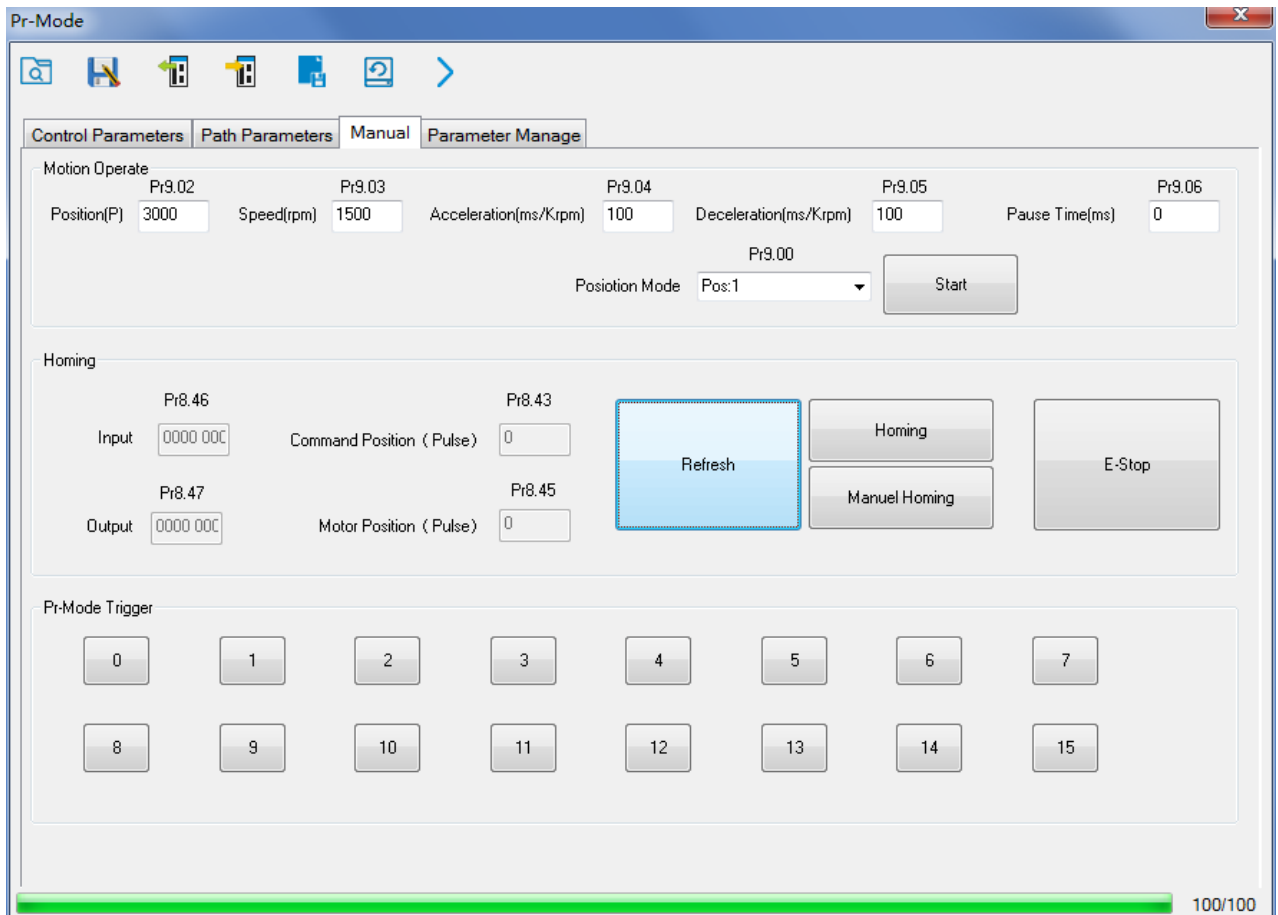
HOME means that path is homing movement.

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



7.4.2 Execute movement by digital signal

Pr-Mode motion can be triggered by IO signal.

| Parameters | Name | Specification |
|---------------|--------------------------|--|
| Pr4.02-Pr4.05 | Digital input selection | Specific of the digital input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.12 | Digital 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 | 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 | Accomplish homing | HOME_OK | 22h | A2h |
| Positive JOG | JOG+ | 23h | A3h | Torque limit | TQL | 06h | 86h |
| Negative JOG | 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.

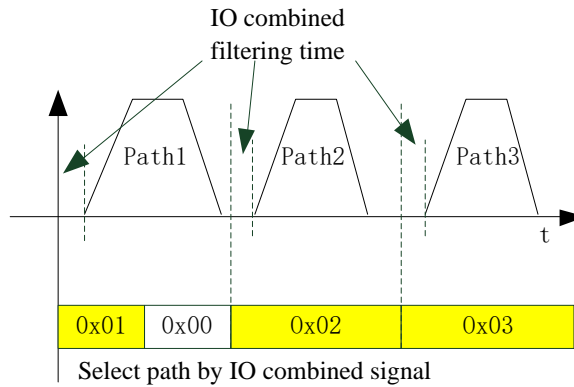
CTRG、HOME is edge triggering, but effective level need to last more than 1ms.

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.

7.4.3 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.

7.4.3.1 Parameters setting

| Parameters | Name | Specification | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-----------------------------------|---|-------------|----------|--------------|----------|---|---|-------------|---|---|---|------------|---|---|---|-------------|---|---|---|------------|---|---|---|------|---|---|---|------|---|
| Pr0.01 | Control Mode Setup | Set Pr0.01=0 for Pr-Mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr4.02 | DI3 Input selection | Set Pr4.02=83 for internal Servo-Enable Set Pr4.02=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> <p>If SW1 and SW2 OFF, then Pr5.30 valid If SW1 or SW2 ON, then these switches valid in higher priority than Pr5.30</p> | 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) If switch S1=0, then Pr5.31 valid. If switch S1=1~F, S1 valid in higher priority than Pr5.31 | | | | | | | | | | | | | | | | | | | | |
| Pr8.02 | PR trigger | (16bit, 485 address..0x6002) 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 | | | | | | | | | | | | | | | | | | | | |

7.4.3.2 Pr-Mode parameters address

8th parameters: $0x6000 + (\text{Parameters NO} - 800)$

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

9th parameters: $0x6200 + (\text{Parameters NO} - 900)$

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 position H | 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 | 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 | P9.104~Pr9.111 | Path 13 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6270~0x6277 | Pr9.112-Pr119 | Path 14 parameters | |
| The same with Pr9.00~Pr9.07 | | | |
| 0x6278~0x627f | Pr9.120-Pr127 | Path 15 parameters | |
| The same with Pr9.00~Pr9.07 | | | |

7.4.4 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 | 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 |

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.

7.4.5 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.

7.5 Operation Examples

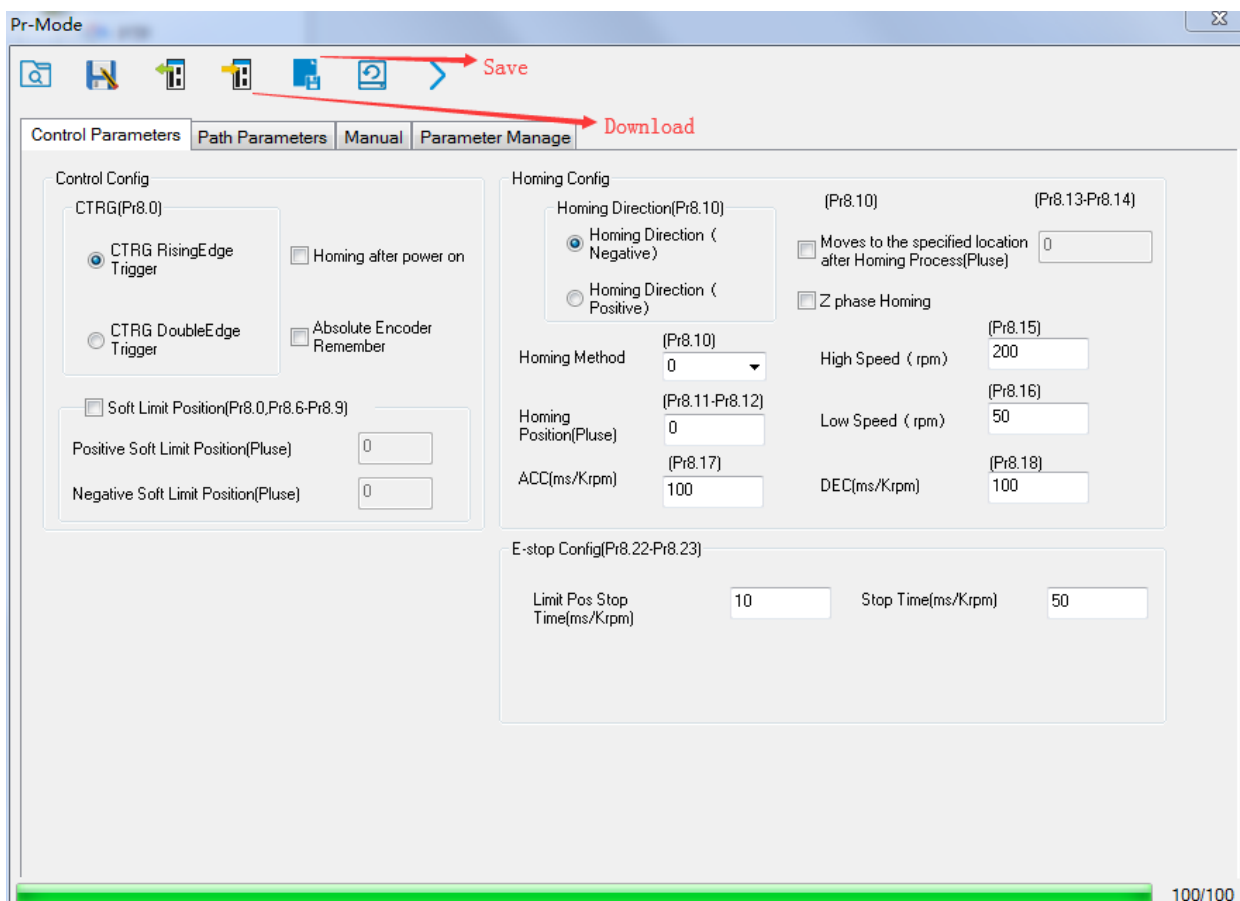
7.5.1 Execute movement by digital signal

Execute movement by digital IO signal.

1、 Parameters setting as follows:

| Parameters | Name | Specification |
|---------------|---------------------|---|
| Pr0.01 | Control Mode Setup | Set Pr0.01=0 for Pr-Mode |
| Pr4.02 | DI3 Input selection | Set Pr4.02=83 for internal Servo-Enable Set Pr4.02=03 for external Servo-Enable (Digital input for Servo-Enable) |
| Pr4.03-Pr4.08 | DI input selection | Specific of the digital input terminals' function distribution, refer to functional allocation table. |
| Pr4.10-Pr4.15 | DO output selection | Specific of the digital 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.

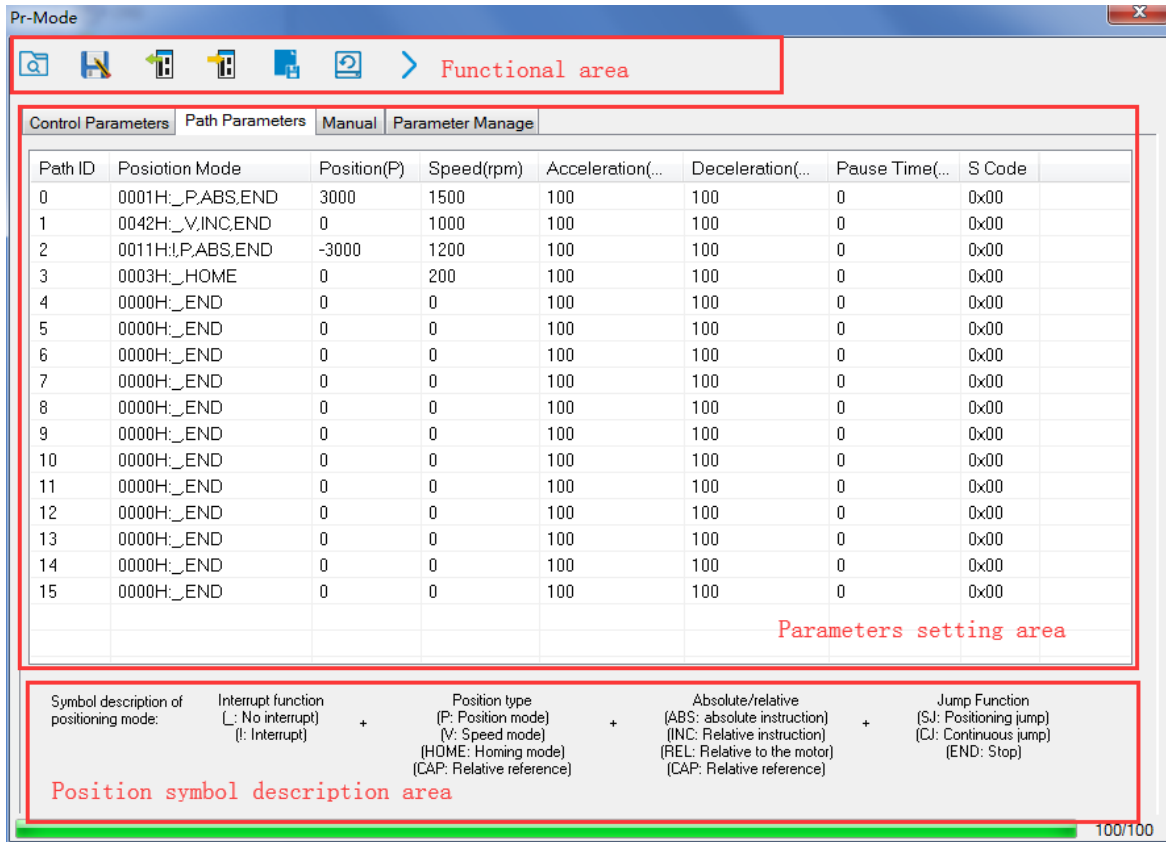
3、 Setup path parameters, such as: Position mode, speed, ACC/DEC, etc.

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.



The screenshot shows the 'Pr-Mode' software interface. At the top, there is a toolbar with icons for search, save, download, upload, and refresh, followed by a 'Functional area' label. Below the toolbar is a tabbed interface with 'Control Parameters', 'Path Parameters', 'Manual', and 'Parameter Manage'. The 'Path Parameters' tab is active, displaying a table with 16 rows of path data. Below the table is a 'Parameters setting area' label. At the bottom, there is a 'Position symbol description area' containing a legend for the path symbols.

| Path ID | Position Mode | Position(P) | Speed(rpm) | Acceleration(...) | Deceleration(...) | Pause Time(...) | S Code |
|---------|------------------|-------------|------------|-------------------|-------------------|-----------------|--------|
| 0 | 0001H:_P,ABS,END | 3000 | 1500 | 100 | 100 | 0 | 0x00 |
| 1 | 0042H:_V,INC,END | 0 | 1000 | 100 | 100 | 0 | 0x00 |
| 2 | 0011H!:P,ABS,END | -3000 | 1200 | 100 | 100 | 0 | 0x00 |
| 3 | 0003H:_HOME | 0 | 200 | 100 | 100 | 0 | 0x00 |
| 4 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 5 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 6 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 7 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 8 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 9 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 10 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 11 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 12 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 13 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 14 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |
| 15 | 0000H:_END | 0 | 0 | 100 | 100 | 0 | 0x00 |

Position symbol description area

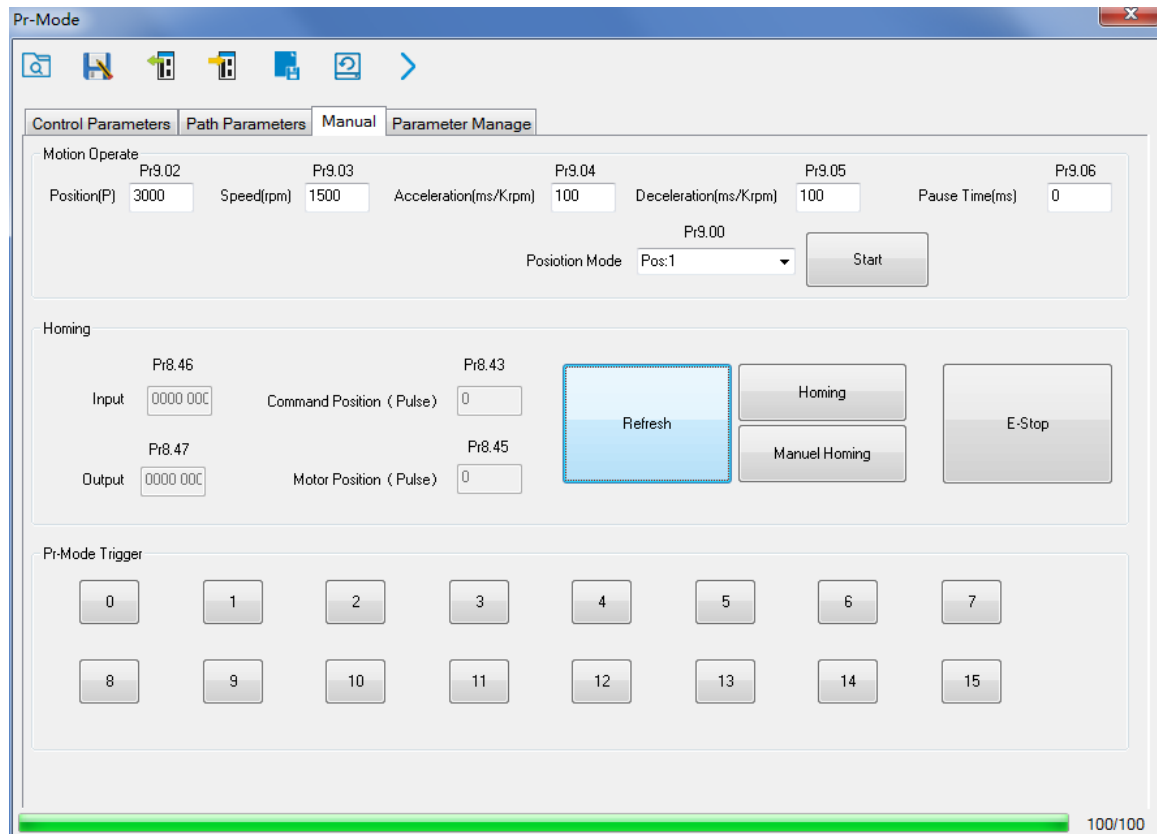
Symbol description of positioning mode: [L: No interrupt] + [!: Interrupt]

Position type: [P: Position mode] + [V: Speed mode] + [HOME: Homing mode] + [CAP: Relative reference]

Absolute/relative: [ABS: absolute instruction] + [INC: Relative instruction] + [REL: Relative to the motor] + [CAP: Relative reference]

Jump Function: [SJ: Positioning jump] + [CJ: Continuous jump] + [END: Stop]

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.

7.5.2 Execute movement by RS485 Communication

7.5.2.1 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 |
|----|--------------------------------|------------------------|
| 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 |

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

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 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 |

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

| NO | RS485 communication data frame | Details |
|----|--------------------------------|----------------------|
| 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 |

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

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 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 |

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

| NO | RS485 communication data frame | Details |
|----|--------------------------------|----------------------|
| 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 |
|---|-------------------------|--------|

(6) Homing

| NO | RS485 communication data frame | Details |
|----|--------------------------------|------------------------|
| 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 |

7.5.2.2 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.

| Parameters | Name | Specification |
|------------|---------------------|---|
| Pr4.02 | DI3 Input selection | Set Pr4.02=83 for internal Servo-Enable Set Pr4.02=03 for external Servo-Enable (Digital input for Servo-Enable) |

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.

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, $8 \times 2 = 16$

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 | | |
|----|------|-------------------------|---|---------|-----------------------------------|---|
| | ID | Slave ID | | ID | Slave ID | |
| 1 | ID | Slave ID | | ID | Slave ID | |
| 2 | FC | Function code | | FC | Function code | |
| 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, $8*2=16$

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 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

Chapter 8 Product Specification



Notice

Contact tech@leadshine.com if you need more technical service.

8.1 Driver Technical Specification

| Specification | | | | | |
|---------------------|--------------------------------|--|--|---|--|
| Driver model | ELD2-RS7005 | ELD2-RS7010 | ELD2-RS7015B | ELD2-RS7020B | ELD2-RS7030B |
| Size(mm) | 118*79.5*25.5 | 118*79.5*25.5 | 175*100.5*31 | 175*100.5*31 | 175*100.5*31 |
| Rated power(kw) | 0.2 | 0.4 | 0.6 | 0.75 | 1.2 |
| Rated current(Arms) | 5 | 10 | 15 | 20 | 30 |
| Peak current(A), 2 | 15 | 30 | 45 | 60 | 90 |
| Power | Voltage(V) | DC24-70(recommended 24-60Vdc) | | | |
| | Current(A) | 48-60Vdc: 3.5Amp 60-70Vdc: 3Amp | 48-60Vdc: 7Amp 60-70Vdc: 6Amp | 48-60Vdc: 11Amp 60-70Vdc: 9Amp | 48-60Vdc: 14Amp 60-70Vdc: 12Amp |
| Control method | IGBT PWM sinusoidal Wave Drive | | | | |
| Overload | 300% | | | | |
| Brake resistor | External connection | | | | |
| Protection rank | IP20 | | | | |

| Feature | | | | | |
|----------------------|--|-------------|--------------|--------------|--------------|
| Driver model | ELD2-RS7005 | ELD2-RS7010 | ELD2-RS7015B | ELD2-RS7020B | ELD2-RS7030B |
| Pulse input | 2 fast pulse input, 5V only, 500kHz | | | | |
| Modes of operation | Position/Velocity/Torque | | | | |
| Command source | Pulse+Direction / ± 10 V Analog / RS485 | | | | |
| Inputs/Outputs | 2 programmable differential inputs(5V-24V); 4 programmable single-end inputs(12-24V); 2 programmable differential outputs; 1 analog input(± 10 V). | | | | |
| Brake Output (24vdc) | -- | | √ | | |
| Motor Supported | Brushless、Brushed | | | | |
| Feedback Supported | 1000. 2500ppr incremental encoder (Encoder(ABZ)+Hall(UVW)) 17bit/23bit serial signal encoder | | | | |
| Communication | RS485/ RS232 | | | | |

8.2 Accessory selection

1. **Power cable** (1.2m, 2.2m, 3m, 5m, 7m, 10m selectable)
CABLE-ACM3M0 (motor with –SS connector)
CABLE-PL3M0-H (motor with –HD connector)
2. **Encoder cable** (1.2m, 2.2m, 3m, 5m, 7m, 10m selectable)
CABLE-LD2-BM3M0 (for motor with 1000lines and 2500lines encoder)
CABLE-LD2-BM5M0-S (for motor with 5000lines\17bit\23bit encoder)
3. **Brake cable** (1.2m, 2.2m, 3m, 5m, 7m, 10m selectable)
CABLE-SC3M0-S
4. **Software configuration cable**
CABLE-PC-1
5. **RS485 communication cable**
CABLE-TX1M0-LD2
6. **Regenerative resistance**(for application with big ACC and DEC)
10Ω+/-5%, 100w RXFB-1, Part num Code : 10100469

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

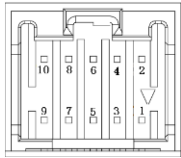
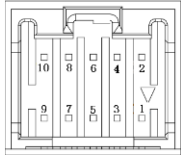
A.2.1 Parameters setting

| 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: 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. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <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* | 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

| CN6 | | Pin | Signal | Detail |
|------------|---|-------|--------|-----------|
| 485 IN |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |
| CN6 | | Pin | Signal | Detail |
| 485 OUT |  | 1 | RS485+ | 485data+ |
| | | 3 | RS485- | 485 data- |
| | | 5 | 485GND | 485 GND |
| | | other | NC | |

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 | 0x01 |
| 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 | | | | | | H |

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 | |
| 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) | | CRC | Check code | L |
| | | | | | | H |
| 8 | DATA1 | DATA1 | H | | | |
| 9 | | | L | | | |
| | DATA2 | DATA2 | H | | | |
| | | | L | | | |
| | CRC | Check code | L | | | |
| | | | 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

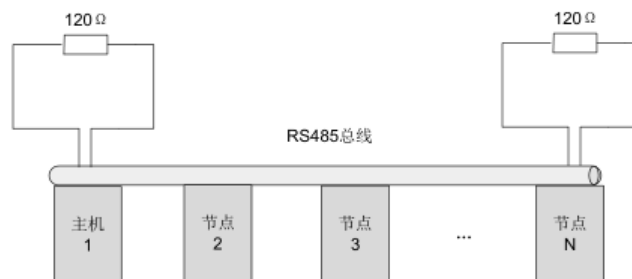
[Receive frame] 01 91 01 8C 50

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

A.4 RS485 common problems and solutions

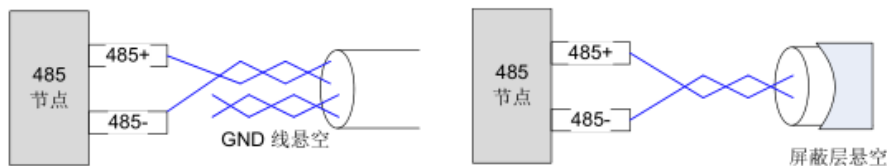
A.4.1 Common problems

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

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