

ELD2-RS Series DC Servo Drive

User Manual



Foreword

Thank you for purchasing Leadshine ELD2-RS series DC Servo drives. This manual will provide information on the ELD2-RS series servo products regarding product safety & specifications, installations & wiring, tuning & problem diagnostics.






Please contact us at tech@leadshine.com if you need further 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 any customer's modification of product and the warranty of product will be canceled at the same time.

Safety Precautions

Please read the safety instructions carefully before using the products and pay attention to the safety signs.

| | |
|---|--|
|  | Might incur death or serious injury |
|  | Might cause injury to operating personals or damage to equipment |
|  | Might cause damage to equipment |
|  | Hot surface. Do not touch |
|  | Protective Earth |

Safety instructions

| |
|---|
|  Warning |
| <ul style="list-style-type: none"> ✓ The design of the product is not to be used in mechanical system which may incur health hazard. ✓ Users should be aware of the product safety precautions during design and installations of the equipment to prevent any unwanted accident. |

Upon receiving

| |
|---|
|  Caution |
| <ul style="list-style-type: none"> ✓ The use of damaged or faulty product(s) is prohibited. ✓ Please refer to item checklist. If the labels don't match, please do not install. |

Transportation



Caution

- ✓ Please provide storage and transportation under protected conditions.
- ✓ Do not stack the products too high up to prevent toppling.
- ✓ The product should be packaged properly during transportation,
- ✓ Do not hold the product by the cable, motor shaft or encoder while transporting it.
- ✓ The product should be protected from external forces and shock.

Installation



Caution

Servo drive and Motor:

- ✓ Do not install around combustibles to prevent fire hazard.
- ✓ Avoid vibration and impact.
- ✓ Do not install products that are damaged or incomplete.

Servo drive:

- ✓ Please install in electrical cabinet with sufficient protection from outside elements.
- ✓ Reserve sufficient gap as per the installation guide.
- ✓ Make sure to have good heat sinking.
- ✓ Avoid dust, corrosive gas, conductive object or fluid and combustibles.

Servo Motor:

- ✓ Make sure installation is tight to prevent it from loosening.
- ✓ Prevent fluid from leaking into motor and encoder.
- ✓ Protect motor from impact to avoid damaging encoder.
- ✓ Motor shaft should not bear the load beyond the limits as specified.

Wiring



Warning

- ✓ Participate installation personals should have sufficient training in product installation safety.
- ✓ Please power off and wait for 10 minutes to make sure a full discharge of electricity.
- ✓ Servo drive and motor must be connected to ground.
- ✓ Connect the cables only after servo drive motor installed correctly
- ✓ Make sure the wires are properly managed and insulation layer is not torn to prevent electrocution.



Caution

- ✓ Wiring must be correctly connected to prevent damage to product(s)
- ✓ Servo motor U, V, W terminal should be connected correctly and NOT connected directly to an AC power supply.
- ✓ Capacitor, inductor or filter shouldn't be installed between servo motor and servo drive.
- ✓ Connecting wires or any non-heat resistant components should be put near to heat sink of the servo drive or motor.
- ✓ The flyback diode which is connected in parallel to output signal DC relay must not be connected in reverse.

Tuning and running



Caution

- ✓ Make sure the wirings of servo drive and servo motor are installed and fixed properly before powering on.
- ✓ On the first time tuning of the product, it is recommended to run unloaded until all the parameter settings are confirmed to prevent any damage to the product or machine.

Usage



Caution

- ✓ Please install an emergency stop button on machine to stop operation immediately if there is an accident.
- ✓ Please make sure machine is stopped before clearing an alarm.
- ✓ Servo drive must be matched with specified motor.
- ✓ Frequent restart of the servo system might incur damage to the product.
- ✓ Servo drive and motor will be hot to touch shortly after power off. Please be careful.
- ✓ Modification(s) to servo system is prohibited.

Error Handling



Warning

- ✓ Please wait for 5 minutes after powering off for the electricity to be fully discharged before uninstalling the cables.
- ✓ Participate maintenance personals should have sufficient training in maintenance and operation of this product series.



Caution

- ✓ Please handle the error before clearing an alarm.
- ✓ Keep away from machine after a restart upon alarm. Mechanical axis might suddenly move. Such hazard should be prevented during the utilization of the product.

Model Selection



Caution

- ✓ Rated torque of the servo motor should be higher than continuous designated torque when fully loaded.
- ✓ Load inertia ratio of the motor should be lower or equals to recommended value for specified models
- ✓ Servo drive must be matched with specified motor.

Warranty Information

Available for

Leadshine overseas warranty only covers Leadshine DC servo products that are obtained through **Leadshine certified sales channel outside of China.**

Warranty claim

- All Leadshine DC servo products (Servo drives and motors) overseas enjoy **18-month** warranty period.
- Due to unforeseen circumstances in different sales regions around the globe, we recommend users to seek technical support from directed sales channel as any warranty claim or repair services may be required.
- Please be informed that any maintenance/repair work that is outside of the warranty claim conditions might incur some charges and to be confirmed before product(s) is being sent in.
- The duration required for maintenance work to be done is to be confirmed after initial check-up but we reserve the right to prolong the repair duration if needed.
- Discontinued products within warranty period will be replaced with a product of similar specifications.

Steps to warranty claim

1. Visit Leadshine global site www.leadshine.com to look for local certified sales channel.
2. Contact designated sales channel to check if any fee might incur. May include repair fee, spare part cost or shipping cost.

Circumstances where warranty claim is not available

- Damage/Loss due to occurrence of natural or man-made disaster such as fire, flood or earthquake.
- Installation or wiring error
- If there is any modification done to the product
- Warranty label on products is torn or not existing
- Not a product bought from Leadshine certified global network of retailers/distributors.

Before warranty claim

- Please backup device parameters before any repair work/warranty claim. Leadshine and Leadshine certified retailers/distributors will not be held responsibilities for any data loss.
- If available, please send product back in original packaging or make sure it is well packaged to prevent any damage to the product during shipping.

Leadshine Technology Co.,Ltd. and its certified sales channel reserved the final right of the interpretation of the warranty information.

TABLE OF CONTENT

| | |
|---|-----------|
| CHAPTER 1 INTRODUCTION | 9 |
| 1.1 Product Introduction | 9 |
| 1.2 Model Number Structure | 10 |
| 1.2.1 Servo Drive | 10 |
| 1.2.2 Servo Motor | 10 |
| 1.3 Servo Drive Technical Specifications | 11 |
| 1.4 Servo Drive Ports and Connectors..... | 12 |
| 1.5 Motor Ports and Connectors..... | 13 |
| CHAPTER 2 INSTALLATION & WIRING | 14 |
| 2.1 Servo Drive Installation | 14 |
| 2.1.1 Servo drive installation environment | 14 |
| 2.1.2 Servo drive dimension | 14 |
| 2.2 Servo Motor Installation | 17 |
| 2.2.1 Installation conditions..... | 17 |
| 2.2.2 Precautions during installation | 17 |
| 2.3 ELD2-RS Wiring Diagram | 18 |
| 2.4 Servo Drive Ports..... | 19 |
| 2.4.1 CN1 I/O Signal Port | 21 |
| 2.4.2 CN3/CN4 Power supply & Regenerative Resistor Port | 24 |
| 2.4.3 CN5 Modbus RS485 Communication Port | 24 |
| 2.4.4 CN6 Safe Torque Off (STO) Port | 25 |
| 2.4.5 CN7 RS232 Tuning Port..... | 26 |
| 2.4.6 CN9 Logic Circuit Power Supply Port | 27 |
| 2.4.7 ENC Encoder Feedback Port | 27 |
| 2.4.8 ID spin dial RSC..... | 28 |
| 2.4.9 Baud rate/Terminal resistor switch SW | 28 |
| 2.5 Cable Selection | 29 |
| 2.5.1 Motor Power Cable | 29 |
| 2.5.2 Motor Encoder Cable | 32 |
| 2.5.3 Motor Brake Cable | 34 |
| 2.5.4 Drive Communication Cable..... | 34 |
| 2.5.4 Tuning Cable | 34 |
| 2.6 Regenerative Resistor Selection | 35 |
| CHAPTER 3 PARAMETER | 39 |
| 3.1 Parameters list | 39 |
| 3.2 Parameters description | 50 |
| 3.2.1 [Class 0] Basic Settings..... | 50 |
| 3.2.2 [Class 1] Gain adjustments..... | 56 |
| 3.2.3 [Class 2] Vibration suppression | 62 |
| 3.2.4 [Class 3] Velocity/Torque control | 66 |

| | |
|--|------------|
| 3.2.5 [Class 4] I/O Monitoring Settings | 73 |
| 3.2.6 [Class 5] Extension Settings..... | 80 |
| 3.2.7 [Class 6] Other settings | 84 |
| 3.2.8 [Class 7] Factory settings | 88 |
| 3.2.9 [Class 8] PR control parameters..... | 89 |
| 3.2.10 [Class 9] PR control path parameters..... | 98 |
| 3.2.11 [Class B] Status Parameters | 114 |
| CHAPTER 4 CONTROL MODE | 117 |
| 4.1 Position control | 118 |
| 4.1.1 Pulse input and direction settings | 119 |
| 4.1.2 Electronic Gear Ratio..... | 120 |
| 4.1.3 Position command filter | 121 |
| 4.1.4 Encoder feedback output | 123 |
| 4.1.5 Positioning completed INP signal output | 124 |
| 4.2 Velocity control mode | 125 |
| 4.2.1 Velocity command input control | 126 |
| 4.2.2 Velocity command acceleration/deceleration | 128 |
| 4.2.3 Velocity reached signal AT-SPEED output | 129 |
| 4.2.4 Velocity coincidence V-COIN signal output | 130 |
| 4.2.5 Zero Speed Clamp | 130 |
| 4.3 Torque control..... | 131 |
| 4.3.1 Torque command input control | 132 |
| 4.3.2 Torque velocity limit..... | 134 |
| 4.3.3 Torque limit (TL-SEL) | 134 |
| 4.4 Hybrid Control Mode..... | 135 |
| CHAPTER 5 APPLICATION CASE | 136 |
| 5.1 Gain Adjustment | 136 |
| 5.2 Inertia ratio identification function | 138 |
| 5.3 Auto gain adjustment | 141 |
| 5.4 Manual gain adjustment | 146 |
| 5.4.1 Parameters adjustment under different control modes..... | 148 |
| 5.4.2 Gain switching..... | 150 |
| 5.5 3rd gain switching | 154 |
| 5.6 Model following control | 155 |
| 5.7 Feedforward gain | 156 |
| 5.7.1 Velocity feedforward..... | 156 |
| 5.7.2 Torque feedforward | 157 |
| 5.8 Friction compensation function | 159 |
| 5.9 Safety Functions | 160 |
| 5.9.1 Max. motor rotational speed limitation..... | 160 |
| 5.9.2 Max. duration for motor to stop after disabling | 161 |
| 5.9.3 External brake deactivation output signal BRK-OFF | 161 |
| 5.9.4 Servo stopping mode..... | 163 |
| 5.9.5 Emergency stop function..... | 163 |

| | |
|---|------------|
| 5.10 Vibration Suppression | 165 |
| 5.10.1 Mechanical resonance suppression | 165 |
| 5.10.2 End vibration suppression | 169 |
| 5.11 Multiturn absolute encoder | 170 |
| 5.11.1 Parameters setting..... | 170 |
| 5.11.2 Read absolute position..... | 171 |
| 5.11.3 Absolute Encoder Related Alarm..... | 173 |
| 5.12 Regenerative resistor settings..... | 174 |
| CHAPTER 6 MODBUS COMMUNICATION | 175 |
| 6.1 Communication connection | 175 |
| 6.2 Modbus RS485 communication parameters and ports | 176 |
| 6.3 Modbus Protocol..... | 178 |
| 6.3.1 Read Data 0x03..... | 178 |
| 6.3.2 Write single data 0x06..... | 178 |
| 6.3.3 Write multiple data 0x10 | 179 |
| 6.3.4 Reply error..... | 180 |
| 6.3.5 Auxiliary function parameters..... | 180 |
| 6.3.6 Alarm info parameters..... | 181 |
| 6.4 Frequently occurred issues and solutions with RS485 communication. | 182 |
| CHAPTER 7 PR MODE | 185 |
| 7.1 PR functions introduction..... | 186 |
| 7.2 Control parameters | 187 |
| 7.3 PR Motion..... | 189 |
| 7.3.1 Homing..... | 189 |
| 7.3.2 Position limit and emergency stop..... | 194 |
| 7.3.3 JOG..... | 194 |
| 7.3.4 Path motion | 195 |
| 7.4 PR Control..... | 198 |
| 7.4.1 PR module in Motion Studio..... | 198 |
| 7.4.2 Physical I/O | 200 |
| 7.4.3 485 communication | 202 |
| 7.4.4 Path trigger..... | 204 |
| 7.5 PR motion | 205 |
| 7.5.1 Trigger using physical I/O | 205 |
| 7.5.2 Control using 485 communication | 206 |
| CHAPTER 8 WARNING AND ALARM | 208 |
| 8.1 Servo Drive alarm indicator..... | 208 |
| 8.2 Servo drive alarm | 209 |
| 8.3 Alarm Handling | 210 |
| 8.4 Alarm clearing | 221 |
| 8.4.1 Servo Drive Alarm Clearing | 221 |
| CONTACT US | 222 |

Chapter 1 Introduction

1.1 Product Introduction

ELD2-RS Series DC Servo Product is a new DC servo drivers and motors product range that we have proudly developed at Leadshine Technology Co.,Ltd. This product series provides more in demanded functionalities and control.

ELD2-RS Series DC Servo Drive comes with voltage rating of 24 to 70VDC and current rating from 5A up to 60A (max. peak current: 180A). This series supports Modbus communication protocol in addition to pulse + direction input control. Using RS485 protocol, multi axis network of ELD2-RS series servo drive can be realized and controlled from 1 single master device.

ELD2-RS series DC Servo Drive also comes with new ELVM series DC servo motors with 17-bit magnetic absolute and 2500-line incremental encoder which offers better accuracy and stability.

First time user of the ELD2-RS series servo products can refer to this manual for more information on this product that cannot be covered in this short introduction. For further technical support, please do contact us or any local Leadshine certified retailers on Contact Us page.

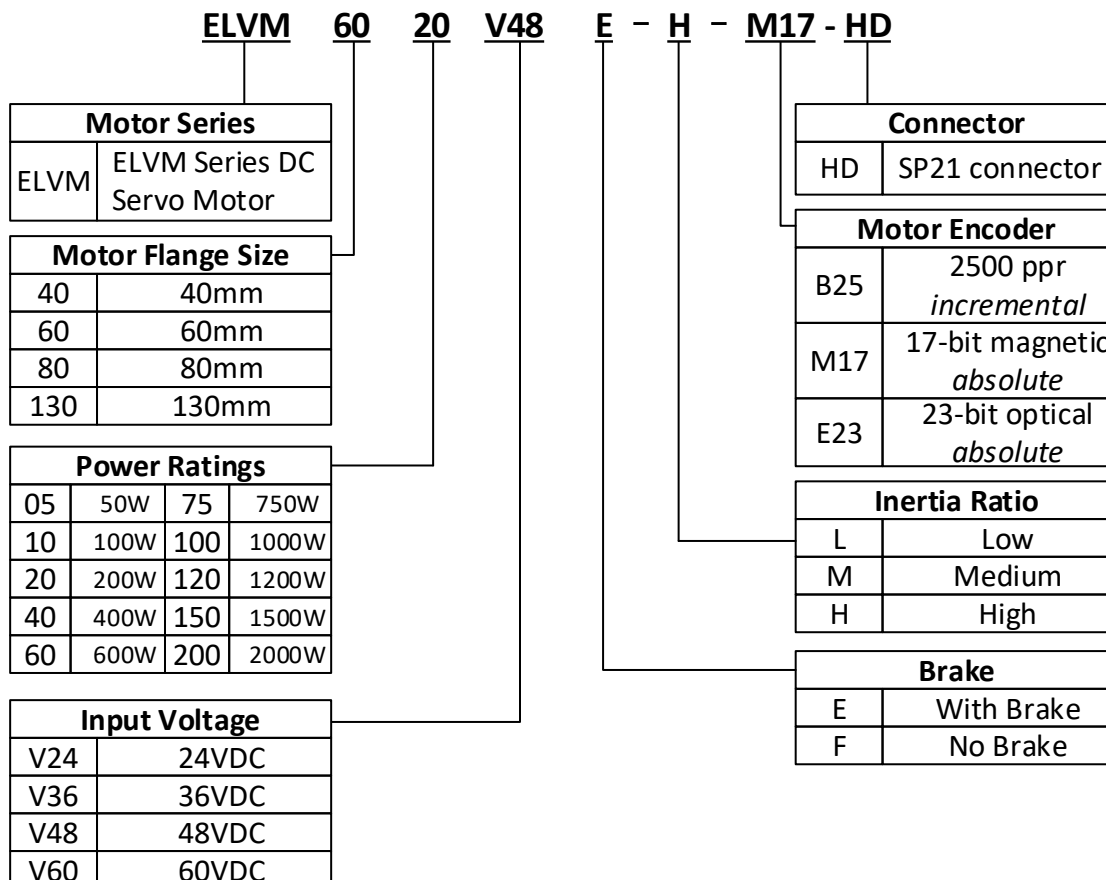
1.2 Model Number Structure

1.2.1 Servo Drive



| No. | Description | |
|-----|------------------------|--|
| ① | Series No. | ELD2: DC Servo Drive Series |
| ② | Communication protocol | RS: Pulse train + Modbus RTU CAN: CANopen + Analogue |
| ③ | Power Rating | 7020: 24-70VDC, rated current 20A 7030: 24-70VDC, rated current 30A |
| ④ | Type | B: Holding brake output Blank: Without holding brake output |

1.2.2 Servo Motor



1.3 Servo Drive Technical Specifications

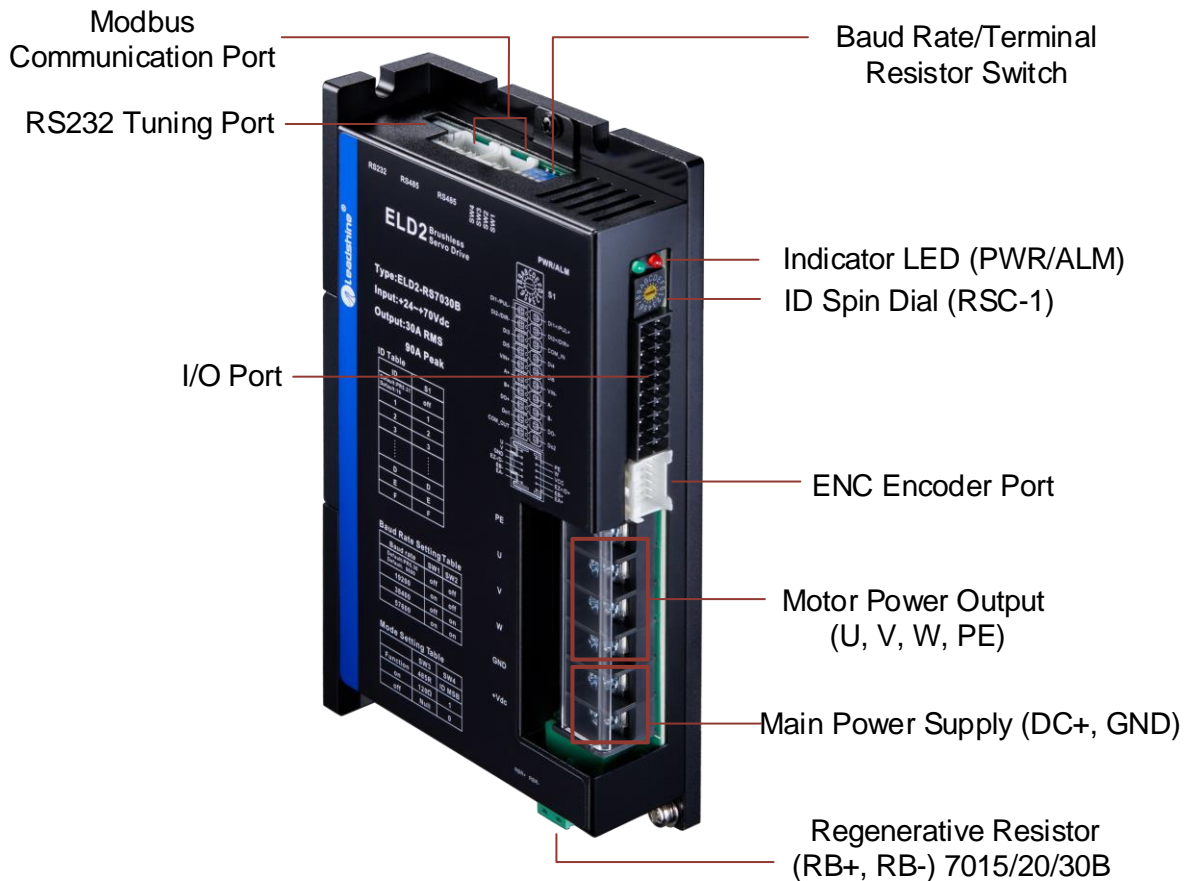
| ELD2-RS series | RS7005B | RS7010B | RS7015B | RS7020B | RS7030B |
|-----------------------|---------------|---------|--------------|---------|---------|
| Rated Current (Arms) | 5 | 10 | 15 | 20 | 30 |
| Peak Current (Arms) | 21 | 42 | 45 | 80 | 90 |
| Dimension(mm) | 118*79.5*25.5 | | 175*100.5*33 | | |
| ELD2-RS series | RS7040B | | RS7060B | | |
| Rated Current (Arms) | 40 | | 60 | | |
| Peak Current (Arms) | 120 | | 180 | | |
| Dimension(mm) | 194*103*41 | | | | |
| Logic Power Supply | 24VDC | | | | |
| Safe Torque Off (STO) | STO S/L3 | | | | |

| | |
|----------------------------|--|
| Main power supply | 24 ~ 70VDC |
| Direct Drive Holding Brake | Yes |
| Drive mode | SVPWM sinusoidal wave drive |
| Velocity regulation ratio | 5000:1 |
| Electronic gear ratio | 1 ~ 32767/1 ~ 32767 |
| Matching encoders | Hall signal UVW + ABZ or RS485 encoder (Tamagawa protocol) |
| Input | 2 pulse differential 5V Digital input (Pulse+direction) 4 configurable NPN/PNP 24V Digital Inputs: DI3-DI6 |
| | 1. Servo enabled (SRV-ON) 2. Positive limit switch (POT) 3. Negative limit switch (NOT) 4. Clear Alarm (A-CLR) 5. Gain switching (GAIN) 6. Deviation counter clearing (CL) 7. Command pulse prohibition(INH) 8. Crossover frequency input switching(DIV1) 9. Internal command velocity selection(INTSPD) 10. Zero speed clamp(ZEROSPD) 11. Velocity sign(VC-SIGN) 12. Torque sign(TC-SIGN) 13. Emergency Stop (E-STOP) |
| Output | 1 holding brake output; 2 configurable single-ended NPN/PNP 24V, 8mA digital outputs |
| | 1. Alarm (ALARM) 2. Servo ready (SRDY) 3. External brake off (BRK-OFF) 4. Positioning completed (INP1) 5. Reached velocity(AT-SPEED) 6. Zero speed position (ZSP) 7. Velocity coincidence (V-COIN) 8. Position command (P-CMD) 9. Velocity command (V-CMD) |
| Alarm | Current circuit error, DC bus overvoltage, DC bus undercurrent, overcurrent, overcurrent on IPM, motor overload, regenerative resistor overload, encoder disconnected, encoder initialization error, encoder data error, excessive position deviation, overspeed, I/O configuration error, EEPROM parameter saving CRC checksum error, positive/negative position limit valid, forced alarm input valid |
| Indicator light | Red & Green LED |

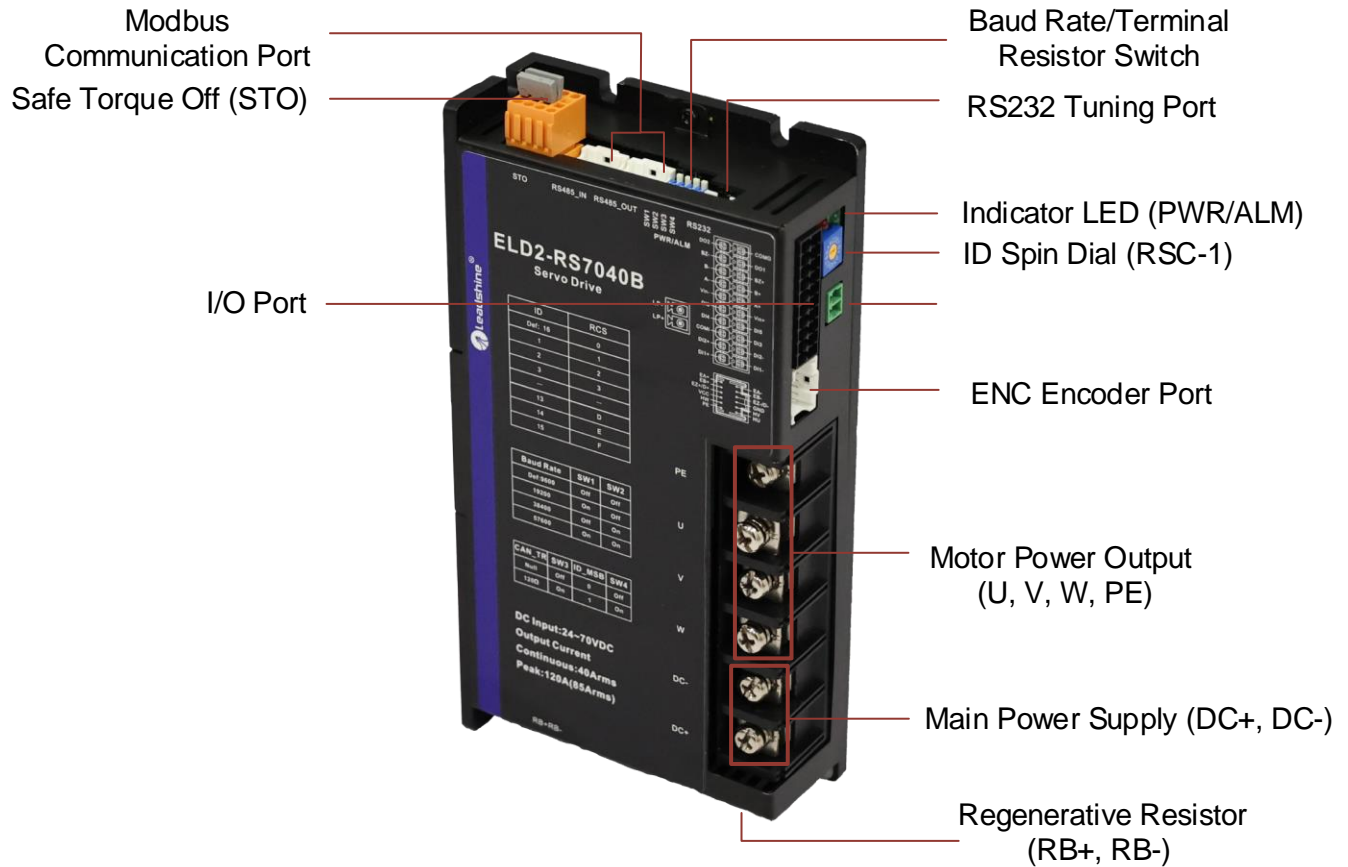
| | | |
|-----------------------------------|---|---|
| Tuning Software | Motion Studio 2 | |
| Motion Studio 2 | Configure parameters for current, position and velocity loop. Parameter uploading using .lsr parameter files. Drive and motor data monitoring using oscilloscope. | |
| Communication Port | RS-232 , 1 : 1 ; RS485 , 0 : N ($0 \leq N \leq 127$) , Modbus protocol | |
| Load-Inertia | Smaller than 20 times motor inertia | |
| Dimension | 175*100*27 mm | 118*79.5*25.5 mm |
| Environmental requirements | Storage condition | Avoid direct sunlight. Keep away from heat generating devices, dust, oil, corrosive liquid/gas and places with strong vibration or high humidity. Prohibit combustible gas and conductive material waste. |
| | Temperature | -20°C ~ + 45°C (Please allow air circulation if >45°C) |
| | Storage temperature | - 20°C ~ + 65°C |
| | Humidity | 40—90%RH (Condensation free) |
| | Installation | Vertical and level to ground |

1.4 Servo Drive Ports and Connectors

ELD2-RS Series Servo Drive (7005B/7010B/7015B/7020B/7030B)

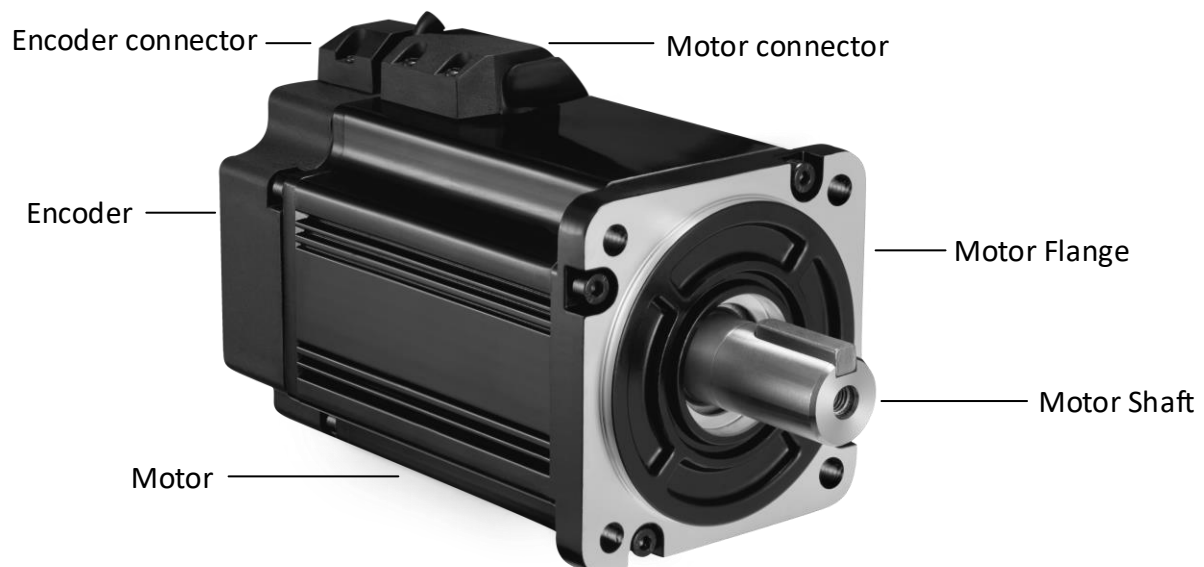


ELD2-RS Series Servo Drive (7040B/7060B)



1.5 Motor Ports and Connectors

ELVM Series DC Servo Motor



Chapter 2 Installation & Wiring

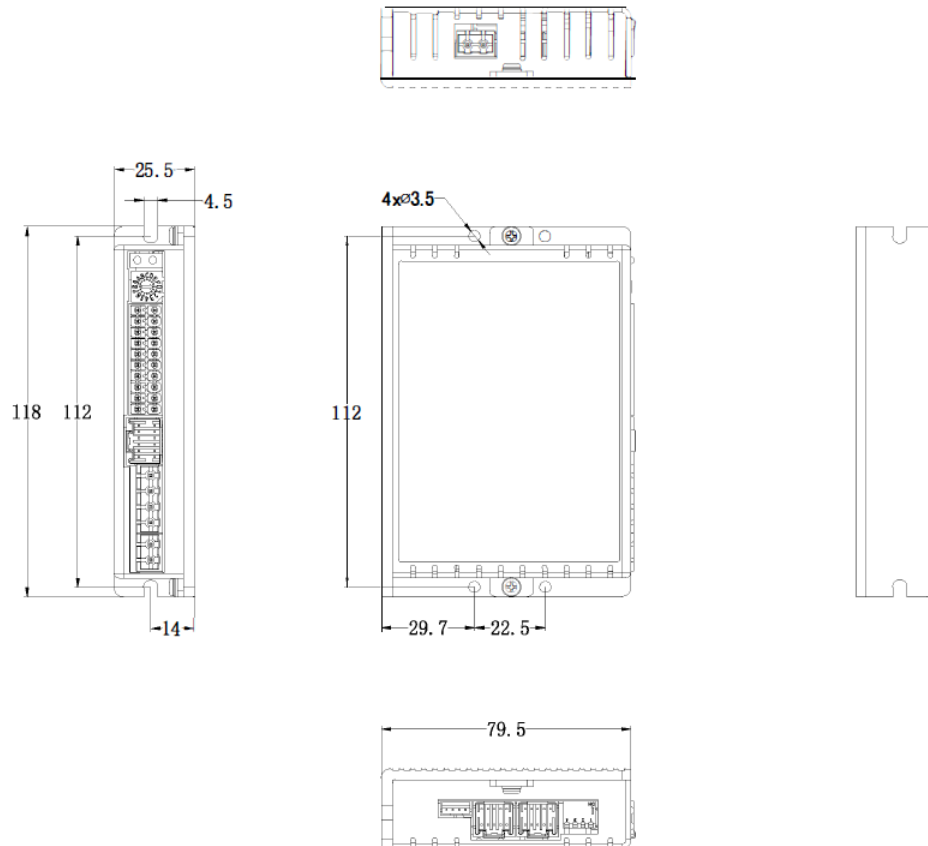
2.1 Servo Drive Installation

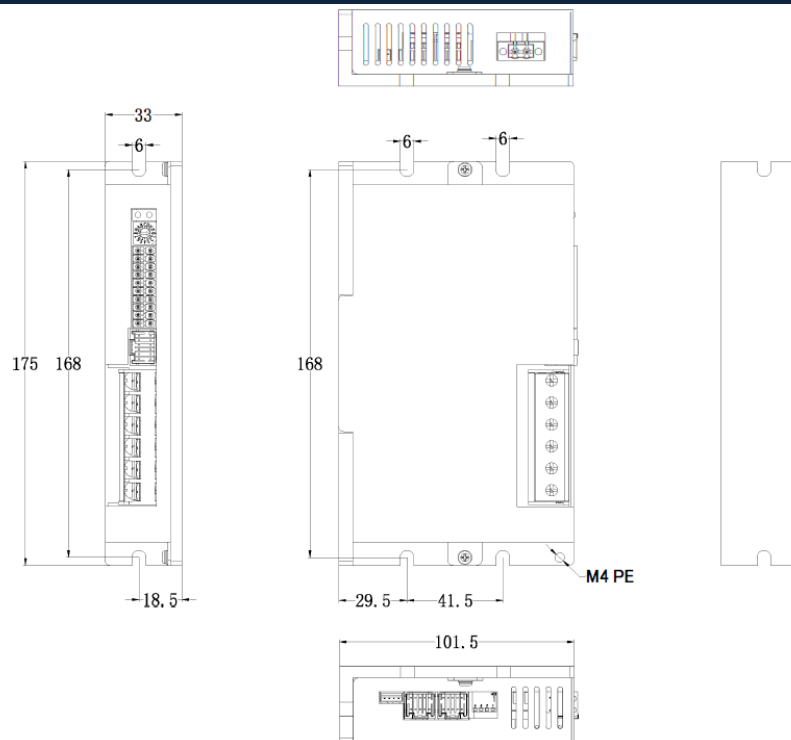
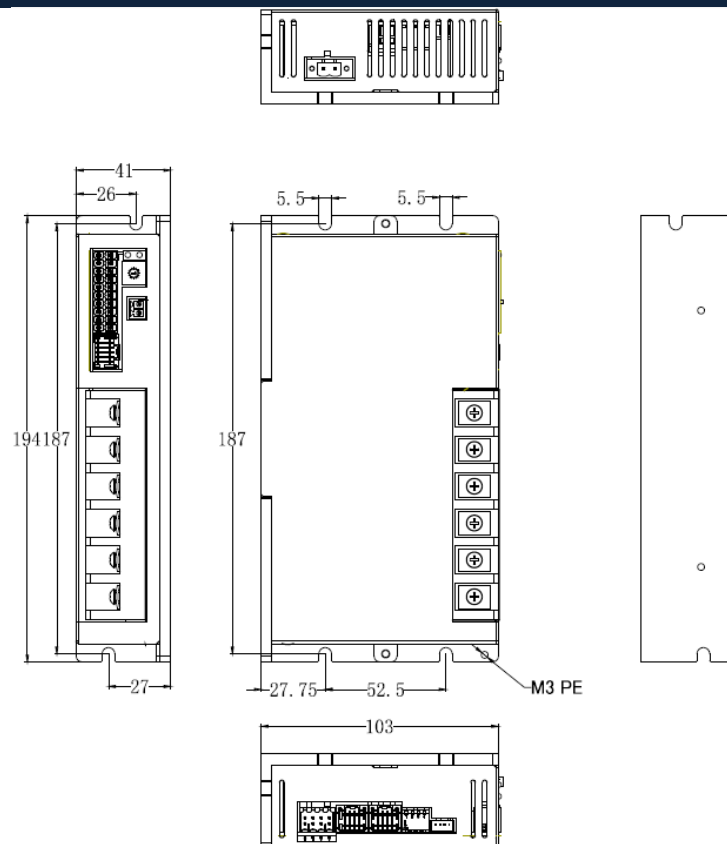
2.1.1 Servo drive installation environment

| | |
|-----------------------------|---|
| Temperature | Storage: -20~+65°C (Condensation free); Installation: -20~+45°C (Please allow air circulation if >45°C) |
| Humidity | Under 90%RH (Condensation free) |
| Altitude | Up to 1000m above sea level |
| Atmospheric pressure | 86 ~ 106kPa |
| Vibration | Less than 0.5G (4.9m/s ²) 10-55Hz (non-continuous working) |
| Atmospheric | No corrosive gas, combustibles, dirt or dust. |
| IP ratings | IP20 |

2.1.2 Servo drive dimension

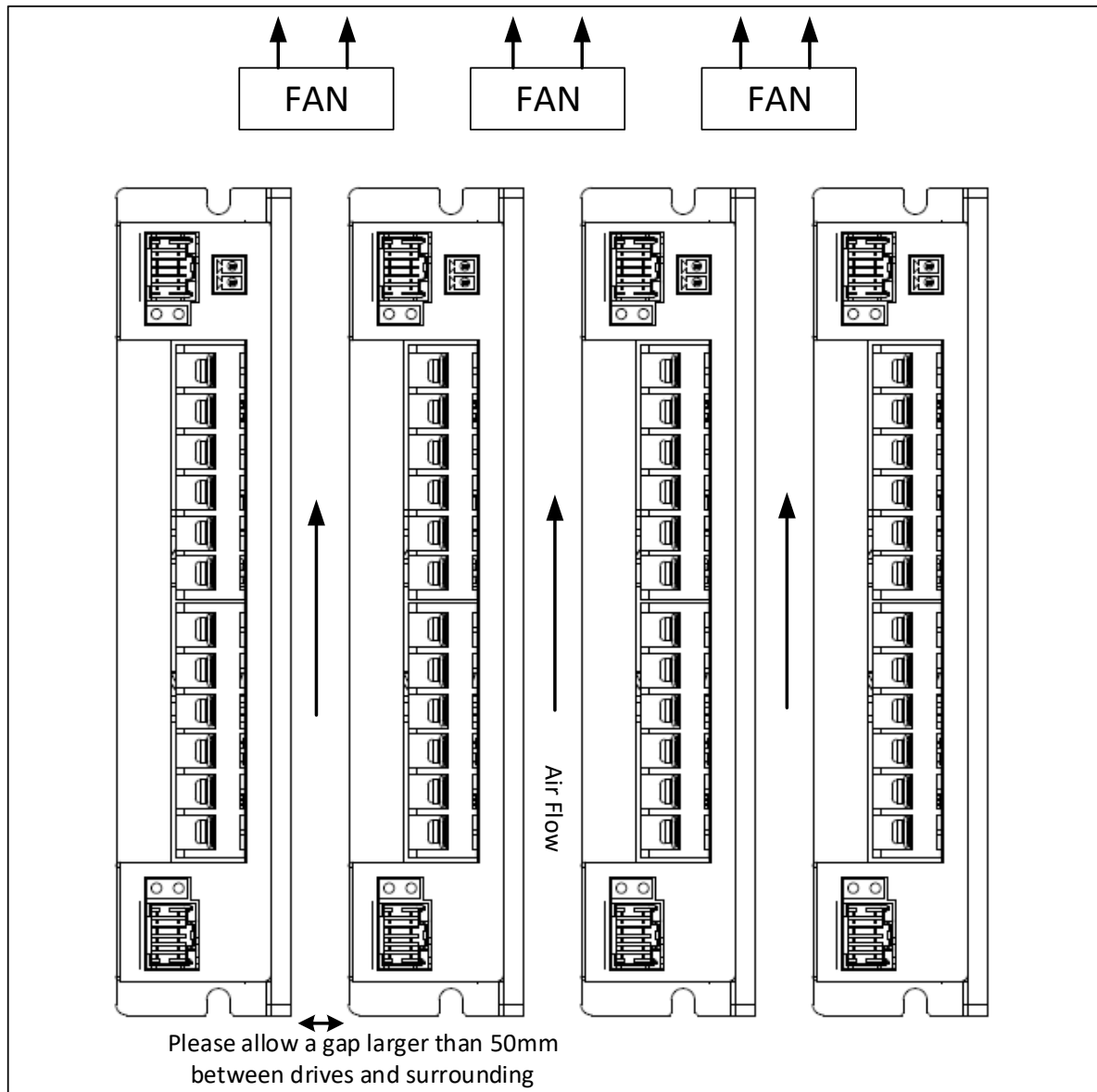
Dimension 1: ELD2-RS7005/7010



Dimension 2: ELD2-RS7015B/7020B/7030B

Dimension 3: ELD2-RS7040B/7060B


Space requirement for installation

1. Please install the drive vertical to ground.
2. Please ensure optimal heat dissipation with enough room (>50mm) between each drives or to surrounding. It is recommended to install cooling fans for drives to achieve optimal performance.



Please refer to the diagram above for a visual guide on how to properly install the DC servo drives.

2.2 Servo Motor Installation

2.2.1 Installation conditions

Installation conditions may affect the lifespan of a motor

- Please keep away from corrosive fluid and combustibles.
- If dusty working environment is unavoidable, please use motors with oil seal.
- Please keep away from heat source.
- If motor is used in enclosed environment without heat dissipation, motor lifespan will be short.
- Please check and clean the installation spot before installation.

2.2.2 Precautions during installation

Installation method

Install horizontal to ground

Make sure power cable and encoder cable is facing downwards to make sure fluid doesn't leak into the ports.

Install vertical to ground

Please use a motor with oil seal when paired with a reducer to prevent reducer oil from leaking into the motor.

Oil- and waterproofing

- Do not submerge motor/cable under oil/water
- Please use a motor with oil seal when paired with a reducer to prevent reducer oil from leaking into the motor.
- If there is an unavoidable fluid leakage near the motor, please use motor with better IP ratings.
- Make sure power cable and encoder cable is facing downwards to make sure fluid doesn't leak into the ports.
- Avoid the usage of motor in water/oil leaking prone environment.

Cable under stress

- Do not bend the cable especially at each ends of the connectors.
- Make sure to not let the cables be too tight and under tremendous stress especially thinner cables such as signal cables.

Connectors

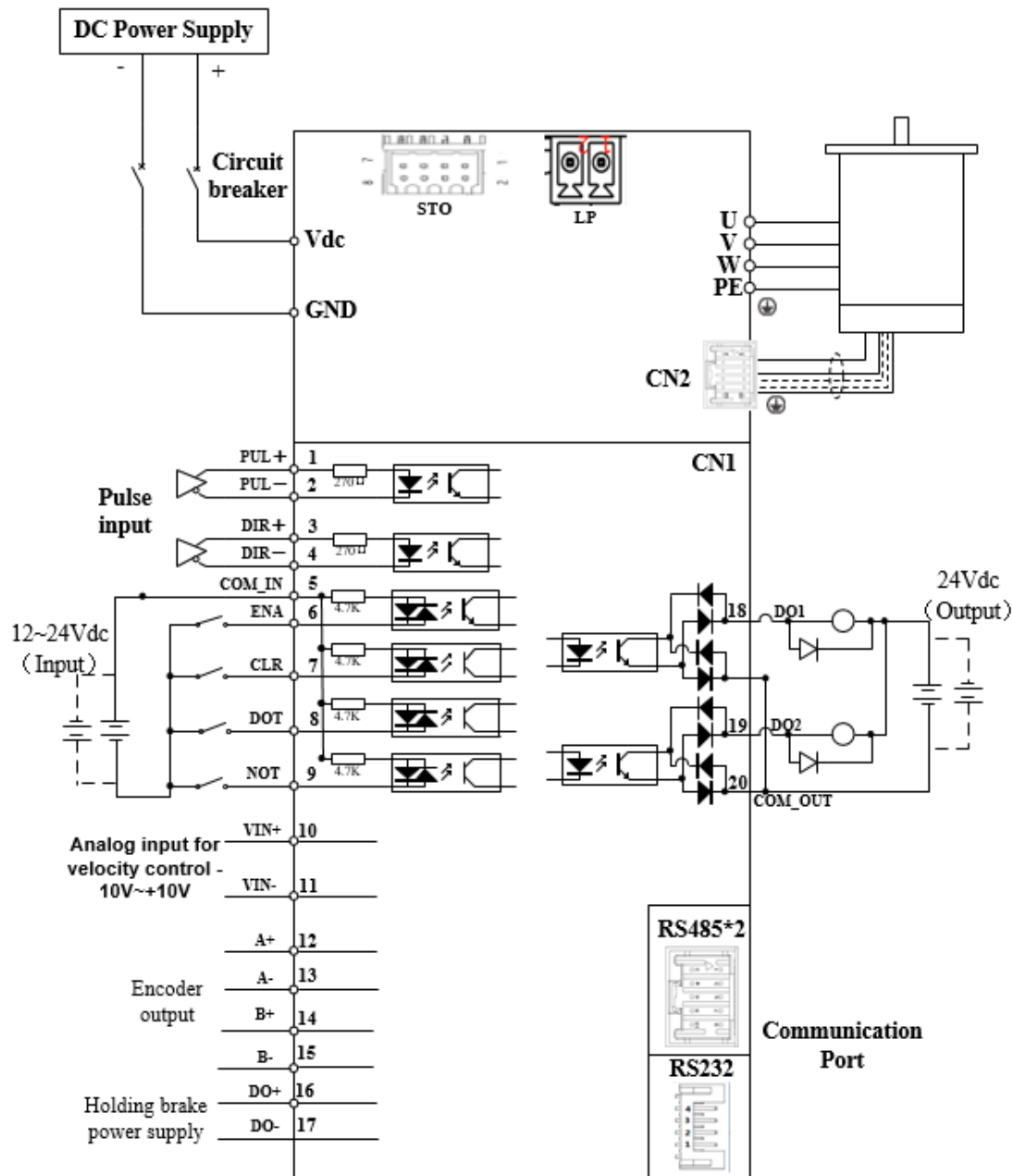
- Please to remove any conductive foreign objects from the connectors before installation
- The connectors are made of resin. May not withstand impact.
- Please hold the driver during transportation, not the cables.
- Leave enough "bend" on the connector cables to ensure less stress upon installation.

Encoder & coupling

- During installation or removal of coupling, please do not hit the motor shaft with a hammer as it would cause damage to internal encoder.
- Please make sure to centralize the motor shaft and coupling, it might cause damage to motor or encoder due to vibration.
- Please make sure axial and radial load is within the limits specified as it might affect the lifespan of the motor or cause damage to it.

2.3 ELD2-RS Wiring Diagram

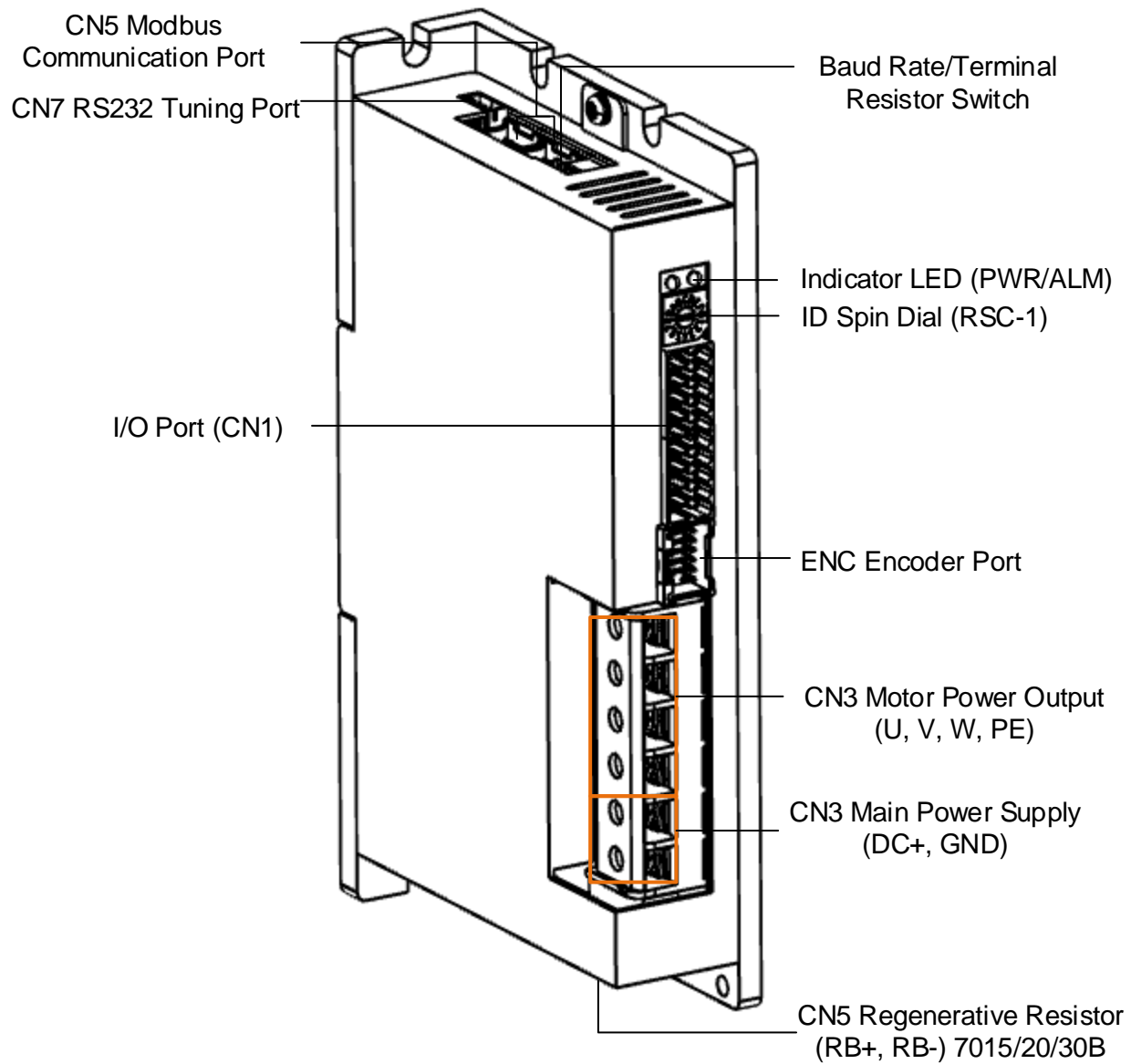
ELD2-RS Wiring Diagram

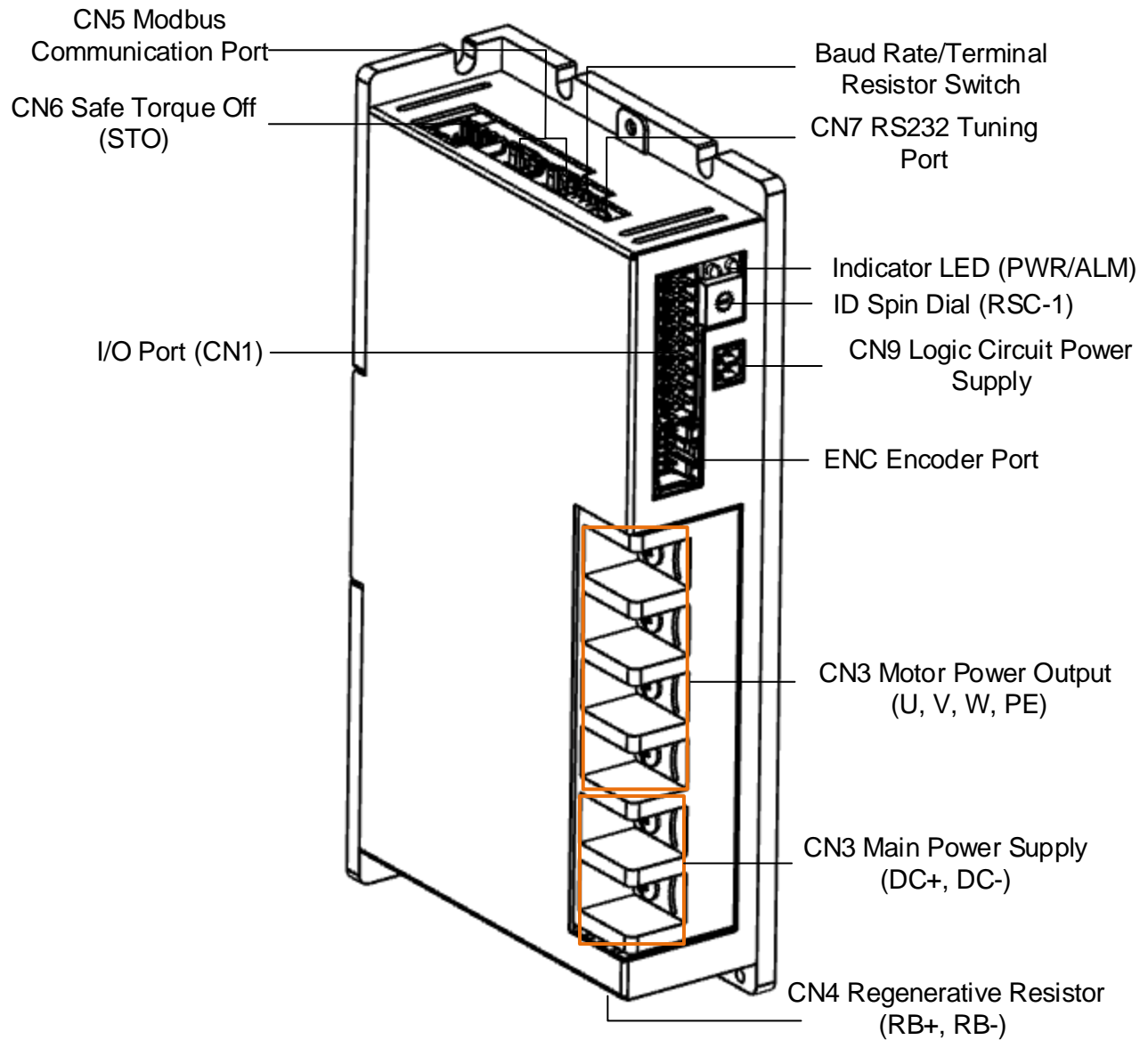


- Make sure data transferring cables are as short as possible. Keep CN1 cable under 3m and CN2 cable under 10m. Use shielded double winding cables to cut down on electromagnetic interference.
- If the load for DO is an inductive load such as a relay, please install freewheeling diodes on both ends of the load in parallel. Please keep in mind that if the diode is connected in reverse, it might cause damage to the drive.
- Use non-fuse breaker (NFB) to cut off power supply to the drive in case of emergency.

2.4 Servo Drive Ports

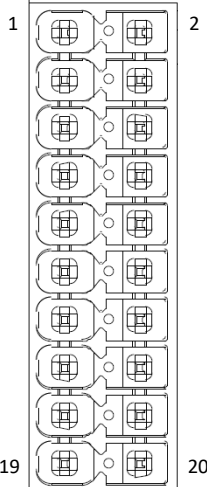
ELD2-RS 7005/7010/7015B/7020B/7030B



ELD2-RS 7040B/7060B


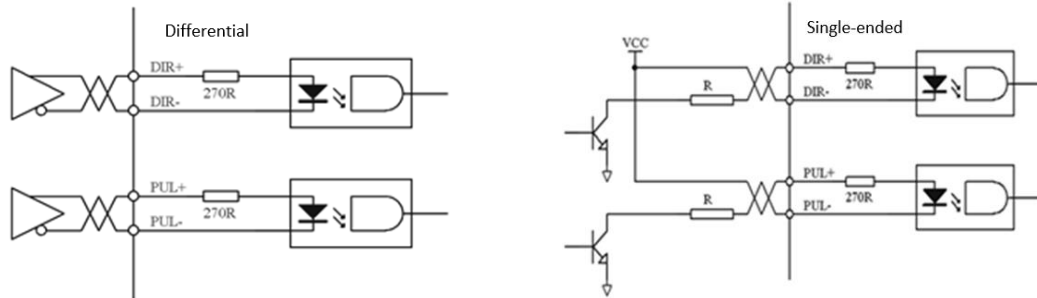
| Connector | Label |
|-----------|--|
| CN1 | I/O signal port |
| CN3 | Motor power output (U, V, W, PE) Main Power Supply (DC+, DC-) |
| CN4 | Regenerative resistor port (RB+, RB-) |
| CN5 | Modbus Communication port |
| CN6 | Safe Torque Off (STO) port |
| CN7 | RS232 tuning port |
| CN9 | Logic circuit power supply port |
| ENC | Motor encoder feedback |
| SW | Baud rate/Terminal resistor switch |
| RSC | ID spin dial |

2.4.1 CN1 I/O Signal Port

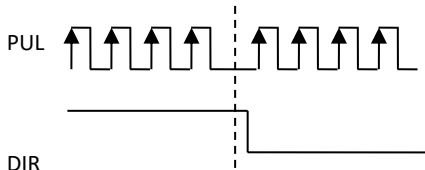
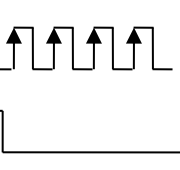
| Diagram | CN | Pin | Signal | Description |
|---|-----|-----|---------|---|
|  | CN1 | 1 | DI1+ | Pulse input, differential, 500kHz |
| | | 2 | DI1- | |
| | | 3 | DI2+ | Direction input, differential, 500kHz |
| | | 4 | DI2- | |
| | | 5 | COM_IN | Common DI |
| | | 6 | DI3 | Servo enable |
| | | 7 | DI4 | Alarm clear |
| | | 8 | DI5 | Homing switch |
| | | 9 | DI6 | Position limit |
| | | 10 | A1+ | Analog input, voltage -10~+10VDC, resistance 20kΩ |
| | | 11 | A1- | |
| | | 12 | A+ | Encoder signal A output |
| | | 13 | A- | |
| | | 14 | B+ | Encoder signal B output |
| | | 15 | B- | |
| | | 16 | BR+ | Holding brake output positive and negative terminal, max current output: 1A |
| | | 17 | BR- | |
| | | 18 | DO1 | Alarm output, current output <100mA |
| | | 19 | DO2 | Servo ready, current output <100mA |
| | | 20 | COM_OUT | Common output |

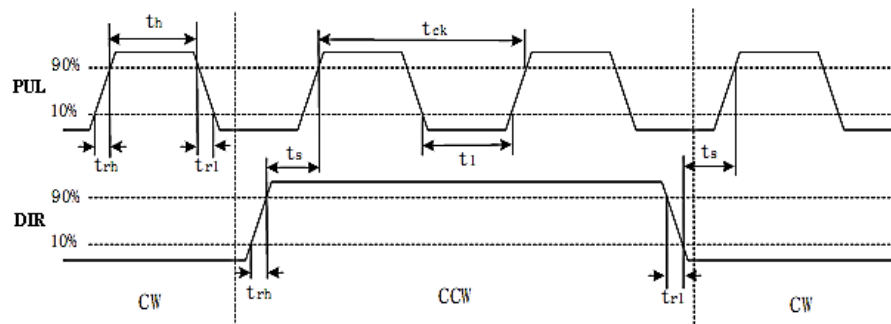
Pulse input

Pulse and direction input only support 5V signal. Please connect in series a resistor with resistance of $2k\Omega$ for 24V pulse and direction signal. Please refer to the following differential and single-ended input wiring diagrams.



Following tables show pulse input signal and sequences. When a 2-phase input is used, 4 times of pulse frequency is $\leq 500\text{kHz}$.

| Pulse input mode | Counter clockwise | Clockwise | Settings |
|------------------|---|---|---------------------------|
| Pulse signal |  |  | Command pulse + direction |



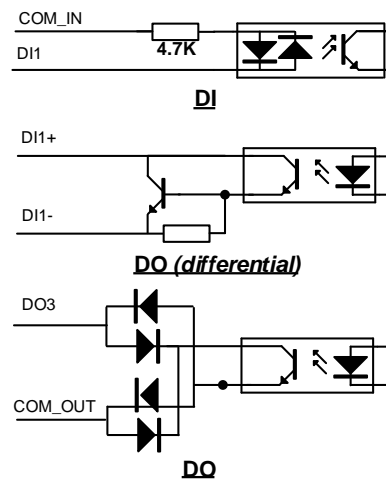
| Symbol | Differential input | Single-ended input |
|-----------|--------------------|--------------------|
| t_{ck} | $> 2\mu\text{s}$ | $> 5\mu\text{s}$ |
| t_h | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |
| t_l | $> 1\mu\text{s}$ | $> 2.5\mu\text{s}$ |
| t_{rh} | $< 0.2\mu\text{s}$ | $< 0.3\mu\text{s}$ |
| 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} | $> 4\mu s$ | $> 5\mu s$ |
| t_{qrh} | $< 0.2\mu s$ | $< 0.3\mu s$ |
| t_{qrl} | $< 0.2\mu s$ | $< 0.3\mu s$ |
| t_{qs} | $> 1\mu s$ | $> 2.5\mu s$ |

I/O Signal Wiring Diagram

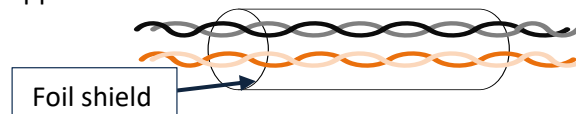
1. DI3-DI6 supports NPN and PNP configuration. Recommended to use an external control signal power supply of 12-24VDC.

2. DO1-DO2 are single ended outputs with 100mA current output that supports NPN and PNP configuration. Recommended to use an external power supply of 24VDC. If the load is an inductive load such as a relay, please install freewheeling diodes on both ends of the load in parallel. If the diode is connected in reverse, it might cause damage to the driver.



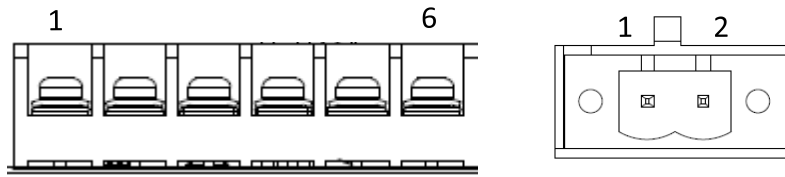
CN1 control signal cable selection

To ensure I/O signal to not be affected by electromagnetic interference, a **shielded cable** is recommended for this application.



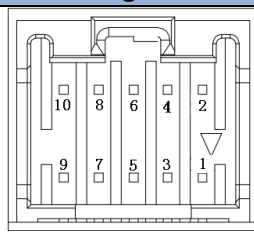
Cables for different analogue signals should be using isolated shielded cable while cables for digital signals should be shielded twisted pair cable. Cables for CN1 connectors should be 24-28AWG in diameter.

2.4.2 CN3/CN4 Power supply & Regenerative Resistor Port



| CN3 | | | CN4 |
|------|-----|--------|---|
| Port | Pin | Signal | Description |
| CN3 | 1 | DC+ | DC Power Supply positive and negative terminals |
| | 2 | DC- | |
| | 3 | PE | U, V, W, PE terminals for motor |
| | 4 | U | |
| | 5 | V | |
| | 6 | W | |
| CN4 | 1 | DC+ | DC Power Supply positive and negative terminals |
| | 2 | DC- | |

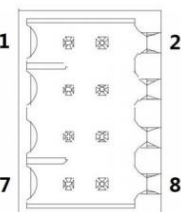
2.4.3 CN5 Modbus RS485 Communication Port

| Port | Diagram | Pin | Signal | Label |
|------|---|--------|--------|----------------------------|
| CN5 |  | 1 | RS485+ | Modbus positive terminal |
| | | 3 | RS485+ | Modbus negative terminal |
| | | 5 | GND | Power supply ground |
| | | Others | NC | 10 pins are not applicable |
| | | | | |

Note:

- Molex 55959-1030 Connector Header (Driver side)
- Molex 51353-1000 10-pin rectangle connector 1pcs for each axis (Provided)
- Molex 56134-9000 female terminal reel 10pcs for each axis (Provided)

2.4.4 CN6 Safe Torque Off (STO) Port

| Port | Diagram | Pin | Signal | Description | Remarks |
|------|---|-----|--------|---|---|
| CN6 |  | 1 | 5V | 24v power supply | Connect to SF1 and SF2 when not in use. Do not use to supply power. |
| | | 2 | GND | Reference ground | |
| | | 3 | STO1+ | STO 1 positive input | When SF1 = OFF or SF2 = OFF, STO is enabled. |
| | | 4 | STO1- | STO 1 negative input | |
| | | 5 | STO2+ | STO 2 positive input | |
| | | 6 | STO2- | STO 2 negative input | |
| | | 7 | EDM+ | External monitoring device (EDM) with differential double | When SF1 = OFF and SF2 = OFF, EDM = ON |
| | | 8 | EDM- | | |

Introduction to Safe Torque Off (STO)

Function: Cut off motor current supply physically (through mechanical means)

STO module (CN6 connector) consists of 2 input channels. It cuts off the motor current supply by blocking of PWM control signal from the power module. When the motor current is cut off, the motor will still move under inertia and stops gradually.

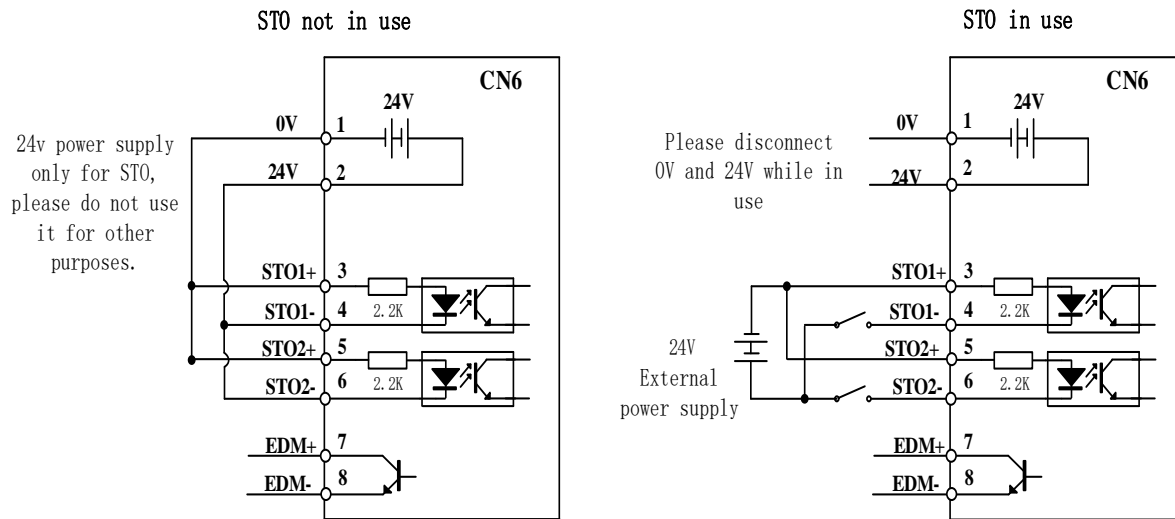
The STO function is set up ready to be used by factory default. Please remove STO connector if it is not needed.

STO functional principle

STO module cuts off the motor current supply and stops motor gradually by blocking of PWM control signal from the power module through 2 isolated circuits. When a STO error occurs, the actual status of STO can be determined by the EDM status feedback.

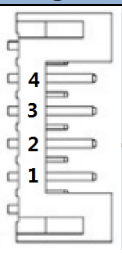
| STO1 Input Status | STO2 Input Status | EDM Output Status | PWM control signal | Alarm code |
|-------------------|-------------------|-------------------|--------------------|------------|
| ON | ON | OFF | Normal | - |
| ON | OFF | OFF | Blocked | Er 1c2 |
| OFF | ON | OFF | Blocked | Er 1c1 |
| OFF | OFF | ON | Blocked | Er 1c0 |

STO wiring diagram



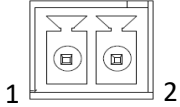
- Please take precautions when enabling STO functions as servo drive will lose control over the motion of the motor. Motor might dropped under gravitational pull (vertically mounted load) or moved when external forces are applied to it. Alternatively, motor with holding brake can be chosen.
- STO is not meant to cut off the power supply of the servo drivers and motors completely. Please power off and wait for a few minutes before starting maintenance work.
- It is recommended to use an isolated power supply for STO signal input as any current leakage might cause STO malfunction.

2.4.5 CN7 RS232 Tuning Port

| Port | Diagram | Pin | Signal |
|------|---|-----|--------|
| CN7 |  | 1 | 5V |
| | | 2 | TX |
| | | 3 | GND |
| | | 4 | RX |

ELD2-RS Series DC Servo Drive can be connected to Motion Studio for parameters tuning and data monitoring using **CABLE-PC-1**.

2.4.6 CN9 Logic Circuit Power Supply Port

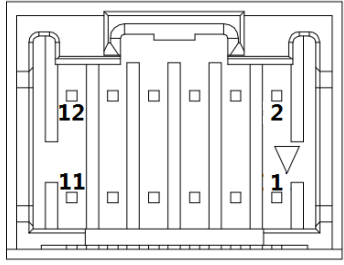
| Port | Diagram | Pin | Signal | Description |
|------|---|-----|--------|-----------------------|
| CN9 |  | 1 | 24V | 24V positive terminal |
| | | 2 | GND | 24V negative terminal |

ELD2-RS7040B/7060B dual-axis DC servo drives include an optional logic circuit power supply port.

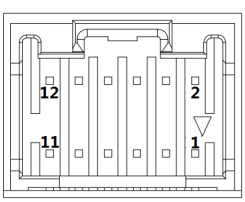
When main power supply is cut, logic circuit power supply port can be connected to realize:

1. Partially functional DSP
2. Holding brake output to directly control the status of motor holding brake

2.4.7 ENC Encoder Feedback Port

| Port | Diagram | Pin | Signal | Description |
|------|--|-----|-------------|---|
| ENC |  | 1 | Foil Shield | Encoder cable shielded layer |
| | | 2 | HU | Motor Hall U signal |
| | | 3 | HW | Motor Hall W signal |
| | | 4 | HV | Motor Hall V signal |
| | | 5 | VCC | 5V power supply from driver. Only for encoder |
| | | 6 | GND | |
| | | 7 | EZ+/D+ | Encoder Z phase positive signal / encoder positive terminal |
| | | 8 | EZ-/D- | Encoder Z phase negative signal / encoder negative terminal |
| | | 9 | EB+ | Encoder B phase positive signal |
| | | 10 | EB- | Encoder B phase negative signal |
| | | 11 | EA+ | Encoder A phase positive signal |
| | | 12 | EA- | Encoder B phase negative signal |

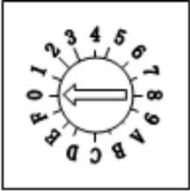
For motors with 17-bit magnetic encoder (battery kit connected externally for absolute encoder):

| Port | Diagram | Pin | Signal | Description |
|------|---|-----|--------|---------------------|
| ENC |  | 1 | Frame | Protective earth |
| | | 5 | VCC5V | Power Supply 5V |
| | | 6 | GND | Power Supply Ground |
| | | 7 | SD+ | SSI Data+ |
| | | 8 | SD- | SSI Data- |

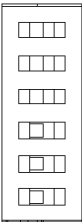
Note:

- Molex 55959-1230 Connector Header (Driver side)
- Molex 51353-1200 12-pin rectangle connector 1pcs for each axis (Provided)
- Molex 56134-9000 female terminal reel 12pcs for each axis (Provided)

2.4.8 ID spin dial RSC

| | Diagram | Bit | Modbus address | Bit | Modbus address |
|-----|---|-----|------------------------|-----|----------------|
| RCS |  | 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 |

2.4.9 Baud rate/Terminal resistor switch SW

| Diagram | Function | | Pr6.33 | SW4 | Baud rate | SW1 | SW2 | Terminal resistor | SW3 |
|---|-------------------------|---------------|--------|-----|-------------------------|-----|-----|-------------------|-----|
|  | Motor direction | CCW (Default) | 0 | OFF | Pr5.30 Default: 9600 | OFF | OFF | Disconnected | OFF |
| | | CW | | ON | 19200 | ON | OFF | | |
| | Modbus high bit address | Spin dial | 8 | OFF | 38400 | OFF | ON | Connected | ON |
| | | 16+Spin dial | | ON | 57600 | ON | ON | | |

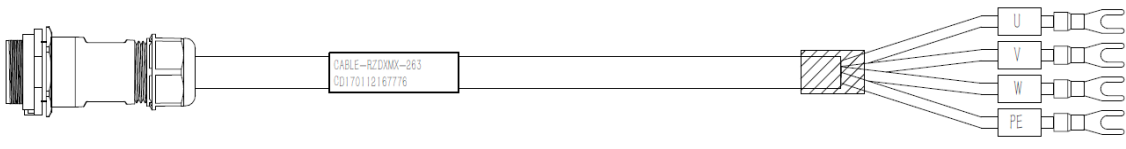
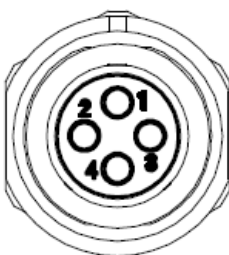
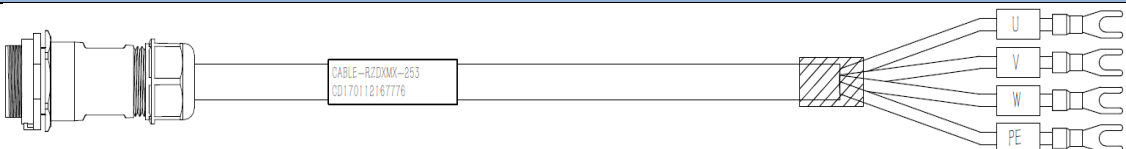
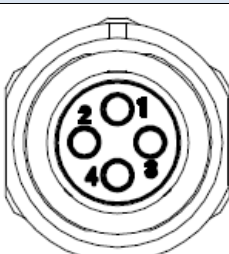
2.5 Cable Selection

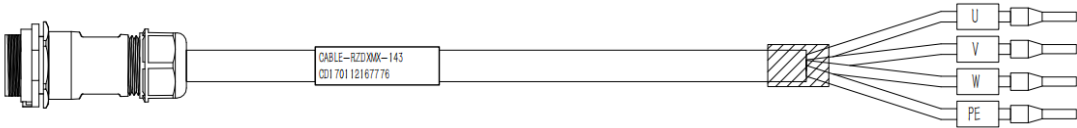
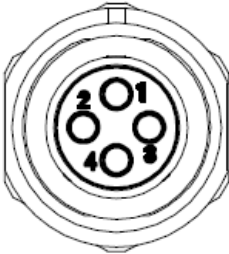
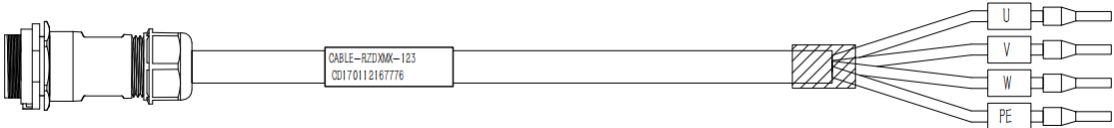
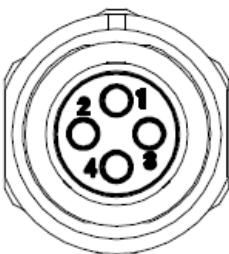
2.5.1 Motor Power Cable

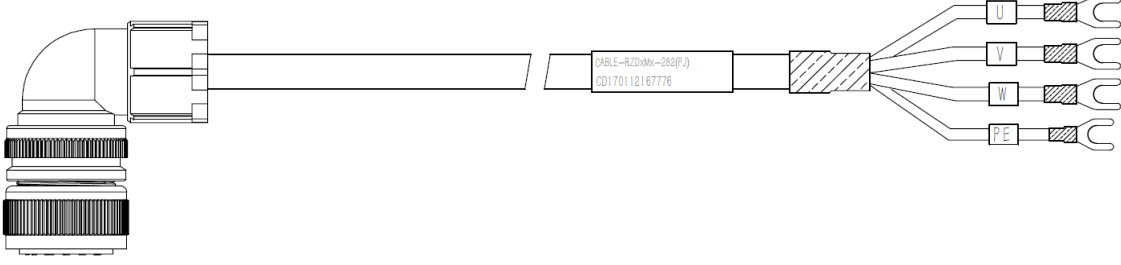
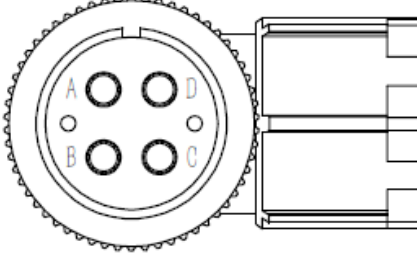
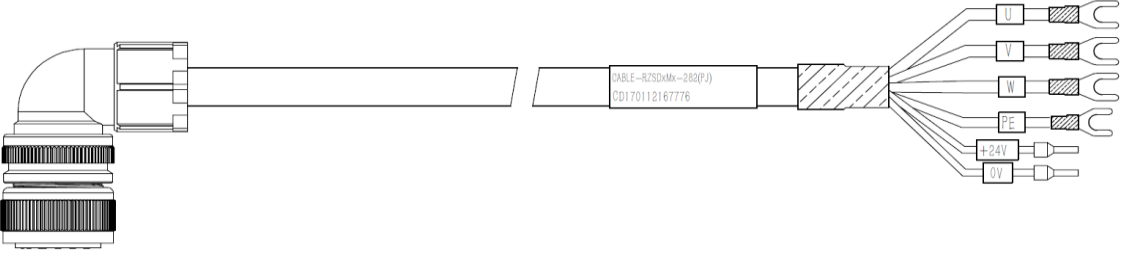
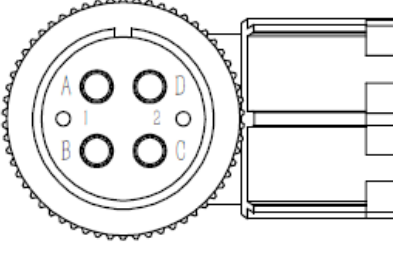
Motor winding power cable

- Wire length available: 0.5m, 1.5m, 3m, 5m, 7m and 10m.
- Connectors type available: SP21 connector
- Please contact Leadshine sales team or any Leadshine certified local retailers for any customized needs.

**M*: Length of the cable*

| Motor Power Cable CABLE-RZD*M*-263 12AWG | | |
|--|-------------|---------------|
|  | | |
| Motor side | Driver side | |
| Driver cable pin | Pins | |
|  | Motor | Color |
| | 1 | Blue |
| | 2 | White |
| | 3 | Black |
| | 4 | Yellow- green |
| | Driver | |
| | | U |
| | | V |
| | | W |
| | | PE |
| Motor Power Cable CABLE-RZD*M*-253 14AWG | | |
|  | | |
| Motor side | Driver side | |
| Driver cable pin | Pins | |
|  | Motor | Color |
| | 1 | Red |
| | 2 | White |
| | 3 | Black |
| | 4 | Yellow- green |
| | Driver | |
| | | U |
| | | V |
| | | W |
| | | PE |

| Motor Power Cable CABLE-RZD*M*-143 16AWG | | |
|---|-------------|---------------|
|  | | |
| Motor side | Driver side | |
| Driver cable pin | Pins | |
|  | Motor | Color |
| | 1 | Red |
| | 2 | White |
| | 3 | Black |
| | 4 | Yellow- green |
| | Driver | |
| | | U |
| | | V |
| | | W |
| | | PE |
| Motor Power Cable CABLE-RZD*M*-123 18AWG | | |
|  | | |
| Motor side | Driver side | |
| Driver cable pin | Pins | |
|  | Motor | Color |
| | 1 | Red |
| | 2 | White |
| | 3 | Black |
| | 4 | Yellow- green |
| | Driver | |
| | | U |
| | | V |
| | | W |
| | | PE |

| Motor Power Cable CABLE-RZD*M*-282 – 130 Frame Motor without brake | | |
|---|-------------|---------------|
|  | | |
| Motor side | Driver side | |
| Motor cable pin | Pins | |
|  | Motor | Color |
| | A | Red |
| | B | White |
| | C | Black |
| | D | Yellow- green |
| | | Driver |
| | | U |
| | | V |
| | | W |
| | | PE |
| Motor Power Cable CABLE-RSZD*M*-282 – 130 Frame Motor with brake | | |
|  | | |
| Motor side | Driver side | |
| Motor cable pin | Pins | |
|  | Motor | Color |
| | A | Red |
| | B | White |
| | C | Black |
| | D | Yellow- green |
| | 1 | Blue |
| | 2 | Brown |
| | | Driver |
| | | U |
| | | V |
| | | W |
| | | PE |
| | | +24V |
| | | 0V |

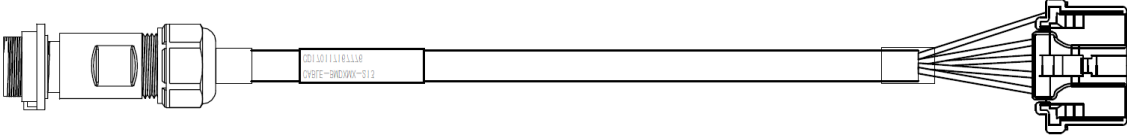
Recommended wire diameter for each drive

| Drive | Wiring diameter (mm ² /AWG) | | |
|--------------|--|-------|-------|
| | DC+, DC- | UVW | PE |
| ELD2-RS7005B | AWG18 | AWG18 | AWG18 |
| ELD2-RS7010B | AWG16 | AWG16 | AWG16 |
| ELD2-RS7015B | AWG14 | AWG16 | AWG16 |
| ELD2-RS7020B | AWG12 | AWG12 | AWG12 |
| ELD2-RS7030B | AWG10 | AWG10 | AWG10 |
| ELD2-RS7040B | AWG8 | AWG8 | AWG8 |
| ELD2-RS7060B | AWG6 | AWG6 | AWG6 |

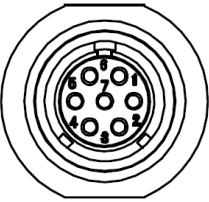
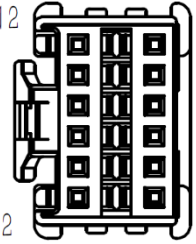
- **Grounding:** Grounding wire should be thicker. Ground PE terminal of servo drive and servo motor together with resistance $<100\ \Omega$.
- Connect a line filter to power supply to reduce electromagnetic interference.
- Please install a fuseless circuit breaker to cut off power supply in time when the driver fails.

2.5.2 Motor Encoder Cable

CABLE-BMD*M*-213 for single turn encoder

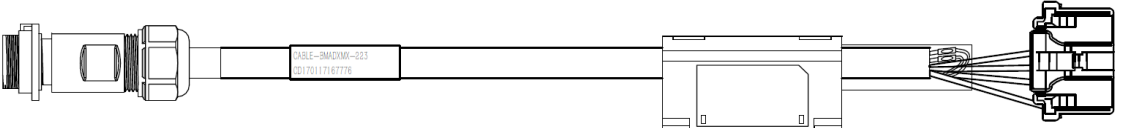


Motor side Driver side

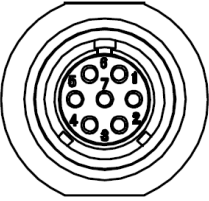
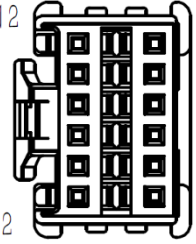
| Motor cable pin | | Pin | | | |
|---|--|-----|----|---|---|
|  Motor side |  Driver side | 12 | 11 | 1 | 1 |
| | | 2 | 1 | 2 | 5 |
| | | 3 | 6 | 3 | 6 |
| | | 4 | 7 | 4 | 7 |
| | | 5 | 8 | 5 | 8 |
| | | 6 | 9 | 6 | 9 |

| Color | Signal | Motor | Drive |
|------------|--------|-------|-------|
| Braid | Shield | 1 | 1 |
| Red | +5V | 2 | 5 |
| Red-white | GND | 3 | 6 |
| Blue | SD+ | 4 | 7 |
| Blue-Black | SD- | 5 | 8 |

CABLE-BMAD*M*-223 with battery kit for multturn absolute encoder

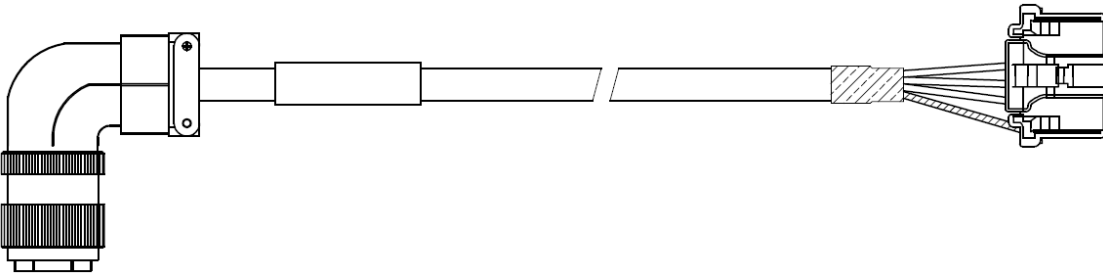
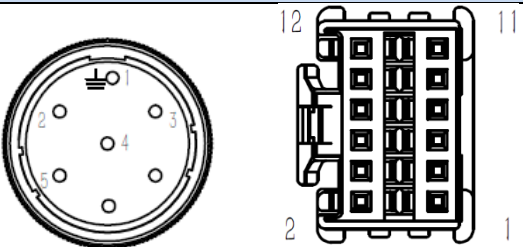


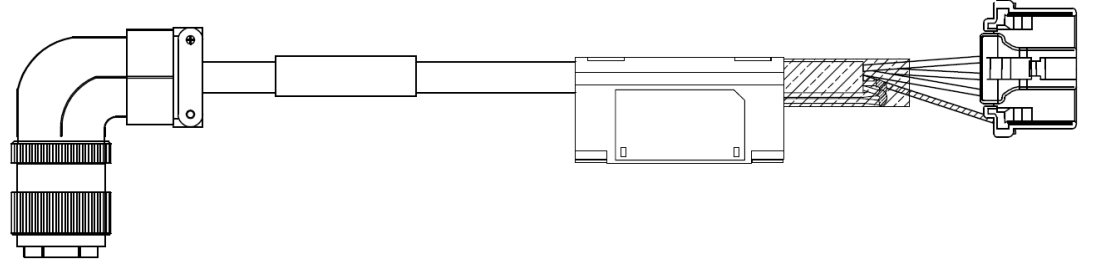
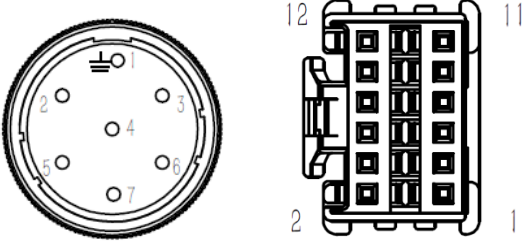
Motor side Driver side

| Motor cable pin | | Pin | | | |
|---|--|-----|----|---|----|
|  Motor side |  Driver side | 12 | 11 | 1 | 1 |
| | | 2 | 1 | 2 | 5 |
| | | 3 | 6 | 3 | 6 |
| | | 4 | 7 | 4 | 7 |
| | | 5 | 8 | 5 | 8 |
| | | 6 | 9 | 6 | 9 |
| | | 7 | 10 | 7 | 10 |
| | | 8 | 11 | 8 | 11 |

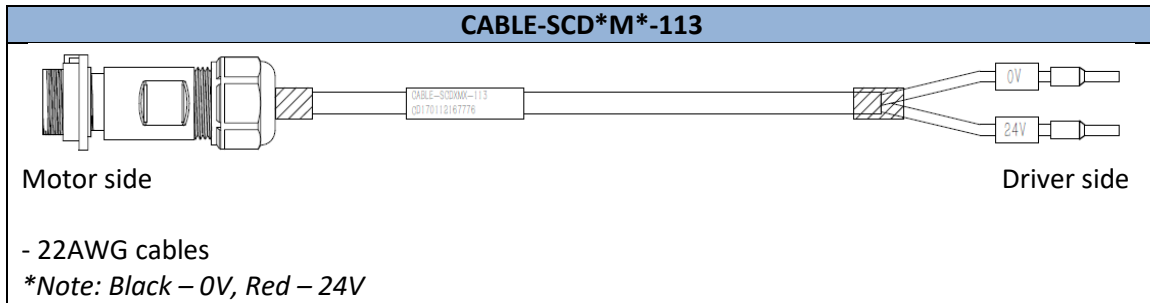
| Color | Signal | Motor | Drive |
|-------------|--------|-------|-------|
| Braid | Shield | 1 | 1 |
| Black | +5V | 2 | 5 |
| Black-White | GND | 3 | 6 |
| Blue | SD+ | 4 | 7 |
| Blue-Black | SD- | 5 | 8 |
| Red | BAT+ | 6 | - |
| Red-White | BAT- | 7 | - |

For ELVM series motors with 130 flange size

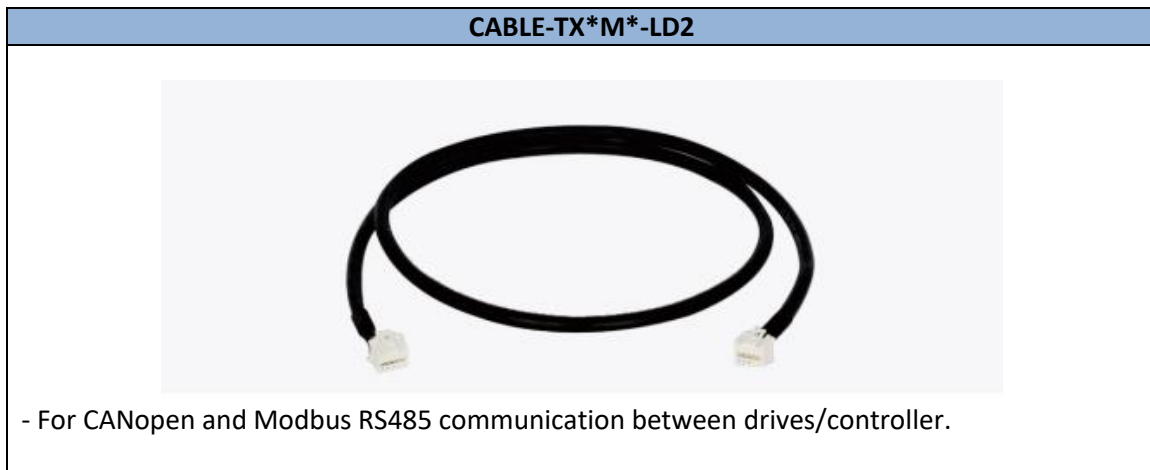
| CABLE-BMD*M*-212 for single turn encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------|---|-------|--------|-------|-------|-------|--------|---|---|-----|-----|---|---|-----------|-----|---|---|------|-----|---|---|------------|-----|---|---|--|--|
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor side | | Driver side | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor cable pin | | Pin | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | <table><tr><th>Color</th><th>Signal</th><th>Motor</th><th>Drive</th></tr><tr><td>Braid</td><td>Shield</td><td>1</td><td>1</td></tr><tr><td>Red</td><td>+5V</td><td>2</td><td>5</td></tr><tr><td>Red-white</td><td>GND</td><td>3</td><td>6</td></tr><tr><td>Blue</td><td>SD+</td><td>4</td><td>7</td></tr><tr><td>Blue-Black</td><td>SD-</td><td>5</td><td>8</td></tr></table> | Color | Signal | Motor | Drive | Braid | Shield | 1 | 1 | Red | +5V | 2 | 5 | Red-white | GND | 3 | 6 | Blue | SD+ | 4 | 7 | Blue-Black | SD- | 5 | 8 | | |
| Color | Signal | Motor | Drive | | | | | | | | | | | | | | | | | | | | | | | | | |
| Braid | Shield | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red | +5V | 2 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red-white | GND | 3 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue | SD+ | 4 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue-Black | SD- | 5 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | |

| CABLE-BMAD*M*-222 with battery kit for multiturn absolute encoder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------|---|-------|--------|-------|-------|-------|--------|---|---|-------|-----|---|---|-------------|-----|---|---|------|-----|---|---|------------|-----|---|---|-----|------|---|---|-----------|------|---|---|--|--|
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor side | | Driver side | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motor cable pin | | Pin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | <table><tr><th>Color</th><th>Signal</th><th>Motor</th><th>Drive</th></tr><tr><td>Braid</td><td>Shield</td><td>1</td><td>1</td></tr><tr><td>Black</td><td>+5V</td><td>2</td><td>5</td></tr><tr><td>Black-White</td><td>GND</td><td>3</td><td>6</td></tr><tr><td>Blue</td><td>SD+</td><td>4</td><td>7</td></tr><tr><td>Blue-Black</td><td>SD-</td><td>5</td><td>8</td></tr><tr><td>Red</td><td>BAT+</td><td>6</td><td>-</td></tr><tr><td>Red-White</td><td>BAT-</td><td>7</td><td>-</td></tr></table> | Color | Signal | Motor | Drive | Braid | Shield | 1 | 1 | Black | +5V | 2 | 5 | Black-White | GND | 3 | 6 | Blue | SD+ | 4 | 7 | Blue-Black | SD- | 5 | 8 | Red | BAT+ | 6 | - | Red-White | BAT- | 7 | - | | |
| Color | Signal | Motor | Drive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Braid | Shield | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black | +5V | 2 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Black-White | GND | 3 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue | SD+ | 4 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blue-Black | SD- | 5 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red | BAT+ | 6 | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Red-White | BAT- | 7 | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

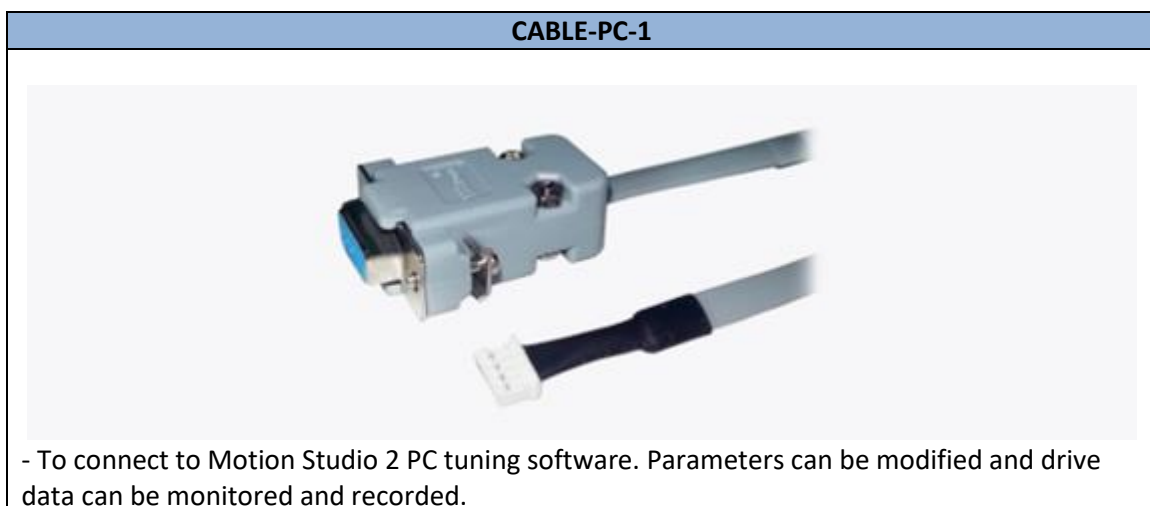
2.5.3 Motor Brake Cable



2.5.4 Drive Communication Cable



2.5.4 Tuning Cable



2.6 Regenerative Resistor Selection

The use of regenerative resistor

When the motor opposes the direction of rotation as in deceleration or vertical axis escalation, part of the regenerative energy will be delivered back to the driver. This energy will first be stored in internal capacitors of the driver. When the energy stored in the capacitors reach the maximum capacity, a regenerative resistor is required the excessive energy to prevent over-voltage.

Calculation of regenerative resistance under normal operation

Steps:

1. Determine if driver comes with a regenerative resistor. If not, please prepare a regenerative resistor with resistance value higher than might be required.
2. Monitor the load rate of the regenerative resistor using front panel (d14). Set the driver on high velocity back and forth motions with high acceleration/deceleration.
3. Please make sure to obtain the value under following conditions: Driver temperature < 60°C, d14<80(Won't trigger alarm), Regenerative resistor is not fuming, No overvoltage alarm(Err120).

$$P_b(\text{Regenerative power rating}) = \text{Resistor power rating} \times \text{Regenerative load rate (\%)}$$

Please choose a regenerative resistor with power rating P_r about **2-4 times the value of P_b** in considered of harsh working conditions and some 'headroom'.

If the calculated P_r value is less than internal resistor power rating, external resistor is not required.

$$R(\text{Max. required regenerative resistance}) = (380^2 - 370^2)/P_r$$

Problem diagnostics related to regenerative resistor:

- If driver temperature is high, reduce regenerative energy power rating or use an external regenerative resistor.
- If regenerative resistor is fuming, reduce regenerative energy power rating or use an external regenerative resistor with higher power rating.
- If d14 is overly large or increasing too fast, reduce regenerative energy power rating or use an external regenerative resistor with higher power rating.
- If driver overvoltage alarm (Err120) occurs, please use an external regenerative resistor with lower resistance or connect another resistor in parallel.

Please take following precautions before installing an external regenerative resistor.

1. Please set the correct resistance value in Pr0.16 and resistor power rating Pr0.17 for the external regenerative resistor.
2. Please ensure the resistance value is higher or equals to the recommended values in table 2-3. Regenerative resistors are generally connected in series but they can also be connected in parallel to lower the total resistance.
3. Please provided enough cooling for the regenerative resistor as it can reach above 100°C under continuous working conditions.
4. The min. resistance of the regenerative resistor is dependent on the IGBT of the regenerative resistor circuit. Please refer to the table above.

Theoretical selection of regenerative resistor

Without external loading torque, the need for an external regenerative resistor can be determined as the flow chart below

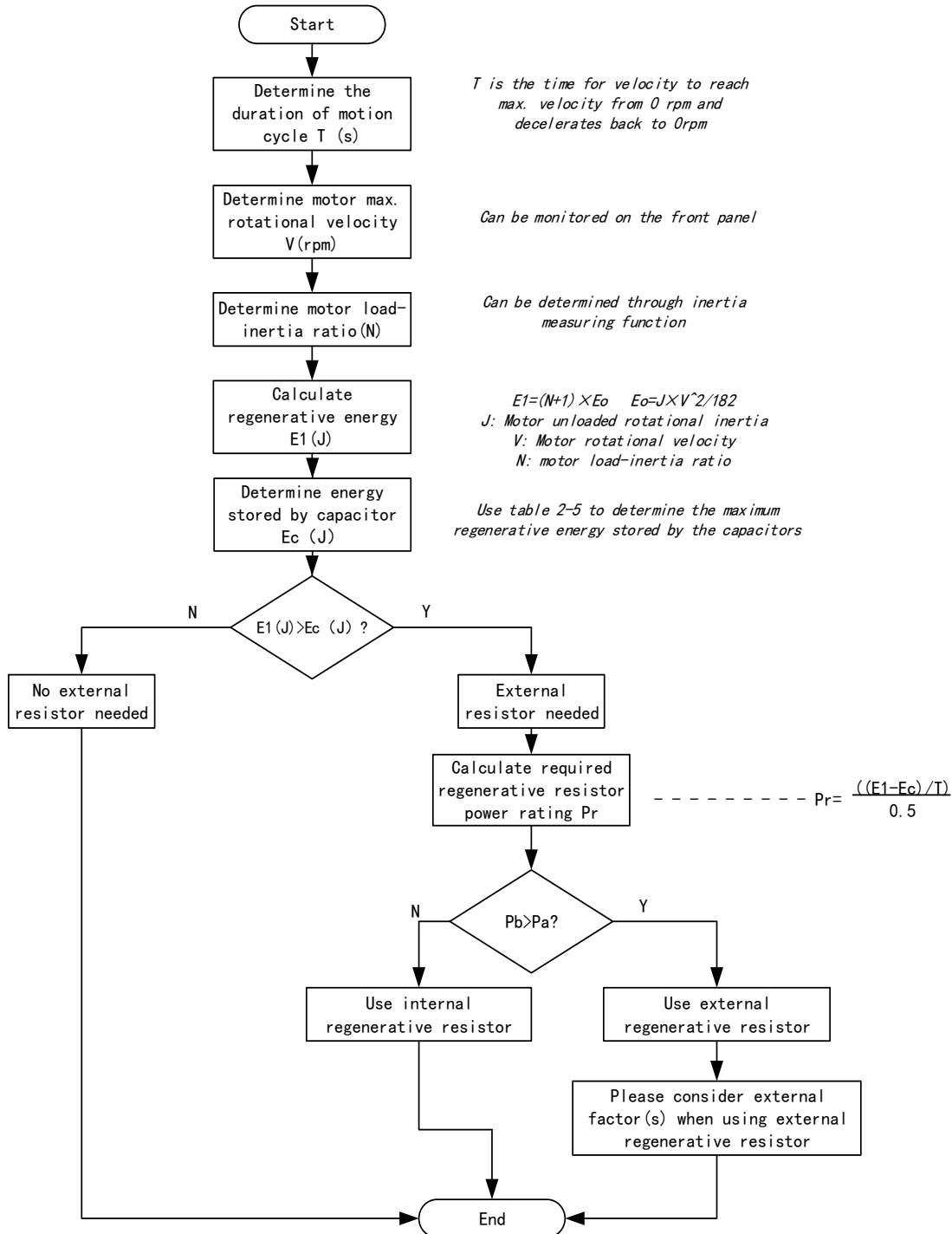
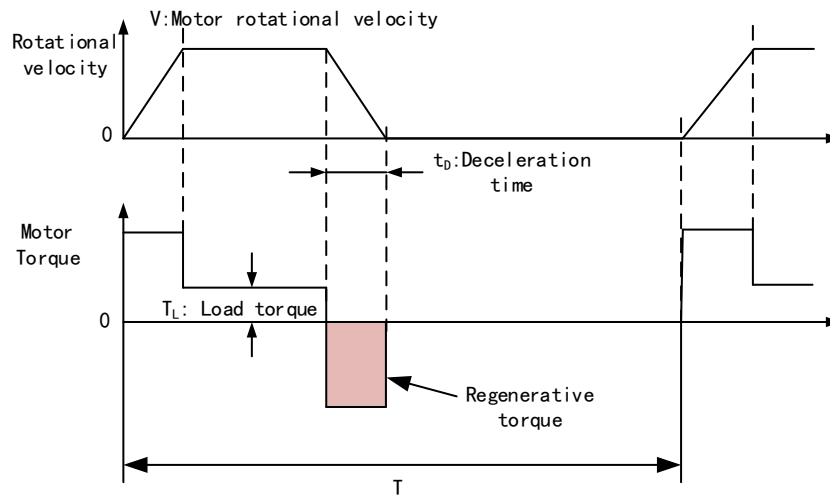


Diagram below shows the acceleration and deceleration cycle periods and the regenerative torque that occurs during the process.



Steps to calculate capacity of regenerative resistor

| Steps | Calculation | Symbol | Formula |
|-------|--|----------------|---|
| 1 | Servo system regenerative energy | E1 | $E1 = (N+1) \times J \times V^2 / 182$ |
| 2 | Depleted energy from loss of load system during acceleration | E _L | $E_L = (\pi/60) V \times T_L \times t_D$ <i>If loss is not determined, please assume $E_L = 0$.</i> |
| 3 | Depleted energy due to motor coil resistance. | E _M | $E_M = (U^2/R) \times t_D$ R= coil resistance, U = operating voltage <i>If R is not determined, please assume $E_M = 0$.</i> |
| 4 | Energy stored by internal DC capacitors | E _C | Please refer to table 2-5 |
| 5 | Depleted energy due to regenerative resistance | E _K | $E_K = E1 - (E_L + E_M + E_C)$, <i>If loss is ignored, $E_K = E1 - E_C$</i> |
| 6 | Required power rating of regenerative resistor | Pr | $Pr = E_K / (0.5 \times T)$ |

Note:

- 0.5 in the calculation for **Pr** represent 50% load rate of regenerative resistor.
- **E1-EK**: Energy(Joule) **T_L**: Load torque(Nm) **V**: Motor velocity(rpm/min)
Pr: Regenerative resistor power rating **t_D**: Deceleration stop time(s)
J: Rotor inertia (kgm²) **T**: Motor cycle time(s) **N**: Ratio of load inertia and rotor inertia

Internal capacitor capacity and rotor inertia

| ELD2 Drives | Servo motor | Rotor Inertia ($\times 10^{-4}\text{kg.m}^2$) | Max. regenerative energy stored in capacitor Ec(J) |
|---------------|--------------------|--|---|
| 750W (7020B) | ELVM8075V48FH-M17 | 1.5 | 2.26 |
| 1000W (7030B) | ELVM80100V48FH-M17 | 1.79 | 2.26 |

There are motors with low, medium and high inertia. Different motor models have different rotor inertia. Please refer to product catalogue for more information on rotor inertia. Please cut down 30%-40% of load rate if the product is used in harsh environment with less than ideal heat dissipation measures.

Recommended regenerative resistor specification for each drives

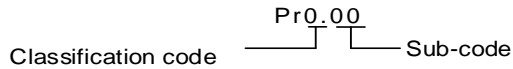
| Drives | Resistance (Ω) | Power rating(W) | Min. Resistance(Ω) |
|--------------|-------------------------|-----------------|-----------------------------|
| ELD2-RS7005B | 10 | 30 | 5 |
| ELD2-RS7010B | 10 | 50 | 5 |
| ELD2-RS7015B | 10 | 50 | 5 |
| ELD2-RS7020B | 10 | 100 | 5 |
| ELD2-RS7030B | 10 | 100/150 | 5 |
| ELD2-RS7040B | 10 | 150/200 | 5 |
| ELD2-RS7060B | 10 | 150/200 | 5 |

Note:

- 1. Use 10 Ω /100W resistor for test operation and make sure: Drive temperature $d33 < 60^\circ\text{C}$, dynamic brake is not in alarm mode (Braking rate $d14 < 80$), brake resistor is not overheated, drive has no overcurrent alarm.*
- 2. If drive temperature is too high, increase power rating of regenerative resistor or reduce drive power.*
- 3. If brake resistor is overheated, reduce drive power or use regenerative resistor with higher resistance.*
- 4. If d14 is too high, reduce drive power or use regenerative resistor with higher resistance and power ratings.*
- 5. External torque might cause regenerative energy to flow back into drive. During normal operation, torque output in the same direction as rotational direction but if external torque exists, directions might oppose and in this case, regenerative resistor with higher resistance may be required.*

Chapter 3 Parameter

3.1 Parameters list



Valid mode:

P: Valid in position control mode

S: Valid in velocity control mode

T: Valid in torque control mode

PR: Valid in PR control mode

Activation:

“O” – Restart driver for parameter changes to be valid

“—” – Valid immediately

“Δ” – Valid when axis stops

“●” – Valid after re-enabling

[Class 0] Basic settings

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|---|---------|----------------|------------|---|---|--------------------|-----|------------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr0.00 | Model-following bandwidth | 1 | Δ | O | — | — | 16bit | R/W | 0x0001 |
| Pr0.01 | Control Mode Settings | 0 | O | O | O | O | 16bit | R/W | 0x0003 |
| Pr0.02 | Real time Auto Gain Adjusting | 0x1 | — | O | O | O | 16bit | R/W | 0x0005 |
| Pr0.03 | Real time auto stiffness adjusting | 70 | — | O | O | O | 16bit | R/W | 0x0007 |
| Pr0.04 | Inertia ratio | 250 | — | O | O | O | 16bit | R/W | 0x0009 |
| Pr0.05 | Command pulse input selection | 0 | O | O | — | — | 16bit | R/W | 0x000B |
| Pr0.06 | Command pulse polarity inversion | 0 | O | O | — | — | 16bit | R/W | 0x000D |
| Pr0.07 | Command pulse input mode | 3 | O | O | — | — | 16bit | R/W | 0x000F |
| Pr0.08 | 1 st command pulse count per revolution | 10000 | O | O | — | — | 32bit | R/W | 0x0010 0x0011 |
| Pr0.09 | 1 st command frequency divider/multiplier numerator | 1 | O | O | — | — | 32bit | R/W | 0x0012 0x0013 |
| Pr0.10 | 1 st command frequency divider/multiplier denominator | 1 | O | O | — | — | 32bit | R/W | 0x0014 0x0015 |
| Pr0.13 | 1 st Torque Limit | 350 | — | O | O | O | 16bit | R/W | 0x001B |
| Pr0.14 | Excessive position deviation | 30 | — | O | — | — | 16bit | R/W | 0x001D |
| Pr0.15 | Absolute Encoder settings | 0 | O | O | O | O | 16bit | R/W | 0x001F |
| Pr0.16 | Regenerative resistance | 100 | — | O | O | O | 16bit | R/W | 0x0021 |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--------------------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr0.17 | Regenerative resistor power rating | 50 | — | O | O | O | 16bit | R/W | 0x0023 |
| Pr0.18 | Vibration suppression after stopping | 0 | — | O | O | O | 16bit | R/W | |
| Pr0.19 | Micro-vibration suppression | 0 | — | O | O | O | 16bit | R/W | |
| Pr0.20 | External pulse valid edge settings | 0 | — | O | O | O | 16bit | R/W | |

[Class 1] Gain adjustment

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|---|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr1.00 | 1 st position loop gain | 320 | — | O | — | — | 16bit | R/W | 0x0101 |
| Pr1.01 | 1 st velocity loop gain | 180 | — | O | O | O | 16bit | R/W | 0x0103 |
| Pr1.02 | 1 st Integral Time Constant of Velocity Loop | 310 | — | O | O | O | 16bit | R/W | 0x0105 |
| Pr1.03 | 1 st velocity detection filter | 15 | — | O | O | O | 16bit | R/W | 0x0107 |
| Pr1.04 | 1 st Torque Filter Time Constant | 126 | — | O | O | O | 16bit | R/W | 0x0109 |
| Pr1.05 | 2 nd Position Loop Gain | 380 | — | O | — | — | 16bit | R/W | 0x010B |
| Pr1.06 | 2 nd velocity loop gain | 180 | — | O | O | O | 16bit | R/W | 0x010D |
| Pr1.07 | 2 nd Integral Time Constant of Velocity Loop | 10000 | — | O | O | O | 16bit | R/W | 0x010F |
| Pr1.08 | 2 nd velocity detection filter | 15 | — | O | O | O | 16bit | R/W | 0x0111 |
| Pr1.09 | 2 nd Torque Filter Time Constant | 126 | — | O | O | O | 16bit | R/W | 0x0113 |
| Pr1.10 | Velocity feed forward gain | 300 | — | O | — | — | 16bit | R/W | 0x0115 |
| Pr1.11 | Velocity feed forward filter time constant | 50 | — | O | — | — | 16bit | R/W | 0x0117 |
| Pr1.12 | Torque feed forward gain | 0 | — | O | O | — | 16bit | R/W | 0x0119 |
| Pr1.13 | Torque feed forward filter time constant | 0 | — | O | O | — | 16bit | R/W | 0x011B |
| Pr1.14 | 2 nd gain switching | 1 | — | O | O | — | 16bit | R/W | |
| Pr1.15 | Position control gain switching mode | 0 | — | O | — | — | 16bit | R/W | 0x011F |
| Pr1.16 | Position control gain switching delay time | 50 | — | O | O | — | 16bit | R/W | |
| Pr1.17 | Position control gain switching level | 50 | — | O | — | — | 16bit | R/W | 0x0123 |
| Pr1.18 | Hysteresis at position control switching | 33 | — | O | — | — | 16bit | R/W | 0x0125 |
| Pr1.19 | Position control switching time | 33 | — | O | — | — | 16bit | R/W | 0x0127 |
| Pr1.35 | Position command pulse filter time | 8 | O | O | — | — | 16bit | R/W | 0x0147 |
| Pr1.37 | Special function register | 0 | — | O | O | O | 16bit | R/W | |

[Class 2] Vibration Suppression

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|----------------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr2.00 | Adaptive filtering mode settings | 0 | — | O | O | — | 16bit | R/W | 0x0201 |
| Pr2.01 | 1 st notch frequency | 4000 | — | O | O | O | 16bit | R/W | 0x0203 |
| Pr2.02 | 1 st notch width | 4 | — | O | O | O | 16bit | R/W | 0x0205 |
| Pr2.03 | 1 st notch depth | 0 | — | O | O | O | 16bit | R/W | 0x0207 |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|-----------------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr2.04 | 2 nd notch frequency | 4000 | — | 0 | 0 | 0 | 16bit | R/W | 0x0209 |
| Pr2.05 | 2 nd notch width | 4 | — | 0 | 0 | 0 | 16bit | R/W | 0x020B |
| Pr2.06 | 2 nd notch depth | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x020D |
| Pr2.07 | 3 rd notch frequency | 4000 | — | 0 | 0 | 0 | 16bit | R/W | 0x020F |
| Pr2.08 | 3 rd notch width | 4 | — | 0 | 0 | 0 | 16bit | R/W | 0x0211 |
| Pr2.09 | 3 rd notch depth | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0213 |
| Pr2.14 | 1 st damping frequency | 0 | — | 0 | — | — | 16bit | R/W | 0x021D |
| Pr2.16 | 2 nd damping frequency | 0 | — | 0 | — | — | 16bit | R/W | 0x0221 |
| Pr2.22 | Position command smoothing filter | 0 | Δ | 0 | — | — | 16bit | R/W | 0x022D |
| Pr2.23 | Position command FIR filter | 0 | Δ | 0 | — | — | 16bit | R/W | 0x022F |

[Class 3] Velocity / Torque Control

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr3.00 | Velocity internal/external switching | 1 | — | — | 0 | — | 16bit | R/W | 0x0301 |
| Pr3.01 | Velocity command rotational direction selection | 0 | — | — | 0 | — | 16bit | R/W | 0x0303 |
| Pr3.02 | Velocity command input gain | 500 | — | — | 0 | 0 | 16bit | R/W | 0x0305 |
| Pr3.03 | Velocity command input inversion | 0 | — | — | 0 | — | 16bit | R/W | 0x0307 |
| Pr3.04 | 1st speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x0309 |
| Pr3.05 | 2nd speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x030B |
| Pr3.06 | 3rd speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x030D |
| Pr3.07 | 4th speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x030F |
| Pr3.08 | 5th speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x0311 |
| Pr3.09 | 6th speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x0313 |
| Pr3.10 | 7th speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x0315 |
| Pr3.11 | 8th speed of velocity setting | 0 | — | — | 0 | — | 16bit | R/W | 0x0317 |
| Pr3.12 | Acceleration time settings | 100 | — | — | 0 | — | 16bit | R/W | 0x0319 |
| Pr3.13 | Deceleration time settings | 100 | — | — | 0 | — | 16bit | R/W | 0x031B |
| Pr3.14 | Sigmoid acceleration/deceleration settings | 0 | 0 | — | 0 | — | 16bit | R/W | 0x031D |
| Pr3.15 | Zero speed clamp function selection | 0 | — | — | 0 | — | 16bit | R/W | 0x031F |
| Pr3.16 | Zero speed clamp level | 30 | — | — | 0 | — | 16bit | R/W | 0x0321 |
| Pr3.17 | Torque internal/external switching | 0 | — | — | — | 0 | 16bit | R/W | 0x0323 |
| Pr3.18 | Torque command direction selection | 0 | — | — | — | 0 | 16bit | R/W | 0x0325 |
| Pr3.19 | Torque command input gain | 30 | — | — | — | 0 | 16bit | R/W | 0x0327 |
| Pr3.20 | Torque command input inversion | 0 | — | — | — | 0 | 16bit | R/W | 0x0329 |
| Pr3.21 | Velocity limit in torque mode | 0 | — | — | — | 0 | 16bit | R/W | 0x032B |
| Pr3.22 | Torque command | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x032D |
| Pr3.23 | Zero speed delay time in velocity mode | 0 | — | — | 0 | — | 16bit | R/W | 0x032F |
| Pr3.24 | Maximum motor rotational speed | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0331 |
| Pr3.25 | Velocity offset – Logistics | 0 | — | — | — | 0 | 16bit | R/W | |
| Pr3.26 | Pulse deviation tolerance at disabling - Logistics | 0 | — | — | — | 0 | 16bit | R/W | |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|-----------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr3.28 | Position gain - Logistics | 0 | — | — | — | 0 | 16bit | R/W | |
| Pr3.29 | Delay time gain - Logistics | 0 | — | — | — | 0 | 16bit | R/W | |

[Class 4] I/O Monitoring Settings

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|---|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr4.00 | Input selection DI1 | 0x1 | — | 0 | 0 | 0 | 16bit | R/W | 0x0401 |
| Pr4.01 | Input selection DI2 | 0x2 | — | 0 | 0 | 0 | 16bit | R/W | 0x0403 |
| Pr4.02 | Input selection DI3 | 0x8 | — | 0 | 0 | 0 | 16bit | R/W | 0x0405 |
| Pr4.03 | Input selection DI4 | 0x4 | — | 0 | 0 | 0 | 16bit | R/W | 0x0407 |
| Pr4.04 | Input selection DI5 | 0x3 | — | 0 | 0 | 0 | 16bit | R/W | 0x0409 |
| Pr4.05 | Input selection DI6 | 0x0 | — | 0 | 0 | 0 | 16bit | R/W | 0x040B |
| Pr4.10 | Output selection DO1 | 0x2 | — | 0 | 0 | 0 | 16bit | R/W | 0x0415 |
| Pr4.11 | Output selection DO2 | 0x4 | — | 0 | 0 | 0 | 16bit | R/W | 0x0417 |
| Pr4.12 | Output selection DO3 | 0x3 | — | 0 | 0 | 0 | 16bit | R/W | 0x0419 |
| Pr4.22 | Analog input 1(AI-1) Zero drift settings | 0 | — | — | 0 | 0 | 16bit | R/W | 0x042D |
| Pr4.23 | Analog input 1(AI-1) filter | 0 | — | — | 0 | 0 | 16bit | R/W | 0x042F |
| Pr4.24 | Analog input 1(AI-1) overvoltage settings | 0 | — | — | 0 | 0 | 16bit | R/W | 0x0431 |
| Pr4.31 | Positioning complete range | 50 | — | 0 | 0 | 0 | 16bit | R/W | 0x0445 |
| Pr4.32 | Positioning complete output setting | 50 | — | — | 0 | — | 16bit | R/W | 0x0447 |
| Pr4.33 | INP positioning delay time | 1000 | — | — | 0 | — | 16bit | R/W | 0x0449 |
| Pr4.34 | Zero speed | 150 | — | 0 | 0 | 0 | 16bit | R/W | 0x044B |
| Pr4.35 | Velocity coincidence range | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x044D |
| Pr4.36 | Reached velocity | 30 | — | 0 | 0 | 0 | 16bit | R/W | 0x044F |
| Pr4.37 | Holding brake deactivation delay time | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr4.38 | Holding brake activation delay time | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr4.43 | Emergency stop function | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0457 |

[Class 5] Extension settings

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|---|---------|----------------|------------|---|---|--------------------|-----|------------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr5.00 | 2nd pulse count per revolution | 10000 | 0 | 0 | — | — | 32bit | R/W | 0x0500 0x0501 |
| Pr5.01 | 2nd Command frequency divider/multiplier numerator | 1 | 0 | 0 | — | — | 32bit | R/W | 0x0502 0x0503 |
| Pr5.02 | 2nd Command frequency divider/multiplier denominator | 1 | 0 | 0 | — | — | 32bit | R/W | 0x0504 0x0505 |
| Pr5.04 | Driver prohibition input settings | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0509 |
| Pr5.06 | Servo-off mode | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x050D |
| Pr5.08 | DC bus voltage undervoltage | 50 | — | 0 | 0 | 0 | 16bit | R/W | 0x0513 |
| Pr5.11 | Servo braking torque setting | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0519 |
| Pr5.12 | Overload level setting | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x051B |
| Pr5.13 | Overspeed level setting | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr5.15 | I/O digital filter | 0 | 0 | 0 | 0 | 0 | 16bit | R/W | 0x051F |
| Pr5.16 | Alarm clearing input | 0 | — | 0 | — | — | 16bit | R/W | |
| Pr5.17 | Counter clearing input mode | 3 | — | 0 | — | — | 16bit | R/W | 0x0523 |
| Pr5.20 | Position unit settings | 1 | — | 0 | — | — | 16bit | R/W | 0x0529 |
| Pr5.21 | Torque limit selection | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x052B |
| Pr5.22 | 2nd torque limit | 300 | — | 0 | 0 | 0 | 16bit | R/W | 0x052D |
| Pr5.23 | Positive torque warning threshold | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x052F |
| Pr5.24 | Negative torque warning threshold | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0531 |
| Pr5.29 | RS485 communication mode | 0x5 | — | 0 | 0 | 0 | 16bit | R/W | 0x053B |
| Pr5.30 | RS485 communication Baud rate | 4 | — | 0 | 0 | 0 | 16bit | R/W | 0x053D |
| Pr5.31 | RS485 axis address | 1 | — | 0 | 0 | 0 | 16bit | R/W | 0x053F |
| Pr5.32 | Max. command pulse input frequency | 0 | — | 0 | — | — | 16bit | R/W | 0x0541 |
| Pr5.33 | Communication cycle 1 for RS485 | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr5.38 | Warning auto clearing delay time | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr5.39 | Enable duration time - Logistics | 0 | — | 0 | 0 | 0 | 16bit | R/W | |

[Class 6] Other Settings

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr6.01 | Encoder zero position compensation | 0 | 0 | 0 | 0 | 0 | 16bit | R/W | 0x0603 |
| Pr6.03 | JOG trial run torque command | 350 | — | — | — | 0 | 16bit | R/W | 0x0607 |
| Pr6.04 | JOG trial run velocity command | 30 | — | 0 | 0 | 0 | 16bit | R/W | 0x0609 |
| Pr6.05 | Position 3rd gain valid time | 0 | — | 0 | — | — | 16bit | R/W | 0x060B |
| Pr6.06 | Position 3rd gain scale factor | 100 | — | 0 | — | — | 16bit | R/W | 0x060D |
| Pr6.07 | Torque command additional value | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x060F |
| Pr6.08 | Positive direction torque compensation value | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0611 |
| Pr6.09 | Negative direction torque compensation value | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0613 |
| Pr6.11 | Current response settings | 100 | — | 0 | 0 | 0 | 16bit | R/W | 0x0617 |
| Pr6.12 | Encoder zero position torque correction | 50 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr6.14 | Max. time to stop after disabling | 500 | — | 0 | 0 | 0 | 16bit | R/W | 0x061D |
| Pr6.20 | Trial run distance | 10 | — | 0 | — | — | 16bit | R/W | 0x0629 |
| Pr6.21 | Trial run waiting time | 300 | — | 0 | — | — | 16bit | R/W | 0x062B |
| Pr6.22 | No. of trial run cycles | 5 | — | 0 | — | — | 16bit | R/W | 0x062D |
| Pr6.25 | Trial run acceleration | 200 | — | 0 | 0 | — | 16bit | R/W | 0x0633 |
| Pr6.28 | Shaft lock current raising time | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x0639 |
| Pr6.29 | Shaft lock duration time | 0 | — | 0 | 0 | 0 | 16bit | R/W | 0x063B |
| Pr6.30 | Special function registry 1 | 0x0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr6.34 | Angle for zero electric angle searching | 0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr6.38 | Special function registry 2 | 0x0 | — | 0 | 0 | 0 | 16bit | R/W | |
| Pr6.56 | Blocked rotor alarm torque threshold | 300 | — | 0 | 0 | 0 | 16bit | R/W | 0x0671 |
| Pr6.57 | Blocked rotor alarm delay time | 400 | — | 0 | 0 | 0 | 16bit | R/W | 0x0673 |
| Pr6.63 | Absolute multiturn data upper limit | 0 | 0 | 0 | 0 | 0 | 16bit | R/W | 0x067F |

[Class 7] Factory settings

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| Pr7.15 | Motor model no. | 0x8010 | | | | | | | |
| Pr7.16 | Encoder model no. | 0x201 | | | | | | | |
| Pr7.23 | Encoder wiring extensions | 150 | | | | | | | |
| Pr7.28 | Regenerative energy alarm window time | 0 | | | | | | | |
| Pr7.30 | Under voltage point | 20 | | | | | | | |
| Pr7.31 | Regenerative energy control mode | 2 | | | | | | | |
| Pr7.32 | Regenerative energy vent on threshold | 80 | | | | | | | |
| Pr7.33 | Regenerative energy control hysteresis | 5 | | | | | | | |
| Pr7.34 | Over voltage point | 90 | | | | | | | |
| Pr7.48 | Enabling delay time | 500 | | | | | | | |
| Pr7.50 | Motor IIT time settings | 0 | | | | | | | |

[Class 8] Pr-Control Parameters

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--------------------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P R | S | T | Byte | Op. | 485 Addr. |
| Pr8.00 | PR Control | 0 | — | 0 | — | — | 16bit | R/W | 0x6000 |
| Pr8.01 | Path count | 16 | — | 0 | — | — | 16bit | R/W | 0x6001 |
| Pr8.02 | Control Operation | | — | 0 | — | — | 16bit | R/W | 0x6002 |
| Pr8.06 | Software positive limit H | 0 | | 0 | | | 16bit | R/W | 0x6006 |
| Pr8.07 | Software positive limit (L) | 0 | — | 0 | — | — | 16bit | R/W | 0x6007 |
| Pr8.08 | Software negative limit H | 0 | — | 0 | — | — | 16bit | R/W | 0x6008 |
| Pr8.09 | Software negative limit (L) | 0 | — | 0 | — | — | 16bit | R/W | 0x6009 |
| Pr8.10 | Homing mode | 0 | — | 0 | — | — | 16bit | R/W | 0x600A |
| Pr8.11 | Zero position H | 0 | — | 0 | — | — | 16bit | R/W | 0x600B |
| Pr8.12 | Zero position (L) | 0 | — | 0 | — | — | 16bit | R/W | 0x600C |
| Pr8.13 | Home position off set H | 0 | — | 0 | — | — | 16bit | R/W | 0x600D |
| Pr8.14 | Home position off set (L) | 0 | | 0 | — | — | 16bit | R/W | 0x600E |
| Pr8.15 | High homing velocity | 200 | — | 0 | — | — | 16bit | R/W | 0x600F |
| Pr8.16 | Low homing velocity | 50 | — | 0 | — | — | 16bit | R/W | 0x6010 |
| Pr8.17 | Homing acceleration | 100 | — | 0 | — | — | 16bit | R/W | 0x6011 |
| Pr8.18 | Homing deceleration | 100 | — | 0 | — | — | 16bit | R/W | 0x6012 |
| Pr8.19 | Homing torque holding time | 100 | — | 0 | — | — | 16bit | R/W | 0x6013 |
| Pr8.20 | Homing torque | 100 | — | 0 | — | — | 16bit | R/W | 0x6014 |
| Pr8.21 | Homing overtravel alarm range | 0 | — | 0 | — | — | 16bit | R/W | 0x6015 |
| Pr8.22 | Emergency stop at limit deceleration | 10 | — | 0 | — | — | 16bit | R/W | 0x6016 |
| Pr8.23 | STP emergency stop deceleration | 50 | — | 0 | — | — | 16bit | R/W | 0x6017 |
| Pr8.24 | I/O combination trigger mode | 0 | — | 0 | — | — | 16bit | R/W | 0x601A |
| Pr8.25 | I/O combination filter | 5 | — | 0 | — | — | 16bit | R/W | 0x601B |
| Pr8.26 | S-code current output value | 0 | — | 0 | — | — | 16bit | R/W | 0x601C |
| Pr8.27 | PR warning | 0 | — | 0 | — | — | 16bit | R/W | 0x601D |
| Pr8.39 | JOG velocity | 100 | — | 0 | — | — | 16bit | R/W | 0x6027 |
| Pr8.40 | JOG acceleration | 100 | — | 0 | — | — | 16bit | R/W | 0x6028 |
| Pr8.41 | JOG deceleration | 100 | — | 0 | — | — | 16bit | R/W | 0x6029 |
| Pr8.42 | Command position H | 0 | — | 0 | — | — | 16bit | R/W | 0x602A |
| Pr8.43 | Command position (L) | 0 | — | 0 | — | — | 16bit | R/W | 0x602B |
| Pr8.44 | Motor position H | 0 | — | 0 | — | — | 16bit | R/W | 0x602C |
| Pr8.45 | Motor position (L) | 0 | — | 0 | — | — | 16bit | R/W | 0x602D |
| Pr8.46 | Input I/O status | 0 | — | 0 | — | — | 16bit | R/W | 0x602E |
| Pr8.47 | Output I/O status | 0 | — | 0 | — | — | 16bit | R/W | 0x602F |
| Pr8.48 | Path 0 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6030 |
| Pr8.49 | Path 1 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6031 |
| Pr8.50 | Path 2 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6032 |
| Pr8.51 | Path 3 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6033 |
| Pr8.52 | Path 4 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6034 |
| Pr8.53 | Path 5 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6035 |
| Pr8.54 | Path 6 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6036 |
| Pr8.55 | Path 7 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6037 |
| Pr8.56 | Path 8 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6038 |
| Pr8.57 | Path 9 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x6039 |
| Pr8.58 | Path 10 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x603A |
| Pr8.59 | Path 11 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x603B |
| Pr8.60 | Path 12 S-code | 0 | — | 0 | — | — | 16bit | R/W | 0x603C |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|----------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P R | S | T | Byte | Op. | 485 Addr. |
| Pr8.61 | Path 13 S-code | 0 | — | O | — | — | 16bit | R/W | 0x603D |
| Pr8.62 | Path 14 S-code | 0 | — | O | — | — | 16bit | R/W | 0x603E |
| Pr8.63 | Path 15 S-code | 0 | — | O | — | — | 16bit | R/W | 0x603F |

[Class 9] Pr-Control Path Parameters

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|-----------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P R | S | T | Byte | Op. | 485 Addr. |
| Pr9.00 | PR0 mode | 0 | — | O | — | — | 16bit | R/W | 0x6200 |
| Pr9.01 | PR0 position H | 0 | — | O | — | — | 16bit | R/W | 0x6201 |
| Pr9.02 | PR0 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6202 |
| Pr9.03 | PR0 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6203 |
| Pr9.04 | PR0 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6204 |
| Pr9.05 | PR0 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6205 |
| Pr9.06 | PR0 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6206 |
| Pr9.07 | PR0 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6207 |
| Pr9.08 | PR1 mode | 0 | — | O | — | — | 16bit | R/W | 0x6208 |
| Pr9.09 | PR1 position H | 0 | — | O | — | — | 16bit | R/W | 0x6209 |
| Pr9.10 | PR1 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x620A |
| Pr9.11 | PR1 velocity | 60 | — | O | — | — | 16bit | R/W | 0x620B |
| Pr9.12 | PR1 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x620C |
| Pr9.13 | PR1 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x620D |
| Pr9.14 | PR1 pause time | 0 | — | O | — | — | 16bit | R/W | 0x620E |
| Pr9.15 | PR1 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x620F |
| Pr9.16 | PR2 mode | 0 | — | O | — | — | 16bit | R/W | 0x6210 |
| Pr9.17 | PR2 position H | 0 | — | O | — | — | 16bit | R/W | 0x6211 |
| Pr9.18 | PR2 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6212 |
| Pr9.19 | PR2 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6213 |
| Pr9.20 | PR2 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6214 |
| Pr9.21 | PR2 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6215 |
| Pr9.22 | PR2 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6216 |
| Pr9.23 | PR2 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6217 |
| Pr9.24 | PR3 mode | 0 | — | O | — | — | 16bit | R/W | 0x6218 |
| Pr9.25 | PR3 position H | 0 | — | O | — | — | 16bit | R/W | 0x6219 |
| Pr9.26 | PR3 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x621A |
| Pr9.27 | PR3 velocity | 60 | — | O | — | — | 16bit | R/W | 0x621B |
| Pr9.28 | PR3 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x621C |
| Pr9.29 | PR3 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x621D |
| Pr9.30 | PR3 pause time | 0 | — | O | — | — | 16bit | R/W | 0x621E |
| Pr9.31 | PR3 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x621F |
| Pr9.32 | PR4 mode | 0 | — | O | — | — | 16bit | R/W | 0x6220 |
| Pr9.33 | PR4 position H | 0 | — | O | — | — | 16bit | R/W | 0x6221 |
| Pr9.34 | PR4 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6222 |
| Pr9.35 | PR4 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6223 |
| Pr9.36 | PR4 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6224 |
| Pr9.37 | PR4 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6225 |
| Pr9.38 | PR4 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6226 |
| Pr9.39 | PR4 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6227 |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P R | S | T | Byte | Op. | 485 Addr. |
| Pr9.40 | PR5 mode | 0 | — | O | — | — | 16bit | R/W | 0x6228 |
| Pr9.41 | PR5 position H | 0 | — | O | — | — | 16bit | R/W | 0x6229 |
| Pr9.42 | PR5 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x622A |
| Pr9.43 | PR5 velocity | 60 | — | O | — | — | 16bit | R/W | 0x622B |
| Pr9.44 | PR5 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x622C |
| Pr9.45 | PR5 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x622D |
| Pr9.46 | PR5 pause time | 0 | — | O | — | — | 16bit | R/W | 0x622E |
| Pr9.47 | PR5 special parameter | 0 | — | O | — | — | 16bit | R | 0x622F |
| Pr9.48 | PR6 mode | 0 | — | O | — | — | 16bit | R/W | 0x6230 |
| Pr9.49 | PR6 position H | 0 | — | O | — | — | 16bit | R/W | 0x6231 |
| Pr9.50 | PR6 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6232 |
| Pr9.51 | PR6 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6233 |
| Pr9.52 | PR6 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6234 |
| Pr9.53 | PR6 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6235 |
| Pr9.54 | PR6 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6236 |
| Pr9.55 | PR6 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6237 |
| Pr9.56 | PR7 mode | 0 | — | O | — | — | 16bit | R/W | 0x6238 |
| Pr9.57 | PR7 position H | 0 | — | O | — | — | 16bit | R/W | 0x6239 |
| Pr9.58 | PR7 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x623A |
| Pr9.59 | PR7 velocity | 60 | — | O | — | — | 16bit | R/W | 0x623B |
| Pr9.60 | PR7 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x623C |
| Pr9.61 | PR7 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x623D |
| Pr9.62 | PR7 pause time | 0 | — | O | — | — | 16bit | R/W | 0x623E |
| Pr9.63 | PR7 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x623F |
| Pr9.64 | PR8 mode | 0 | — | O | — | — | 16bit | R/W | 0x6240 |
| Pr9.65 | PR8 position H | 0 | — | O | — | — | 16bit | R/W | 0x6241 |
| Pr9.66 | PR8 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6242 |
| Pr9.67 | PR8 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6243 |
| Pr9.68 | PR8 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6244 |
| Pr9.69 | PR8 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6245 |
| Pr9.70 | PR8 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6246 |
| Pr9.71 | PR8 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6247 |
| Pr9.72 | PR9 mode | 0 | — | O | — | — | 16bit | R/W | 0x6248 |
| Pr9.73 | PR9 position H | 0 | — | O | — | — | 16bit | R/W | 0x6249 |
| Pr9.74 | PR9 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x624A |
| Pr9.75 | PR9 velocity | 60 | — | O | — | — | 16bit | R/W | 0x624B |
| Pr9.76 | PR9 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x624C |
| Pr9.77 | PR9 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x624D |
| Pr9.78 | PR9 pause time | 0 | — | O | — | — | 16bit | R/W | 0x624E |
| Pr9.79 | PR9 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x624F |
| Pr9.80 | PR10 mode | 0 | — | O | — | — | 16bit | R/W | 0x6250 |
| Pr9.81 | PR10 position H | 0 | — | O | — | — | 16bit | R/W | 0x6251 |
| Pr9.82 | PR10 position(L) | 0 | — | O | — | — | 16bit | R/W | 0x6252 |
| Pr9.83 | PR10 velocity | 60 | — | O | — | — | 16bit | R/W | 0x6253 |
| Pr9.84 | PR10 acceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6254 |
| Pr9.85 | PR10 deceleration time | 100 | — | O | — | — | 16bit | R/W | 0x6255 |
| Pr9.86 | PR10 pause time | 0 | — | O | — | — | 16bit | R/W | 0x6256 |
| Pr9.87 | PR10 special parameter | 0 | — | O | — | — | 16bit | R/W | 0x6257 |

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|---------|------------------------|---------|----------------|------------|---|---|--------------------|-----|--------------|
| | | | | P R | S | T | Byte | Op. | 485 Addr. |
| Pr9.88 | PR11 mode | 0 | — | 0 | — | — | 16bit | R/W | 0x6258 |
| Pr9.89 | PR11 position H | 0 | — | 0 | — | — | 16bit | R/W | 0x6259 |
| Pr9.90 | PR11 position(L) | 0 | — | 0 | — | — | 16bit | R/W | 0x625A |
| Pr9.91 | PR11 velocity | 60 | — | 0 | — | — | 16bit | R/W | 0x625B |
| Pr9.92 | PR11 acceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x625C |
| Pr9.93 | PR11 deceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x625D |
| Pr9.94 | PR11 pause time | 0 | — | 0 | — | — | 16bit | R/W | 0x625E |
| Pr9.95 | PR11 special parameter | 0 | — | 0 | — | — | 16bit | R/W | 0x625F |
| Pr9.96 | PR12 mode | 0 | — | 0 | — | — | 16bit | R/W | 0x6260 |
| Pr9.97 | PR12 position H | 0 | — | 0 | — | — | 16bit | R/W | 0x6261 |
| Pr9.98 | PR12 position(L) | 0 | — | 0 | — | — | 16bit | R/W | 0x6262 |
| Pr9.99 | PR12 velocity | 60 | — | 0 | — | — | 16bit | R/W | 0x6263 |
| Pr9.100 | PR12 acceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x6264 |
| Pr9.101 | PR12 deceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x6265 |
| Pr9.102 | PR12 pause time | 0 | — | 0 | — | — | 16bit | R/W | 0x6266 |
| Pr9.103 | PR12 special parameter | 0 | — | 0 | — | — | 16bit | R/W | 0x6267 |
| Pr9.104 | PR13 mode | 0 | — | 0 | — | — | 16bit | R/W | 0x6268 |
| Pr9.105 | PR13 position H | 0 | — | 0 | — | — | 16bit | R/W | 0x6269 |
| Pr9.106 | PR13 position(L) | 0 | — | 0 | — | — | 16bit | R/W | 0x626A |
| Pr9.107 | PR13 velocity | 60 | — | 0 | — | — | 16bit | R/W | 0x626B |
| Pr9.108 | PR13 acceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x626C |
| Pr9.109 | PR13 deceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x626D |
| Pr9.110 | PR13 pause time | 0 | — | 0 | — | — | 16bit | R/W | 0x626E |
| Pr9.111 | PR13 special parameter | 0 | — | 0 | — | — | 16bit | R/W | 0x626F |
| Pr9.112 | PR14 mode | 0 | — | 0 | — | — | 16bit | R/W | 0x6270 |
| Pr9.113 | PR14 position H | 0 | — | 0 | — | — | 16bit | R/W | 0x6271 |
| Pr9.114 | PR14 position(L) | 0 | — | 0 | — | — | 16bit | R/W | 0x6272 |
| Pr9.115 | PR14 velocity | 60 | — | 0 | — | — | 16bit | R/W | 0x6273 |
| Pr9.116 | PR14 acceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x6274 |
| Pr9.117 | PR14 deceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x6275 |
| Pr9.118 | PR14 pause time | 0 | — | 0 | — | — | 16bit | R/W | 0x6276 |
| Pr9.119 | PR14 special parameter | 0 | — | 0 | — | — | 16bit | R/W | 0x6277 |
| Pr9.120 | PR15 mode | 0 | — | 0 | — | — | 16bit | R/W | 0x6278 |
| Pr9.121 | PR15 position H | 0 | — | 0 | — | — | 16bit | R/W | 0x6279 |
| Pr9.122 | PR15 position(L) | 0 | — | 0 | — | — | 16bit | R/W | 0x627A |
| Pr9.123 | PR15 velocity | 60 | — | 0 | — | — | 16bit | R/W | 0x627B |
| Pr9.124 | PR15 acceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x627C |
| Pr9.125 | PR15 deceleration time | 100 | — | 0 | — | — | 16bit | R/W | 0x627D |
| Pr9.126 | PR15 pause time | 0 | — | 0 | — | — | 16bit | R/W | 0x627E |
| Pr9.127 | PR15 special parameter | 0 | — | 0 | — | — | 16bit | R/W | 0x627F |

[Class B] Status Parameters

| Code | Label | Default | Activ ation | Valid mode | | | Communication mode | | |
|--------|--------------------------------------|---------|----------------|------------|---|---|--------------------|-----|------------------|
| | | | | P | S | T | Byte | Op. | 485 Addr. |
| PrB.00 | Software version 1 (DSP) | / | — | 0 | 0 | 0 | 16bit | R | 0x0B00 |
| PrB.01 | Software version 2 (CPLD) | / | — | 0 | 0 | 0 | 16bit | R | 0x0B01 |
| PrB.02 | Software version 3 (Others) | / | — | 0 | 0 | 0 | 16bit | R | 0x0B02 |
| PrB.03 | Current alarm | / | — | 0 | 0 | 0 | 16bit | R | 0x0B03 |
| PrB.04 | Motor not rotating cause | / | — | 0 | 0 | 0 | 16bit | R | 0x0B04 |
| PrB.05 | Driver operation status | / | — | 0 | 0 | 0 | 16bit | R | 0x0B05 |
| PrB.06 | Motor speed (Before filter) | / | — | 0 | 0 | 0 | 16bit | R | 0x0B06 |
| PrB.07 | Motor torque | / | — | 0 | 0 | 0 | 16bit | R | 0x0B07 |
| PrB.08 | Motor current | / | — | 0 | 0 | 0 | 16bit | R | 0x0B08 |
| PrB.09 | Motor speed (After filter) | / | — | 0 | 0 | 0 | 16bit | R | 0x0B09 |
| PrB.10 | DC bus voltage | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0A |
| PrB.11 | Driver temperature | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0B |
| PrB.12 | External analog 1 | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0C |
| PrB.13 | External analog 2 | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0D |
| PrB.14 | External analog 3 | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0E |
| PrB.15 | Motor overload rate | / | — | 0 | 0 | 0 | 16bit | R | 0x0B0F |
| PrB.16 | Vent overload rate | / | — | 0 | 0 | 0 | 16bit | R | 0x0B10 |
| PrB.17 | Physical I/O input status | / | — | 0 | 0 | 0 | 16bit | R | 0x0B11 |
| PrB.18 | Physical I/O output status | / | — | 0 | 0 | 0 | 16bit | R | 0x0B12 |
| PrB.20 | Command position (Command unit) | / | — | 0 | 0 | 0 | 32bit | R | 0x0B14 0x0B15 |
| PrB.21 | Motor position (Command unit) | / | — | 0 | - | - | 32bit | R | 0x0B16 0x0B17 |
| PrB.22 | Position deviation (Command unit) | / | — | 0 | 0 | 0 | 32bit | R | 0x0B18 0x0B19 |
| PrB.23 | Command position (Encoder unit) | / | — | 0 | 0 | 0 | 32bit | R | 0x0B1A 0x0B1B |
| PrB.24 | Motor position (Encoder unit) | / | — | 0 | - | - | 32bit | R | 0x0B1C 0x0B1D |
| PrB.25 | Position deviation (Encoder unit) | / | — | 0 | 0 | 0 | 32bit | R | 0x0B1E 0x0B1F |
| PrB.26 | Rotational encoder position feedback | / | — | 0 | - | - | 32bit | R | 0x0B20 0x0B21 |

3.2 Parameters description

3.2.1 [Class 0] Basic Settings

| Pr0.00 | Label | Model-following/Zero tracking control | | | Valid mode(s) | P | | | | | | | | | | | | |
|---|---|---------------------------------------|-----------|-------|---------------|--------|--|--|-------|-------------|---|---|---|-----------------------------|-----|----------|---------|---|
| | Range | 0-10000 | Unit | 0.1Hz | Default | 1 | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0001 | | | | | | | | | | | | |
| | Valid | At stop | | | | | | | | | | | | | | | | |
| <p>Model-following bandwidth, also known as model-following control (MFC), is used to control the position loop to improve the responsiveness to commands, speed up positioning time and reduce following error. The effect is obvious especially in low and medium mechanical stiffness.</p> <table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>Disable model following/zero tracking control</td></tr><tr><td>1</td><td>Set bandwidth automatically</td></tr><tr><td>2~9</td><td>Reserved</td></tr><tr><td>10~2000</td><td>Manually set control bandwidth. 30~100 recommended for belt application</td></tr></table> | | | | | | | | | Value | Description | 0 | Disable model following/zero tracking control | 1 | Set bandwidth automatically | 2~9 | Reserved | 10~2000 | Manually set control bandwidth. 30~100 recommended for belt application |
| Value | Description | | | | | | | | | | | | | | | | | |
| 0 | Disable model following/zero tracking control | | | | | | | | | | | | | | | | | |
| 1 | Set bandwidth automatically | | | | | | | | | | | | | | | | | |
| 2~9 | Reserved | | | | | | | | | | | | | | | | | |
| 10~2000 | Manually set control bandwidth. 30~100 recommended for belt application | | | | | | | | | | | | | | | | | |

| | | | | | | | | |
|--------|-------------|-----------------------|-----------|-----|---------------|--------|---|---|
| Pr0.01 | Label | Control Mode Settings | | | Valid mode(s) | P | S | T |
| | Range | 0~10 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0003 | | |
| | Valid | After restart | | | | | | |

| Value | Description | |
|-------|-----------------------------|----------------------|
| | 1 st mode | 2 nd mode |
| 【0】 | Position | — |
| 1 | Velocity | — |
| 2 | Torque | — |
| 3 | Position | Velocity |
| 4 | Position | Torque |
| 5 | Velocity | Torque |
| 6 | PR internal command control | Position Pr0.22=1 |
| | | Velocity Pr0.22=1 |
| | | Torque Pr0.22=2 |
| 7~10 | Reserved | |

◆When 3, 4, 5, 6 combination hybrid mode, 1st and 2nd mode can be chosen accordingly with control mode switching input (C-MODE).
C-MODE: Invalid, select 1st mode.
C-MODE: Valid, select 2st mode.
Please allow some time in between mode switching commands.

◆Please set Pr0.01 = 6 to switch to other modes from PR mod, then set 2nd mode using Pr0.22.

C-MODE is defaulted to Normally Open

| Pr0.02 | Label | | Real time Auto Gain Adjusting | | Valid mode(s) | P | S | T |
|--------|---------------------|--|--|-----------|---------------|-------------|--------|---|
| | Range | | 0x0~0xFF F | Unit | — | Default | 0x1 | |
| | Byte length | | 16bit | Attribute | R/W | 485 address | 0x0005 | |
| | Valid | | Immediate | | | | | |
| Value | Category | Settings | Application | | | | | |
| 0x00_ | Motion setting mode | Used to set motion setting mode, which can be selected according to the motion characteristics or setting requirements. Generally, it is recommended to select mode 1 with good generality when there is no special requirement, mode 2 when rapid positioning is needed. If mode 1 and mode 2 cannot meet the requirements, please choose mode 0. | | | | | | |
| | | 0:Manual | Pr0.03 invalid. Gain value must be adjusted manually and accordingly. | | | | | |
| | | 1:Standard | Pr0.03 valid. Quick gain adjusting can be achieved by changing Pr0.03 stiffness value. Gain switching is not used in this mode, suitable for applications with requirements for stability. | | | | | |
| | | 2:Positioning | Pr0.03 valid. Quick gain adjusting can be achieved by changing Pr0.03 stiffness value. This mode is suitable for applications requiring quick positioning. Not recommended for load mounted vertical to ground, or please compensate for the load using Pr6.07 | | | | | |
| 0x0_0 | Load type setting | Used to select the load type, choose according to load-inertia ratio and mechanical structure. | | | | | | |
| | | 0: Rigid structure | This mode prioritizes system responsiveness. Use this mode when there is a relatively rigid structure with low load inertia. Typical application including directly connected high-precision gearbox, lead screw, gears, etc. | | | | | |
| | | 1:High inertia | For applications with higher load inertia (10 times or above), gain settings take into account both machine stability and responsiveness. Not recommended to set stiffness above 15 for high load inertia. | | | | | |
| | | 2: Flexible structure | This mode prioritizes system stability. Use this mode when there is low rigidity structure with high load inertia. Typical applications included belts and chains. | | | | | |
| 0x_00 | reserved | | | | | | | |

The setting type combination is a hexadecimal standard, as follows:

| Setting type combination | Application type |
|--------------------------|---------------------------------|
| 0X000 | Rigid structure + Manual |
| 0X001 | Rigid structure +Standard |
| 0X002 | Rigid structure +Positioning |
| 0X010 | High inertia + Manual |
| 0X011 | High inertia + Standard |
| 0X012 | High inertia + Positioning |
| 0X020 | Flexible structure + Manual |
| 0X021 | Flexible structure +Standard |
| 0X022 | Flexible structure +Positioning |

| Pr0.03 | Label | Real time auto stiffness adjusting | | | Valid mode(s) | P | S | T |
|---|-------------|------------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 50 ~ 81 | Unit | — | Default | 70 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0007 | | |
| | Valid | Immediate | | | | | | |
| <div><div>Low —————> Mechanical stiffness —————> High</div><div>Low —————> Servo gain —————> High</div><div><div>81.80.....70.69.68.....51.50</div><div>Low —————> Responsiveness —————> High</div></div></div> <p>Lower values ensure better system responsiveness and mechanical stiffness but machine vibration might occur, please set accordingly. Recommend to set to around 70 with motor with high inertia.</p> | | | | | | | | |

| Pr0.04 | Label | Inertia ratio | | | Valid mode(s) | P | S | T |
|--------|-------------|---------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~20000 | Unit | % | Default | 250 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0009 | | |
| | Valid | Immediate | | | | | | |

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| | | | | | | | | |
|--------|-------------|-------------------------------|-----------|-----|---------------|--------|--|--|
| Pr0.05 | Label | Command pulse input selection | | | Valid mode(s) | P | | |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x000B | | |
| | Valid | After restart | | | | | | |

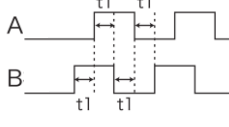
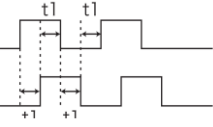
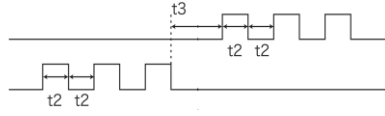
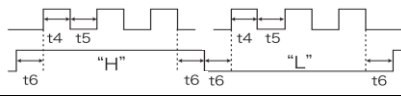
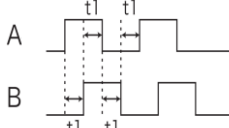
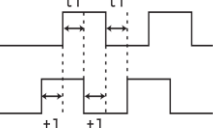
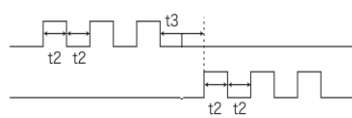
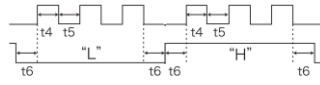
| Value | Description |
|-------|--|
| 【0】 | Pulse input low speed channel (200/500kHz pulse input) |
| 1 | Pulse input high speed channel (4MHz pulse input) |

Both channels cannot be used at the same time.

| Pr0.06 | Label | Command pulse polarity inversion | | | Valid mode(s) | P | | |
|---|-------------|----------------------------------|-----------|-----|---------------|--------|--|--|
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x000D | | |
| | Valid | After restart | | | | | | |
| Pr0.06 and Pr0.07 set command pulse input inversion and mode correspondingly. | | | | | | | | |

| | | | | | | | |
|---------------|--------------------|--------------------------|------------------|-----|----------------------|----------|--|
| Pr0.07 | Label | Command pulse input mode | | | Valid mode(s) | P | |
| | Range | 0~3 | Unit | — | Default | 3 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x000F | |
| | Valid | After restart | | | | | |

Command pulse input

| Command Polarity inversion (Pr0.06) | Command pulse input mode settings (Pr0.07) | Command Pulse Mode | Positive signal | Negative signal |
|-------------------------------------|--|--|--|---|
| 【0】 | 0 or 2 | 90°phase difference 2 phase pulse (Phase A+ Phase B) |  |  |
| | 1 | CW pulse sequence + CCW pulse sequence |  | |
| | 【3】 | Pulse sequence + Directional symbol |  | |
| 1 | 0 or 2 | 90°phase difference 2 phase pulse (Phase A+Phase B) |  |  |
| | 1 | CW pulse sequence + CCW pulse sequence |  | |
| | 3 | Pulse sequence + Directional symbol |  | |

Command pulse input signal max. frequency and min. duration needed

| Command pulse input interface | | Max. Frequency | Min. duration needed (μ s) | | | | | |
|-------------------------------|-------------------------------|----------------|------------------------------|-------|-------|-------|-------|-------|
| | | | t1 | t2 | t3 | t4 | t5 | t6 |
| Pulse sequence interface | Differential drive | 500 kHz | 2 | 1 | 1 | 1 | 1 | 1 |
| | Open collector | 200 kHz | 5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| | High speed differential drive | 4Mhz | 0.25 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 |

Please set >0.1 μs for the duration between rising and falling edge of command pulse input signal.

1 revolution with 2500 pulses 2-phase pulse input when Pr0.07=0 or 2, Pr0.08 = 10000;

1 revolution with 10000 pulses 1-phase pulse input when Pr0.07=1 or 3, Pr0.08 = 10000

| | | | | | | | | |
|--|-------------|--|-----------|-------|---------------|------------------------|---|---|
| Pr0.08 | Label | 1st command pulse count per revolution | | | Valid mode(s) | P | S | T |
| | Range | 0-67100864 | Unit | PULSE | Default | 10000 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0010 L: 0x0011 | | |
| | Valid | After restart | | | | | | |
| Control will affected if value set is too low. Err1b1 might occur if value < 500. (1) Pr0.08 valid when ≠ 0: Motor revolution = input pulse count / [Pr0.08 value] (2) Pr0.08 invalid when = 0: Pr0.09 and Pr0.10 valid. | | | | | | | | |
| Pr0.09 | Label | 1st command frequency divider/multiplier numerator | | | Valid mode(s) | P | | |
| | Range | 1~2147483647 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0012 L: 0x0013 | | |
| | Valid | After restart | | | | | | |
| Valid when Pr0.08 = 0, please refer to description in Pr0.10. | | | | | | | | |
| Pr0.10 | Label | 1st command frequency divider/multiplier denominator | | | Valid mode(s) | P | | |
| | Range | 1~2147483647 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0014 L: 0x0015 | | |
| | Valid | After restart | | | | | | |
| <div>1. Settings: (1)Driver command pulse input count : X (2)Encoder pulse count after frequency divider/multiplier: Y (3)Encoder pulse count per revolution: Z (4)Motor revolution: W 2. Calculation: (1) X, Y Y = X * Pr0.09 / Pr0.10 Please keep the value of Pr0.09 and Pr0.10 to be smaller than 2²⁴ (16777216). (2) Z Motor with 23-bit motor: Z= 2²³ = 8388608 (3) Y, Z, W W = Y / Z Performance cannot be guaranteed if frequency divider/multiplier ratio is set to extreme values. Err1b1 might occur if W < 500.</div> | | | | | | | | |

| | | | | | | | | |
|--|--------------------|------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr0.13 | Label | 1 st torque limit | | | Valid mode(s) | P | S | T |
| | Range | 0~500 | Unit | % | Default | 350 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x001B | | |
| | Valid | Immediate | | | | | | |
| 1 st torque limit is set according to ratio percentage of motor rated current. Do not exceed max driver output current. Please refer to Pr5.21 on how to set torque limit. | | | | | | | | |

| | | | | | | | | |
|---|-------------|------------------------------|-----------|--------|---------------|--------|--|--|
| Pr0.14 | Label | Excessive position deviation | | | Valid mode(s) | P | | |
| | Range | 0~310 | Unit | 0.1rev | Default | 30 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x001D | | |
| | Valid | Immediate | | | | | | |
| Please set threshold value for position deviation accordingly. Default factory setting = 30, Er180 will be triggered if positive deviation is in excess of 3 revolutions. | | | | | | | | |

| | | | | | | | | |
|--------|---------------------------|--|-----------|-----|---------------|--------|---|---|
| Pr0.15 | Label | Absolute encoder settings | | | Valid mode(s) | P | S | T |
| | Range | 0~15 | Unit | - | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x001F | | |
| | Valid | After restart | | | | | | |
| Value | Mode | Description | | | | | | |
| 【0】 | Incremental | Doesn't retain position data on power off. Unlimited travel distance. | | | | | | |
| 1 | Multiturn absolute linear | Retrain position data on power off. For applications with fixed travel distance and no multiturn data overflow. | | | | | | |
| 2 | Multiturn absolute rotary | Retrain position data on power off. Actual data feedback in between 0-(Pr6.63+1). Unlimited travel distance. | | | | | | |
| 3 | Single turn absolute | Used when travel distance is within 1 revolution of the encoder. Data overflow will trigger alarm. | | | | | | |
| 5 | Multi turn absolute | Clear multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 5 after 3s, please solve according to Er153. | | | | | | |
| 9 | | Clear multiturn position, reset multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 9 after 3s, please solve according to Er153. Please disable axis before setting to 9 and home the axis before using. | | | | | | |
| Others | | Do not use! | | | | | | |

| | | | | | | | | |
|---|-------------|------------------------------------|-----------|-----------------|---------------|--------|---|---|
| Pr0.16 | Label | Regenerative resistance | | | Valid mode(s) | P | S | T |
| | Range | 25~500 | Unit | Ohm | Default | 100 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0021 | | |
| | Valid | Immediate | | | | | | |
| To set resistance value of regenerative resistor Pr0.16 and Pr0.17set value determine alarm threshold of Er120. If set value > actual regenerative resistance, Er120 occurrence might be delayed. | | | | | | | | |
| Pr0.17 | Label | Regenerative resistor power rating | | | Valid mode(s) | P | S | T |
| | Range | 20~5000 | Unit | W | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0023 | | |
| | Valid | Immediate | | | | | | |
| To set power rating of regenerative resistor. Please refer to table below | | | | | | | | |
| Drives | | Resistance (Ω) | | Power rating(W) | | | | |
| ELD2-RS7005B | | 10 | | 30 | | | | |
| ELD2-RS7010B | | 10 | | 50 | | | | |
| ELD2-RS7015B | | 10 | | 50 | | | | |
| ELD2-RS7020B | | 10 | | 100 | | | | |
| ELD2-RS7030B | | 10 | | 100/150 | | | | |

| | | | |
|--|--------------|----|---------|
| | ELD2-RS7040B | 10 | 150/200 |
| | ELD2-RS7060B | 10 | 150/200 |

Pr0.16 and Pr0.17 determines the threshold value of Er120. Please set accordingly or it might trigger false alarm or damage to servo drive.
Note: If external regenerative resistor is used, please set according to its labeled power rating.

3.2.2 [Class 1] Gain adjustments

| | | | | | | | | |
|---|--------------------|---|------------------|-------|----------------------|----------|----------|----------|
| Pr1.00 | Label | 1 st position loop gain | | | Valid mode(s) | P | | |
| | Range | 0~30000 | Unit | 0.1/s | Default | 320 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0101 | | |
| | Valid | Immediate | | | | | | |
| <p>Higher position loop gain value improves the responsiveness of the servo driver and lessens the positioning time. Position loop gain value shouldn't exceed responsiveness of the mechanical system and take in consideration velocity loop gain, if not it might cause vibration, mechanical noise and overtravel. As velocity loop gain is based on position loop gain, please set both values accordingly. Recommended range: $1.2 \leq \text{Pr1.00}/\text{Pr1.01} \leq 1.8$</p> | | | | | | | | |
| Pr1.01 | Label | 1 st velocity loop gain | | | Valid mode(s) | P | S | T |
| | Range | 1~32767 | Unit | 0.1Hz | Default | 180 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0103 | | |
| | Valid | Immediate | | | | | | |
| <p>To determine the responsiveness of the velocity loop. If inertia ratio of Pr0.04 is uniform with actual inertia ratio, velocity loop responsiveness = Pr1.01. To increase position loop gain and improve responsiveness of the whole system, velocity loop gain must be set at higher value. Please notice that if the velocity loop gain is too high, it might cause vibration.</p> | | | | | | | | |
| Pr1.02 | Label | 1 st Integral Time Constant of Velocity Loop | | | Valid mode(s) | P | S | T |
| | Range | 1~10000 | Unit | 0.1ms | Default | 310 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0105 | | |
| | Valid | Immediate | | | | | | |
| <p>The lower the set value, the closer the lag error at stop to 0 but might cause vibration. If the value set is overly large, overshoot, delay of positioning time duration and lowered responsiveness might occur. Set 10000 to deactivate Pr1.02.</p> | | | | | | | | |

| | | | | | | | | |
|--------|-------------|---|-----------|-----|---------------|--------|---|---|
| Pr1.03 | Label | 1 st velocity detection filter | | | Valid mode(s) | P | S | T |
| | Range | 0~31 | Unit | — | Default | 15 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0107 | | |
| | Valid | Immediate | | | | | | |

This filter is a low pass filter. It blocks high frequencies which cause system instability from velocity feedback data. The higher the set value, lower frequencies will be blocked and velocity responsiveness will also be lowered. Pr1.03 needs to match velocity loop gain. Please refer to the following table.

| Value | Velocity Detection Filter Cut-off Frequency(Hz) | Value | Velocity Detection Filter Cut-off Frequency(Hz) |
|-------|---|-------|---|
| 0 | 2500 | 16 | 750 |
| 1 | 2250 | 17 | 700 |
| 2 | 2100 | 18 | 650 |
| 3 | 2000 | 19 | 600 |
| 4 | 1800 | 20 | 550 |
| 5 | 1600 | 21 | 500 |
| 6 | 1500 | 22 | 450 |
| 7 | 1400 | 23 | 400 |
| 8 | 1300 | 24 | 350 |
| 9 | 1200 | 25 | 300 |
| 10 | 1100 | 26 | 250 |
| 11 | 1000 | 27 | 200 |
| 12 | 950 | 28 | 175 |
| 13 | 900 | 29 | 150 |
| 14 | 850 | 30 | 125 |
| 【15】 | 800 | 31 | 100 |

| | | | | | | | | |
|--------|-------------|---|-----------|--------|---------------|--------|---|---|
| Pr1.04 | Label | 1 st Torque Filter Time Constant | | | Valid mode(s) | P | S | T |
| | Range | 0~2500 | Unit | 0.01ms | Default | 126 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0109 | | |
| | Valid | Immediate | | | | | | |

To set torque command low-pass filter, add a filter delay time constant to torque command and filter out the high frequencies in the command.

Often used to reduce or eliminate some noise or vibration during motor operation, but it will reduce the responsiveness of current loop, resulting in undermining velocity loop and position loop control. Pr1.04 needs to match velocity loop gain.

Recommended range: $1,000,000/(2\pi \times \text{Pr1.04}) \geq \text{Pr1.01} \times 4$

For example: Velocity loop gain Pr1.01=180(0.1Hz) which is 18Hz. Time constant of torque filter should be $\text{Pr1.01} \leq 221(0.01\text{ms})$

If mechanical vibration is due to servo driver, adjusting Pr1.04 might eliminate the vibration. The smaller the value, the better the responsiveness but also subjected to machine conditions. If the value is too large, it might lower the responsiveness of current loop.

With higher Pr1.01 value settings and no resonance, reduce Pr1.04 value;

With lower Pr1.01 value settings, increase Pr1.04 value to lower motor noise.

| | | | | | | | | |
|--|-------------|---|-----------|--------|---------------|--------|---|---|
| Pr1.05 | Label | 2 nd Position Loop Gain | | | Valid mode(s) | P | | |
| | Range | 0~30000 | Unit | 0.1/s | Default | 380 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x010B | | |
| | Valid | Immediate | | | | | | |
| Pr1.06 | Label | 2 nd velocity loop gain | | | Valid mode(s) | P | S | T |
| | Range | 1~32767 | Unit | 0.1Hz | Default | 180 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x010D | | |
| | Valid | Immediate | | | | | | |
| Pr1.07 | Label | 2 nd Integral Time Constant of Velocity Loop | | | Valid mode(s) | P | S | T |
| | Range | 1~10000 | Unit | 0.1ms | Default | 10000 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x010F | | |
| | Valid | Immediate | | | | | | |
| Pr1.08 | Label | 2 nd velocity detection filter | | | Valid mode(s) | P | S | T |
| | Range | 0~31 | Unit | — | Default | 15 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0111 | | |
| | Valid | Immediate | | | | | | |
| Pr1.09 | Label | 2 nd Torque Filter Time Constant | | | Valid mode(s) | P | S | T |
| | Range | 0~2500 | Unit | 0.01ms | Default | 126 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0113 | | |
| | Valid | Immediate | | | | | | |
| Position loop, velocity loop, velocity detection filter, torque command filter each have 2 pairs of gain or time constant (1st and 2nd). | | | | | | | | |
| Pr1.10 | Label | Velocity feed forward gain | | | Valid mode(s) | P | | |
| | Range | 0~1000 | Unit | 0.10% | Default | 300 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0115 | | |
| | Valid | Immediate | | | | | | |
| Used for decreasing following error caused by low responsiveness of velocity loop. Might cause overshoot or increase in noise if set value is too high. | | | | | | | | |
| Pr1.11 | Label | Velocity feed forward filter time constant | | | Valid mode(s) | P | | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0117 | | |
| | Valid | Immediate | | | | | | |
| <p>Set velocity feed forward low pass filter to eliminate high or abnormal frequencies in velocity feed forward command. Often used when position command with low resolution or high electronic gear ration to smoothen velocity feed forward.</p> <p>Position deviation under constant velocity can be lowered with higher velocity feed forward gain. Please to refer to the equation below.</p> <p>Reduce Pr1.11 value to suppress velocity overshoot during deceleration; Increase Pr1.11 value to suppress noise or vibration due to long driver control cycle or position command uneven pulse frequency.</p> <p><Application></p> <p>Set Pr1.11 = 50 (0.5ms) , improve feedforward effect by gradually increase Pr1.10. The equation below can be used to determine the position deviation due to velocity feedforward gain under constant velocity.</p> $\text{Position deviation[Uint]} = \frac{\text{Set velocity}[\frac{\text{Uint}}{\text{s}}]}{\text{Position loop gain[Hz]}} \times \frac{100 - \text{Velocity feed forward gain}[\%]}{100}$ | | | | | | | | |

| | | | | | | | | |
|---|-------------|--|-----------|--------|---------------|--------|---|--|
| Pr1.12 | Label | Torque feed forward gain | | | Valid mode(s) | P | S | |
| | Range | 0~1000 | Unit | 0.1% | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0119 | | |
| | Valid | Immediate | | | | | | |
| <p>Before using torque feed forward, please set correct inertia ratio Pr0.04. By increasing torque feed forward gain, position deviation on constant acceleration/deceleration can be reduced to close to 0. Under ideal condition and trapezoidal speed profile, position deviation of the whole motion can be reduced to close to 0. In reality, perturbation torque will always exist, hence position deviation can never be 0.</p> | | | | | | | | |
| Pr1.13 | Label | Torque feed forward filter time constant | | | Valid mode(s) | P | S | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x011B | | |
| | Valid | Immediate | | | | | | |
| <p>Low pass filter to eliminate abnormal or high frequencies in torque feed forward command. Usually used when encoder has lower resolution or precision. Noise reduces if torque feed forward filter time constant is set higher but position deviation will increase at acceleration varied points.</p> <p><Application></p> <ul style="list-style-type: none">Set Pr1.13 = 50ms, please increase torque forward gain gradually to enable torque feedforward.By increasing Pr1.13, noise will reduce but position deviation will become larger. | | | | | | | | |

| | | | | | | | | |
|---------------|--------------------|--------------------------------------|------------------|-----|----------------------|----------|--|--|
| Pr1.15 | Label | Position control gain switching mode | | | Valid mode(s) | P | | |
| | Range | 0~10 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x011F | | |
| | Valid | Immediate | | | | | | |

In position control, set the conditions for gain switching to be valid.

| Value | Condition | Gain switching condition |
|------------|---|--|
| 【0】 | 1 st gain fixed | Fixed on using 1 st gain(Pr1.00-Pr1.04) |
| 1 | 2 nd gain fixed | Fixed on using 2 nd gain (Pr1.05-Pr1.09) |
| 2 | Gain switching input valid | · Gain switching input (GAIN) invalid: 1 st gain. · Gain switching input (GAIN) valid: 2 nd gain. *Default: 1 st gain |
| 3 | High command torque | Switch to 2 nd gain when set torque command absolute value larger than (level + hysteresis)[%] Switch to 1 st gain when set torque command absolute value smaller than (level + hysteresis)[%] |
| 4-9 | Reserved | Reserved |
| 10 | Pending position command +actual velocity | Valid for position control. Switch to 2 nd gain if position command $\neq 0$ Switch to 1 st gain if positional command = 0 throughout the duration of delay time and absolute value of actual velocity remains smaller than (level - hysteresis) (r/min) |

**** Above 'level' and 'hysteresis' are in correspondence to Pr1.17 Position control gain switching level and Pr1.18 Hysteresis at position control switching.**

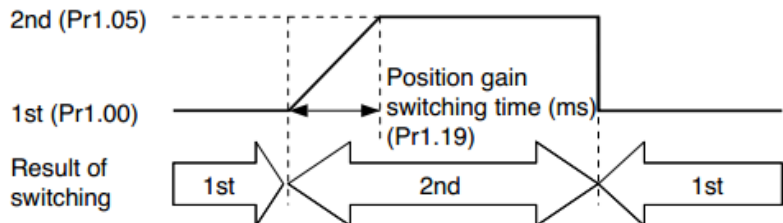
| | | | | | | | | |
|---------------|--------------------|---------------------------------------|------------------|----------------|----------------------|----------|--|--|
| Pr1.17 | Label | Position control gain switching level | | | Valid mode(s) | P | | |
| | Range | 0~20000 | Unit | Mode dependent | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0123 | | |
| | Valid | Immediate | | | | | | |

Set threshold value for gain switching to occur.

Unit is mode dependent.

| Switching condition | Unit |
|---------------------|---------------------|
| Position | Encoder pulse count |
| Velocity | RPM |
| Torque | % |

Please set level \geq hysteresis

| | | | | | | | | |
|--|-------------|--|-----------|----------------|---------------|--------|--|--|
| Pr1.18 | Label | Hysteresis at position control switching | | | Valid mode(s) | P | | |
| | Range | 0~20000 | Unit | Mode dependent | Default | 33 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0125 | | |
| | Valid | Immediate | | | | | | |
| To eliminate the instability of gain switching. Used in combination with Pr1.17 using the same unit. If level< hysteresis, drive will set internally hysteresis = level. | | | | | | | | |
| Pr1.19 | Label | Position control switching time | | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 33 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0127 | | |
| | Valid | Immediate | | | | | | |
| During position control, if 1 st and 2 nd gain difference is too large, to ease torque changes and vibration due to rapid changes in position loop gain, set suitable Pr1.19 value For example: 1st (pr1.00) <-> 2nd (Pr1.05) | | | | | | | | |
|  | | | | | | | | |

| | | | | | | | | |
|--------|-------------|------------------------------------|-----------|--------|---------------|--------|--|--|
| Pr1.35 | Label | Position command pulse filter time | | | Valid mode(s) | P | | |
| | Range | 0~200 | Unit | 0.01us | Default | 8 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0147 | | |
| | Valid | After restart | | | | | | |

To filter position setting pulse, getting rid of narrow pulse frequency with interference. Low-speed pulse input unit: 0.05us; High-speed pulse input unit: 0.01us.
If set value is overly large, it will affect the receiving of high frequency command pulse and with high delay time.

Pr1.35 formula:

$$\text{Filter frequency} = \frac{1}{2 \times \text{Pr1.35} \times 0.05\text{us}} \times 1000000\text{Hz}$$

Example: Pr1.35=100, pulse frequency > 100KHz will be filtered;

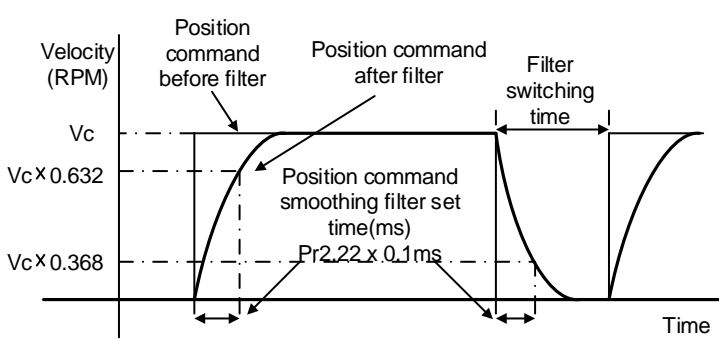
| Pr1.35 | Filter frequency | Pr1.35 | Filter frequency |
|--------|------------------|--------|------------------|
| 0 | Null | 100 | 100kHz(500KHz) |
| 8 | 1.25MHz(6.25MHz) | 125 | 80kHz(400KHz) |
| 10 | 1MHz (5MHz) | 160 | 62.5kHz(312KHz) |
| 20 | 500kHz(2.5MHz) | 200 | 50kHz(250KHz) |
| 50 | 200kHz(1MHz) | | |
| 80 | 125kHz(625KHz) | | |

3.2.3 [Class 2] Vibration suppression

| Pr2.00 | Label | Adaptive filtering mode settings | | | Valid mode(s) | P | S | | | | | | | | | | | | | | | | |
|---|---|--|-----------|-----|---------------|--------|---|---|-------|-------------|--|---|--------------------------|---|---|---|--|---|---|--|-----|----------|---|
| | Range | 0~4 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0201 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th colspan="2">Description</th></tr><tr><td>0</td><td>Adaptive filter: invalid</td><td>Parameters related to 3rd notch filter remain unchanged</td></tr><tr><td>1</td><td>Adaptive filter: 1 filter valid for once.</td><td>1 adaptive filter becomes valid. 3rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated.</td></tr><tr><td>2</td><td>Adaptive filter: 1 filter remains valid</td><td>1 adaptive filter becomes valid. 3rd notch filter related parameters will keep updating accordingly.</td></tr><tr><td>3-4</td><td>Reserved</td><td>-</td></tr></table> | | | | | | | | | Value | Description | | 0 | Adaptive filter: invalid | Parameters related to 3 rd notch filter remain unchanged | 1 | Adaptive filter: 1 filter valid for once. | 1 adaptive filter becomes valid. 3 rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated. | 2 | Adaptive filter: 1 filter remains valid | 1 adaptive filter becomes valid. 3 rd notch filter related parameters will keep updating accordingly. | 3-4 | Reserved | - |
| Value | Description | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Adaptive filter: invalid | Parameters related to 3 rd notch filter remain unchanged | | | | | | | | | | | | | | | | | | | | | |
| 1 | Adaptive filter: 1 filter valid for once. | 1 adaptive filter becomes valid. 3 rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated. | | | | | | | | | | | | | | | | | | | | | |
| 2 | Adaptive filter: 1 filter remains valid | 1 adaptive filter becomes valid. 3 rd notch filter related parameters will keep updating accordingly. | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | Reserved | - | | | | | | | | | | | | | | | | | | | | | |
| Pr2.01 | Label | 1 st notch frequency | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 50~4000 | Unit | Hz | Default | 4000 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0203 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set center frequency of 1 st torque command notch filter. Set Pr2.01 to 4000 to deactivate notch filter | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.02 | Label | 1 st notch width | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 0~20 | Unit | — | Default | 4 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0205 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set notch bandwidth for 1 st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.01 and Pr2.03, Pr2.02 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.03 | Label | 1 st notch depth | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 0~99 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0207 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set notch depth for 1 st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.01 and Pr2.02, Pr2.03 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings | | | | | | | | | | | | | | | | | | | | | | | |

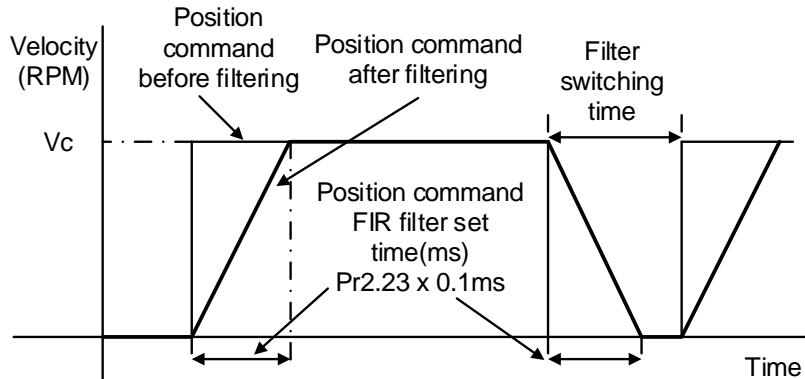
| | | | | | | | | |
|---|-------------|---------------------------------|-----------|-----|---------------|--------|---|---|
| Pr2.04 | Label | 2 nd notch frequency | | | Valid mode(s) | P | S | T |
| | Range | 50~4000 | Unit | Hz | Default | 4000 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0209 | | |
| | Valid | Immediate | | | | | | |
| Set center frequency of 2 nd torque command notch filter. Set Pr2.04 to 4000 to deactivate notch filter | | | | | | | | |
| Pr2.05 | Label | 2 nd notch width | | | Valid mode(s) | P | S | T |
| | Range | 0~20 | Unit | — | Default | 4 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020B | | |
| | Valid | Immediate | | | | | | |
| Set notch bandwidth for 2 nd resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.06, Pr2.05 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | | | |
| Pr2.06 | Label | 2 nd notch depth | | | Valid mode(s) | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020D | | |
| | Valid | Immediate | | | | | | |
| Set notch depth for 1 st resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | | | |
| Pr2.07 | Label | 3 rd notch frequency | | | Valid mode(s) | P | S | T |
| | Range | 50~4000 | Unit | Hz | Default | 4000 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020F | | |
| | Valid | Immediate | | | | | | |
| Set center frequency of 3 rd torque command notch filter. Set Pr2.07 to 4000 to deactivate notch filter | | | | | | | | |
| Pr2.08 | Label | 3 rd notch width | | | Valid mode(s) | P | S | T |
| | Range | 0~20 | Unit | — | Default | 4 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0211 | | |
| | Valid | Immediate | | | | | | |
| Set notch depth for 3 rd resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | | | |
| Pr2.09 | Label | 3 rd notch depth | | | Valid mode(s) | P | S | T |
| | Range | 0~99 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0213 | | |
| | Valid | Immediate | | | | | | |
| Set notch depth for 3 rd resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | | | |

| | | | | | | | |
|---|--------------------|-----------------------------------|------------------|-------|----------------------|----------|--|
| Pr2.14 | Label | 1 st damping frequency | | | Valid mode(s) | P | |
| | Range | 0/10~2000 | Unit | 0.1Hz | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x021D | |
| | Valid | Immediate | | | | | |
| Set Pr2.16 to 0 to deactivate this parameter. To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set Pr2.15 to wobble frequency (wobble frequency can be determined using tracing function of Motion Studio) | | | | | | | |
| Pr2.16 | Label | 2 nd damping frequency | | | Valid mode(s) | P | |
| | Range | 0/10~2000 | Unit | 0.1Hz | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0221 | |
| | Valid | Immediate | | | | | |
| Set Pr2.16 to 0 to deactivate this parameter. To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set Pr2.16 to wobble frequency (wobble frequency can be determined using tracing function of Motion Studio) | | | | | | | |

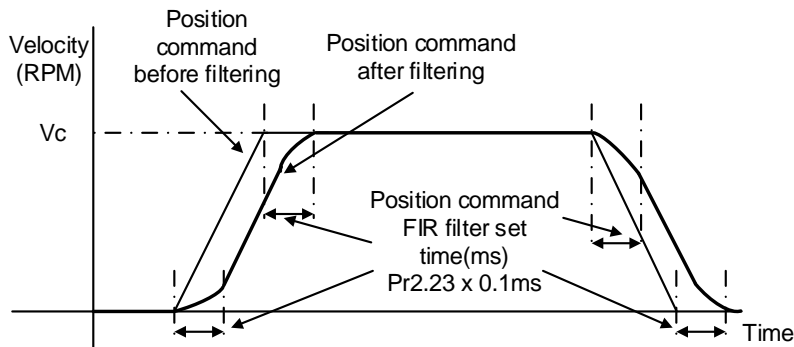
| | | | | | | | |
|---|--------------------|-----------------------------------|------------------|-------|----------------------|----------|--|
| Pr2.22 | Label | Position command smoothing filter | | | Valid mode(s) | P | |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x022D | |
| | Valid | At stop | | | | | |
| <p>To set time constant of 1 time delay filter of position command.</p> <p>To set time constant of 1 time delay filter, according to target velocity V_c square wave command as show below.</p>  <p>Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If Pr2.22 is set too high, overall time will be lengthened.</p> | | | | | | | |

| | | | | | | | |
|---------------|--------------------|-----------------------------|------------------|-------|----------------------|----------|--|
| Pr2.23 | Label | Position command FIR filter | | | Valid mode(s) | P | |
| | Range | 0~2500 | Unit | 0.1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x022F | |
| | Valid | At stop | | | | | |

As shown below, when target velocity V_c square wave command reaches V_c , it becomes trapezoidal wave after filtering.



As shown below, when target velocity V_c trapezoidal command reaches V_c , it becomes S wave after filtering.



Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If Pr2.23 is set too high, overall time will be lengthened.

Note: Please wait for command to stop and after filter idle time to modify Pr2.23.

Filter switching time = $(\text{Pr2.23 set value} \times 0.1\text{ms} + 0.25\text{ms})$

3.2.4 [Class 3] Velocity/Torque control

| | | | | | | |
|--------|-------------|--------------------------------------|-----------|-----|---------------|--------|
| Pr3.00 | Label | Velocity internal/external switching | | | Valid mode(s) | S |
| | Range | 0~3 | Unit | — | Default | 1 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0301 |
| | Valid | Immediate | | | | |

Connect to the right DI to control internal command velocity settings.

| Value | Velocity settings |
|-------|---|
| 0 | Analog - Velocity command (SPR) |
| 【1】 | Internal velocity settings 1 st – 4 th speed (Pr3.04~Pr3.07) |
| 2 | Internal velocity settings 1 st – 3 rd speed (Pr3.04~P3.06) 、 Analog velocity command (SPR) |
| 3 | Internal velocity settings 1 st – 8 th speed (Pr3.00~Pr3.11) |

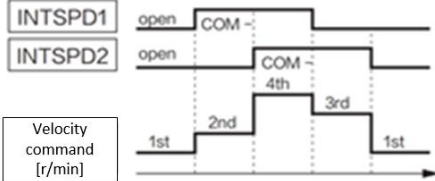
| Value | Internal command velocity 1 (INTSPD 1) | Internal command velocity 2 (INTSPD2) | Internal command velocity 3 (INTSPD3) | Velocity command |
|-------|---|--|--|---|
| 1 | OFF | OFF | No effect | 1 st speed |
| | ON | OFF | | 2 nd speed |
| | OFF | ON | | 3 rd speed |
| | ON | ON | | 4 th speed |
| 2 | OFF | OFF | No effect | 1 st speed |
| | ON | OFF | | 2 nd speed |
| | OFF | ON | | 3 rd speed |
| | ON | ON | | Simulated speed |
| 3 | Similar to Pr3.00=1 | | OFF | 1 st – 4 th speed |
| | OFF | OFF | ON | 5 th speed |
| | ON | OFF | ON | 6 th speed |
| | OFF | ON | ON | 7 th speed |
| | ON | ON | ON | 8 th speed |

Please change internal command velocity as per diagram below as unexpected axis movement might occurs if 2 command velocities are changed at the same time.

INTSPD1

INTSPD2

Velocity command
[r/min]

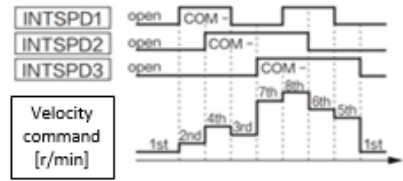


INTSPD1

INTSPD2

INTSPD3

Velocity command
[r/min]



Pr3.00=1 / 2

Pr3.00=3

| | | | | | | |
|---------------|--------------------|---|------------------|-----|----------------------|----------|
| Pr3.01 | Label | Velocity command rotational direction selection | | | Valid mode(s) | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0303 |
| | Valid | Immediate | | | | |

To set positive/negative direction of velocity command

| Value | Velocity settings (Analog or internal velocity) | Velocity command sign selection (VC-SIGN) | Velocity command direction |
|------------|--|---|----------------------------|
| 【0】 | + | No effect | Positive |
| | — | No effect | Negative |
| 1 | No effect | OFF | Positive |
| | No effect | ON | Negative |

| | | | | | | |
|---------------|--------------------|-----------------------------|------------------|-----------|----------------------|----------|
| Pr3.02 | Label | Velocity command input gain | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | (r/min)/V | Default | 500 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0305 |
| | Valid | Immediate | | | | |

To set gain changes from voltage added onto analog velocity command (SPR) to motor command velocity

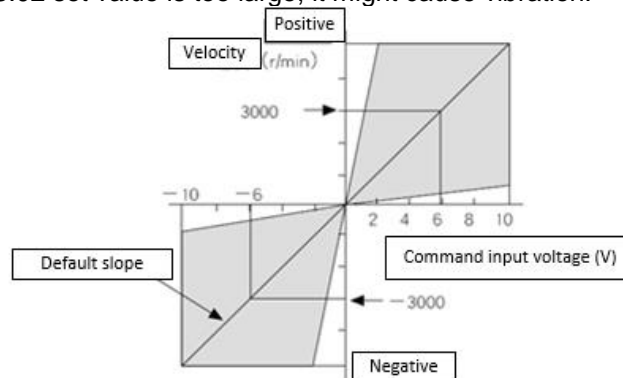
Pr3.02 sets command input voltage and rotational speed slope.

Factory default:

Pr3.02=500(r/min)/V.

Hence 6V input: 3000 r/min

1. Do not supply more than $\pm 10V$ power for analog velocity command (SPR).
2. If Pr3.02 set value is too large, it might cause vibration.



| | | | | | | |
|--------|-------------|----------------------------------|-----------|-----|---------------|--------|
| Pr3.03 | Label | Velocity command input inversion | | | Valid mode(s) | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0307 |
| | Valid | Immediate | | | | |

To set voltage polarity of analog velocity command.
Only valid when Pr3.01 = 0. When Pr3.01 = 1, rotational direction is only related to VC-SIGN.

| Value | Motor rotational direction | |
|-------|----------------------------|--|
| 【0】 | Not inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |
| 1 | Inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |

If there is an external position sensor with different polarity from Pr3.03, motor might undergo abnormal motion.

| | | | | | | |
|---|--------------------|-------------------------------|------------------|-------|----------------------|----------|
| Pr3.04 | Label | 1st speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0309 |
| | Valid | Immediate | | | | |
| Pr3.05 | Label | 2nd speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x030B |
| | Valid | Immediate | | | | |
| Pr3.06 | Label | 3rd speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x030D |
| | Valid | Immediate | | | | |
| Pr3.07 | Label | 4th speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x030F |
| | Valid | Immediate | | | | |
| Pr3.08 | Label | 5th speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0311 |
| | Valid | Immediate | | | | |
| Pr3.09 | Label | 6th speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0313 |
| | Valid | Immediate | | | | |
| Pr3.10 | Label | 7th speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0315 |
| | Valid | Immediate | | | | |
| Pr3.11 | Label | 8th speed of velocity setting | | | Valid mode(s) | S |
| | Range | -10000~10000 | Unit | r/min | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0317 |
| | Valid | Immediate | | | | |
| To set internal velocity command 1 st -8 th speed | | | | | | |

| | | | | | | |
|---------------|--------------------|----------------------------|------------------|------------------|----------------------|----------|
| Pr3.12 | Label | Acceleration time settings | | | Valid mode(s) | S |
| | Range | 0~10000 | Unit | ms/ (1000rpm) | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0319 |
| | Valid | Immediate | | | | |
| Pr3.13 | Label | Deceleration time settings | | | Valid mode(s) | S |
| | Range | 0~10000 | Unit | ms/ (1000rpm) | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x031B |
| | Valid | Immediate | | | | |

Set max acceleration/deceleration for velocity command.

If target velocity = x [rpm], max acceleration = a [unit: rpm/ms], acceleration time = t [ms]

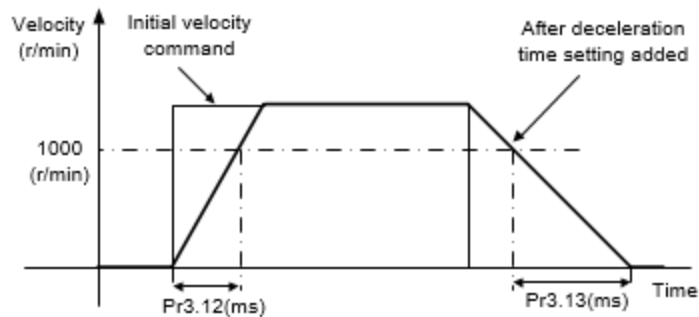
$$\text{Pr3.12} = 1000/a$$

$$\text{Pr3.13} = 1000/a$$

$$a = x/t$$

For example: If motor is to achieve 1500rpm in 30s, $a=1500/30=50\text{rpm/ms}$

Pr3.12 = $1000/a=20$. Hence when Pr3.12 = 20, motor can achieve 1500rpm in 30s.



Usually used when there is rapid acceleration or trapezoidal wave velocity command due to many different internal speed segments under velocity control mode which causes instable while motor in motion.

Under velocity control mode, 6083 and 6084 is limited by Pr3.12 and Pr3.13 correspondingly.

| | | | | | | |
|--------|--------------------|-------------------------------------|------------------|-----|----------------------|----------|
| Pr3.15 | Label | Zero speed clamp function selection | | | Valid mode(s) | S |
| | Range | 0~3 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x031F |
| | Valid | Immediate | | | | |

| Value | Zero speed clamp function |
|-------|--|
| 0 | Invalid: zero speed clamp deactivated |
| 1 | Velocity command is forced to 0 when the zero speed clamp (ZEROSPD) input signal is valid. |
| 2 | Velocity command is forced to 0 when actual velocity is lower than Pr3.16. |
| 3 | Includes conditions from 1 and 2 |

| | | | | | | | |
|---|-------------|--|-----------|-----|---------------|--------|---|
| Pr3.18 | Label | Torque command direction selection | | | Valid mode(s) | | T |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0325 | |
| | Valid | Immediate | | | | | |
| To set torque command positive/negative direction | | | | | | | |
| | Value | Direction settings | | | | | |
| | 【0】 | TC-SIGN ON/OFF has no effect on torque direction Torque command input 「Positive」 →Positive direction、 「Negative」 →Negative direction | | | | | |
| | 1 | Use TC-SIGN ON/OFF status for torque direction OFF: Positive direction ON: Negative direction | | | | | |

| | | | | | | | |
|--------|--------------------|---------------------------|------------------|-----------|----------------------|--------|----------|
| Pr3.19 | Label | Torque command input gain | | | Valid mode(s) | | T |
| | Range | 10~100 | Unit | 0.1V/100% | Default | 30 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0327 | |
| | Valid | Immediate | | | | | |

To set gain changes from voltage added onto analog torque command (TRQR) to torque command (%)

- Unit: (0.1V/100%)。
- Set input voltage required for rated output torque.
- Default = 30, which is 3V/100%

The graph illustrates the relationship between Command input voltage (X-axis, ranging from -10V to 10V) and Torque (Y-axis, ranging from -300% to 300%). Two linear plots are shown, both passing through the origin (0,0). The upper plot, labeled 'Positive', shows a line for 'Factory default' and a steeper line for 'Rated torque'. The lower plot, labeled 'Negative', shows a line for 'Factory default' and a less steep line for 'Rated torque'. The 'Rated torque' lines are shifted outwards from the origin compared to the 'Factory default' lines, indicating a gain change. The Y-axis is marked at 300%, 200%, 100%, 0%, -100%, -200%, and -300%. The X-axis is marked at -10V, -8, -6, -4, -2, 2, 4, 6, 8, and 10V.

| | | | | | | | |
|--------|-------------|--------------------------------|-----------|-----|---------------|--------|---|
| Pr3.20 | Label | Torque command input inversion | | | Valid mode(s) | | T |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0329 | |
| | Valid | Immediate | | | | | |

To set voltage polarity of analog torque command.
Only valid when Pr3.18 = 0.

| Value | Motor torque direction | |
|-------|------------------------|--|
| 【0】 | Not inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |
| 1 | Inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |

| | | | | | | | | |
|---|-------------|-------------------------------|-----------|-------|---------------|--------|--|---|
| Pr3.21 | Label | Velocity limit in torque mode | | | Valid mode(s) | | | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x032B | | |
| | Valid | Immediate | | | | | | |
| To set velocity limit in torque control mode. Only valid when Pr3.17 = 0 / 2. | | | | | | | | |

| | | | | | | | | |
|--------|--|----------------|-----------|-----|---------------|--------|--|---|
| Pr3.22 | Label | Torque command | | | Valid mode(s) | | | T |
| | Range | 0~300 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x032D | | |
| | Valid | Immediate | | | | | | |
| | To set torque limit in torque control mode. Only valid when Pr3.17 = 2. Please refer to Pr3.17. | | | | | | | |

| | | | | | | | | |
|--|-------------|--|-----------|-----|---------------|--------|---|--|
| Pr3.23 | Label | Zero speed delay time in velocity mode | | | Valid mode(s) | | S | |
| | Range | 0~2000 | Unit | ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x032F | | |
| | Valid | Immediate | | | | | | |
| To set the time interval between axis reaches zero speed level and the moment it totally stops. Used when axis crawls under velocity mode. Set 0 to deactivate this parameter. | | | | | | | | |

| Pr3.24 | Label | Maximum motor rotational speed | | | Valid mode(s) | P | S | T |
|---|-------------|--------------------------------|-----------|-------|---------------|--------|---|---|
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0331 | | |
| | Valid | Immediate | | | | | | |
| To set maximum motor rotational speed but not higher than motor rated speed If Pr3.24 = 0, maximum motor rotational speed = max. speed in motor parameter. | | | | | | | | |

| | | | | | | | |
|---------------|--------------------|---------------------------|------------------|-----|----------------------|--------|----------|
| Pr3.29 | Label | Analog 1 clamping voltage | | | Valid mode(s) | | T |
| | Range | 0~20000 | Unit | mv | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x033B | |
| | Valid | Immediate | | | | | |

Only valid when Pr3.17 = 1.
When Pr3.17=1, velocity is set to 0 if analog 1 voltage is below Pr3.29 set value.

| | | | | | | | |
|---------------|--------------------|---------------------------|------------------|-----|----------------------|--------|----------|
| Pr3.30 | Label | Analog 3 clamping voltage | | | Valid mode(s) | | T |
| | Range | 0~20000 | Unit | mv | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x033D | |
| | Valid | Immediate | | | | | |

Only valid when Pr3.17 = 1 / 0.
When Pr3.17=1 / 0, velocity is set to 0 if analog 1 voltage is below Pr3.30 set value.

3.2.5 [Class 4]I/O Monitoring Settings

| | | | | | | | | |
|---------------|--------------------|---------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr4.00 | Label | Input selection DI3 | | | Valid mode(s) | P | S | T |
| | Range | 0x00~0xFF | Unit | — | Default | 0x2 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0401 | | |
| | Valid | Immediate | | | | | | |

Please refer to the table below to set DI signals and table on the right for corresponding pin and parameters

| Signal | Symbol | Value | |
|--|---------|-------|----|
| | | NO | NC |
| Invalid | — | 0 | - |
| Positive limit switch | POT | 1 | 81 |
| Negative limit switch | NOT | 2 | 82 |
| Servo enabled | SRV-ON | 3 | 83 |
| Clear alarm | A-CLR | 4 | - |
| Control mode switching | C-MODE | 5 | 85 |
| Gain switching | GAIN | 6 | 86 |
| Clear deviation count | CL | 7 | - |
| Command pulse prohibited | INH | 8 | 88 |
| Torque limit switching | TL-SEL | 9 | 89 |
| Command frequency divider/multiplier switching | DIV1 | C | 8C |
| Internal command velocity 1 | INTSPD1 | E | 8E |
| Internal command velocity 2 | INTSPD2 | F | 8F |
| Internal command velocity 3 | INTSPD3 | 10 | 90 |
| Zero speed clamp | ZEROSPD | 11 | 91 |
| Velocity command sign | VC-SIGN | 12 | 92 |
| Torque command sign | TC-SIGN | 13 | 93 |
| Forced alarm | E-STOP | 14 | 94 |

| CN1&2 PIN | Input | Parameters |
|-----------|-------|------------|
| 6/20 | DI3 | Pr4.00 |
| 7/21 | DI4 | Pr4.01 |
| 8/22 | DI5 | Pr4.02 |
| 9/23 | DI6 | Pr4.03 |

Please don't set anything other than listed in table above.

Normally open (NO) : Valid when input = ON

Normally close (NC): Valid when input = OFF

Er210 might occur if same function is allocated to different channels at the same time

Servo enabled (SRV-ON) has to be allocated to enabled servo drive.

Inputs related to Pr-mode:

| Signal | Symbol | Value | |
|-----------------|--------|-------|----|
| | | NO | NC |
| Trigger command | CTRG | 20 | A0 |
| Home | HOME | 21 | A1 |
| Forced stop | STP | 22 | A2 |

| Signal | Symbol | Value | |
|----------------|--------|-------|----|
| | | NO | NC |
| Positive JOG | PJOG | 23 | A3 |
| Negative JOG | NJOG | 24 | A4 |
| Positive limit | PL | 25 | A5 |

| | | | |
|----------------|------|----|----|
| Negative limit | NL | 26 | A6 |
| Origin | ORG | 27 | A7 |
| Path address 0 | ADD0 | 28 | A8 |
| Path address 1 | ADD1 | 29 | A9 |
| Path address 2 | ADD2 | 2A | AA |
| Path address 3 | ADD3 | 2B | AB |

Note: CTRG, HOME are edge triggered, please make sure electronic bits last 1ms or above.

| | | | | | | | | |
|---|-------------|---------------------|-----------|-----|---------------|--------|---|---|
| Pr4.01 | Label | Input selection DI4 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x1 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0403 | | |
| | Valid | Immediate | | | | | | |
| Pr4.02 | Label | Input selection DI5 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0405 | | |
| | Valid | Immediate | | | | | | |
| Pr4.03 | Label | Input selection DI6 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x6 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0407 | | |
| | Valid | Immediate | | | | | | |
| DI4~DI6allocation is the same as DI1. Please refer to Pr4.00. | | | | | | | | |

| | | | | | | | | |
|--------|-------------|----------------------|-----------|-----|---------------|--------|---|---|
| Pr4.10 | Label | Output selection DO1 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x3 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0415 | | |
| | Valid | Immediate | | | | | | |

Please allocate DO as per table below. ALARM logic is the opposite of others

| Value | | Signal | Symbol |
|-------|----|----------------------------|----------|
| NO | NC | | |
| 00 | 80 | Invalid | — |
| 01 | 81 | Alarm | ALARM |
| 02 | 82 | Servo-Ready | SRDY |
| 03 | 83 | External brake released | BRK-OFF |
| 04 | 84 | Positioning completed | INP |
| 05 | 85 | At-speed | AT-SPPED |
| 06 | 86 | Torque limit signal | TLC |
| 07 | 87 | Zero speed clamp detection | ZSP |
| 08 | 88 | Velocity coincidence | V-COIN |
| 12 | 92 | Servo Status | SRV-ST |
| 15 | 95 | Positive limit valid | POT-OUT |
| 16 | 96 | Negative limit valid | NOT-OUT |
| 0B | 8B | Position command ON/OFF | P-CMD |
| 0F | 8F | Velocity command ON/OFF | V-CMD |
| 0D | 8D | Velocity limit signal | V-LIMIT |
| 14 | 94 | Position comparison | CMP-OUT |

Same signal can be assigned to multiple different outputs.

Normally open(NO): Active low

Normally close(NC): Active high

Err212 might occur if output is allocated to signals other than listed in the table above.

Outputs related to PR-mode

| Signal | Symbol | Value | |
|-------------------|---------|-------|----|
| | | NO | NC |
| Command completed | CMD-OK | 20 | A0 |
| Path completed | PR-OK | 21 | A1 |
| Homing done | HOME-OK | 22 | A2 |

Note: CMD-OK indicates PR command is sent by axis might not yet be in position. PR-OK indicates axis is in place.

| | | | | | | | | |
|---|--------------------|----------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr4.11 | Label | Output selection DO2 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x2 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0417 | | |
| | Valid | Immediate | | | | | | |
| Pr4.12 | Label | Output selection DO3 | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0xFF | Unit | — | Default | 0x1 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0419 | | |
| | Valid | Immediate | | | | | | |
| DO2/DO3 is allocated by the same method as per DO1. Please refer to Pr4.10. | | | | | | | | |

| | | | | | | | | |
|--|--------------------|---|------------------|--------|----------------------|--------|----------|--|
| Pr4.22 | Label | Analog input 1(AI-1) Zero drift settings | | | Valid mode(s) | | S | |
| | Range | -1860~1860 | Unit | 5.37mv | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x042D | | |
| | Valid | Immediate | | | | | | |
| To set zero drift compensation value on analog input 1 voltage for zero drift correction. | | | | | | | | |
| Pr4.23 | Label | Analog input 1(AI-1) filter | | | Valid mode(s) | | S | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x042F | | |
| | Valid | Immediate | | | | | | |
| To set a delay filter time coefficient for AI1 input voltage. When filter time takes effect, input voltage will be smoothen. | | | | | | | | |
| Pr4.24 | Label | Analog input 1(AI-1) overvoltage settings | | | Valid mode(s) | | S | |
| | Range | 0~100 | Unit | 0.1V | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0431 | | |
| | Valid | Immediate | | | | | | |
| Pr4.24 is invalid when set to 0. Er270 might occur when the input voltage of AI1 is higher than the voltage after zero drift correction. | | | | | | | | |

| | | | | | | | |
|--|-------------|----------------------------|-----------|-----------------|---------------|--------|--|
| Pr4.31 | Label | Positioning complete range | | | Valid mode(s) | P | |
| | Range | 0~10000 | Unit | Pr5.21 set unit | Default | 20 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x043F | |
| | Valid | Immediate | | | | | |
| <p>To set position deviation range of INP1 positioning completed output signal. INP1 output signal will be valid once position is complete within the range of deviation set.</p> <p><i>Default unit: 0.00001rev. Can be set on Pr5.21 as command unit (pulse) or encoder unit (pulse)</i></p> | | | | | | | |

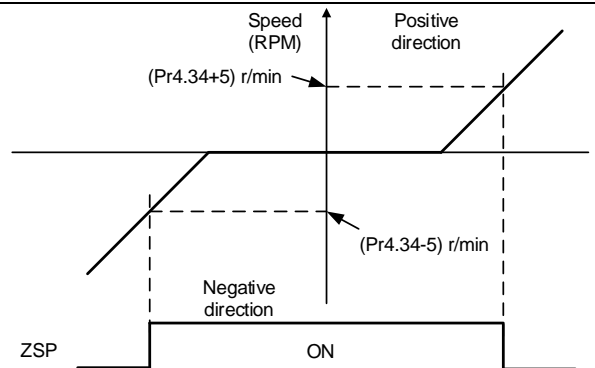
| | | | | | | | |
|--|-------------|--|-----------|-----|---------------|--------|--|
| Pr4.32 | Label | Positioning complete output setting | | | Valid mode(s) | P | |
| | Range | 0~4 | Unit | — | Default | 1 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0441 | |
| | Valid | Immediate | | | | | |
| To set conditions for INP1 output signal to be valid | | | | | | | |
| Value | | Positioning completed signal | | | | | |
| 0 | | Signal valid when the position deviation is smaller than Pr4.31 | | | | | |
| 1 | | Signal valid when there is no position command and position deviation is smaller than Pr4.31 | | | | | |
| 2 | | Signal valid when there is no position command, zero-speed clamp detection (ZSP) signal is ON and the positional deviation is smaller than Pr4.31 | | | | | |
| 3 | | Signal valid when there is no position command and position deviation is smaller than Pr4.31. Signal ON when within the time set in Pr4.33 otherwise OFF. | | | | | |
| 4 | | When there is no command, position detection starts after the delay time set in Pr4.33. Signal valid when there is no position command and positional deviation is smaller than Pr4.31. | | | | | |
| Pr4.33 | Label | INP positioning delay time | | | Valid mode(s) | P | |
| | Range | 0~15000 | Unit | 1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0443 | |
| | Valid | Immediate | | | | | |
| Valid when Pr4.32 = 3. | | | | | | | |
| Set value | | Positioning completed signal | | | | | |
| 0 | | Indefinite delay time, signal ON until next position command | | | | | |
| 1-15000 | | OFF within the time set; ON after time set. Switch OFF after receiving next position command. | | | | | |

| | | | | | | | | |
|---------------|--------------------|------------|------------------|-------|----------------------|----------|----------|----------|
| Pr4.34 | Label | Zero speed | | | Valid mode(s) | P | S | T |
| | Range | 1~2000 | Unit | r/min | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0445 | | |
| | Valid | Immediate | | | | | | |

To set threshold value for zero speed clamp detection.

Zero speed clamp detection (ZSP) output signal valid when motor speed goes under the value set in Pr4.34

- Disregard the direction of rotation, valid for both directions.
- Hysteresis of 5RPM. Please refer to diagram on the right side.



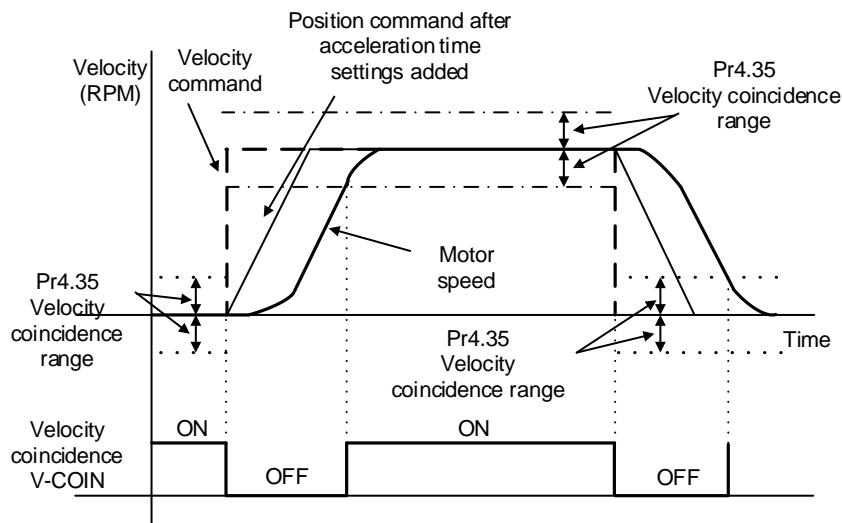
| | | | | | | | | |
|---------------|--------------------|----------------------------|------------------|-------|----------------------|--------|----------|--|
| Pr4.35 | Label | Velocity coincidence range | | | Valid mode(s) | | S | |
| | Range | 10~2000 | Unit | r/min | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0447 | | |
| | Valid | Immediate | | | | | | |

If the difference between velocity command and motor actual speed is below Pr4.35, Velocity coincidence (V-COIN) output signal valid.

Due to 10RPM hysteresis:

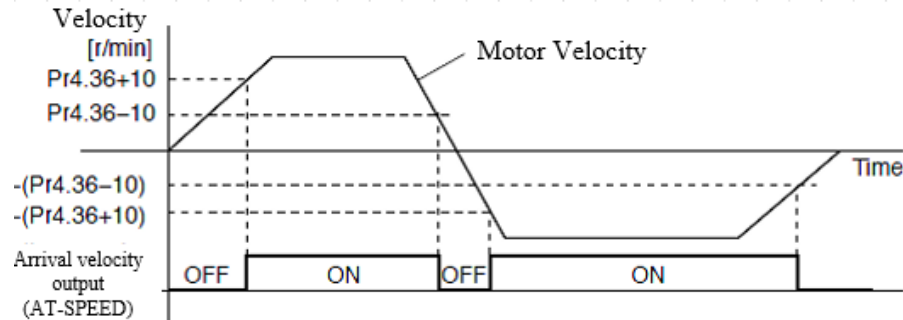
Velocity coincidence output OFF -> ON timing (Pr4.35 -10) r/min

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



| | | | | | | |
|---------------|--------------------|------------------|------------------|-------|----------------------|----------|
| Pr4.36 | Label | Reached velocity | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | r/min | Default | 1000 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0449 |
| | Valid | Immediate | | | | |

When motor velocity > Pr4.36, AT-speed output signal is valid.
Detection using 10RPM hysteresis.



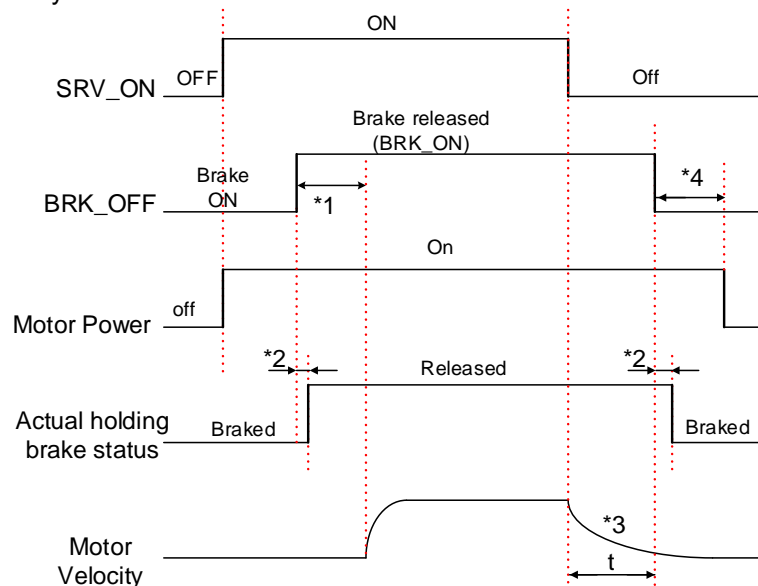
| | | | | | | | | |
|---------------|--------------------|---------------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr4.37 | Label | Holding brake deactivation delay time | | | Valid mode(s) | P | S | T |
| | Range | 0~3000 | Unit | 1ms | Default | 150 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x044B | | |
| | Valid | Immediate | | | | | | |

To set delay time for holding brake to be activated after motor power off to prevent axis from sliding.

When Pr5.06 = 0, SRV-ON signal is off, holding brake is activated (delay time is determined by Pr4.39 or Pr6.14). Motor powered-off once delay time set in Pr4.37 is due.

| | | | | | | | | |
|---------------|--------------------|-------------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr4.38 | Label | Holding brake activation delay time | | | Valid mode(s) | P | S | T |
| | Range | 0~3000 | Unit | 1ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x044D | | |
| | Valid | Immediate | | | | | | |

To set delay time for holding brake to be released after motor power on. Motor will remain at current position and input command is masked to allow holding brake to be fully released before motor is set in motion.



- *1: Delay time set in Pr4.38
 *2: Delay time from the moment BRK_OFF signal is given until actual holding brake is released or BRK_ON signal is given until actual holding brake is activated. It is dependent on the holding brake of the motor.
 *3: Deceleration time is determined by Pr6.14 or if motor speed goes below Pr4.39, whichever comes first. BRK_OFF given after deceleration time.
 *4: Pr4.37 set time value.

Delay time from the moment SRV_ON is given until BRK_OFF switch to BRK_ON, is less than 500ms.

| Pr4.43 | Label | Emergency stop function | | | Valid mode(s) | P | S | T |
|--------|-------------|-------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0457 | | |
| | Valid | Immediate | | | | | | |

| Value | Description. |
|-------|---|
| 【0】 | Emergency stop is valid, servo driver will be forced to STOP and Err570 occurs. |
| 1 | Emergency stop is invalid, servo driver will not be forced to STOP. Servo can be enabled once E-STOP signal is cleared. |

3.2.6 [Class 5] Extension Settings

| | | | | | | | | |
|--------|-------------|--|-----------|-------|---------------|------------------------|--|--|
| Pr5.00 | Label | 2 nd pulse count per revolution | | | Valid mode(s) | P | | |
| | Range | 0-67108864 | Unit | PULSE | Default | 10000 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0500 L: 0x0501 | | |
| | Valid | After restart | | | | | | |

Switch between Pr0.08 and Pr5.00 with DI signal DIV1.

When switch to Pr5.00:

 (1) Pr5.00 valid when ≠ 0:

Motor revolution = Input pulse count / [Pr5.00 set value]

 (2) Pr5.00 invalid when = 0:

Actual position pulse count is according to Pr5.01 and Pr5.02.

Switching with DIV1 signal only valid when servo drive is re-enabled.

| | | | | | | | | |
|---------------|--------------------|--|------------------|-----|----------------------|------------------------|--|--|
| Pr5.01 | Label | 2 nd Command frequency divider/multiplier numerator | | | Valid mode(s) | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0502 L: 0x0503 | | |
| | Valid | After restart | | | | | | |

To set command pulse input frequency division and multiplication numerator

| | | | | | | | | |
|---------------|--------------------|--|------------------|-----|----------------------|------------------------|--|--|
| Pr5.02 | Label | 2 nd Command frequency divider/multiplier denominator | | | Valid mode(s) | P | | |
| | Range | 1~1073741824 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0504 L: 0x0505 | | |
| | Valid | After restart | | | | | | |

To set command pulse input frequency division and multiplication denominator. Please refer to Pr0.09 and Pr0.10. Switch using DIV1 signal.

| | | | | | | | | |
|---------------|--------------------|-----------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.04 | Label | Driver prohibition input settings | | | Valid mode(s) | P | S | T |
| | Range | 0/1/2 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0509 | | |
| | Valid | Immediate | | | | | | |

To set driver prohibition input (POT/NOT)

| Value | Description |
|--------------|--|
| 0 | POT → Positive direction drive prohibited NOT → Negative direction drive prohibited |
| 1 | POT and NOT invalid |
| 2 | Any single sided input from POT or NOT might cause Er260 |

| | | | | | | | | |
|---------------|--------------------|----------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.06 | Label | Servo-off mode | | | Valid mode(s) | P | S | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x050D | | |
| | Valid | Immediate | | | | | | |

To set servo driver disable mode and status.

| Set value | Explanation |
|-----------|---|
| 0 | Driver disables after velocity reaching value set in Pr4.39 |
| 1 | Driver disables immediately, axis in free stopping mode |

| | | | | | | | | |
|---------------|--------------------|------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.11 | Label | Servo braking torque setting | | | Valid mode(s) | P | S | T |
| | Range | 0~500 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0517 | | |
| | Valid | Immediate | | | | | | |

To set torque limit for servo braking mode.

If Pr5.11 = 0, use torque limit as under normal situation.

Please note that if Pr5.11 set value is too low, emergency stop will take longer.

| | | | | | | | | |
|---------------|--------------------|------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.12 | Label | Overload level setting | | | Valid mode(s) | P | S | T |
| | Range | 0~115 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0519 | | |
| | Valid | Immediate | | | | | | |

- When set to 0, overload level = 100%.

- Set to 0 under regular usage. Lowering overload level will cause motor to overload in shorter time.

- Er100 occurs when driver output current higher than motor rated current (overload)

- Er101 occurs when driver output current lower than motor rated current

| | | | | | | | | |
|---------------|--------------------|--------------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr5.13 | Label | Overspeed level settings | | | Valid mode(s) | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x051B | | |
| | Valid | Immediate | | | | | | |

If motor speed exceeds Pr5.13, Er1A0 might occur.

When Pr5.13 = 0, overspeed level = max. motor speed x 1.2

| | | | | | | | | |
|---------------|--------------------|--------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr5.15 | Label | I/O digital filter | | | Valid mode(s) | P | S | T |
| | Range | 0~255 | Unit | 0.1ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x051F | | |
| | Valid | After restart | | | | | | |

Digital filtering of I/O input. Overly large value set will cause control delay.

| | | | | | | | | |
|---------------|--------------------|-----------------------------|------------------|-----|----------------------|----------|--|--|
| Pr5.17 | Label | Counter clearing input mode | | | Valid mode(s) | P | | |
| | Range | 0~4 | Unit | — | Default | 3 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0523 | | |
| | Valid | Immediate | | | | | | |

To set the clearing conditions for deviation counter clearing input signal.

| Value | Condition |
|-------|---------------------------------------|
| 0/2/4 | Invalid |
| 1 | Always clear |
| 3 | Clear only once (Rising edge trigger) |

| | | | | | | | |
|--------|-------------|------------------------|-----------|-----|---------------|--------|--|
| Pr5.20 | Label | Position unit settings | | | Valid mode(s) | P | |
| | Range | 0~2 | Unit | — | Default | 1 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0529 | |
| | Valid | Immediate | | | | | |

Set unit for position related parameters

| Value | Unit |
|-------|--------------|
| 0 | Encoder unit |
| 1 | Command unit |
| 2 | 0.0001rev |

Command unit: Pulse from host (Affected by electronic gear ratio)
Encoder unit: Pulse from encoder (Related to encoder resolution)
Pr5.20 can only be modified when axis is disabled as it will clear position data

| | | | | | | | | |
|--------|-------------|------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.21 | Label | Torque limit selection | | | Valid mode(s) | P | S | T |
| | Range | 0~6 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x052B | | |
| | Valid | Immediate | | | | | | |

| Value | | Limit |
|-------|------------|--|
| 【0】 | | 1 st torque limit Pr0.13 |
| 1 | | 2 nd torque limitPr5.22 |
| 2 | TL-SEL OFF | Pr0.13 |
| | TL-SEL ON | Pr5.22 |
| 3~4 | | Reserved |
| 5 | | Pr0.13 →Positive torque limit Pr5.22 →Negative torque limit |

| Pr5.22 | Label | 2 nd torque limit | | | Valid mode(s) | P | S | T |
|--|-------------|------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~500 | Unit | % | Default | 300 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x052D | | |
| | Valid | Immediate | | | | | | |
| Pr5.22 is limited by max. torque set in motor parameter. | | | | | | | | |

| | | | | | | | | |
|---------------|--------------------|-----------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.23 | Label | Positive torque warning threshold | | | Valid mode(s) | P | S | T |
| | Range | 0~300 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x052F | | |
| | Valid | Immediate | | | | | | |

Default = 0, which is 95%. Other values only valid when Pr5.21 = 5.
If actual torque higher than threshold, TLC torque limit signal will be valid.

| | | | | | | | | |
|---------------|--------------------|-----------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr5.24 | Label | Negative torque warning threshold | | | Valid mode(s) | P | S | T |
| | Range | 0~300 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0531 | | |
| | Valid | Immediate | | | | | | |

Default = 0, which is 95%. Other values only valid when Pr5.21 = 5.
If actual torque higher than threshold, TLC torque limit signal will be valid.

| Pr5.29 | Label | RS485 communication mode | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------|------------------------------------|-----------|-----|---------------|--------|---|---|-------|-----------|----------|---------|---|---------|------|---------|---|----------|-------|-----------|-----|----------|------|----------|---|-----------|-----|---|---|---|------|---|-----|---|------|---|
| | Range | 0~255 | Unit | — | Default | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Valid | After restart | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th>Bit</th><th>Checksum</th><th>Stop</th></tr><tr><td>0</td><td>8</td><td>Even</td><td>2</td></tr><tr><td>1</td><td>8</td><td>Odd</td><td>2</td></tr><tr><td>2</td><td>8</td><td>Even</td><td>1</td></tr><tr><td>3</td><td>8</td><td>Odd</td><td>1</td></tr><tr><td>4</td><td>8</td><td>Null</td><td>1</td></tr><tr><td>【5】</td><td>8</td><td>Null</td><td>2</td></tr></table> | | | | | | | | | Value | Bit | Checksum | Stop | 0 | 8 | Even | 2 | 1 | 8 | Odd | 2 | 2 | 8 | Even | 1 | 3 | 8 | Odd | 1 | 4 | 8 | Null | 1 | 【5】 | 8 | Null | 2 |
| Value | Bit | Checksum | Stop | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 8 | Even | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 8 | Odd | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 8 | Even | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 8 | Odd | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 8 | Null | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 【5】 | 8 | Null | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.30 | Label | RS485 communication Baud rate | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0~15 | Unit | — | Default | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053D | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Valid | After restart | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th>Baud rate</th></tr><tr><td>0</td><td>2400bps</td></tr><tr><td>1</td><td>4800bps</td></tr><tr><td>2</td><td>9600bps</td></tr><tr><td>3</td><td>19200bps</td></tr></table> <table><tr><th>Value</th><th>Baud rate</th></tr><tr><td>【4】</td><td>38400bps</td></tr><tr><td>5</td><td>57600bps</td></tr><tr><td>6</td><td>115200bps</td></tr></table> <p>Baud rate tolerance: 2400~38400bps±0.5%, 57600~115200bps±2%</p> | | | | | | | | | Value | Baud rate | 0 | 2400bps | 1 | 4800bps | 2 | 9600bps | 3 | 19200bps | Value | Baud rate | 【4】 | 38400bps | 5 | 57600bps | 6 | 115200bps | | | | | | | | | | |
| Value | Baud rate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 2400bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 4800bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 9600bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 19200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value | Baud rate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 【4】 | 38400bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 57600bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 115200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.31 | Label | RS485 axis address | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0~127 | Unit | — | Default | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Valid | After restart | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| When controller is connected to multiple axis and controller needs to identify the axis, Pr5.31 can be used to set the axis ID/address. Please set to a max of 31 if the communication is between RS232 and RS485 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.32 | Label | Max. command pulse input frequency | | | Valid mode(s) | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0~8000 | Unit | kHz | Default | 4100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0541 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Please set the max. frequency required for command pulse input. Er1B0 will occur, if command pulse input frequency exceeds Pr5.32. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

3.2.7 [Class 6] Other settings

| Pr6.01 | Label | Encoder zero position compensation | | | Valid mode(s) | P | S | T |
|---|-------------|------------------------------------|-----------|---------------------|---------------|--------|---|---|
| | Range | 0~360 | Unit | Electrical angel | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0603 | | |
| | Valid | Power-off | | | | | | |
| Zero position compensation for encoder zero drift to avoid abnormality due to zero drift. | | | | | | | | |

| | | | | | | | | |
|---------------|--------------------|------------------------------|------------------|-----|----------------------|--------|--|----------|
| Pr6.03 | Label | JOG trial run torque command | | | Valid mode(s) | | | T |
| | Range | 0~350 | Unit | % | Default | 350 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0607 | | |
| | Valid | Immediate | | | | | | |

To set torque for JOG trial run command.

| | | | | | | | | |
|---------------|--------------------|--------------------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr6.04 | Label | JOG trial run velocity command | | | Valid mode(s) | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 30 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0609 | | |
| | Valid | Immediate | | | | | | |

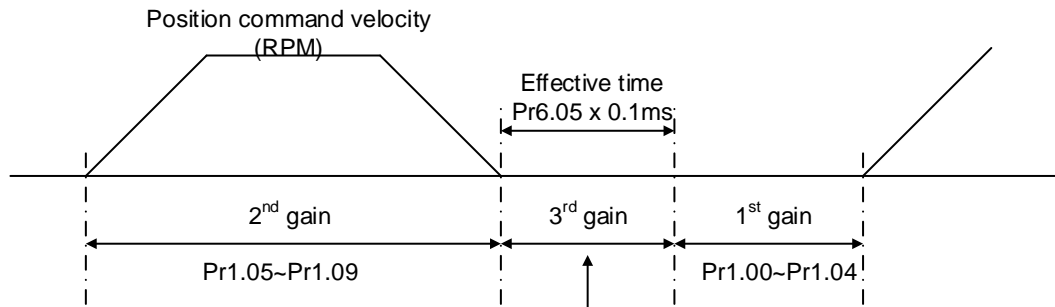
To set velocity for JOG trial run command.

| | | | | | | | | |
|---------------|--------------------|--|------------------|-------|----------------------|----------|--|--|
| Pr6.05 | Label | Position 3 rd gain valid time | | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060B | | |
| | Valid | Immediate | | | | | | |

To set time for 3rd gain to be valid
Only available in position mode
When not in use, set Pr6.05=0, Pr6.06=100

| | | | | | | | | |
|---------------|--------------------|--|------------------|------|----------------------|----------|--|--|
| Pr6.06 | Label | Position 3 rd gain scale factor | | | Valid mode(s) | P | | |
| | Range | 50~1000 | Unit | 100% | Default | 100 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060D | | |
| | Valid | Immediate | | | | | | |

Set up the 3rd gain by multiplying factor of the 1st gain



Position loop gain = $Pr1.00 \times Pr6.06/100$

Velocity loop gain = $Pr1.01 \times Pr6.06/100$

Velocity loop integral time constant, Velocity detection filter,
Torque filter time constant still uses 1st gain

Above diagram is illustrated using $Pr1.15 = 7$.

3rd gain = 1st gain * $Pr6.06/100$

Only effective under position control mode. 3rd gain valid when $Pr6.05 \neq 0$. Set 3rd gain value in $Pr6.06$. When 2nd gain switches to 1st gain, it will go through 3rd, switching time is set in $Pr1.19$.

| Pr6.07 | Label | Torque command additional value | | | Valid mode(s) | P | S | T |
|---|-------------|---------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060F | | |
| | Valid | Immediate | | | | | | |
| <p>To set torque forward feed additional value of vertical axis. Applicable for loaded vertical axis, compensate constant torque. Application: When load move along vertical axis, pick any point from the whole motion and stop the load at that particular point with motor enabled but not rotating. Record output torque value from d04, use that value as torque command additional value (compensation value)</p> | | | | | | | | |

| Pr6.08 | Label | Positive direction torque compensation value | | | Valid mode(s) | P | S | T |
|---|-------------|--|-----------|-----|---------------|--------|---|---|
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0611 | | |
| | Valid | Immediate | | | | | | |
| Pr6.09 | Label | Negative direction torque compensation value | | | Valid mode(s) | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0613 | | |
| | Valid | Immediate | | | | | | |
| <p>To reduce the effect of mechanical friction in the movement(s) of the axis. Compensation values can be set according to needs for both rotational directions.</p> <p>Applications:</p> <p>1. When motor is at constant speed, d04 will deliver torque values. Torque value in positive direction = T1; Torque value in negative direction = T2</p> | | | | | | | | |

$$Pr6.08/Pr6.09 = T_f = \frac{|T1 - T2|}{2}$$

Positive/Negative compensation corresponds to actual position feedback.

Positive torque compensation value = $+(Pr6.08=+T_f)$

Negative torque compensation value = $-(Pr6.08=+T_f)$

$Pr6.08 = x$, $Pr6.09 = y$; friction compensation value = $|x-y|/2$

| Pr6.11 | Label | Current response settings | | | Valid mode(s) | P | S | T |
|---|-------------|---------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 50~100 | Unit | % | Default | 100 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0617 | | |
| | Valid | Immediate | | | | | | |
| To set driver current loop related effective value ratio. | | | | | | | | |

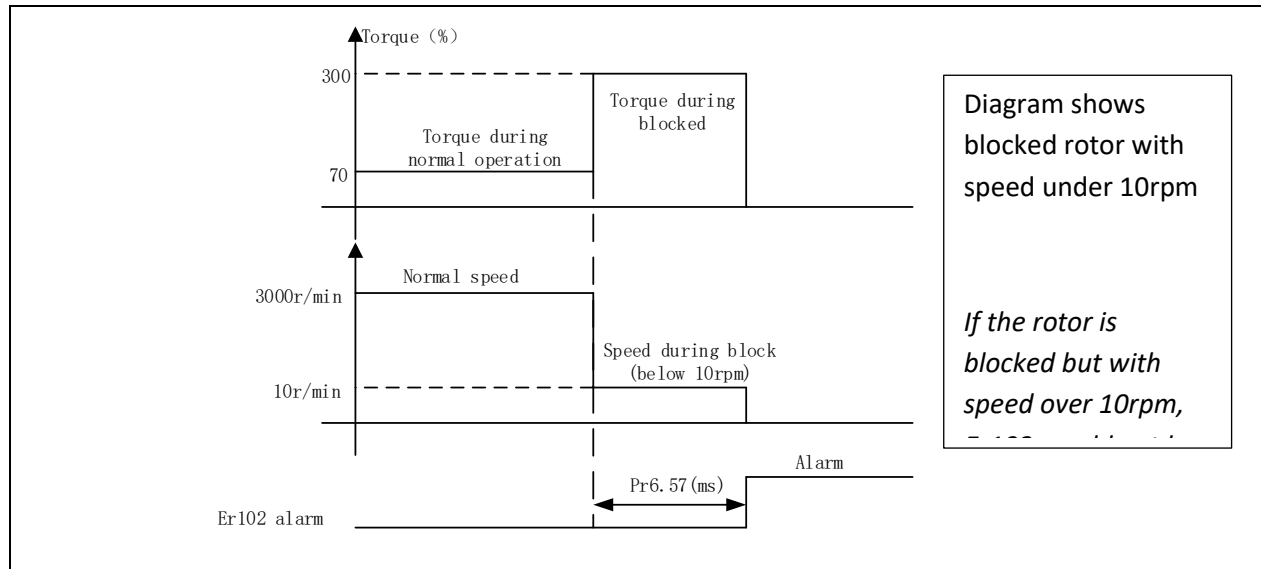
| | | | | | | | | |
|--|--|-----------------------------------|-----------|-----|---------------|--------|---|---|
| Pr6.14 | Label | Max. time to stop after disabling | | | Valid mode(s) | P | S | T |
| | Range | 0~1000 | Unit | ms | Default | 500 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x061D | | |
| | Valid | Immediate | | | | | | |
| | To set the max. time allowed for the axis to stop on emergency stop or normal axis disabling. After disabling axis, if motor speed is still higher than Pr4.39 but the time set in Pr6.14 is reached, BRK_ON given and holding brake activated. BRK_ON given time is determined by Pr6.14 or when motor speed goes below Pr4.39, whichever comes first. | | | | | | | |
| Applications: 1. After disabling axis, if motor speed is still higher than Pr4.39 but the time set in Pr6.14 is reached, BRK_ON given and holding brake activated. 2. After disabling axis, if motor speed is already lower than Pr4.39 but the time set in Pr6.14 is not yet reached, BRK_ON given and holding brake activated. | | | | | | | | |
| Dynamic brake will be provide the braking function if the function is activated for motors without holding brake. | | | | | | | | |

| | | | | | | | | |
|--|-------------|-------------------------|-----------|--------|---------------|--------|--|--|
| Pr6.20 | Label | Trial run distance | | | Valid mode(s) | P | | |
| | Range | 0~1200 | Unit | 0.1rev | Default | 10 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0629 | | |
| | Valid | Immediate | | | | | | |
| JOG (Position control) : Distance travel of each motion. | | | | | | | | |
| Pr6.21 | Label | Trial run waiting time | | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | ms | Default | 300 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x062B | | |
| | Valid | Immediate | | | | | | |
| JOG (Position control) : Waiting time interval after each motion cycle | | | | | | | | |
| Pr6.22 | Label | No. of trial run cycles | | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | — | Default | 5 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x062D | | |

| | | | | | | |
|--|--------------------|------------------------|------------------|-----|----------------------|-------------------|
| | Valid | Immediate | | | | |
| JOG (Position control) : No. of cycles When Pr6.22, trial run goes into endless cycles. | | | | | | |
| Pr6.25 | Label | Trial run acceleration | | | Valid mode(s) | P S |
| | Range | 0~10000 | Unit | ms | Default | 200 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0633 |
| | Valid | Immediate | | | | |
| To set the acceleration/deceleration time for JOG command between 0 rpm to 1000 rpm | | | | | | |

| | | | | | | |
|---------------|--------------------|---------------------------------|------------------|-----|----------------------|-------------------|
| Pr6.28 | Label | Shaft lock current raising time | | | Valid mode(s) | P S |
| | Range | 0~32767 | Unit | % | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0639 |
| | Valid | Immediate | | | | |
| Pr6.29 | Label | Shaft lock duration time | | | Valid mode(s) | P S |
| | Range | 0~32767 | Unit | μs | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x063B |
| | Valid | Immediate | | | | |

| | | | | | | |
|---|--------------------|--------------------------------------|------------------|-----|----------------------|-------------------|
| Pr6.56 | Label | Blocked rotor alarm torque threshold | | | Valid mode(s) | P S |
| | Range | 0~300 | Unit | % | Default | 300 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0671 |
| | Valid | Immediate | | | | |
| To set the torque threshold of blocked rotor to trigger alarm. (Alarm triggered if torque output% larger than threshold value & under 10rpm) If Pr6.56 = 0, blocked rotor alarm deactivated. If motor speed is 10rpm or above, Err102 won't be triggered. | | | | | | |
| Pr6.57 | Label | Blocked rotor alarm delay time | | | Valid mode(s) | P S |
| | Range | 1~10000 | Unit | ms | Default | 400 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0673 |
| | Valid | Immediate | | | | |
| To set delay time for blocked rotor alarm. Err102 won't be triggered if time doesn't exceed set time in Pr6.57. Blocked rotor alarm is activated by default, alarm torque threshold = 300%, delay time = 400ms; speed threshold = 10rpm; | | | | | | |



| | | | | | | | | |
|---------------|--------------------|-------------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr6.63 | Label | Absolute multiturn data upper limit | | | Valid mode(s) | P | S | T |
| | Range | 0~32766 | Unit | rev | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x067F | | |
| | Valid | After restart | | | | | | |

Use Pr0.15 = 2 in rotational mode, Feedback position cycles between 0 and (Pr6.63+1) x encoder resolution.
Absolute multiturn data will be set to 0 if reaches upper limit.

3.2.8 [Class 7] Factory settings

**Please take precaution when modifying Class 7 parameters. Might cause driver errors*

| | | | | | | | | |
|---------------|--------------------|---------------|------------------|-----|----------------------|----------|----------|----------|
| Pr7.15 | Label | Motor model | | | Valid mode(s) | P | S | T |
| | Range | 0x0~0x7FFF | Unit | — | Default | 0x200 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x071F | | |
| | Valid | After restart | | | | | | |

| Value | Description |
|---------|-------------------|
| 0x100 | Read from EEPROM |
| [0x200] | Read from Encoder |

When Pr7.15 = 0x200(2xx):

| Parameter | Label |
|-----------|------------------------------|
| Pr7.00 | Current loop gain |
| Pr7.01 | Current loop integral time |
| Pr7.05 | No. of motor pole pairs |
| Pr7.06 | Motor phase resistance |
| Pr7.07 | Motor D/Q induction |
| Pr7.08 | Motor back EMF coefficient |
| Pr7.09 | Motor torque coefficient |
| Pr7.10 | Motor rated rotational speed |
| Pr7.11 | Motor max. rotational speed |
| Pr7.12 | Motor rated current |
| Pr7.13 | Motor rotor inertia |

| | | | | | | |
|---------------|--------------------|----------------------------------|------------------|-----|----------------------|--------------|
| | Pr7.14 | Driver power rating | | | | |
| | Pr7.16 | Encoder | | | | |
| | Pr7.17 | Motor max. current | | | | |
| | Pr7.18 | Encoder index angle compensation | | | | |
| Pr7.16 | Label | Encoder | | | Valid mode(s) | P S T |
| | Range | 0x0~0x200 | Unit | — | Default | Encoder |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0721 |
| | Valid | After restart | | | | |

3.2.9 [Class 8] PR control parameters

| | | | | | | | | | | | | | | | | |
|--|--|---|--|--|---------------|--------|-----|---|---|---|---|-------------|--|---|--|--|
| Pr8.00 | Label | PR Control | | | Valid mode(s) | PR | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6000 | | | | | | | | | | |
| It is recommended to modify PR control parameters using Motion Studio. | | | | | | | | | | | | | | | | |
| <table><tr><td>Bit</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>Description</td><td>=1, absolute value memory =0, absolute value with no memory</td><td>=1, homing upon power on =0, no homing upon power on</td><td>=1, software position limit valid =0, software position limit not valid</td><td>=0, CTRG rising edge trigger =1, double edges trigger</td></tr></table> | | | | | | | Bit | 3 | 2 | 1 | 0 | Description | =1, absolute value memory =0, absolute value with no memory | =1, homing upon power on =0, no homing upon power on | =1, software position limit valid =0, software position limit not valid | =0, CTRG rising edge trigger =1, double edges trigger |
| Bit | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| Description | =1, absolute value memory =0, absolute value with no memory | =1, homing upon power on =0, no homing upon power on | =1, software position limit valid =0, software position limit not valid | =0, CTRG rising edge trigger =1, double edges trigger | | | | | | | | | | | | |
| If parameter modifications are done through the front panel or parameters list, please keep in mind that PR control parameters byte are decimal system. For example: If Bit 3, 2, 1, 0 are to be set to 1 (1111). Conversion using decimal system, 1111 = 15. Pr8.00 is to be set to 15. | | | | | | | | | | | | | | | | |

| | | | | | | |
|---------------|--------------------|-------------------|------------------|-----|----------------------|-----------|
| Pr8.01 | Label | Path count | | | Valid mode(s) | PR |
| | Range | 16 | Unit | / | Default | 16 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6001 |
| 16 paths | | | | | | |
| Pr8.02 | Label | Control Operation | | | Valid mode(s) | PR |
| | Range | 0x0 ~ 0xFFFF | Unit | / | Default | 0x0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6002 |

Attributes of Pr8.02 functions are divided into Read/Write. P refers to positioning motion of *N* path. Please refer to the following table.

| Attribute | Address | Description |
|-----------|---------------------------|--|
| Write | 0x01P | <i>N</i> path positioning |
| Write | 0x020 | Reset |
| Write | 0x021 | Manually set currently position as 0 (Origin) |
| Write | 0x040 | Emergency stop |
| Read | 0x000P | Positioning completed. Ready to receive new data |
| Read | 0x01P, 0x020, 0x040 | Yet to respond to command |
| Read | 0x10P | Path motion undergoing |
| Read | 0x200 | Command completed. Waiting for positioning |

| Pr8.06 | Label | Software positive limit H | | | Valid mode(s) | PR |
|---|-------------|---------------------------|-----------|-------|---------------|--------|
| | Range | 0~ 65535 | Unit | Pulse | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6006 |
| High bit of software positive limit; (Only valid using 485 communication) | | | | | | |

| | | | | | | |
|---|--------------------|-----------------------------|------------------|-------|----------------------|-----------|
| Pr8.07 | Label | Software positive limit (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6007 |
| To set software positive limit position (32 bit base) Using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr8.06 When software positive limit = 994817, 0x000F2E01(Hexadecimal) high16bit = 0x000F, hence Pr8.05 reading = 0x000F, controller = 15. R/W of high/low bit data is similar when using 485 communication. | | | | | | |
| Pr8.08 | Label | Software negative limit H | | | Valid mode(s) | PR |
| | Range | 0~ 0x65535 | Unit | Pulse | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6008 |
| High bit of software negative limit; (Only valid using 485 communication) | | | | | | |
| Pr8.09 | Label | Software negative limit (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6009 |
| To set software positive limit position. Using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr8.08. | | | | | | |

| | | | | | | |
|---|--------------------|-----------------|---|---|------------------------------------|----------------------------|
| Pr8.10 | Label | Homing mode | | | Valid mode(s) | PR |
| | Range | 0~ 0xFFFF | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X600A |
| To set homing method in PR mode. It is recommended to modify PR control parameters using Motion Studio. | | | | | | |
| | | Bit | 8 (Z-signal homing) | 2-7 (Homing mode) | 1 (Specific position after homing) | 0 (Homing direction) |
| | | Description | =1, homing with Z-signal =0, homing without Z-signal | =0 Limit homing =1 Origin homing =2 Single turn Z homing =3 Torque homing =8 Immediate homing | =1, Yes =0, No | =1, Forward =0, Reverse |
| Pr8.11 | Label | Zero position H | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X600B |
| High bit of zero position; (Only valid using 485 communication) | | | | | | |

| | | | | | | |
|--|--------------------|----------------------------|------------------|-----|----------------------|-----------|
| Pr8.12 | Label | Zero position (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | p | Default | 0 |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X600C |
| To set zero position. Using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr8.11. | | | | | | |

| | | | | | | |
|---|--------------------|--------------------------------------|------------------|---------|----------------------|-----------|
| Pr8.13 | Label | Home position offset H | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X600D |
| High bit of home position offset: (Only valid using 485 communication) | | | | | | |
| Pr8.14 | Label | Home position offset (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | p | Default | 0 |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X600E |
| To set home position offset. Using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr8.13. | | | | | | |
| Pr8.15 | Label | High homing velocity | | | Valid mode(s) | PR |
| | Range | 1 ~ 6000 | Unit | rpm | Default | 200 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X600F |
| To set high homing velocity in PR mode. | | | | | | |
| Pr8.16 | Label | Low homing velocity | | | Valid mode(s) | PR |
| | Range | 1 ~ 6000 | Unit | rpm | Default | 50 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6010 |
| To set low homing velocity in PR mode. | | | | | | |
| Pr8.17 | Label | Homing acceleration | | | Valid mode(s) | PR |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6011 |
| To set homing acceleration time in PR mode, time needed for 0rpm to accelerate to 1000rpm | | | | | | |
| Pr8.18 | Label | Homing deceleration | | | Valid mode(s) | PR |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6012 |
| To set homing deceleration time in PR mode, time needed for 1000rpm to decelerate to 0rpm | | | | | | |
| Pr8.19 | Label | Homing torque holding time | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | ms | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6013 |
| To set homing torque holding time | | | | | | |
| Pr8.20 | Label | Homing torque | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | % | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6014 |
| To set homing torque | | | | | | |
| Pr8.21 | Label | Homing overtravel alarm range | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | 0.1r | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6015 |
| To set homing overtravel alarm threshold. | | | | | | |
| Pr8.22 | Label | Emergency stop at limit deceleration | | | Valid mode(s) | PR |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 10 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6016 |
| To set position limit emergency stop deceleration. | | | | | | |

| | | | | | | |
|---|--------------------|---------------------------------|------------------|---------|----------------------|-----------|
| Pr8.23 | Label | STP emergency stop deceleration | | | Valid mode(s) | PR |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 50 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6017 |
| To set STP emergency stop deceleration. | | | | | | |

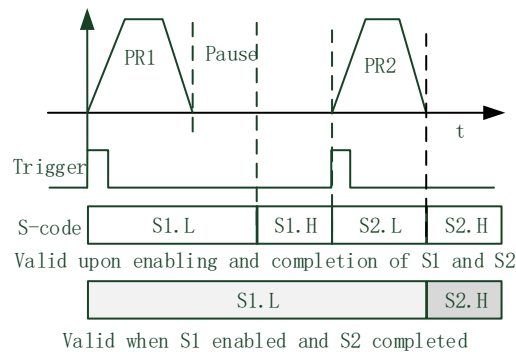
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|------------------------------|-----------|---------------------|---------------|--------|-------|-------------|------|--|----------------|---|-----|--|-----|---------------------|-----|-----|-----|----|-------|-----|-----|----|-----|-------|-----|-----|----|----|-------|-----|----|-----|-----|-------|-----|----|-----|----|-------|-----|----|----|-----|-------|-----|----|----|----|-------|----|-----|-----|-----|-------|----|-----|-----|----|-------|----|-----|----|-----|--------|----|-----|----|----|--------|----|----|-----|-----|--------|----|----|-----|----|--------|----|----|----|-----|--------|----|----|----|----|--------|
| Pr8.26 | Label | I/O combination trigger mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X601A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>Value</td><td>Description</td></tr><tr><td>【0】</td><td>Disable I/O combination trigger mode. Uses I/O CTRG signal edge trigger.</td></tr><tr><td>1</td><td>Enable I/O combination trigger. Valid when HOME-OK signal is valid.</td></tr><tr><td>2</td><td>Enable I/O combination trigger. HOME-OK signal not required.</td></tr></table> | | | | | | | Value | Description | 【0】 | Disable I/O combination trigger mode. Uses I/O CTRG signal edge trigger. | 1 | Enable I/O combination trigger. Valid when HOME-OK signal is valid. | 2 | Enable I/O combination trigger. HOME-OK signal not required. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 【0】 | Disable I/O combination trigger mode. Uses I/O CTRG signal edge trigger. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Enable I/O combination trigger. Valid when HOME-OK signal is valid. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Enable I/O combination trigger. HOME-OK signal not required. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IO combination trigger select path using ADD0~ADD3. Trigger mode is set in Pr8.26. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>ADD3</td><td>ADD2</td><td>ADD1</td><td>ADD0</td><td>Path selection</td></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Path 0 (Non-action)</td></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>Path1</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>Path2</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>Path3</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td><td>Path4</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>Path5</td></tr><tr><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>Path6</td></tr><tr><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>Path7</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Path8</td></tr><tr><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>Path9</td></tr><tr><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>Path10</td></tr><tr><td>ON</td><td>OFF</td><td>ON</td><td>ON</td><td>Path11</td></tr><tr><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>Path12</td></tr><tr><td>ON</td><td>ON</td><td>OFF</td><td>ON</td><td>Path13</td></tr><tr><td>ON</td><td>ON</td><td>ON</td><td>OFF</td><td>Path14</td></tr><tr><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>Path15</td></tr></table> | | | | | | | ADD3 | ADD2 | ADD1 | ADD0 | Path selection | OFF | OFF | OFF | OFF | Path 0 (Non-action) | OFF | OFF | OFF | ON | Path1 | OFF | OFF | ON | OFF | Path2 | OFF | OFF | ON | ON | Path3 | OFF | ON | OFF | OFF | Path4 | OFF | ON | OFF | ON | Path5 | OFF | ON | ON | OFF | Path6 | OFF | ON | ON | ON | Path7 | ON | OFF | OFF | OFF | Path8 | ON | OFF | OFF | ON | Path9 | ON | OFF | ON | OFF | Path10 | ON | OFF | ON | ON | Path11 | ON | ON | OFF | OFF | Path12 | ON | ON | OFF | ON | Path13 | ON | ON | ON | OFF | Path14 | ON | ON | ON | ON | Path15 |
| ADD3 | ADD2 | ADD1 | ADD0 | Path selection | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | OFF | OFF | OFF | Path 0 (Non-action) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | OFF | OFF | ON | Path1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | OFF | ON | OFF | Path2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | OFF | ON | ON | Path3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | ON | OFF | OFF | Path4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | ON | OFF | ON | Path5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | ON | ON | OFF | Path6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OFF | ON | ON | ON | Path7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | OFF | OFF | OFF | Path8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | OFF | OFF | ON | Path9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | OFF | ON | OFF | Path10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | OFF | ON | ON | Path11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | ON | OFF | OFF | Path12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | ON | OFF | ON | Path13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | ON | ON | OFF | Path14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON | ON | ON | ON | Path15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr8.27 | Label | I/O combination filter | | | Valid mode(s) | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | ms | Default | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X601B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| To set I/O combination filter time. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|---------------|--------------------|-----------------------------|------------------|-----|----------------------|-----------|
| Pr8.28 | Label | S-code current output value | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X601C |

S-code (Status code) is the S-code of currently operating PR positioning data.
Every PR path has a S-code setting.

| | | | | |
|-------------|---|------------------------|--|------------------------|
| S-code | Sx.H | | Sx.L | |
| Bit | 15 | 8-14 | 7 | 0-6 |
| Description | S-code valid when completed. 0: Invalid, retain previous value 1: Valid | S-code upon completion | S-code valid upon activation 0: Invalid 1: Valid | S-code upon activation |

Sequence diagram



| | | | | | | | |
|------------|--------|--------|---------|---------|---------|---------|---------|
| S-code bit | bit0/8 | bit1/9 | bit2/10 | bit3/11 | bit4/12 | bit5/13 | Bit6/14 |
| SDx | SD0 | SD1 | SD2 | SD3 | SD4 | SD5 | SD6 |

| | | | | | | |
|---------------|--------------------|--------------------------------------|------------------|-----|----------------------|-----------|
| Pr8.29 | Label | PR warning | | | Valid mode(s) | PR |
| | Range | 0x0~0x20F | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X601D |
| | Address | Warning | | | | |
| | 0 | Reset new command automatically | | | | |
| | 0x100 | Position limit error during homing | | | | |
| | 0x101 | Emergency stop. Homing not completed | | | | |
| | 0x102 | Homing overtravel alarm | | | | |
| | 0x20x | Position limit error on Path N | | | | |

| | | | | | | |
|----------------------------------|--------------------|------------------|------------------|---------|----------------------|-----------|
| Pr8.39 | Label | JOG velocity | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | rpm | Default | 100 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6027 |
| Set JOG velocity in PR mode. | | | | | | |
| Pr8.40 | Label | JOG acceleration | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | ms/Krpm | Default | 100 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6028 |
| Set JOG acceleration in PR mode. | | | | | | |

| | | | | | | |
|----------------------------------|--------------------|------------------|------------------|---------|----------------------|-----------|
| Pr8.41 | Label | JOG deceleration | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | ms/Krpm | Default | 100 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6029 |
| Set JOG deceleration in PR mode. | | | | | | |

| | | | | | | |
|--|--------------------|--------------------|------------------|---|----------------------|-----------|
| Pr8.42 | Label | Command position H | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X602A |
| High bit of command position; (Only valid using 485 communication) | | | | | | |

| | | | | | | |
|---------------|--------------------|----------------------------|------------------|---|----------------------|-----------|
| Pr8.43 | Label | Command position (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | p | Default | |
| | Byte length | 32bit | Attribute | R | 485 address | 0X602B |

To set PR-motion command position.
Using 485 communication, only able to R/W low 16 bit.
R/W high 16 bit needs to be realized through Pr8.42.

| | | | | | | |
|--|--------------------|------------------|------------------|---|----------------------|-----------|
| Pr8.44 | Label | Motor position H | | | Valid mode(s) | PR |
| | Range | 0~ 0xFFFF | Unit | / | Default | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X602C |
| High bit of command position; (Only valid using 485 communication) | | | | | | |

| | | | | | | |
|---------------|--------------------|----------------------------|------------------|---|----------------------|-----------|
| Pr8.45 | Label | Motor position (L) | | | Valid mode(s) | PR |
| | Range | -2147483648~ 2147483647 | Unit | p | Default | |
| | Byte length | 32bit | Attribute | R | 485 address | 0X602D |

Using 485 communication, only able to R/W low 16 bit.
R/W high 16 bit needs to be realized through Pr8.44.

| | | | | | | |
|---------------|--------------------|------------------|------------------|---|----------------------|-----------|
| Pr8.46 | Label | Input I/O status | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X602E |

Input I/O status, displays in decimal system. Convert to binary system to determine which bit is valid.

| | | | | | | |
|---------------|--------------------|-------------------|------------------|---|----------------------|-----------|
| Pr8.47 | Label | Output I/O status | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X602F |

Output I/O status, displays in decimal system. Convert to binary system to determine which bit is valid.

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.48 | Label | Path 0 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6030 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.49 | Label | Path 1 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6031 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.50 | Label | Path 2 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6032 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.51 | Label | Path 3 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6033 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.52 | Label | Path 4 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6034 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.53 | Label | Path 5 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6035 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.54 | Label | Path 6 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6036 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.55 | Label | Path 7 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6037 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.56 | Label | Path 8 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6038 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|---------------|------------------|---|----------------------|-----------|
| Pr8.57 | Label | Path 9 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6039 |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.58 | Label | Path 10 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603A |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.59 | Label | Path 11 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603B |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.60 | Label | Path 12 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603C |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.61 | Label | Path 13 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603D |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.62 | Label | Path 14 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603E |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

| | | | | | | |
|--|--------------------|----------------|------------------|---|----------------------|-----------|
| Pr8.63 | Label | Path 15 S-code | | | Valid mode(s) | PR |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R | 485 address | 0X603F |
| Please refer to Pr8.28 for S-code setting. | | | | | | |

3.2.10 [Class 9] PR control path parameters

It is more convenient to set Class 9 parameters on Motion Studio

| Pr9.00 | Label | PR0 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6200 | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Bit</th><th>14</th><th>8-13</th><th>6-7</th><th>5</th><th>4</th><th>0-3</th></tr> </thead> <tbody> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </tbody> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.01 | Label | PR0 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6201 | | | | | | | | | | | | | | |
| High bit of Path 0 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.02 | Label | PR0 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6202 | | | | | | | | | | | | | | |
| For Path 0 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.02. | | | | | | | | | | | | | | | | | | | | |
| Pr9.03 | Label | PR0 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6203 | | | | | | | | | | | | | | |
| To set PR path 0 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.04 | Label | PR0 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6204 | | | | | | | | | | | | | | |
| To set PR path 0 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.05 | Label | PR0 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6205 | | | | | | | | | | | | | | |
| To set PR path 0 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.06 | Label | PR0 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6206 | | | | | | | | | | | | | | |
| To set pause time for PR path 0 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.07 | Label | PR0 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6207 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.08 | Label | PR1 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6208 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.09 | Label | PR1 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6209 | | | | | | | | | | | | | | |
| High bit of Path 1 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.10 | Label | PR1 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X620A | | | | | | | | | | | | | | |
| For Path position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.09. | | | | | | | | | | | | | | | | | | | | |
| Pr9.11 | Label | PR1 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X620B | | | | | | | | | | | | | | |
| To set PR path 1 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.12 | Label | PR1 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X620C | | | | | | | | | | | | | | |
| To set PR path 1 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.13 | Label | PR1 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X620D | | | | | | | | | | | | | | |
| To set PR path 1 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.14 | Label | PR1 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X620E | | | | | | | | | | | | | | |
| To set pause time for PR path 2 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.15 | Label | PR1 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X620F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.16 | Label | PR2 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6210 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.17 | Label | PR2 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6211 | | | | | | | | | | | | | | |
| High bit of Path 2 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.18 | Label | PR2 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6212 | | | | | | | | | | | | | | |
| For Path 2 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.17. | | | | | | | | | | | | | | | | | | | | |
| Pr9.19 | Label | PR2 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6213 | | | | | | | | | | | | | | |
| To set PR path 2 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.20 | Label | PR2 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6214 | | | | | | | | | | | | | | |
| To set PR path 2 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.21 | Label | PR2 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6215 | | | | | | | | | | | | | | |
| To set PR path 2 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.22 | Label | PR2 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6216 | | | | | | | | | | | | | | |
| To set pause time for PR path 2 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.23 | Label | PR2 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6217 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.24 | Label | PR3 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6218 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.25 | Label | PR3 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6219 | | | | | | | | | | | | | | |
| High bit of Path 3 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.26 | Label | PR3 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X621A | | | | | | | | | | | | | | |
| For Path 3 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.25. | | | | | | | | | | | | | | | | | | | | |
| Pr9.27 | Label | PR3 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X621B | | | | | | | | | | | | | | |
| To set PR path 3 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.28 | Label | PR3 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X621C | | | | | | | | | | | | | | |
| To set PR path 3 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.29 | Label | PR3 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X621D | | | | | | | | | | | | | | |
| To set PR path 0 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.30 | Label | PR3 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X621E | | | | | | | | | | | | | | |
| To set pause time for PR path 3 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.31 | Label | PR3 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X621F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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| Pr9.32 | Label | PR4 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6220 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.33 | Label | PR4 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6221 | | | | | | | | | | | | | | |
| High bit of Path 0 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.34 | Label | PR4 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6222 | | | | | | | | | | | | | | |
| For Path 4 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.33. | | | | | | | | | | | | | | | | | | | | |
| Pr9.35 | Label | PR4 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6223 | | | | | | | | | | | | | | |
| To set PR path 4 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.36 | Label | PR0 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6224 | | | | | | | | | | | | | | |
| To set PR path 4 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.37 | Label | PR4deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6225 | | | | | | | | | | | | | | |
| To set PR path 4 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.38 | Label | PR4 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6226 | | | | | | | | | | | | | | |
| To set pause time for PR path 4 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.39 | Label | PR4 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6227 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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| Pr9.40 | Label | PR5 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6228 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.41 | Label | PR5 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6229 | | | | | | | | | | | | | | |
| High bit of Path 5 position: (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.42 | Label | PR5 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X622A | | | | | | | | | | | | | | |
| For Path 0 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.41. | | | | | | | | | | | | | | | | | | | | |
| Pr9.43 | Label | PR5 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X622B | | | | | | | | | | | | | | |
| To set PR path 5 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.44 | Label | PR5 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X622C | | | | | | | | | | | | | | |
| To set PR path 5 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.45 | Label | PR5 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X622D | | | | | | | | | | | | | | |
| To set PR path 5 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.46 | Label | PR5 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X622E | | | | | | | | | | | | | | |
| To set pause time for PR path 5 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.47 | Label | PR5 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X622F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.48 | Label | PR6 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6230 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.49 | Label | PR6 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6231 | | | | | | | | | | | | | | |
| High bit of Path 6 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.50 | Label | PR6 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6232 | | | | | | | | | | | | | | |
| For Path 6 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.49. | | | | | | | | | | | | | | | | | | | | |
| Pr9.51 | Label | PR6 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6233 | | | | | | | | | | | | | | |
| To set PR path 6 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.52 | Label | PR6 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6234 | | | | | | | | | | | | | | |
| To set PR path 6 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.53 | Label | PR6 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6235 | | | | | | | | | | | | | | |
| To set PR path 6 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.54 | Label | PR6 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6236 | | | | | | | | | | | | | | |
| To set pause time for PR path 6 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.55 | Label | PR6 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6237 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.56 | Label | PR7 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6238 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.57 | Label | PR7 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6239 | | | | | | | | | | | | | | |
| High bit of Path 7 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.58 | Label | PR7 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X623A | | | | | | | | | | | | | | |
| For Path 7 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.57. | | | | | | | | | | | | | | | | | | | | |
| Pr9.59 | Label | PR7 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X623B | | | | | | | | | | | | | | |
| To set PR path 7 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.60 | Label | PR7 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X623C | | | | | | | | | | | | | | |
| To set PR path 7 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.61 | Label | PR0 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X623D | | | | | | | | | | | | | | |
| To set PR path 0 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.62 | Label | PR7 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X623E | | | | | | | | | | | | | | |
| To set pause time for PR path 7 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.63 | Label | PR7 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X623F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.64 | Label | PR8 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6240 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.65 | Label | PR8 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6241 | | | | | | | | | | | | | | |
| High bit of Path 0 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.66 | Label | PR8 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6242 | | | | | | | | | | | | | | |
| For Path 8 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.65. | | | | | | | | | | | | | | | | | | | | |
| Pr9.67 | Label | PR8 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6243 | | | | | | | | | | | | | | |
| To set PR path 8 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.68 | Label | PR8 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6244 | | | | | | | | | | | | | | |
| To set PR path 8 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.69 | Label | PR8 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6245 | | | | | | | | | | | | | | |
| To set PR path 8 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.70 | Label | PR8 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6246 | | | | | | | | | | | | | | |
| To set pause time for PR path 8 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.71 | Label | PR8 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6247 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

| Pr9.72 | Label | PR9 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6248 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <th>Bit</th><th>14</th><th>8-13</th><th>6-7</th><th>5</th><th>4</th><th>0-3</th></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.73 | Label | PR9 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6249 | | | | | | | | | | | | | | |
| High bit of Path 9 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.74 | Label | PR9 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X624A | | | | | | | | | | | | | | |
| For Path 9 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.73. | | | | | | | | | | | | | | | | | | | | |
| Pr9.75 | Label | PR0 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X624B | | | | | | | | | | | | | | |
| To set PR path 0 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.76 | Label | PR9 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X624C | | | | | | | | | | | | | | |
| To set PR path 9 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.77 | Label | PR9 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X624D | | | | | | | | | | | | | | |
| To set PR path 9 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.78 | Label | PR9 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X624E | | | | | | | | | | | | | | |
| To set pause time for PR path 9 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.79 | Label | PR9 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X624F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.80 | Label | PR10 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6250 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.81 | Label | PR10 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6251 | | | | | | | | | | | | | | |
| High bit of Path10 position: (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.82 | Label | PR10 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6252 | | | | | | | | | | | | | | |
| For Path 10 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.81. | | | | | | | | | | | | | | | | | | | | |
| Pr9.83 | Label | PR10 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6253 | | | | | | | | | | | | | | |
| To set PR path 10 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.84 | Label | PR10 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6254 | | | | | | | | | | | | | | |
| To set PR path 10 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.85 | Label | PR10 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6255 | | | | | | | | | | | | | | |
| To set PR path 10 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.86 | Label | PR10 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6256 | | | | | | | | | | | | | | |
| To set pause time for PR path 10 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.87 | Label | PR10 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6257 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.88 | Label | PR11 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6258 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.89 | Label | PR11 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6259 | | | | | | | | | | | | | | |
| High bit of Path 11 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.90 | Label | PR11 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X625A | | | | | | | | | | | | | | |
| For Path 11 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.89. | | | | | | | | | | | | | | | | | | | | |
| Pr9.91 | Label | PR11 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X625B | | | | | | | | | | | | | | |
| To set PR path 11 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.92 | Label | PR11 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X625C | | | | | | | | | | | | | | |
| To set PR path 11 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.93 | Label | PR11 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X625D | | | | | | | | | | | | | | |
| To set PR path 11 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.94 | Label | PR11 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X625E | | | | | | | | | | | | | | |
| To set pause time for PR path 11 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.95 | Label | PR11 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X625F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.96 | Label | PR12 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6260 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.97 | Label | PR12 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6261 | | | | | | | | | | | | | | |
| High bit of Path 12 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.98 | Label | PR12 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6262 | | | | | | | | | | | | | | |
| For Path 12 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.97. | | | | | | | | | | | | | | | | | | | | |
| Pr9.99 | Label | PR12 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6263 | | | | | | | | | | | | | | |
| To set PR path 12 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.100 | Label | PR12 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6264 | | | | | | | | | | | | | | |
| To set PR path 12 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.101 | Label | PR12 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6265 | | | | | | | | | | | | | | |
| To set PR path 12 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.102 | Label | PR12 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6266 | | | | | | | | | | | | | | |
| To set pause time for PR path 12 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.103 | Label | PR12 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6267 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.104 | Label | PR13 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6268 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Bit</td><td>14</td><td>8-13</td><td>6-7</td><td>5</td><td>4</td><td>0-3</td></tr> <tr> <td>Definition</td><td>0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ</td><td>0-15: Jump to correspond path</td><td>0: absolute 1: correspond command 2: correspond motor</td><td>0: No overlap, indicates with SJ 1 Overlap, indicated with CJ</td><td>0: Can be Interrupt 1: Can't be Interrupt, indicates using !</td><td>0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S</td></tr> </table> | | | | | | | Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S |
| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.105 | Label | PR13 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6269 | | | | | | | | | | | | | | |
| High bit of Path 13 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.106 | Label | PR13 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X626A | | | | | | | | | | | | | | |
| For Path 13 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.105. | | | | | | | | | | | | | | | | | | | | |
| Pr9.107 | Label | PR13 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X626B | | | | | | | | | | | | | | |
| To set PR path 13 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.108 | Label | PR13 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X626C | | | | | | | | | | | | | | |
| To set PR path 13 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.109 | Label | PR13 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X626D | | | | | | | | | | | | | | |
| To set PR path 13 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.110 | Label | PR13 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X626E | | | | | | | | | | | | | | |
| To set pause time for PR path 13 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.111 | Label | PR13 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X626F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.112 | Label | PR14 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6270 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.113 | Label | PR14 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6271 | | | | | | | | | | | | | | |
| High bit of Path 14 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.114 | Label | PR14 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~ 2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X6272 | | | | | | | | | | | | | | |
| For Path 14 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.113. | | | | | | | | | | | | | | | | | | | | |
| Pr9.115 | Label | PR14 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6273 | | | | | | | | | | | | | | |
| To set PR path 14 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.116 | Label | PR14 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6274 | | | | | | | | | | | | | | |
| To set PR path 14 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.117 | Label | PR14 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6275 | | | | | | | | | | | | | | |
| To set PR path 14 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.118 | Label | PR14 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6276 | | | | | | | | | | | | | | |
| To set pause time for PR path 14 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.119 | Label | PR14 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X6277 | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

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|--|---|-------------------------------|---|--|---|--|-----|----|------|-----|---|---|-----|------------|---|-------------------------------|---|--|---|--|
| Pr9.120 | Label | PR15 mode | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0x0~0xFFFF | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6278 | | | | | | | | | | | | | | |
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| Bit | 14 | 8-13 | 6-7 | 5 | 4 | 0-3 | | | | | | | | | | | | | | |
| Definition | 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0-15: Jump to correspond path | 0: absolute 1: correspond command 2: correspond motor | 0: No overlap, indicates with SJ 1 Overlap, indicated with CJ | 0: Can be Interrupt 1: Can't be Interrupt, indicates using ! | 0: null 1: Positioning 2: Velocity motion 3: Homing 4: Emergency stop Indicates using P/V/H/S | | | | | | | | | | | | | | |
| Pr9.121 | Label | PR15 position H | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0~ 0xFFFF | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X6279 | | | | | | | | | | | | | | |
| High bit of Path 15 position; (Only valid using 485 communication) | | | | | | | | | | | | | | | | | | | | |
| Pr9.122 | Label | PR15 position(L) | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -2147483648~2147483647 | Unit | Pulse | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | 0X627A | | | | | | | | | | | | | | |
| For Path 15 position, using 485 communication, only able to R/W low 16 bit. R/W high 16 bit needs to be realized through Pr9.121. | | | | | | | | | | | | | | | | | | | | |
| Pr9.123 | Label | PR15 velocity | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | -10000~10000 | Unit | rpm | Default | 60 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X627B | | | | | | | | | | | | | | |
| To set PR path 15 velocity. | | | | | | | | | | | | | | | | | | | | |
| Pr9.124 | Label | PR15 acceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~ 32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X627C | | | | | | | | | | | | | | |
| To set PR path 15 acceleration time, time needed for 0rpm to accelerate to 1000rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.125 | Label | PR15 deceleration time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 1 ~32767 | Unit | ms/Krpm | Default | 100 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X627D | | | | | | | | | | | | | | |
| To set PR path 15 deceleration time, time needed for 1000rpm to decelerate to 0rpm | | | | | | | | | | | | | | | | | | | | |
| Pr9.126 | Label | PR15 pause time | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 32767 | Unit | ms | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X627E | | | | | | | | | | | | | | |
| To set pause time for PR path 15 from completion to next path | | | | | | | | | | | | | | | | | | | | |
| Pr9.127 | Label | PR15 special parameter | | | Valid mode(s) | PR | | | | | | | | | | | | | | |
| | Range | 0 ~ 65535 | Unit | / | Default | 0 | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0X627F | | | | | | | | | | | | | | |
| Reserved | | | | | | | | | | | | | | | | | | | | |

3.2.11 [Class B] Status Parameters

| | | | | | | | | |
|--|-------------|-----------------------------|------------------|-------|---------------|--------|---|---|
| PrB.00 | Label | Software version 1（DSP） | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B00 | | |
| Show DSP software version info. | | | | | | | | |
| PrB.01 | Label | Software version 2（CPLD） | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B01 | | |
| Show software version info. | | | | | | | | |
| PrB.02 | Label | Software version 3（Others） | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B02 | | |
| Show software version info. | | | | | | | | |
| PrB.03 | Label | Current alarm | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B03 | | |
| Show current alarm | | | | | | | | |
| PrB.04 | Label | Motor not rotating cause | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B04 | | |
| Show cause of motor not rotating | | | | | | | | |
| PrB.05 | Label | Driver operation status | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B05 | | |
| | Bit | Status | Description | | | | | |
| | 0 | RDY | Servo is ready | | | | | |
| | 1 | RUN | Servo is running | | | | | |
| | 2 | ERR | Driver error | | | | | |
| | 3 | HOME_OK | Homing completed | | | | | |
| | 4 | INP | In position | | | | | |
| | 5 | AT-SPEED | Velocity reached | | | | | |
| | 6~15 | | Reserved | | | | | |
| PrB.06 | Label | Motor speed (Before filter) | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | rpm | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B06 | | |
| Motor actual speed | | | | | | | | |
| PrB.07 | Label | Motor torque | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | % | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B07 | | |
| The percentage of motor actual torque and rated torque | | | | | | | | |
| PrB.08 | Label | Motor current | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | 0.01A | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B08 | | |
| Motor actual current | | | | | | | | |

| | | | | | | | | |
|--|-------------|----------------------------|-----------|-----|---------------|--------|---|---|
| PrB.09 | Label | Motor speed (After filter) | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | rpm | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B09 | | |
| Motor speed after motor actual speed filtering | | | | | | | | |

| | | | | | | | | |
|------------------------------|-------------|----------------|-----------|---|---------------|--------|---|---|
| PrB.10 | Label | DC bus voltage | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | V | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0A | | |
| Driver DC bus actual voltage | | | | | | | | |

| | | | | | | | | |
|---------------------------|-------------|--------------------|-----------|----|---------------|--------|---|---|
| PrB.11 | Label | Driver temperature | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | °C | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0B | | |
| Actual driver temperature | | | | | | | | |

| | | | | | | | | |
|-----------------------|-------------|-------------------|-----------|-------|---------------|--------|---|---|
| PrB.12 | Label | External analog 1 | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | 0.01V | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0C | | |
| Driver analog input 1 | | | | | | | | |

| | | | | | | | | |
|-----------------------|-------------|-------------------|-----------|-------|---------------|--------|---|---|
| PrB.13 | Label | External analog 2 | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | 0.01V | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0D | | |
| Driver analog input 2 | | | | | | | | |

| | | | | | | | | |
|-----------------------|-------------|-------------------|-----------|-------|---------------|--------|---|---|
| PrB.14 | Label | External analog 3 | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | 0.01V | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0E | | |
| Driver analog input 3 | | | | | | | | |

| | | | | | | | | |
|---------------------|-------------|---------------------|-----------|---|---------------|--------|---|---|
| PrB.15 | Label | Motor overload rate | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | % | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B0F | | |
| Motor overload rate | | | | | | | | |

| | | | | | | | | |
|--------------------|-------------|--------------------|-----------|---|---------------|--------|---|---|
| PrB.16 | Label | Vent overload rate | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | % | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B10 | | |
| Vent overload rate | | | | | | | | |

| | | | | | | | | |
|--|-------------|---------------------------|-----------|---|---------------|--------|---|---|
| PrB.17 | Label | Physical I/O input status | | | Valid mode(s) | P | S | T |
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B04 | | |
| Driver physical I/O input bit0 corresponds to DI1, bit1 to DI2 and so on; Bitn=1, DI n+1 high level signal input; Bitn=0, DI n+1 low level signal input | | | | | | | | |

| PrB.18 | Label | Cause of motor not rotating | | | Valid mode(s) | P | S | T |
|--|-------------|-----------------------------|-----------|---|---------------|--------|---|---|
| | Range | / | Unit | / | Default | / | | |
| | Byte length | 16bit | Attribute | R | 485 address | 0x0B04 | | |
| Driver physical I/O output bit0 corresponds to DO1, bit1 to DO2 and so on; Bitn=1, DOn+1 high level signal output; Bitn=0 indicates DOn+1 low level signal output | | | | | | | | |

| | | | | | | | | |
|--|-------------|---------------------------------|-----------|---|---------------|------------------------|--|--|
| PrB.20 | Label | Command position (Command unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B14 L: 0x0B15 | | |
| Driver receives command pulse count. Driver command unit: 10000 pulses/rev, Encoder unit: 8388608 pulses/rev. If driver receives 8388608 pulses, 10000P will be shown. | | | | | | | | |

| | | | | | | | | |
|--|-------------|-------------------------------|-----------|---|---------------|------------------------|--|--|
| PrB.21 | Label | Motor position (Command unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B16 L: 0x0B17 | | |
| Motor position feedback. Driver command unit: 10000 pulses/rev, Encoder unit: 8388608 pulses/rev. If driver receives 8388608 pulses, 10000P will be shown. | | | | | | | | |

| | | | | | | | | |
|---|-------------|-----------------------------------|-----------|---|---------------|------------------------|--|--|
| PrB.22 | Label | Position deviation (Command unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B18 L: 0x0B19 | | |
| Shows position deviation. Please refer to PrB.20. | | | | | | | | |

| | | | | | | | | |
|--|-------------|---------------------------------|-----------|---|---------------|------------------------|--|--|
| PrB.23 | Label | Command position (Encoder unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B1A L: 0x0B1B | | |
| Driver receives command pulse count. Driver command unit: 10000 pulses/rev, Encoder unit: 8388608 pulses/rev. If driver receives 10000 pulses, 8388608 pulses will be shown. | | | | | | | | |

| | | | | | | | | |
|---|-------------|-------------------------------|-----------|---|---------------|------------------------|--|--|
| PrB.24 | Label | Motor position (Encoder unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B1C L: 0x0B1D | | |
| Driver receives motor encoder feedback pulses | | | | | | | | |

| | | | | | | | |
|---|-------------|-----------------------------------|-----------|---|---------------|------------------------|--|
| PrB.25 | Label | Position deviation (Encoder unit) | | | Valid mode(s) | P | |
| | Range | / | Unit | P | Default | / | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B1E L: 0x0B1F | |
| Shows position deviation. Please refer to PrB.23. | | | | | | | |

| | | | | | | | | |
|--|-------------|--|-----------|---|---------------|------------------------|--|--|
| PrB.26 | Label | Rotational encoder position feedback (Command unit) | | | Valid mode(s) | P | | |
| | Range | / | Unit | P | Default | / | | |
| | Byte length | 32bit | Attribute | R | 485 address | H: 0x0B20 L: 0x0B21 | | |
| Motor position under rotary mode. Please refer to PrB.21 | | | | | | | | |

Chapter 4 Control Mode

Control modes for ELD2-RS series DC servo drives can be divided into 3 categories: Position control mode, Velocity control mode and Torque control mode. RS models also come with a hybrid control mode which is a combination of any 2 modes which are above.

- Position control mode determines position through pulse count. External input pulse frequency determines rotational speed, mainly through motion controller, control card (5V pulse), PLC (24V pulse). Due to the ability of position control mode to control velocity and position tightly, it is usually use in positioning devices. It is the most widely used control mode for servo drives.
- Velocity control mode controls rotational speed through digital I/O or communication command settings. Mainly use in application where speed stability is required.
- Torque control mode is used in applications where forced applied on production material is restricted, mainly winding or scrolling devices. For example, coil winding machines or optical fiber cable production. Torque settings change according to the coil winding diameter as to maintain stable force output throughout the process.

To set control mode

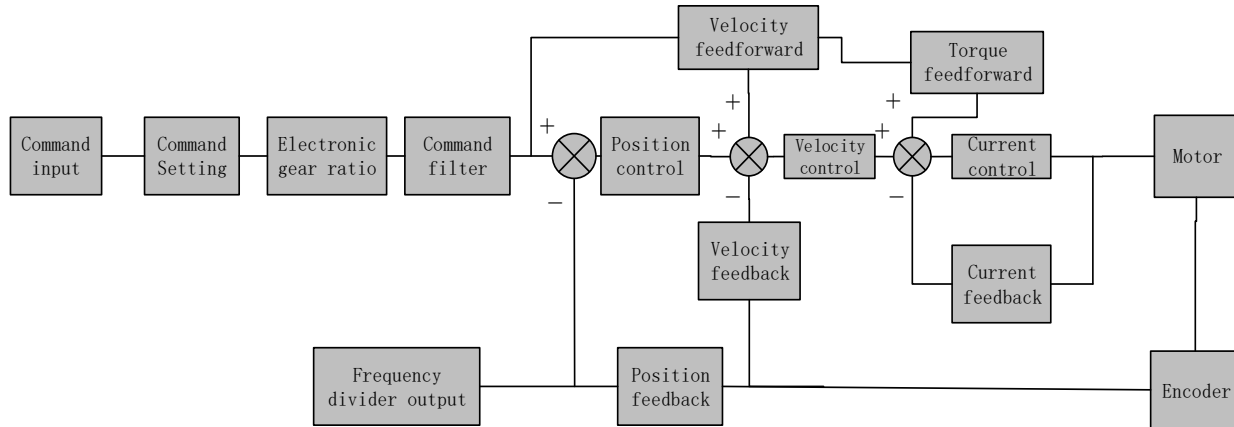
| Pr0.01 * | Label | Control Mode Settings | | | Valid mode(s) | P | S | T |
|----------|-------------|-----------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~10 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0003 | | |
| | Valid | After restart | | | | | | |

| Value | Description | |
|-------|-----------------------------|----------------------|
| | 1 st mode | 2 nd mode |
| 【0】 | Position | — |
| 1 | Velocity | — |
| 2 | Torque | — |
| 3 | Position | Velocity |
| 4 | Position | Torque |
| 5 | Velocity | Torque |
| 6 | PR internal command control | Position Pr0.22=1 |
| | | Velocity Pr0.22=1 |
| | | Torque Pr0.22=2 |
| 7~10 | Reserved | |

◆When 3, 4, 5, 6 combination hybrid mode, 1st and 2nd mode can be chosen accordingly with control mode switching input (C-MODE).
C-MODE: Invalid, select 1st mode.
C-MODE: Valid, select 2st mode.
Please allow some time in between mode switching commands.
◆Please set Pr0.01 = 6 to switch to other modes from PR mod, then set 2nd mode using Pr0.22.
C-MODE is defaulted to Normally Open

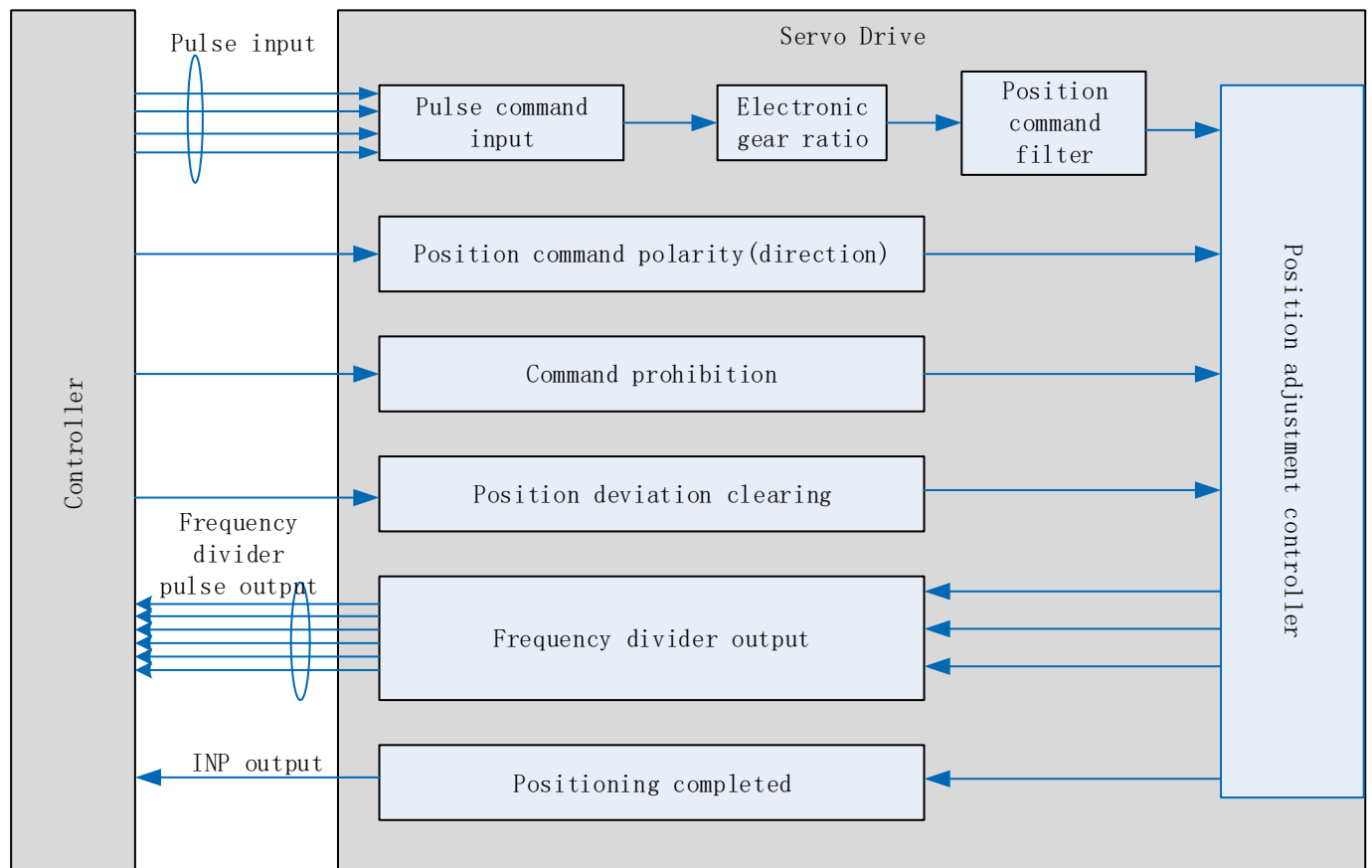
4.1 Position control

Position control determines rotational speed by frequency of external input pulse and angle of rotation through pulse count using 5V pulse from motion controller, control card or 24V pulse (Please add 2kΩ resistor) for PLC. Applies where precise positioning is required.



Set Pr0.01 = 0 to activate position control mode.

Please set related servo parameters according with the following diagram.



4.1.1 Pulse input and direction settings

Position command (pulse) input method:

1. A and B phase pulse
2. Positive/Negative direction pulse
3. Pulse count + symbol

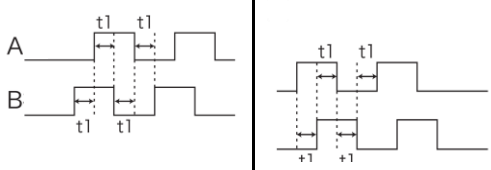
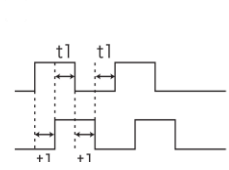
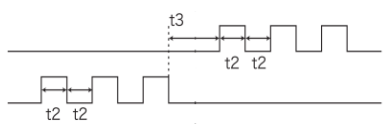
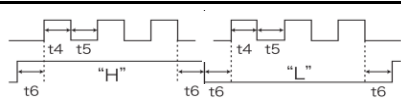
Set pulse mode, rotational direction and max. pulse input frequency according to actual need

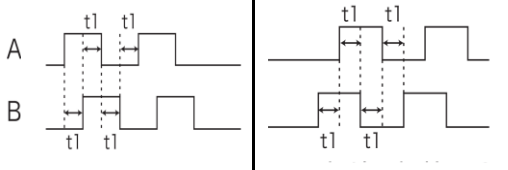
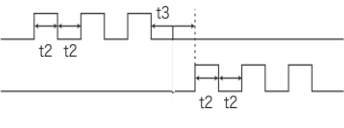
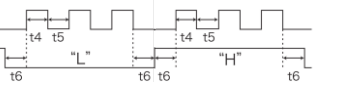
| CN1 Pin | Label | Definition | Description |
|---------|-------|--|--|
| 1/15 | DI1+ | Pulse command input Direction command input | Low speed pulse direction command input: PUL+ / PUL-: 5V differential input (500KHz) DIR+ / DIR-: 5V differential input (500KHz) |
| 2/16 | DI1- | | |
| 3/17 | DI2+ | | |
| 4/18 | DI2- | | |

| | | | | | | | | |
|---|-------------|----------------------------------|-----------|-----|---------------|--------|--|--|
| Pr0.06 | Label | Command pulse polarity inversion | | | Valid mode(s) | P | | |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x000D | | |
| | Valid | After restart | | | | | | |
| Pr0.06 and Pr0.07 set command pulse input inversion and mode correspondingly. | | | | | | | | |

| | | | | | | | | |
|---------------|--------------------|--------------------------|------------------|-----|----------------------|----------|--|--|
| Pr0.07 | Label | Command pulse input mode | | | Valid mode(s) | P | | |
| | Range | 0~3 | Unit | — | Default | 3 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x000F | | |
| | Valid | After restart | | | | | | |

Command pulse input

| Command Polarity inversion (Pr0.06) | Command pulse input mode settings (Pr0.07) | Command Pulse Mode | Positive signal | Negative signal |
|-------------------------------------|--|--|--|---|
| 【0】 | 0 or 2 | 90°phase difference 2 phase pulse (Phase A+ Phase B) |  |  |
| | 1 | CW pulse sequence + CCW pulse sequence |  | |
| | 【3】 | Pulse sequence + Directional symbol |  | |

| | | | |
|---|--------------|---|--|
| 1 | 0 or 2 | 90°phase difference 2 phase pulse (Phase A+Phase B) |  |
| | 1 | CW pulse sequence + CCW pulse sequence |  |
| | 3 | Pulse sequence + Directional symbol |  |

4.1.2 Electronic Gear Ratio

To realize correspondent motor rotational angle to arbitrarily set input command input by multiplying pulse command input from controller and coefficient of frequency divider/multiplier. Motor might not reach target velocity due to insufficient pulse output from controller. This function can be used to solve this issue by increasing pulse command frequency.

- When Pr0.08 = 0, Pr0.09 and Pr0.10 will be valid. Other than that, Pr0.08 set value will be valid.
- ELD2-RS series supports 2 independent sets of electronic gear ratio. The 2 sets can be switch by delivering a command frequency divider/multiplier input DIV1. Both sets of electronic gear ratio is set up using Pr0.08, Pr0.09 and Pr0.10; Pr5.00, Pr5.01 and Pr5.02.

Set up using Pr0.02, Pr0.03 and Pr0.04, Pr0.05, Pr0.06 and Pr0.07.

| | | | | | | | | |
|--|-------------|--|-----------|-------|---------------|------------------------|---|---|
| Pr0.08 | Label | 1st command pulse count per revolution | | | Valid mode(s) | P | S | T |
| | Range | 0-67100864 | Unit | PULSE | Default | 10000 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0010 L: 0x0011 | | |
| | Valid | After restart | | | | | | |
| Control will affected if value set is too low. Err1b1 might occur if value < 500. (1) Pr0.08 valid when ≠ 0: Motor revolution = input pulse count / [Pr0.08 value] (2) Pr0.08 invalid when = 0: Pr0.09 and Pr0.10 valid. | | | | | | | | |
| Pr0.09 | Label | 1st command frequency divider/multiplier numerator | | | Valid mode(s) | P | | |
| | Range | 1~2147483647 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0012 L: 0x0013 | | |
| | Valid | After restart | | | | | | |
| Valid when Pr0.08 = 0, please refer to description in Pr0.10. | | | | | | | | |
| Pr0.10 | Label | 1st command frequency divider/multiplier denominator | | | Valid mode(s) | P | | |
| | Range | 1~2147483647 | Unit | — | Default | 1 | | |
| | Byte length | 32bit | Attribute | R/W | 485 address | H: 0x0014 L: 0x0015 | | |
| | Valid | After restart | | | | | | |

1. Settings:

- (1) Driver command pulse input count : X
- (2) Encoder pulse count after frequency divider/multiplier: Y
- (3) Encoder pulse count per revolution: Z
- (4) Motor revolution: W

2. Calculation:

- (1) X, Y

$$Y = X * Pr0.09 / Pr0.10$$

Please keep the value of Pr0.09 and Pr0.10 to be smaller than 2^{24} (16777216).

- (2) Z

$$\text{Motor with 17-bit motor: } Z = 2^{17} = 131072$$

- (3) Y, Z, W

$$W = Y / Z$$

Performance cannot be guaranteed if frequency divider/multiplier ratio is set to extreme values. Err1b1 might occur if $W < 500$.

4.1.3 Position command filter

Position command filter is to filter position command after electronic gear ratio frequency dividing/multiplying. Including position command smoothing filter and position command FIR filter.

Position command filter should be added for the following cases:

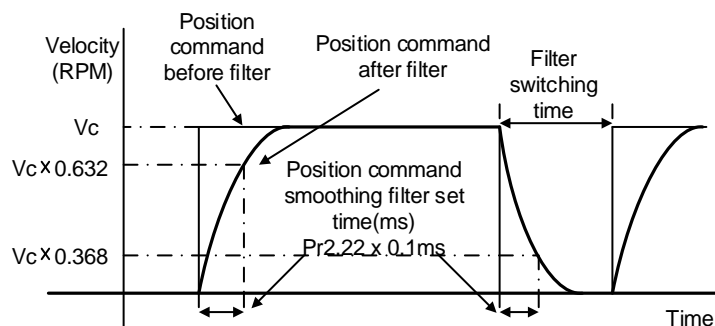
1. Position command pulse from controller has not yet to undergo acceleration/deceleration (with steep acceleration/deceleration).
2. Low command pulse frequency
3. Electronic gear ratio = 10 times or above

Position command filter can smoothen position command and motor rotation will be more stable

| | | | | | | | |
|---------------|--------------------|-----------------------------------|------------------|-------|----------------------|----------|--|
| Pr2.22 | Label | Position command smoothing filter | | | Valid mode(s) | P | |
| | Range | 0~32767 | Unit | 0.1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x022D | |
| | Valid | At stop | | | | | |

To set time constant of 1 time delay filter of position command.

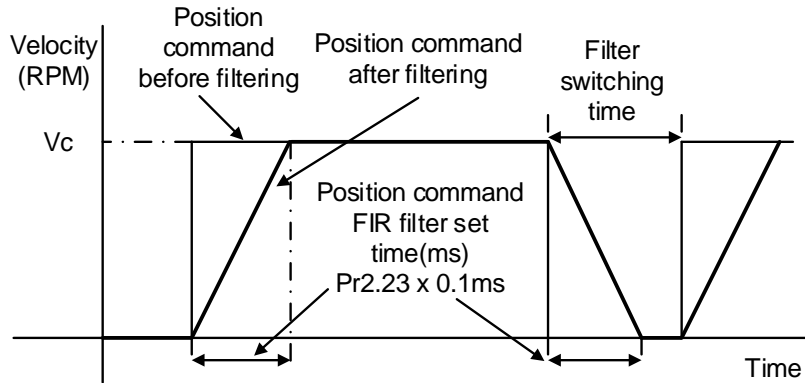
To set time constant of 1 time delay filter, according to target velocity V_c square wave command as show below.



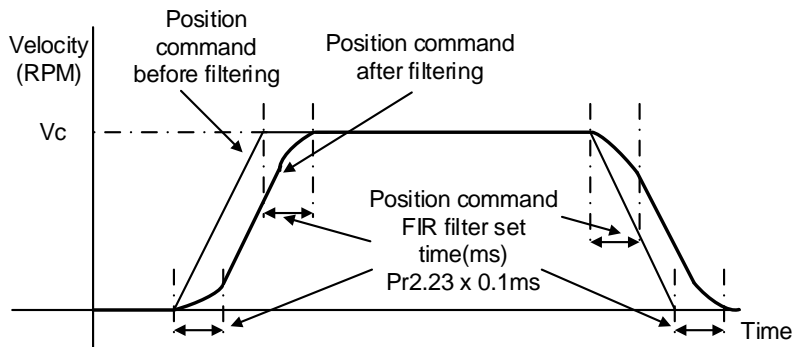
Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If Pr2.22 is set too high, overall time will be lengthened.

| | | | | | | | |
|---------------|--------------------|-----------------------------|------------------|-------|----------------------|----------|--|
| Pr2.23 | Label | Position command FIR filter | | | Valid mode(s) | P | |
| | Range | 0~2500 | Unit | 0.1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x022F | |
| | Valid | At stop | | | | | |

As shown below, when target velocity V_c square wave command reaches V_c , it becomes trapezoidal wave after filtering.



As shown below, when target velocity V_c trapezoidal command reaches V_c , it becomes S wave after filtering.











Usually applied when there is rather sharp acceleration which might cause motor overshoot or undershoot. To smoothen command signal, reduces impact to machines and eliminate vibration. If Pr2.23 is set too high, overall time will be lengthened.

Note: Please wait for command to stop and after filter idle time to modify Pr2.23.

Filter switching time = (Pr2.23 set value \times 0.1ms + 0.25ms)

4.1.4 Encoder feedback output

Motor position feedback of A, B phase to master device (controller) in pulse

| | | | | | | | | |
|--|---------------|---|-----------|-----|---|--------|---|---|
| Pr0.11 | Label | Encoder output pulse count per revolution | | | Valid mode(s) | P | S | T |
| | Range | 1~32767 | Unit | P/r | Default | 2500 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0017 | | |
| | Valid | After restart | | | | | | |
| If Pr0.11 = 1000, encoder differential output signal per revolution = 4000 pulses | | | | | | | | |
| Pr0.12 | Label | Pulse output logic inversion | | | Valid mode(s) | P | S | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0019 | | |
| | Valid | After restart | | | | | | |
| To set phase B logic and output source from encoder pulse output. To inverse B-Phase pulse logic and change the relation between Phase A and Phase B | | | | | | | | |
| Pulse output logic inversion | | | | | | | | |
| Pr0.12 | Phase B logic | CCW direction | | | CW direction | | | |
| [0] | Not inverted | A-phase  B-phase  | | | A-phase  B-phase  | | | |
| [1] | Inverted | A-phase  B-phase  | | | A-phase  B-phase  | | | |

4.1.5 Positioning completed INP signal output

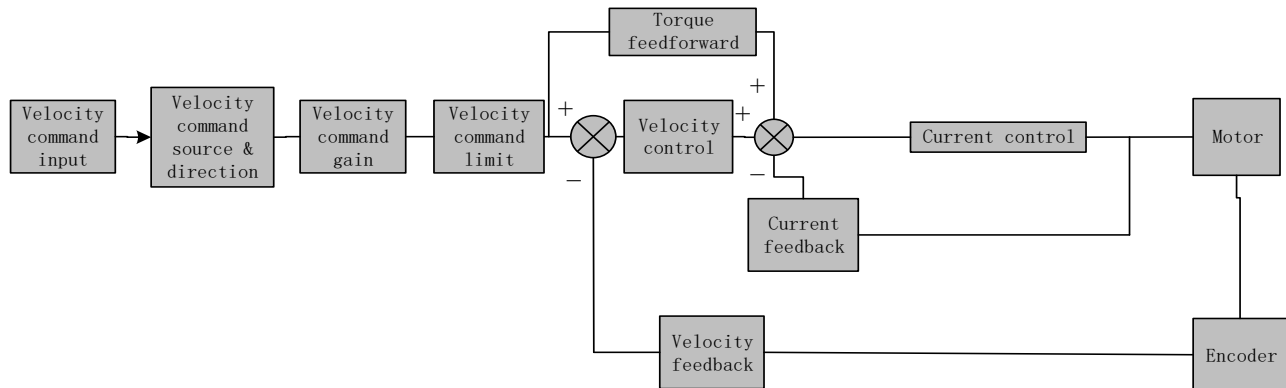
INP signal output will be valid when position deviation is within the range when positioning is completed. Set unit in Pr5.20.

| | | | | | | | |
|---|--------------------|-------------------------------------|--|-----------------|----------------------|----------|--|
| Pr4.31 | Label | Positioning complete range | | | Valid mode(s) | P | |
| | Range | 0~10000 | Unit | Pr5.21 set unit | Default | 20 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x043F | |
| | Valid | Immediate | | | | | |
| To set position deviation range of INP1 positioning completed output signal. INP1 output signal will be valid once position is complete within the range of deviation set. <i>Default unit: 0.00001rev. Can be set on Pr5.21 as command unit (pulse) or encoder unit (pulse)</i> | | | | | | | |
| Pr4.32 | Label | Positioning complete output setting | | | Valid mode(s) | P | |
| | Range | 0~4 | Unit | — | Default | 1 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0441 | |
| | Valid | Immediate | | | | | |
| To set conditions for INP1 output signal to be valid | | | | | | | |
| | | Value | Positioning completed signal | | | | |
| | | 0 | Signal valid when the position deviation is smaller than Pr4.31 | | | | |
| | | 1 | Signal valid when there is no position command and position deviation is smaller than Pr4.31 | | | | |
| | | 2 | Signal valid when there is no position command, zero-speed clamp detection (ZSP) signal is ON and the positional deviation is smaller than Pr4.31 | | | | |
| | | 3 | Signal valid when there is no position command and position deviation is smaller than Pr4.31. Signal ON when within the time set in Pr4.33 otherwise OFF. | | | | |
| | | 4 | When there is no command, position detection starts after the delay time set in Pr4.33. Signal valid when there is no position command and positional deviation is smaller than Pr4.31. | | | | |
| Pr4.33 | Label | INP positioning delay time | | | Valid mode(s) | P | |
| | Range | 0~15000 | Unit | 1ms | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0443 | |
| | Valid | Immediate | | | | | |
| Valid when Pr4.32 = 3. | | | | | | | |
| | | Set value | Positioning completed signal | | | | |
| | | 0 | Indefinite delay time, signal ON until next position command | | | | |
| | | 1-15000 | OFF within the time set; ON after time set. Switch OFF after receiving next position command. | | | | |

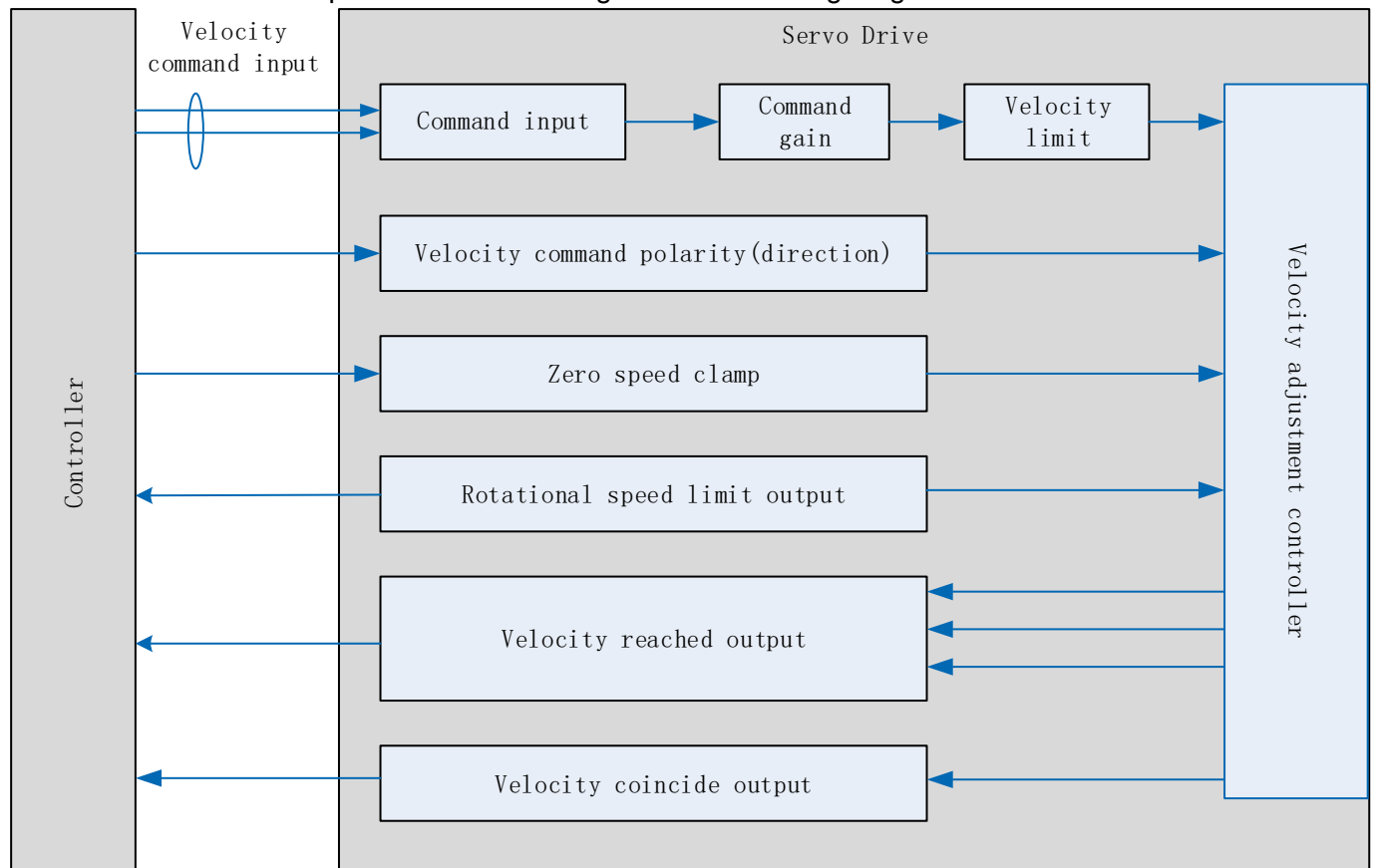
4.2 Velocity control mode

Velocity mode precisely controls motor rotational speed/direction using analog velocity command or internal related parameters. There are 4 types of velocity control modes for ELD2-RS series DC Servo Drives: Analog control, internal velocity 4 speeds, internal velocity 8 speeds and analog + internal velocity control.

Set Pr0.01 = 1 to activate velocity control mode.

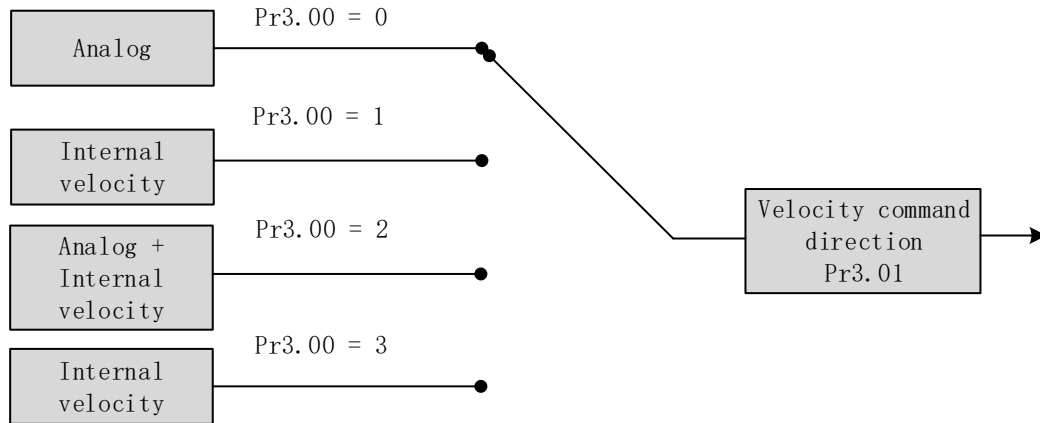


Please set related servo parameters according with the following diagram.



4.2.1 Velocity command input control

Set velocity control mode in Pr3.00



| | | | | | | |
|--|--------------------|---|------------------|-----|----------------------|----------|
| Pr3.00 | Label | Velocity internal/external switching | | | Valid mode(s) | S |
| | Range | 0~3 | Unit | — | Default | 1 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0301 |
| | Valid | Immediate | | | | |
| Connect to the right DI to control internal command velocity settings. | | | | | | |
| Value | | Velocity settings | | | | |
| 0 | | Analog - Velocity command (SPR) | | | | |
| 【1】 | | Internal velocity settings 1 st – 4 th speed (Pr3.04~Pr3.07) | | | | |
| 2 | | Internal velocity settings 1 st – 3 rd speed (Pr3.04~P3.06) 、 Analog velocity command (SPR) | | | | |
| 3 | | Internal velocity settings 1 st – 8 th speed (Pr3.00~Pr3.11) | | | | |

Velocity command direction settings

Switch velocity command direction using I/O. Assign VC-SIGN to corresponding DI terminal, velocity command direction will be in accordance to DI signal.

| | | | | | | |
|--|--------------------|--|---|-----|-----------------------------------|----------|
| Pr3.01 | Label | Velocity command rotational direction selection | | | Valid mode(s) | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0303 |
| | Valid | Immediate | | | | |
| To set positive/negative direction of velocity command | | | | | | |
| Value | | Velocity settings (Analog or internal velocity) | Velocity command sign selection (VC-SIGN) | | Velocity command direction | |
| 【0】 | | + | No effect | | Positive | |
| | | — | No effect | | Negative | |
| 1 | | No effect | OFF | | Positive | |
| | | No effect | ON | | Negative | |

Velocity command input inversion

Set Analog-Velocity command (SPR) voltage polarity

| | | | | | | |
|--------|-------------|----------------------------------|-----------|-----|---------------|--------|
| Pr3.03 | Label | Velocity command input inversion | | | Valid mode(s) | S |
| | Range | 0~1 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0307 |
| | Valid | Immediate | | | | |

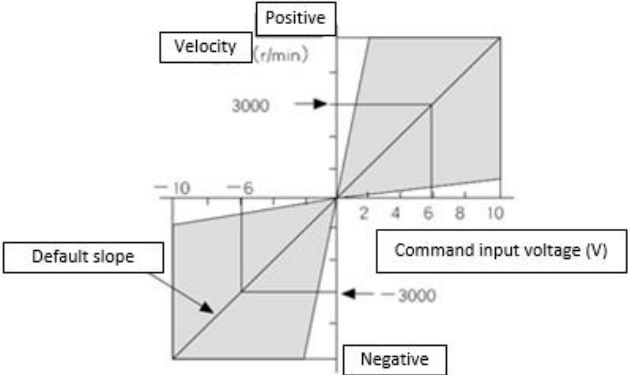
To set voltage polarity of analog velocity command.
Only valid when Pr3.01 = 0. When Pr3.01 = 1, rotational direction is only related to VC-SIGN.

| Value | Motor rotational direction | |
|-------|----------------------------|--|
| 【0】 | Not inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |
| 1 | Inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 |

If there is an external position sensor with different polarity from Pr3.03, motor might undergo abnormal motion.

Velocity command input gain

Set Analog-Velocity command (SPR) voltage to motor velocity command switching gain

| | | | | | | |
|---|--------------------|-----------------------------|------------------|-----------|----------------------|----------|
| Pr3.02 | Label | Velocity command input gain | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | (r/min)/V | Default | 500 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0305 |
| | Valid | Immediate | | | | |
| <p>To set gain changes from voltage added onto analog velocity command (SPR) to motor command velocity</p> <p>Pr3.02 sets command input voltage and rotational speed slope.</p> <p>Factory default: Pr3.02=500(r/min)/V. Hence 6V input: 3000 r/min</p> <ol style="list-style-type: none"> Do not supply more than $\pm 10V$ power for analog velocity command (SPR). If Pr3.02 set value is too large, it might cause vibration. <div data-bbox="451 1360 1075 1732">  </div> | | | | | | |

4.2.2 Velocity command acceleration/deceleration

Acceleration/Deceleration is added onto velocity command input to control velocity. This function is valid when entering step-like velocity command or internal velocity settings is used to realize motor soft start. Use Sigmoid acceleration/deceleration to reduce vibration and impact due to changes in velocity.

| | | | | | | |
|---------------|--------------------|----------------------------|------------------|------------------|----------------------|----------|
| Pr3.12 | Label | Acceleration time settings | | | Valid mode(s) | S |
| | Range | 0~10000 | Unit | ms/ (1000rpm) | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0319 |
| | Valid | Immediate | | | | |
| Pr3.13 | Label | Deceleration time settings | | | Valid mode(s) | S |
| | Range | 0~10000 | Unit | ms/ (1000rpm) | Default | 100 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x031B |
| | Valid | Immediate | | | | |

Set max acceleration/deceleration for velocity command.

If target velocity = x [rpm], max acceleration = a [unit: rpm/ms], acceleration time = t [ms]

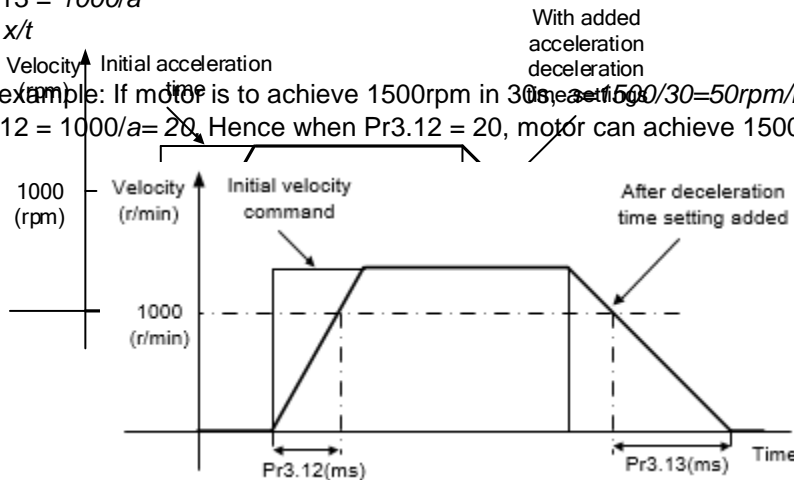
$$\text{Pr3.12} = 1000/a$$

$$\text{Pr3.13} = 1000/a$$

$$a = x/t$$

For example: If motor is to achieve 1500rpm in 30s, set $1500/30=50\text{rpm/ms}$

Pr3.12 = $1000/a=20$. Hence when Pr3.12 = 20, motor can achieve 1500rpm in 30s.

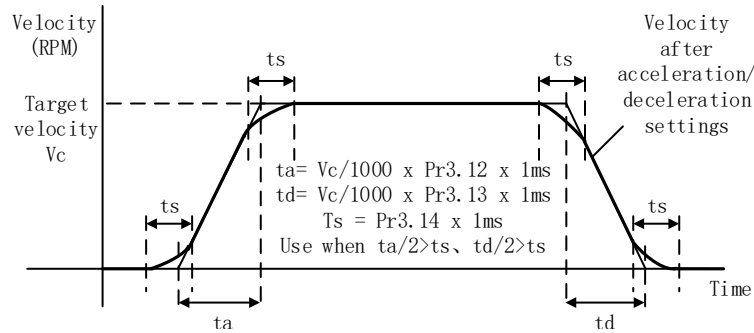


Usually used when there is rapid acceleration or trapezoidal wave velocity command due to many different internal speed segments under velocity control mode which causes instable while motor in motion.

Under velocity control mode, 6083 and 6084 is limited by Pr3.12 and Pr3.13 correspondingly.

| | | | | | | |
|---------------|--------------------|--|------------------|-----|----------------------|----------|
| Pr3.14 | Label | Sigmoid acceleration/deceleration settings | | | Valid mode(s) | S |
| | Range | 0~1000 | Unit | ms | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x031D |
| | Valid | After restart | | | | |

To set sigmoid acceleration and deceleration turning point in accordance to Pr3.12 and Pr3.13.



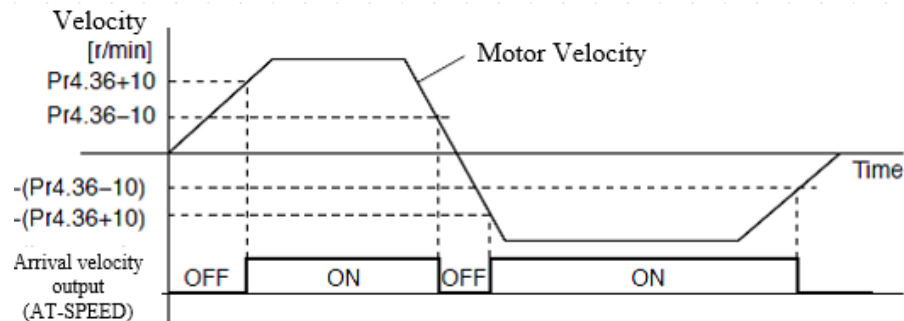
4.2.3 Velocity reached signal AT-SPEED output

Velocity reached signal AT-SPEED output will be valid when motor velocity reached set speed in Pr4.36. This output function can be assigned through I/O configurations, please refer to Pr4.10. When velocity matches set conditions, assigned I/O terminal will be ON, signal will be valid.

| | | | | | | |
|---------------|--------------------|------------------|------------------|-------|----------------------|----------|
| Pr4.36 | Label | Arrival velocity | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | r/min | Default | 1000 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0449 |
| | Valid | Immediate | | | | |

When motor velocity > Pr4.36, AT-speed output signal is valid.

Detection using 10RPM hysteresis.



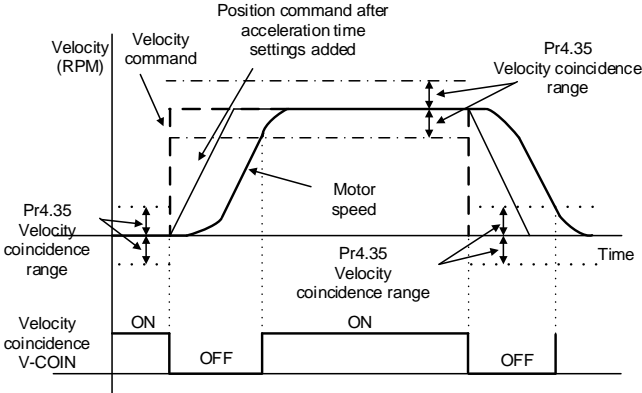
4.2.4 Velocity coincidence V-COIN signal output

V-COIN signal output will be valid when velocity command (before acceleration/deceleration) coincides with motor velocity. Velocity is considered to be coincided if the difference between velocity command before acceleration/deceleration from servo drive and motor velocity is within the value set in Pr4.35. This output function can be assigned through I/O configurations, please refer to Pr4.10. When velocity matches set conditions, assigned I/O terminal will be ON, signal will be valid. In Position signal in PV mode is in synchronization with V-COIN signal.

| | | | | | | |
|---------------|--------------------|----------------------------|------------------|-------|----------------------|----------|
| Pr4.35 | Label | Velocity coincidence range | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | r/min | Default | 50 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0447 |
| | Valid | Immediate | | | | |

If the difference between velocity command and motor actual speed is below Pr4.35, Velocity coincidence (V-COIN) output signal valid.

Due to 10RPM hysteresis:
Velocity coincidence output OFF -> ON timing (Pr4.35 -10) r/min
Velocity coincidence output ON -> OFF timing (Pr4.35 +10) r/min



4.2.5 Zero Speed Clamp

Forced set velocity command to 0 using zero speed clamp to avoid servo axis from crawling at low velocity.

This input function can be assigned through I/O configurations, please refer to Pr4.00.

| | | | | | | |
|---------------|--------------------|-------------------------------------|------------------|-----|----------------------|----------|
| Pr3.15 | Label | Zero speed clamp function selection | | | Valid mode(s) | S |
| | Range | 0~3 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x031F |
| | Valid | Immediate | | | | |

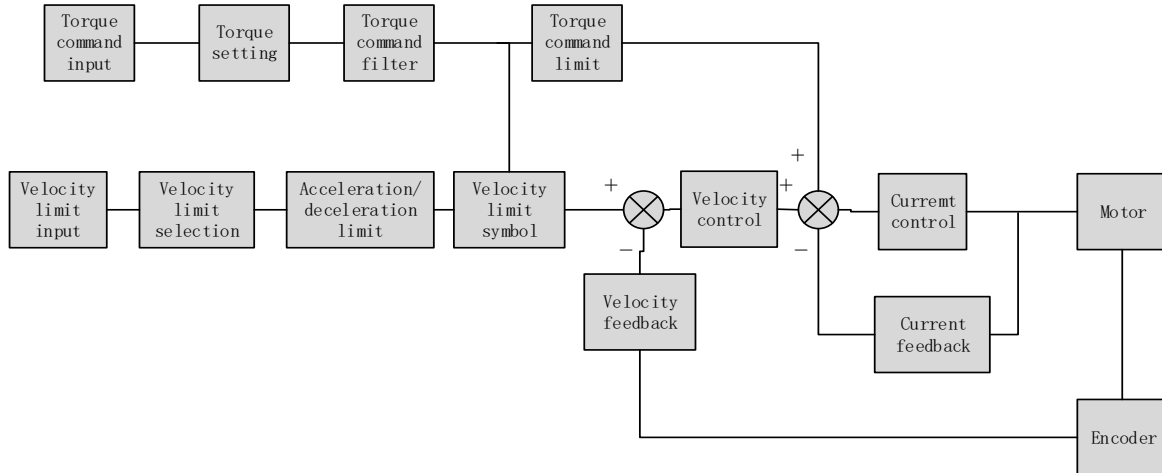
| Value | Zero speed clamp function |
|-------|--|
| 0 | Invalid: zero speed clamp deactivated |
| 1 | Velocity command is forced to 0 when the zero speed clamp (ZEROSPD) input signal is valid. |
| 2 | Velocity command is forced to 0 when actual velocity is lower than Pr3.16. |
| 3 | Includes conditions from 1 and 2 |

| | | | | | | |
|---------------|--------------------|------------------------|------------------|-------|----------------------|----------|
| Pr3.16 | Label | Zero speed clamp level | | | Valid mode(s) | S |
| | Range | 10~2000 | Unit | r/min | Default | 30 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0321 |

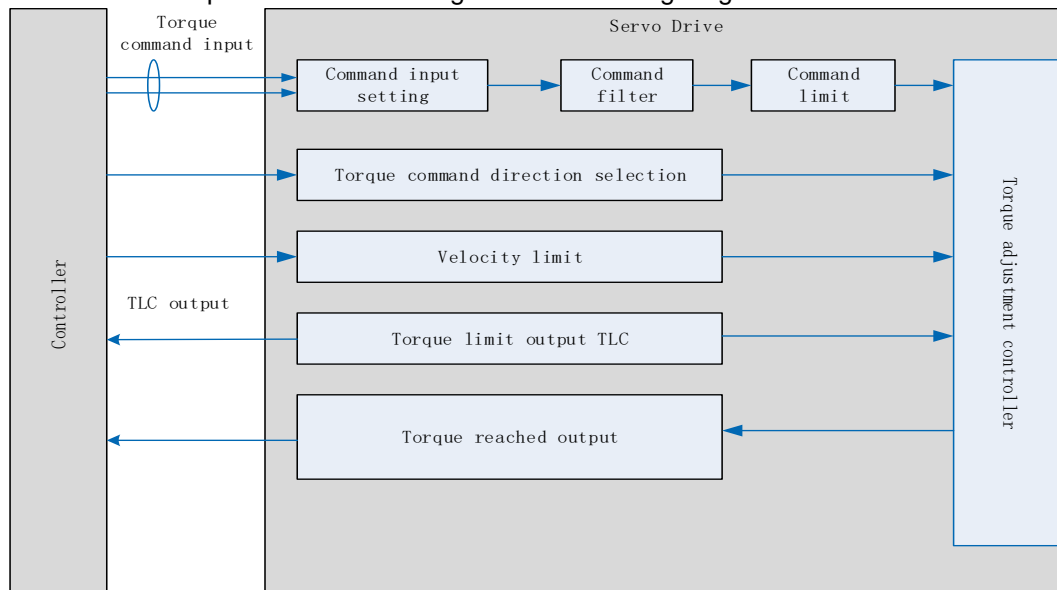
| | | | | | |
|---|-----------|--|--|--|--|
| Valid | Immediate | | | | |
| Valid when Pr3.15 = 2/3, velocity command is forced to 0 when actual velocity is lower than Pr3.16 and after static time set in Pr3.23. | | | | | |

4.3 Torque control

Torque control mode is to the size of motor asserted torque through external analogue input or directly from set value internally. This control mode is applicable where torque is the main control and limiting factor.



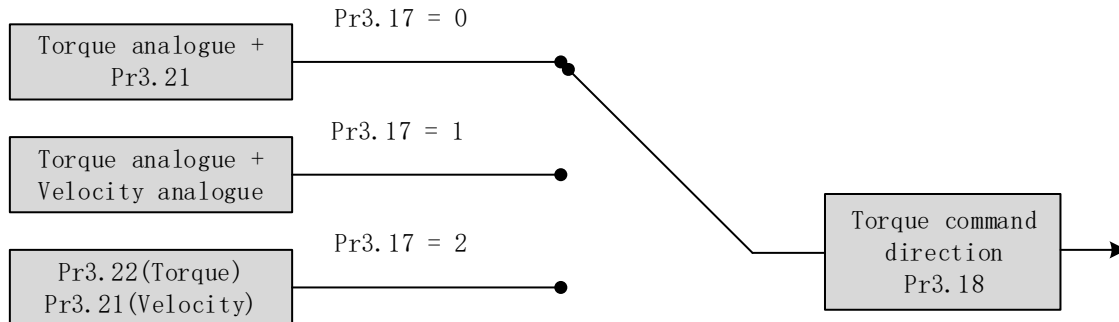
Using Motion Studio, set Pr0.01 = 2 to activate torque control mode.
Please set related servo parameters according with the following diagram.



4.3.1 Torque command input control

Torque control mode settings

Torque control mode includes 3 control modes as shown below. Set torque control mode in Pr3.17.



| Pr3.17 | Label | Torque internal/external switching | | | Valid mode(s) | | | T |
|--------|-------------|------------------------------------|-----------|----------------------|---------------|--------|--|---|
| | Range | 0~2 | Unit | | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0323 | | |
| | Valid | Immediate | | | | | | |
| | Value | Torque command input | | Velocity limit input | | | | |
| | 【0】 | Analog input 3(AI 3) | | Pr3.21 set value | | | | |
| | 1 | Analog input 3(AI 3) | | Analog input 1(AI 1) | | | | |
| | 2 | Pr3.22 set value | | Pr3.21 set value | | | | |

Torque command direction settings

To switch velocity command direction through DI. Assign TC-SIGN signal to corresponding DI terminal and determine velocity command direction through digital input signal.

| | | | | | | | |
|--------|-------------|------------------------------------|-----------|-----|---------------|--------|---|
| Pr3.18 | Label | Torque command direction selection | | | Valid mode(s) | | T |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0325 | |
| | Valid | Immediate | | | | | |

To set torque command positive/negative direction

| Value | Direction settings |
|-------|--|
| 【0】 | TC-SIGN ON/OFF has no effect on torque direction Torque command input 「 Positive 」 →Positive direction、 「 Negative 」 →Negative direction |
| 1 | Use TC-SIGN ON/OFF status for torque direction OFF: <i>Positive direction</i> ON: <i>Negative direction</i> |

Torque command input inversion

To set the voltage polarity added onto analogue torque command (TRQR)

| | | | | | | | |
|--|--------------|--|-----------|-----|---------------|--------|---|
| Pr3.20 | Label | Torque command input inversion | | | Valid mode(s) | | T |
| | Range | 0~1 | Unit | — | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0329 | |
| | Valid | Immediate | | | | | |
| To set voltage polarity of analog torque command. Only valid when Pr3.18 = 0. | | | | | | | |
| Value | | Motor torque direction | | | | | |
| 【0】 | Not inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 | | | | | |
| 1 | Inversed | 「 Positive voltage 」 → 「 Positive direction 」 「 Negative voltage 」 → 「 Negative direction 」 | | | | | |

Torque command input gain

To set voltage added on to switching gain of motor torque command from analog torque command (TRQR)

| | | | | | | | |
|--|--------------------|---------------------------|------------------|-----------|----------------------|--------|----------|
| Pr3.19 | Label | Torque command input gain | | | Valid mode(s) | | T |
| | Range | 10~100 | Unit | 0.1V/100% | Default | 30 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0327 | |
| | Valid | Immediate | | | | | |
| <p>To set gain changes from voltage added onto analog torque command (TRQR) to torque command (%)</p> <p>·Unit: (0.1V/100%) 。 ·Set input voltage required for rated output torque. ·Default = 30, which is 3V/100%</p> | | | | | | | |

4.3.2 Torque velocity limit

To set velocity limit in torque mode for safety reasons.

| | | | | | | | |
|--|--------------------|-------------------------------|------------------|-------|----------------------|--------|----------|
| Pr3.21 | Label | Velocity limit in torque mode | | | Valid mode(s) | | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x032B | |
| | Valid | Immediate | | | | | |
| To set velocity limit in torque control mode. Only valid when Pr3.17 = 0 / 2. | | | | | | | |
| Pr3.22 | Label | Torque command | | | Valid mode(s) | | T |
| | Range | 0~300 | Unit | % | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x032D | |
| | Valid | Immediate | | | | | |
| To set torque limit in torque control mode. Only valid when Pr3.17 = 2. Please refer to Pr3.17. | | | | | | | |

4.3.3 Torque limit (TL-SEL)

This input function can be assigned through I/O configurations, please refer to Pr4.00.

To set torque limiting method.

| | | | | | | | | |
|--------|-------------|------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.21 | Label | Torque limit selection | | | Valid mode(s) | P | S | T |
| | Range | 0~6 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x052B | | |
| | Valid | Immediate | | | | | | |

| Value | | Limit |
|-------|------------|--|
| 【0】 | | 1 st torque limit Pr0.13 |
| 1 | | 2 nd torque limitPr5.22 |
| 2 | TL-SEL OFF | Pr0.13 |
| | TL-SEL ON | Pr5.22 |
| 3~4 | | Reserved |
| 5 | | Pr0.13 →Positive torque limit Pr5.22 →Negative torque limit |

| | | | | | | | | |
|--------|-------------|------------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.22 | Label | 2 nd torque limit | | | Valid mode(s) | P | S | T |
| | Range | 0~500 | Unit | % | Default | 300 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x052D | | |
| | Valid | Immediate | | | | | | |

Pr5.22 is limited by max. torque set in motor parameter.

| | | | | | | | | |
|--|--------------------|------------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr0.13 | Label | 1 st torque limit | | | Valid mode(s) | P | S | T |
| | Range | 0~500 | Unit | % | Default | 350 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x001B | | |
| | Valid | Immediate | | | | | | |
| 1 st torque limit is set according to ratio percentage of motor rated current. Do not exceed max driver output current. Please refer to Pr5.21 on how to set torque limit. | | | | | | | | |

4.4 Hybrid Control Mode

Hybrid control mode is for servo drive to be able to switch between different modes during operation.

Hybrid control mode consists of the 3 listed below:

- Position-velocity mode
- Position-torque mode
- Velocity-torque mode

Set Pr0.01 to select the hybrid control mode needed through Motion Studio or servo drive front panel.

| Pr0.01 | Label | Control Mode Settings | | | Valid mode(s) | P | S | T |
|--------|-------------|-----------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~10 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0003 | | |
| | Valid | After restart | | | | | | |

| Value | Description | |
|-------|-----------------------------|----------------------|
| | 1 st mode | 2 nd mode |
| 【0】 | Position | — |
| 1 | Velocity | — |
| 2 | Torque | — |
| 3 | Position | Velocity |
| 4 | Position | Torque |
| 5 | Velocity | Torque |
| 6 | PR internal command control | Position Pr0.22=1 |
| | | Velocity Pr0.22=1 |
| | | Torque Pr0.22=2 |
| 7~10 | Reserved | |

◆When 3, 4, 5, 6 combination hybrid mode, 1st and 2nd mode can be chosen accordingly with control mode switching input (C-MODE).
C-MODE: Invalid, select 1st mode.
C-MODE: Valid, select 2st mode.
Please allow some time in between mode switching commands.
◆Please set Pr0.01 = 6 to switch to other modes from PR mod, then set 2nd mode using Pr0.22.
C-MODE is defaulted to Normally Open

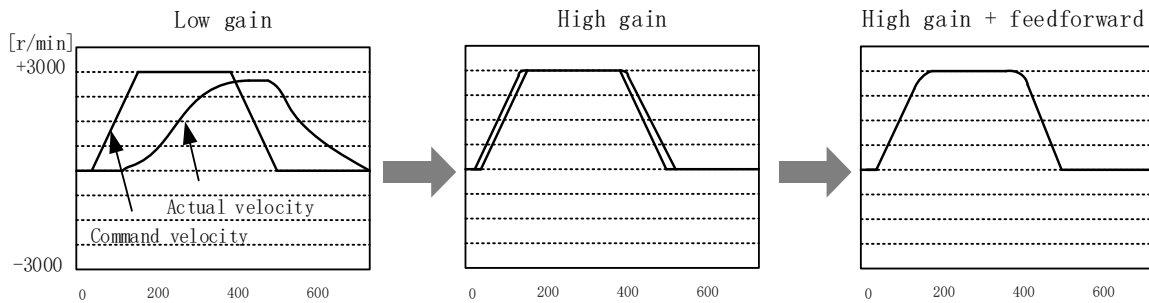
When Pr0.01 = 3/4/5, please set assign C-MODE mode switching signal to one of the DI terminal and make sure the logic is valid.

| Signal | Set value | Label | Description | | |
|--------|-----------|------------------------|-------------|---------|---------------|
| C-MODE | 0x5 | Control mode switching | Pr0.01 | C-MODE | Control mode |
| | | | 3 | Invalid | Position mode |
| | | | | Valid | Velocity mode |
| | | | 4 | Invalid | Position mode |
| | | | | Valid | Torque mode |
| | | | 5 | Invalid | Velocity mode |
| | | | | Valid | Torque mode |

Chapter 5 Application Case

5.1 Gain Adjustment

In order for servo driver to execute commands from master device without delay and to optimize machine performance, gain adjustment has to be done yet.

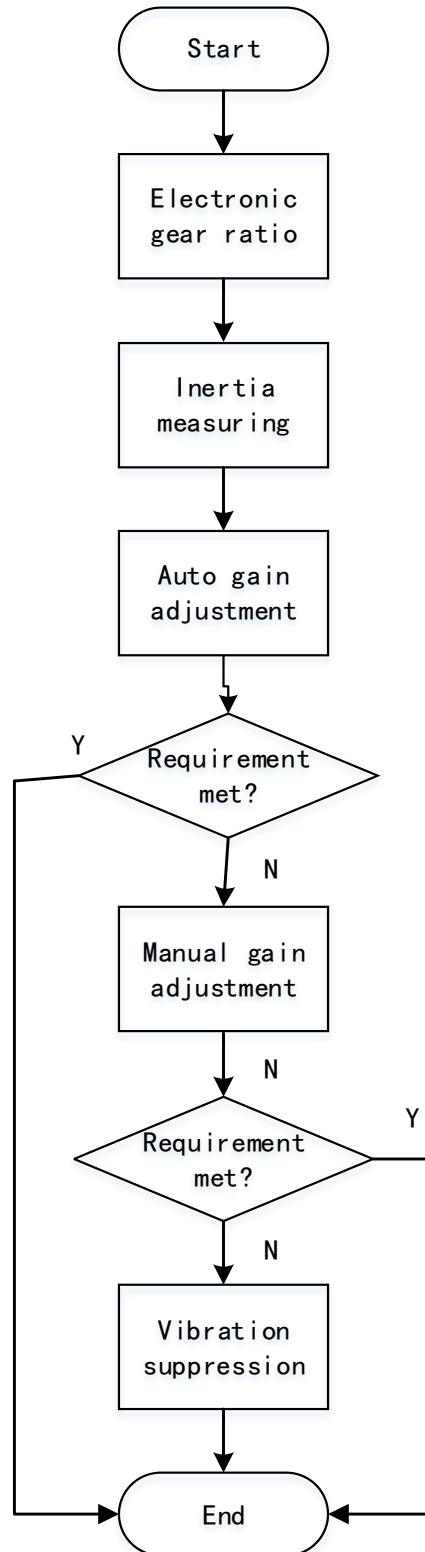


Position loop gain: 320 (0.1/s)
Velocity loop gain: 180 (0.1Hz)
Velocity loop integral time constant: 31ms

Position loop gain: 900 (0.1/s)
Velocity loop gain: 500 (0.1Hz)
Velocity loop integral time constant: 31ms

Position loop gain: 900 (0.1/s)
Velocity loop gain: 500 (0.1Hz)
Velocity loop integral time constant: 31ms

Servo driver gain adjustment is done in combination with a few other parameters (Inertia ratio, Position loop gain, Velocity loop gain and Filters settings). These parameters will have an effect on each other so it always advisable to tune each parameter according in order to achieve optimal machine performance. Please refer to the steps below

**Gain Adjustment Flow Chart**

| Steps | Functions | Explanation |
|------------------------------|--------------------------------|--|
| Inertia ratio identification | Online | Motor moves with command from controller, servo driver will automatically calculate load-inertia ratio |
| Auto gain adjustment | Auto gain adjustment | Real time determining of mechanical load, gain value is set accordingly. <ol style="list-style-type: none"> One-click tuning (Can be realized using Motion Studio. Auto tuning of gain and inertia according to actual data) Real time auto adjustment (Set by selecting mechanical stiffness level, related gain parameters will be automatically adjusted accordingly) |
| Manual gain adjustment | Basic gain | On top of auto gain adjustment, manually adjust related parameters so that machine can have better responsiveness and following |
| | Basic steps | <ol style="list-style-type: none"> Gain related parameters tuning under position mode Gain related parameters tuning under velocity mode Gain related parameters tuning under torque mode |
| | Gain switching | Gain switching through internal data or external signal. Lower vibration at stop, shorten tuning time, improve command following. |
| | Model following control | Improve responsiveness, shorten positioning time (Only available in position mode) |
| | Command pulse filter | Set filter for position, velocity and torque command pulse. |
| | Gain feedforward | Enable feedforward function to improve following behavior |
| | Friction compensation | Reduce the effect of mechanical friction |
| | 3 rd gain switching | Base on usual gain switching function. Can be set to switch gain at stopping and reduce positioning time. |
| Vibration suppression | Mechanical resonance | Using notch filtering function to suppress mechanical resonance. |
| | End vibration suppression | To suppress low frequency vibration of mechanical end |

5.2 Inertia ratio identification function

Inertia ratio = Total mechanical load rotational inertia / Motor rotational inertia

Inertia ratio is an important parameter. Setting a suitable value can help with the precise tuning of the servo system. Inertia ratio can be set manually and also be determined automatically through servo driver

To make sure accurate inertia ratio identification:

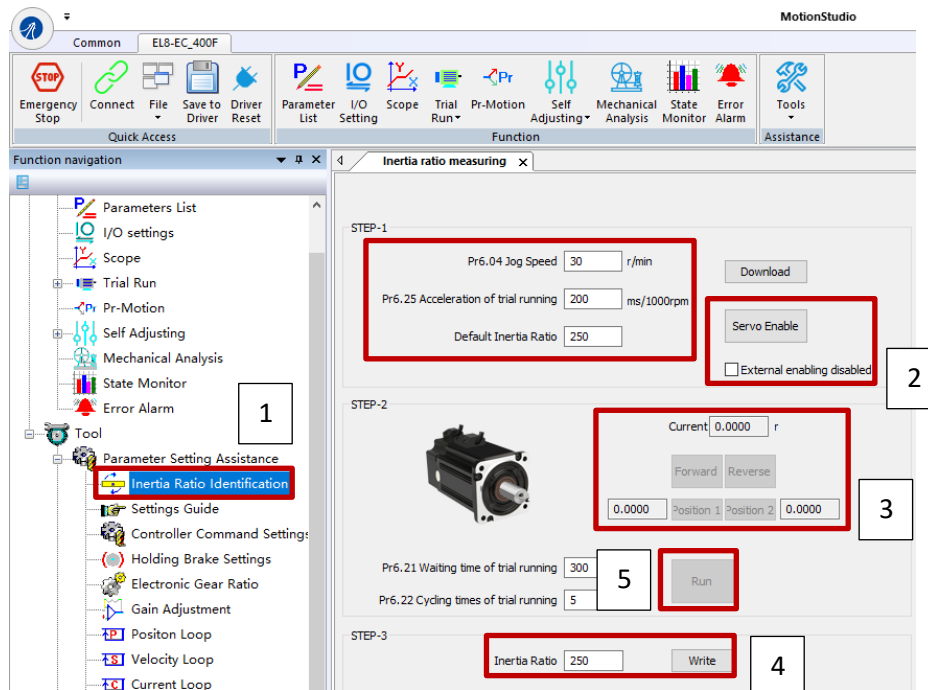
- Max rotational velocity at 400rpm
- Acceleration/deceleration time above 100ms
- Stable load torque without large variation.

Online inertia determination

Enable motor using controller. Let motor run at above 400rpm, make sure there are acceleration, constant velocity and deceleration phase during the whole run. Cycle through 2-3 times to calculate load-inertia ratio. Result can be found on the front panel d16 or through Motion Studio system monitoring page. Enter the calculated value into Pr0.04 and save.

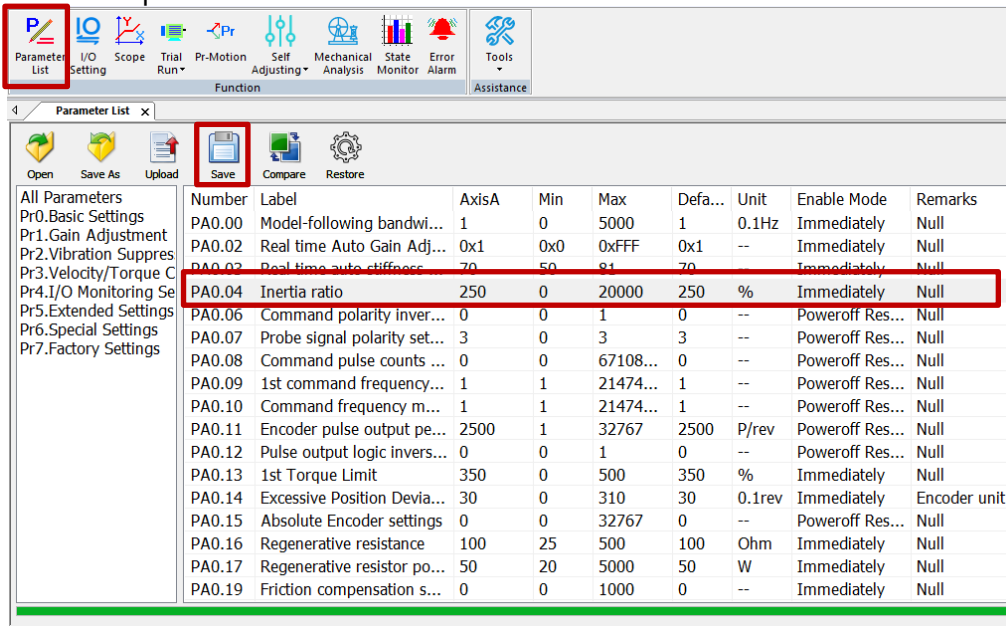
Inertia measuring using Motion Studio

1. Start Motion Studio and maneuver to inertia ratio identification page under performance tuning. Set trial run velocity Pr6.04 and acc-/deceleration time Pr6.25, click on 'Upload' to upload parameters to servo driver.
2. Tick "Prohibit external enabling" and click on "servo on".
3. Click and hold "CCW" to start the motor. Current position will show motor cycles of revolution. Click on POS 1 to save current position as starting point. Click and hold "CW" to start the motor again. Click on POS 2 to save current position as ending point.
4. Set the waiting time between each cycle in Pr6.21 and no. of cycles in Pr6.22. Click on 'Run' and motor will run according to the parameters set.



5. After the calculation is done, inertia ratio will be calculated automatically and click on 'write' to enter the calculated value into Pr0.04.

6. Click on “Parameter List” to enter parameters management to check or modify Pr0.04. Then, click on “Save” to save parameters to driver.



Please take note:

1. Trial run velocity and distance should be optimal to prevent any axis from bumping into objects.
2. It is recommended to move only in 1 direction for vertically mounted axis. Take precaution before moving the axis.
3. For applications with higher frictional drag, please set a minimal travel distance.

| Pr0.04 | Label | Inertia ratio | | | Valid mode(s) | P | S | T |
|--------|-------------|---------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~20000 | Unit | % | Default | 250 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0009 | | |
| | Valid | Immediate | | | | | | |

Pr0.04=(load inertia/motor rotational inertia)*100%

Set inertia ratio according to actual load inertia. When both are uniform, actual motor velocity loop responsiveness and gain settings will be consistent. If inertia ratio is greater than actual value, velocity loop gain settings will be higher and vice versa. For motor with high inertia, Pr0.04 can be left unfilled but optimal setting of Pr0.04 could improve system performance

Common issues

| Error | Cause | Solution |
|---------------------------|---------------------------------|---|
| Inertia measuring failure | Loose load connection | Check for mechanical failure |
| | Measuring distance is too short | Increase measuring distance |
| | Belt load | Please pre-set an inertia ratio when using a belt to prevent jolt due to low inertia. |

5.3 Auto gain adjustment

This function will measure real time mechanical properties and set gain values in accordance to mechanical stiffness. Can be used in any control mode

| Conditions to implement | |
|-------------------------|---|
| Control mode | Please refer to Pr0.02 for detailed explanations. Auto gain adjustment is different for each control mode. |
| Other | <ul style="list-style-type: none"> • Servo driver needs to be enabled • Set up input signals such as deviation counter clearing and command input; Torque limit and other motion control parameters to enable motor to move normally without obstacles. |

- Under certain conditions, external factors might affect automatic gain adjustment functions. If the conditions as listed exist or unfavorable, please disable the automatic gain adjustment function.

| Affecting conditions | |
|----------------------|--|
| Load inertia | <ul style="list-style-type: none"> • If inertia is less than 3 times or over 20 times of rotor inertia. • Changes in load inertia |
| Load | <ul style="list-style-type: none"> • Very low mechanical stiffness • If gear backlash is a non-linear property |
| Motion | <ul style="list-style-type: none"> • Velocity less than 100r/min or continuously in low velocity mode • Acc-/deceleration to 2000r/min within 1s. . • Acc-/deceleration torque lower than eccentric load, frictional torque. • Velocity < 100r/min, acc-/deceleration to 2000r/min within 1s but not longer than 50ms |

To enable automatic gain adjustment:

1. Disable the servo driver.
2. Set Pr0.02 = 0x01/0x11 or 0x02/0x12. Then, set Pr0.03
3. Servo enabled. Run motion as normal to start measuring load properties. Related parameters will be automatically set.
4. Increase motor responsiveness by increasing Pr0.03. Please check if there is any vibration before setting Pr0.03 to max. value.
5. Save the parameters.

Please take note:

- Please stop the motor before modifying any parameter. Pr0.02 only takes effect after saving modified parameter values into EEPROM and restarting the driver.
 - After enabling the servo driver for the first time or when increasing Pr0.03, mechanical noise or vibration might occur for the first run, it is normal. If it persists, please set Pr0.03 to lower value.
- Parameters that change in accordance to real time gain adjustment

There are 2 types of auto gain adjustment methods:

- **Standard mode** (Pr0.02 = 0x__1): Basic mode, prioritizing on stability, gain switching is disabled. Actual gain auto adjustment as accordance to Pr0.03.

Gain related parameters that change as shown below.

| Parameter | Label | Remarks |
|-----------|---|--|
| Pr1.00 | 1 st position loop gain | When stiffness setting is valid, parameters will be updated to match stiffness value |
| Pr1.01 | 1 st velocity loop gain | |
| Pr1.02 | 1 st velocity integral time constant | |
| Pr1.03 | 1 st velocity detection filter | |
| Pr1.04 | 1 st torque filter | |

Gain related that doesn't change

| Parameter | Label | Reference value | Remarks |
|-----------|------------------------------------|-----------------|--|
| Pr1.10 | Velocity feedforward gain constant | 300 (0.1%) | Doesn't change according to changes in stiffness |

- **Positioning mode** (Pr0.02=0x2): Prioritizing positioning. Usually applies on horizontal axis without variable load, ball screws with lower friction, gain switching enabled. Stiffness level of 2nd position loop gain is 1 level higher than 1st position.

| No. | Parameters | Label | Remarks |
|-----|------------|---|--|
| 1 | Pr1.00 | 1 st position loop gain | When stiffness setting is valid, parameters will be updated to match stiffness value |
| 2 | Pr1.01 | 1 st velocity loop gain | |
| 3 | Pr1.02 | 1 st velocity integral time constant | |
| 4 | Pr1.03 | 1 st velocity detection filter | |
| 5 | Pr1.04 | 1 st torque filter | |
| 6 | Pr1.05 | 2 nd position loop gain | |
| 7 | Pr1.06 | 2 nd velocity loop gain | |
| 8 | Pr1.07 | 2 nd velocity integral time constant | |
| 9 | Pr1.08 | 2 nd velocity detection filter | |
| 10 | Pr1.09 | 2 nd torque filter | |

If auto gain adjustment is valid, the parameters listed above can't be manually modified. Only when Pr0.02 = 0x00 or 0x10, can the gain related parameters be modified manually.

Gain related parameters that don't change with the real time gain adjustment

| Parameter | Label | Reference value |
|-----------|---|-----------------|
| Pr1.10 | Velocity feedforward gain constant | 1000ms |
| Pr1.11 | Velocity feedforward filter time constant | 30% |
| Pr1.12 | Torque feedforward gain | 0.50ms |
| Pr1.13 | Torque feedforward filter time constant | 0 |
| Pr1.15 | Position control gain switching mode | 0 |
| Pr1.17 | Position control switching level | 10 |
| Pr1.18 | Position control switching hysteresis | 50 |
| Pr1.19 | Position gain switching time | 33 |

Types of mechanical load

Please select mechanical load according to load-inertia ratio and mechanical structures:

| Load types | Description |
|-----------------------------------|--|
| 0x00_ : Rigid structure | When load is rigid with relatively low inertia . Gain adjustments prioritize system responsiveness . Structures including high precision reducer, lead screws, mechanical gears, etc. |
| 0x01_ : High inertia | High load inertia (10 times or above). Gain adjustments prioritize operation stability and responsiveness . Recommended mechanical stiffness level not more than 15 . |
| 0x02_ : Flexible structure | When load is flexible with relatively high inertia . Gain adjustments prioritize operation stability . Structures including long transportation belt or chain. |

Structures with high inertia can have better performance if inertia ratio is set accurately.

| Pr0.02 | Label | | Real time Auto Gain Adjusting | | Valid mode(s) | | P | S | T |
|-----------|---------------------|---|--|-----------|---------------|-------------|--------|---|---|
| | Range | | 0x0~0xFFFF | Unit | — | Default | 0x1 | | |
| | Byte length | | 16bit | Attribute | R/W | 485 address | 0x0005 | | |
| | Valid | | Immediate | | | | | | |
| Data bits | Category | Settings | Application | | | | | | |
| 0x00_ | Motion setting mode | Used to set motion setting mode, which can be selected according to the motion characteristics or setting requirements. Generally, it is recommended to select mode 1 with good generality when there is no special requirement, mode 2 when rapid positioning is needed If mode 1 and mode 2 cannot meet the requirements, please choose mode 0. | | | | | | | |
| | | 0:Manual | Pr0.03 invalid. Gain value must be adjusted manually and accordingly. | | | | | | |
| | | 1:Standard | Pr0.03 valid. Quick gain adjusting can be achieved by changing Pr0.03 stiffness value. Gain switching is not used in this mode, suitable for applications with requirements for stability. | | | | | | |
| | | 2:Positioning | Pr0.03 valid. Quick gain adjusting can be achieved by changing Pr0.03 stiffness value. This mode is suitable for applications requiring quick positioning. Not recommended for load mounted vertical to ground, or please compensate for the load using Pr6.07 | | | | | | |

| | | | |
|-------|-------------------|--|---|
| 0x0_0 | Load type setting | Used to select the load type, choose according to load-inertia ratio and mechanical structure. | |
| | | 0: Rigid structure | This mode prioritizes system responsiveness. Use this mode when there is a relatively rigid structure with low load inertia. Typical application including directly connected high-precision gearbox, lead screw, gears, etc. |
| | | 1: High inertia | For applications with higher load inertia (10 times or above), gain settings take into account both machine stability and responsiveness. Not recommended to set stiffness above 15 for high load inertia. |
| | | 2: Flexible structure | This mode prioritizes system stability. Use this mode when there is low rigidity structure with high load inertia. Typical applications included belts and chains. |
| 0x_00 | reserved | | |

The setting type combination is a hexadecimal standard, as follows:

| Setting type combination | Application type |
|--------------------------|----------------------------------|
| 0X000 | Rigid structure + Manual |
| 0X001 | Rigid structure + Standard |
| 0X002 | Rigid structure + Positioning |
| 0X010 | High inertia + Manual |
| 0X011 | High inertia + Standard |
| 0X012 | High inertia + Positioning |
| 0X020 | Flexible structure + Manual |
| 0X021 | Flexible structure + Standard |
| 0X022 | Flexible structure + Positioning |

| Pr0.03 | Label | Real time auto stiffness adjusting | | | Valid mode(s) | P | S | T |
|--------|-------------|------------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0 ~ 31 | Unit | — | Default | 11 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0007 | | |
| | Valid | Immediate | | | | | | |

Low —————> Mechanical stiffness —————> High

Low —————> Servo gain —————> High

81.80.....70.69.68.....51.50

Low —————> Responsiveness —————> High

Lower values ensure better system responsiveness and mechanical stiffness but machine vibration might occur, please set accordingly. Recommend to set to around 15 with motor with high inertia.

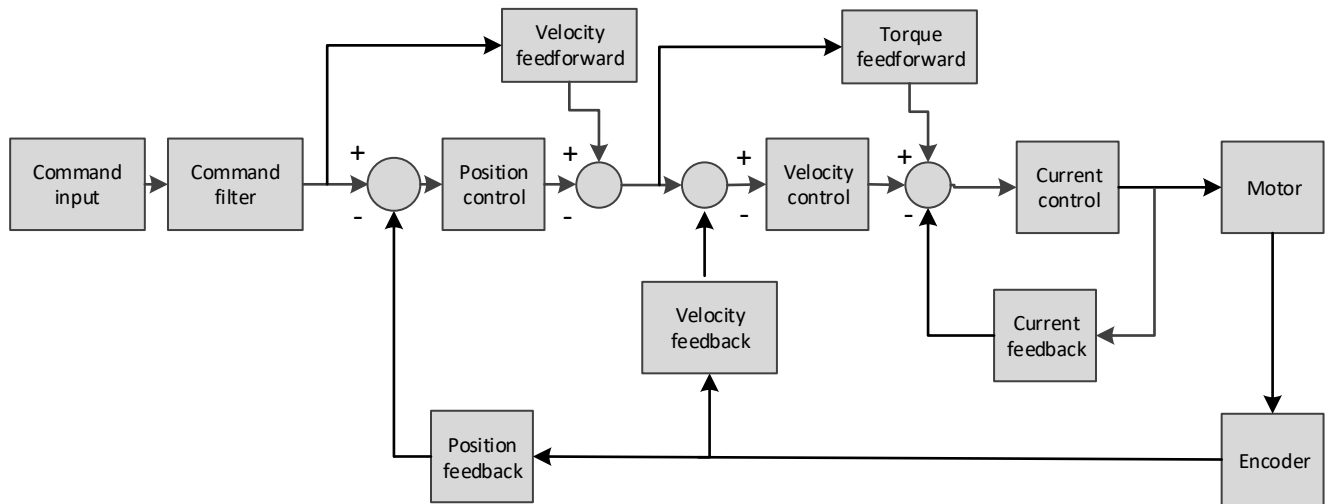
Gain parameters settings table

| Stiffness | 1 st gain | | | | 2 nd gain | | | |
|-----------|----------------------------|-------------------------|--|------------------------|----------------------------|-------------------------|--|------------------------|
| | Pr1.00 | Pr1.01 | Pr1.02 | Pr1.04 | Pr1.05 | Pr1.06 | Pr1.07 | Pr1.09 |
| | Position loop gain (0.1/s) | Velocity loop gain (Hz) | Velocity loop integral time constant (0.1ms) | Torque filter (0.01ms) | Position loop gain (0.1/s) | Velocity loop gain (Hz) | Velocity loop integral time constant (0.1ms) | Torque filter (0.01ms) |
| 81 | 20 | 15 | 3700 | 1500 | 25 | 15 | 10000 | 1500 |
| 80 | 25 | 20 | 2800 | 1100 | 30 | 20 | 10000 | 1100 |
| 79 | 30 | 25 | 2200 | 900 | 40 | 25 | 10000 | 900 |
| 78 | 40 | 30 | 1900 | 800 | 45 | 30 | 10000 | 800 |
| 77 | 45 | 35 | 1600 | 600 | 55 | 35 | 10000 | 600 |
| 76 | 55 | 45 | 1200 | 500 | 70 | 45 | 10000 | 500 |
| 75 | 75 | 60 | 900 | 400 | 95 | 60 | 10000 | 400 |
| 74 | 95 | 75 | 700 | 300 | 120 | 75 | 10000 | 300 |
| 73 | 115 | 90 | 600 | 300 | 140 | 90 | 10000 | 300 |
| 72 | 140 | 110 | 500 | 200 | 175 | 110 | 10000 | 200 |
| 71 | 175 | 140 | 400 | 200 | 220 | 140 | 10000 | 200 |
| 70 | 320 | 180 | 310 | 126 | 380 | 180 | 10000 | 126 |
| 69 | 390 | 220 | 250 | 103 | 460 | 220 | 10000 | 103 |
| 68 | 480 | 270 | 210 | 84 | 570 | 270 | 10000 | 84 |
| 67 | 630 | 350 | 160 | 65 | 730 | 350 | 10000 | 65 |
| 66 | 720 | 400 | 140 | 57 | 840 | 400 | 10000 | 57 |
| 65 | 900 | 500 | 120 | 45 | 1050 | 500 | 10000 | 45 |
| 64 | 1080 | 600 | 110 | 38 | 1260 | 600 | 10000 | 38 |
| 63 | 1350 | 750 | 90 | 30 | 1570 | 750 | 10000 | 30 |
| 62 | 1620 | 900 | 80 | 25 | 1880 | 900 | 10000 | 25 |
| 61 | 2060 | 1150 | 70 | 20 | 2410 | 1150 | 10000 | 20 |
| 60 | 2510 | 1400 | 60 | 16 | 2930 | 1400 | 10000 | 16 |
| 59 | 3050 | 1700 | 50 | 13 | 3560 | 1700 | 10000 | 13 |
| 58 | 3770 | 2100 | 40 | 11 | 4400 | 2100 | 10000 | 11 |
| 57 | 4490 | 2500 | 40 | 9 | 5240 | 2500 | 10000 | 9 |
| 56 | 5000 | 2800 | 35 | 8 | 5900 | 2800 | 10000 | 8 |
| 55 | 5600 | 3100 | 30 | 7 | 6500 | 3100 | 10000 | 7 |
| 54 | 6100 | 3400 | 30 | 7 | 7100 | 3400 | 10000 | 7 |
| 53 | 6600 | 3700 | 25 | 6 | 7700 | 3700 | 10000 | 6 |
| 52 | 7200 | 4000 | 25 | 6 | 8400 | 4000 | 10000 | 6 |
| 51 | 8100 | 4500 | 20 | 5 | 9400 | 4500 | 10000 | 5 |
| 50 | 9000 | 5000 | 20 | 5 | 10500 | 5000 | 10000 | 5 |

5.4 Manual gain adjustment

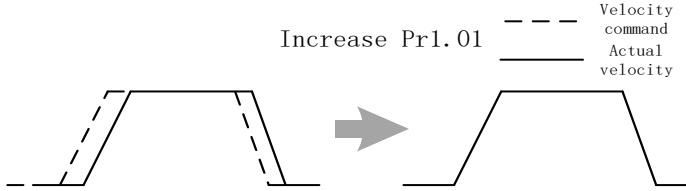
Due to limitation of load conditions, automatic gain adjustment might not achieve expected performance. Control can be improved through manual gain adjustment

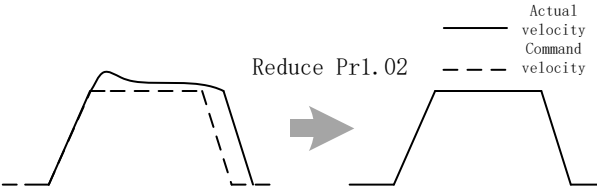
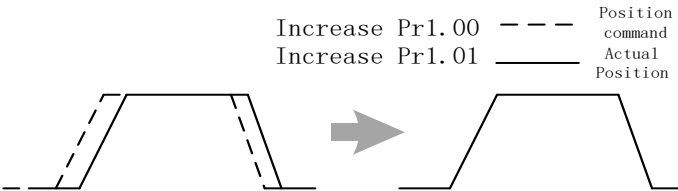
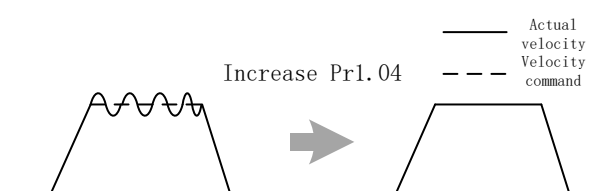
The servo system is made up of 3 control loops. From outer to inner: position loop, velocity loop, current loop as shown in the diagram below.



Inner control loop demands higher responsiveness. In order to avoid system instability, please tune in accordance to this principle. Current loop gain usually satisfies the responsiveness demand without tuning. When gain adjustment is done under position control mode, in order to keep the system stable, position and velocity loop gain have to be increased at the same time to make sure the responsiveness of the position loop is lower than velocity loop.

Steps to tuning (Position and velocity control)

| Step | Parameter | Label | Tuning method |
|------|-----------|--------------------|---|
| 1 | Pr1.01 | Velocity loop gain | <p>Determine if velocity loop is able to follow the changes in velocity command at highest frequency. If Pr0.04 is set correctly, velocity loop highest following frequency = Pr1.01</p> <p>  </p> <p>Increase Pr1.01 provided there is no noise or vibration to reduce positioning time, better velocity stability and following. Reduce Pr1.01 if there is mechanical noise. Set up vibration suppression if there is mechanical vibration.</p> |

| Step | Parameter | Label | Tuning method |
|------|-----------|---|--|
| 2 | Pr1.02 | Velocity loop integral time constant | <p>To eliminate velocity loop deviation</p>  <p>Reduce Pr1.02</p> <p>Velocity loop integral time constant (ms) = $4000 / (2 \times \pi \times \text{Velocity loop gain(Hz)})$</p> <p>Reduce Pr1.02 to reduce positioning time. Mechanical vibration might occur if set value is too low; Velocity loop deviation can't be zeroed if set value is too high.</p> <p>Reduce Pr1.02 to increase systemic stiffness, reduce deviation, provided that there is no resonance or noise in the system. If load-inertia ratio is high or resonance exists in mechanical system, increase Pr1.02.</p> |
| 3 | Pr1.00 | Position loop gain | <p>Determine if position loop is able to follow the changes in position command at highest frequency. Position loop highest following frequency = Pr1.00</p>  <p>Increase Pr1.00</p> <p>Increase Pr1.01</p> <p>Increase Pr1.00 to reduce position following deviation, reduce positioning time provided that there is no resonance or noise in the system. If Pr1.00 is set too high, it might cause trembling in the mechanical system or positioning overshoot</p> |
| 4 | Pr1.04 | 1 st torque filter time constant | <p>Eliminate high frequency noise, suppress mechanical resonance.</p>  <p>Increase Pr1.04</p> <p>System response improves with lower set value but there is mechanical limitations; High frequency resonance suppression improves with higher set value but it might cause reduction in response bandwidth and phase margin, resulting in system turbulence.</p> <p>Torque filtering frequency is 4 times higher than velocity loop max following frequency: $1000000 / (2 \times \pi \times \text{Pr1.04}) \geq \text{Pr1.01} \times 4$</p> <p>For example, when Pr1.01=180 (0.1 Hz) , Pr1.04 should satisfy: $\text{Pr1.04} \leq 221$ (0.01ms)</p> |

1. If vibration occurs with increasing Pr1.01, please modify Pr1.04 to suppress vibration.
2. If the parameters are set too high, it might cause current loop response to reduce.
3. To suppress vibration at stop, increase Pr1.01 and decrease Pr1.04.
4. Decrease Pr1.04 if motor vibrates too much at rest.
5. Pr1.04 cannot be set to overly high value as it might cause control system instability because the torque loop response is much higher than velocity loop.

For servo gain, if any one of the parameters is changed, please modify other gain related parameters accordingly. Make sure to the change at around 5% and follow the rules as below.

- 1) Increase responsiveness
 - a) Reduce torque command filter time
 - b) Increase velocity loop gain
 - c) Decrease velocity loop integral time
 - d) Increase position loop gain
- 2) Decrease responsiveness, prevent vibration and over shoot
 - a) Reduce position loop gain
 - b) Increase velocity loop integral time
 - c) Reduce velocity loop gain
 - d) Increase torque filter time

5.4.1 Parameters adjustment under different control modes

Under different control mode, parameters adjustment has to be adjusted in this order:
 “Inertia measuring” -> “Auto gain adjustment”->” Manual gain adjustments”

Position control mode

Set load-inertia ratio Pr0.04 after inertia determination.

| No. | Parameter | Label |
|-----|-----------|---|
| 1 | Pr1.00 | 1 st position loop gain |
| 2 | Pr1.01 | 1 st velocity loop gain |
| 3 | Pr1.02 | 1 st velocity integral time constant |
| 4 | Pr1.03 | 1 st velocity detection filter |
| 5 | Pr1.04 | 1 st torque filter time constant |
| 6 | Pr1.05 | 2 nd position loop gain |
| 7 | Pr1.06 | 2 nd velocity loop gain |
| 8 | Pr1.07 | 2 nd velocity integral time constant |
| 9 | Pr1.08 | 2 nd velocity detection filter |
| 10 | Pr1.09 | 2 nd torque filter time constant |
| 11 | Pr1.10 | Velocity feedforward gain constant |
| 12 | Pr1.11 | Velocity feedforward filter time constant |
| 13 | Pr1.12 | Torque feedforward gain |
| 14 | Pr1.13 | Torque feedforward filter time constant |
| 15 | Pr1.15 | Position control gain switching mode |
| 16 | Pr1.17 | Position control switching level |
| 17 | Pr1.18 | Position control switching hysteresis |
| 18 | Pr1.19 | Position gain switching time |

1st and 2nd gain initial values are obtained by automatic gain adjustment

| No. | Parameter | Label |
|-----|-----------|---|
| 1 | Pr1.00 | 1 st position loop gain |
| 2 | Pr1.01 | 1 st velocity loop gain |
| 3 | Pr1.02 | 1 st velocity integral time constant |
| 4 | Pr1.03 | 1 st velocity detection filter |
| 5 | Pr1.04 | 1 st torque filter time constant |
| 6 | Pr1.05 | 2 nd position loop gain |
| 7 | Pr1.06 | 2 nd velocity loop gain |
| 8 | Pr1.07 | 2 nd velocity integral time constant |
| 9 | Pr1.08 | 2 nd velocity detection filter |
| 10 | Pr1.09 | 2 nd torque filter time constant |

Manually adjusted gain parameters

| No. | Parameter | Label |
|-----|-----------|---|
| 1 | Pr1.00 | 1 st position loop gain |
| 2 | Pr1.01 | 1 st velocity loop gain |
| 3 | Pr1.02 | 1 st velocity integral time constant |
| 4 | Pr1.04 | 1 st torque filter time constant |
| 5 | Pr1.10 | Velocity feedforward gain constant |
| 6 | Pr1.11 | Velocity feedforward filter time constant |

Velocity control mode

Velocity control mode parameters adjustment is pretty similar to position control mode. Except for position loop gain Pr1.00 and Pr1.05, velocity feedforward gain (Pr1.10)

Torque control mode

Parameters adjustment for torque control mode has to be differentiate into 2 conditions:

1. When actual velocity reaches velocity limit, adjustment will be as per velocity control mode. Motor will switch from torque control to velocity limit as velocity control.
2. When actual velocity doesn't reach velocity limit yet, Except for position loop gain, velocity loop gain and feedforward gain, parameter adjustments as per velocity control mode.

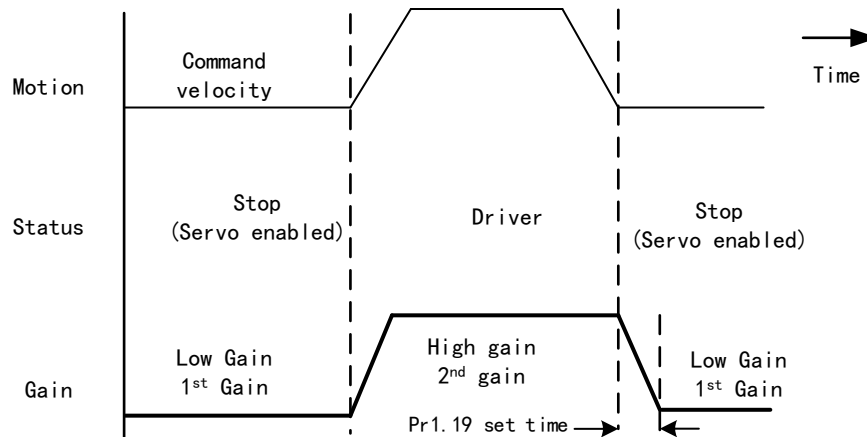
If there is no velocity limit and control is through torque command, please deactivate torque and notch filter, set velocity limit to max. value and increase velocity loop gain to as high as possible.

5.4.2 Gain switching

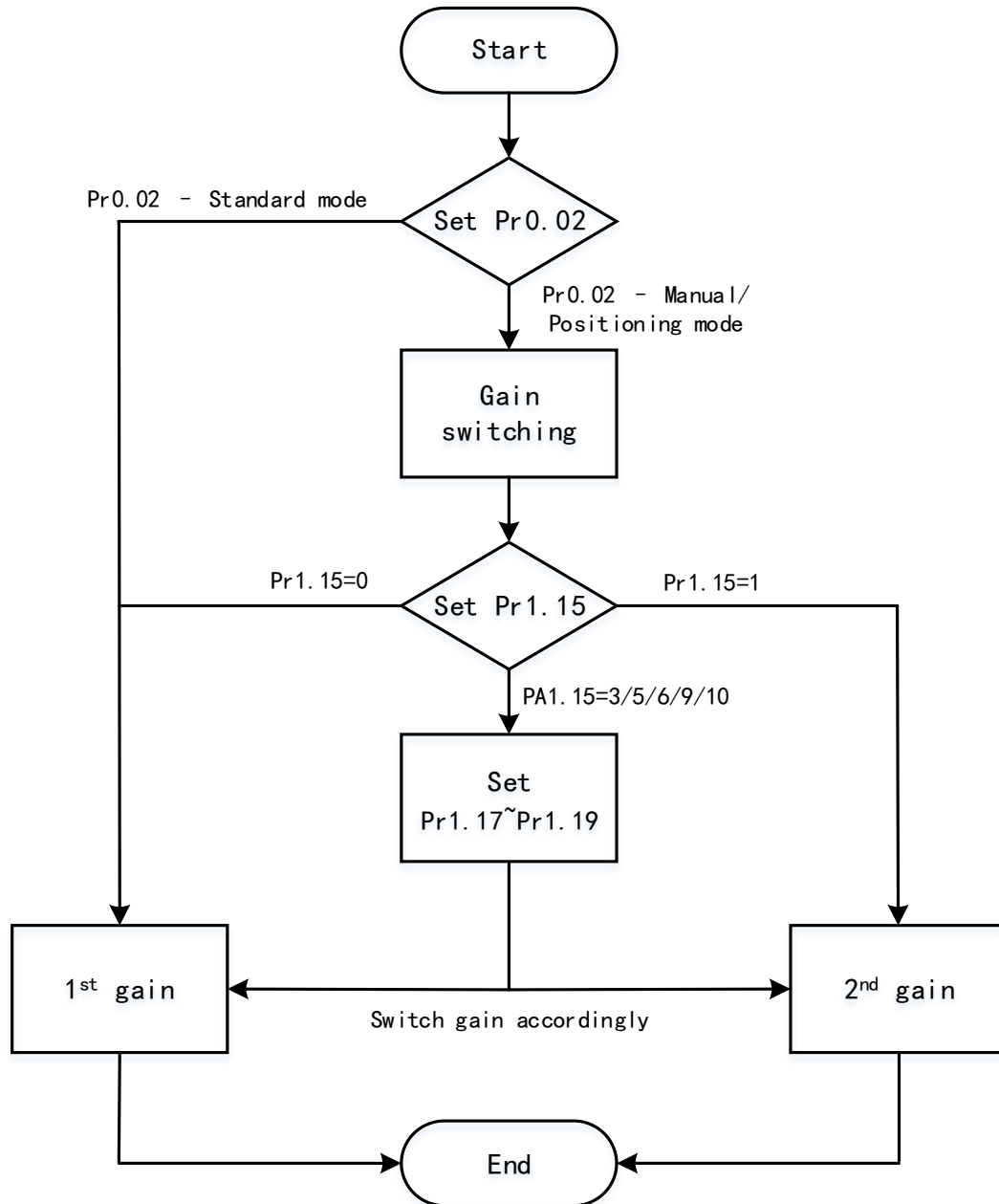
Gain switching function can be triggered internally in servo driver. Only valid under position or velocity control mode. Following effects can be realized by gain switching:

1. Switch to lower gain when motor stops to suppress vibration
2. Switch to higher gain when motor is moving at a low velocity to shorten positioning time
3. Switch to higher gain when motor is moving at a high velocity to improve command following behavior.

Diagram below shows gain switching when motor stops.

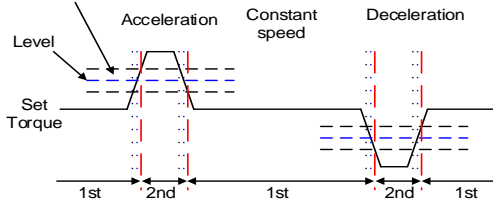
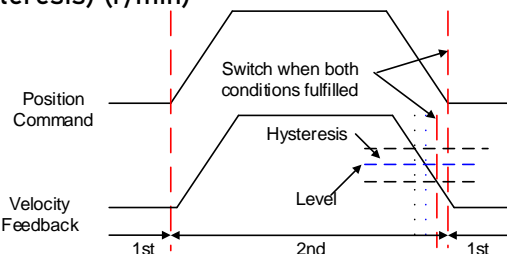


1st gain (Pr1.00-Pr1.04) and 2nd gain (Pr1.05-Pr1.09) switching can be realized through manual and positioning mode. Switching condition is set through Pr1.15. Gain switching is invalid under standard mode.



Related parameters on gain switching

| No. | Parameter | Label | Remarks |
|-----|-----------|---------------------------------------|--|
| 1 | Pr1.15 | Position control gain switching mode | In position control, set Pr1.15=3、5、6、9、10. In velocity control, set Pr1.15=3、5、9 |
| 2 | Pr1.17 | Position control level switching | Please set Pr1.17≥Pr1.18 |
| 3 | Pr1.18 | Position control hysteresis switching | If Pr1.17<Pr1.18, driver will set Pr1.17=Pr1.18 |
| 4 | Pr1.19 | Position gain time switching | As shown below |

| | | | | | | |
|--|-------------|---|---|----------------|-------------|--------|
| Pr1.15 | Label | Position control gain switching mode | | Valid mode(s) | P | |
| | Range | 0~10 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x011F |
| | Valid | Immediate | | | | |
| In position control, set the conditions for gain switching to be valid. | | | | | | |
| | Value | Condition | Gain switching condition | | | |
| | 【0】 | 1 st gain fixed | Fixed on using 1 st gain(Pr1.00-Pr1.04) | | | |
| | 1 | 2 nd gain fixed | Fixed on using 2 nd gain (Pr1.05-Pr1.09) | | | |
| | 2 | Gain switching input valid | · Gain switching input (GAIN) invalid: 1 st gain. · Gain switching input (GAIN) valid: 2 nd gain. *Default: 1 st gain | | | |
| | 3 | High command torque | <p>Switch to 2nd gain when set torque command absolute value larger than (level + hysteresis)[%] Switch to 1st gain when set torque command absolute value smaller than (level + hysteresis)[%]</p>  | | | |
| | 4-9 | Reserved | Reserved | | | |
| | 10 | Pending position command +actual velocity | <p>Valid for position control. Switch to 2nd gain if position command ≠ 0 Switch to 1st gain if positional command = 0 throughout the duration of delay time and absolute value of actual velocity remains smaller than (level - hysteresis) (r/min)</p>  | | | |
| ** Above 'level' and 'hysteresis' are in correspondence to Pr1.17 Position control gain switching level and Pr1.18 Hysteresis at position control switching. | | | | | | |
| Pr1.17 | Label | Position control gain switching level | | Valid mode(s) | P | |
| | Range | 0~20000 | Unit | Mode dependent | Default | 50 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0123 |
| | Valid | Immediate | | | | |

Set threshold value for gain switching to occur.
Unit is mode dependent.

| Switching condition | Unit |
|---------------------|---------------------|
| Position | Encoder pulse count |
| Velocity | RPM |
| Torque | % |

Please set level \geq hysteresis

| | | | | | | | |
|---------------|--------------------|--|------------------|----------------------|--------------------|--------|--|
| Pr1.18 | Label | Hysteresis at position control switching | | Valid mode(s) | P | | |
| | Range | 0~20000 | Unit | Mode dependent | Default | 33 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0125 | |
| | Valid | Immediate | | | | | |

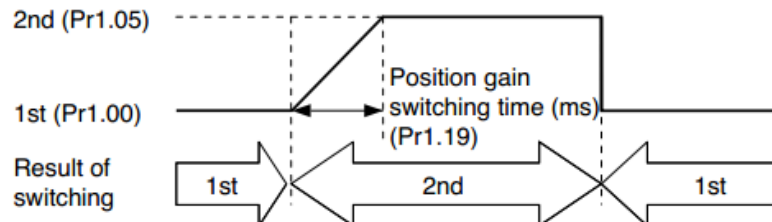
To eliminate the instability of gain switching. Used in combination with Pr1.17 using the same unit.

If level < hysteresis, drive will set internally hysteresis = level.

| | | | | | | | |
|---------------|--------------------|---------------------------------|------------------|----------------------|--------------------|--------|--|
| Pr1.19 | Label | Position control switching time | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 33 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0127 | |
| | Valid | Immediate | | | | | |

During position control, if 1st and 2nd gain difference is too large, to ease torque changes and vibration due to rapid changes in position loop gain, set suitable Pr1.19 value

For example: 1st (pr1.00) <-> 2nd (Pr1.05)

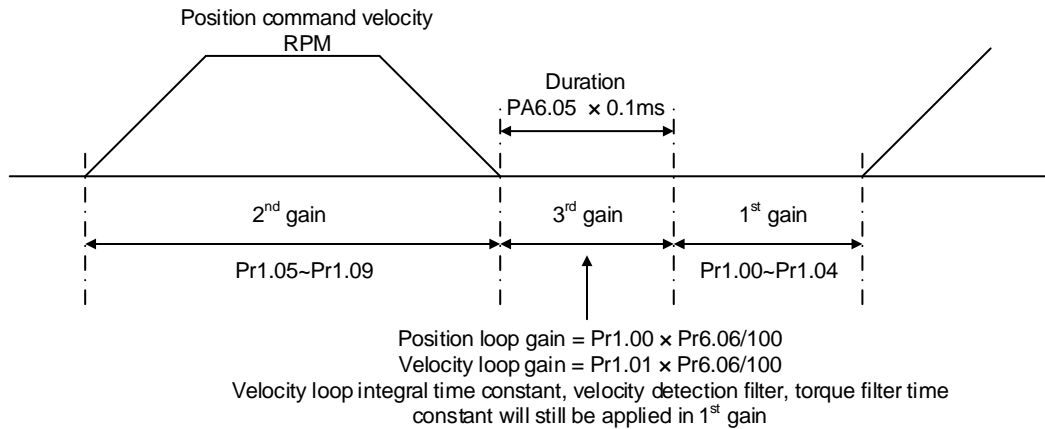


5.5 3rd gain switching

Besides switching between 1st and 2nd gain, a 3rd gain switching is added to set gain at the moment of stopping to reduce positioning time.

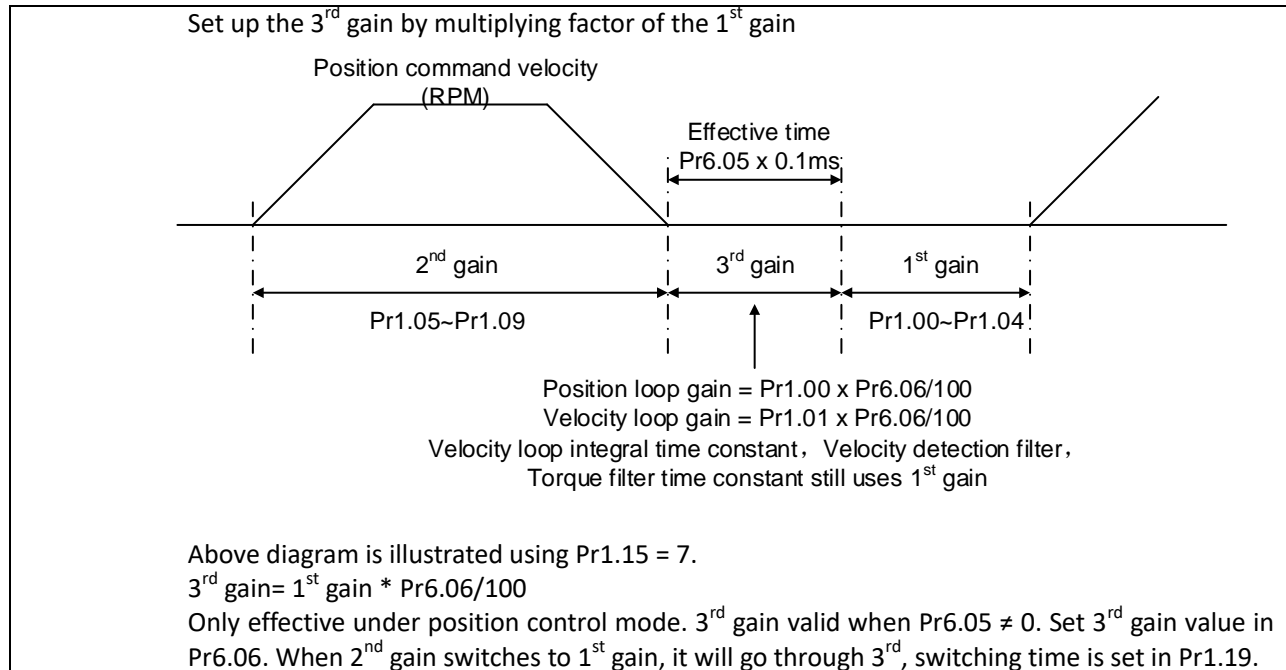
Only available under position mode and Pr6.05 ≠ 0, set Pr6.06 for 3rd gain value. When 2nd gain switches to 1st gain, it has to go through 3rd gain, switching time is set in Pr1.19.

Diagram below shows when Pr1.15 = 7.



Related parameters

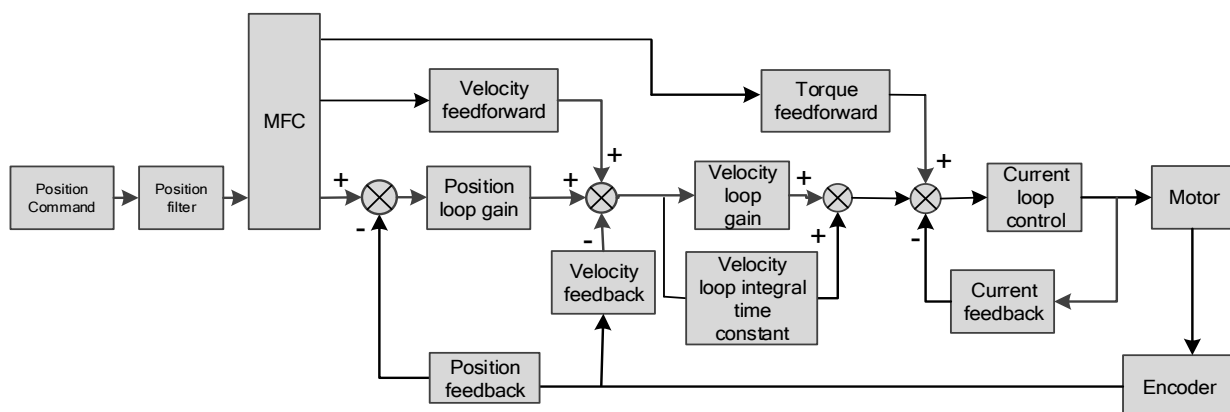
| | | | | | | | | |
|--|-------------|--|-----------|-------|---------------|--------|--|--|
| Pr6.05 | Label | Position 3 rd gain valid time | | | Valid mode(s) | P | | |
| | Range | 0~10000 | Unit | 0.1ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060B | | |
| | Valid | Immediate | | | | | | |
| To set time for 3 rd gain to be valid Only available in position mode When not in use, set Pr6.05=0, Pr6.06=100 | | | | | | | | |
| Pr6.06 | Label | Position 3 rd gain scale factor | | | Valid mode(s) | P | | |
| | Range | 50~1000 | Unit | 100% | Default | 100 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060D | | |
| | Valid | Immediate | | | | | | |



5.6 Model following control

Model following control is a type of closed loop control system. First, an ideal model is constructed and acts as a reference for actual model in a closed loop control. Model following control can be treated as a control mode with 2 flexibilities: Model reference can be used to improve command responsiveness and closed loop control used to increase responsiveness of the system towards interference. They don't affect each other.

Model following control can be used in position loop control to increase responsiveness to commands, reduce positioning time and following error. This function is only available in position control mode.



To adjust model following control

1. Automatic adjustment

Set model following bandwidth $Pr0.00 = 1$ for automatic adjustment. Now, $Pr0.00 = Pr1.01$, model following bandwidth is adjusted automatically according to different velocity loop gain.

3. Manual adjustment

Please use manual adjustment if

- Automatic adjustment is not satisfactory.
- Responsiveness needs further improvement in comparison with automatic adjustment.
- There is a need to set servo gain or model following control parameters manually.

Steps to manually adjust

| Step | Content |
|------|---|
| 1 | Set up vibration suppression. |
| 2 | Set up the right inertia ratio. |
| 3 | Manually adjust gain. |
| 4 | Increase $Pr0.00$ provided that there is no overshoot and vibration. Usually $Pr0.00 \geq Pr1.01$ is recommended. |

Model following bandwidth determines the responsiveness of the servo system. Increase the value set will increase responsiveness and reduce positioning time. Overshoot can be prevented if it is set at a lower value but responsiveness will be lowered. Model following bandwidth shouldn't be too large for mechanical structure with lower stiffness, excessive position deviation alarm might occur under high velocity.

5.7 Feedforward gain

In position control, velocity feedforward is calculated by comparing the velocity control command calculated internally and velocity command calculated from position feedback. Comparing to control only using feedbacks, this will reduce position deviation and increase responsiveness. Besides, by comparing the torque needed during motion from velocity control command in comparison with velocity feedback, torque feedback can be calculated to improve system responsiveness.

5.7.1 Velocity feedforward

Velocity feedforward can be used in position control mode. When the function is enabled, it can increase velocity responsiveness, reduce position deviation during constant velocity.

| | | | | | | | |
|---|--------------------|--|------------------|--------|----------------------|----------|--|
| Pr1.10 | Label | Velocity feed forward gain | | | Valid mode(s) | P | |
| | Range | 0~1000 | Unit | 0.10% | Default | 300 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0115 | |
| | Valid | Immediate | | | | | |
| Used for decreasing following error caused by low responsiveness of velocity loop. Might cause overshoot or increase in noise if set value is too high. | | | | | | | |
| Pr1.11 | Label | Velocity feed forward filter time constant | | | Valid mode(s) | P | |
| | Range | 0~6400 | Unit | 0.01ms | Default | 50 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0117 | |
| | Valid | Immediate | | | | | |
| Set velocity feed forward low pass filter to eliminate high or abnormal frequencies in velocity feed forward command. Often used when position command with low resolution or high electronic gear ration to smoothen velocity feed forward. Position deviation under constant velocity can be lowered with higher velocity feed forward | | | | | | | |

gain. Please to refer to the equation below.

Reduce Pr1.11 value to suppress velocity overshoot during deceleration; Increase Pr1.11 value to suppress noise or vibration due to long driver control cycle or position command uneven pulse frequency.

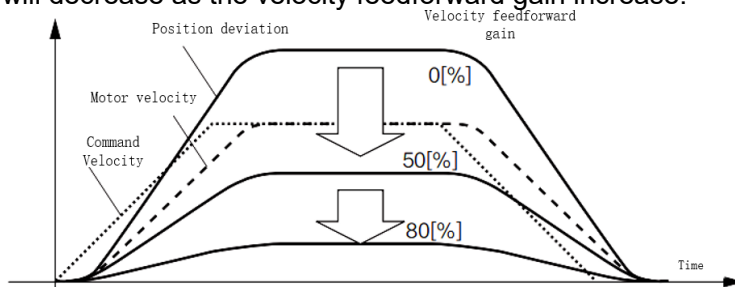
<Application>

Set Pr1.11 = 50 (0.5ms) , improve feedforward effect by gradually increase Pr1.10. The equation below can be used to determine the position deviation due to velocity feedforward gain under constant velocity.

$$\text{Position deviation[Um]} = \frac{\text{Set velocity}[\frac{\text{Um}}{\text{s}}]}{\text{Position loop gain[Hz]}} \times \frac{100 - \text{Velocity feed forward gain}[\%]}{100}$$

Velocity feedforward application

Set Pr1.11 to around 50 (0.5ms), then tune Pr1.10 from 0 to bigger values until the velocity feedforward achieves better performance. Under constant velocity, the position deviation in a motion will decrease as the velocity feedforward gain increase.



Steps to tuning:

1. Increase Pr1.10 to increase responsiveness but velocity overshoot might occur during acc-/deceleration.
2. By reducing Pr1.11, velocity feedforward would be more effective and vice versa. Pr1.10 and Pr1.11 need to be tuned to a balance.
3. If mechanical noise exists under normal working conditions, please increase Pr1.11 or use position command filter (1 time delay/ FIR smoothing filter)

5.7.2 Torque feedforward

Position control mode: Torque feedforward can increase the responsiveness of torque command, decrease position deviation during constant acc-/deceleration.

Velocity control mode: Torque feedforward can increase the responsiveness of torque command, decrease velocity deviation during constant velocity.

| Pr1.12 | Label | Torque feed forward gain | | | Valid mode(s) | P | S |
|--------|-------------|--------------------------|-----------|------|---------------|--------|---|
| | Range | 0~1000 | Unit | 0.1% | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0119 | |
| | Valid | Immediate | | | | | |

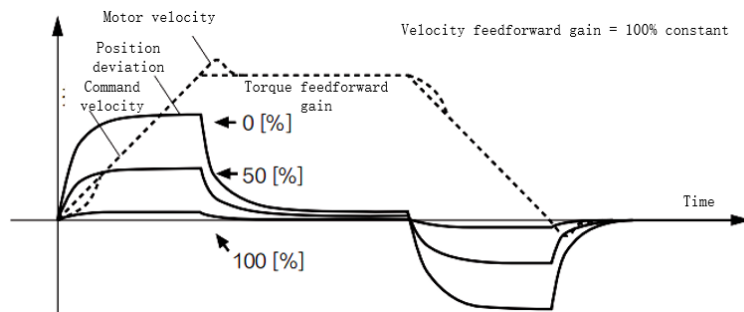
Before using torque feed forward, please set correct inertia ratio Pr0.04. By increasing torque feed forward gain, position deviation on constant acceleration/deceleration can be reduced to close to 0. Under ideal condition and trapezoidal speed profile, position deviation of the whole motion can be reduced to close to 0. In reality, perturbation torque will always exist, hence

position deviation can never be 0.

| Pr1.13 | Label | Torque feed forward filter time constant | | | Valid mode(s) | P | S | |
|--|-------------|--|-----------|--------|---------------|--------|---|--|
| | Range | 0~6400 | Unit | 0.01ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x011B | | |
| | Valid | Immediate | | | | | | |
| <p>Low pass filter to eliminate abnormal or high frequencies in torque feed forward command. Usually used when encoder has lower resolution or precision.</p> <p>Noise reduces if torque feed forward filter time constant is set higher but position deviation will increase at acceleration varied points.</p> <p><Application></p> <ul style="list-style-type: none">• Set Pr1.13 = 50ms, please increase torque forward gain gradually to enable torque feedforward.• By increasing Pr1.13, noise will reduce but position deviation will become larger. | | | | | | | | |

Torque feedforward application

Set Pr1.13 to around 50 (0.5ms), then tune Pr1.10 from 0 to bigger values until torque feedforward achieves better performance. Under constant acc-/deceleration, the position deviation in a motion will decrease as the velocity feedforward gain increase.

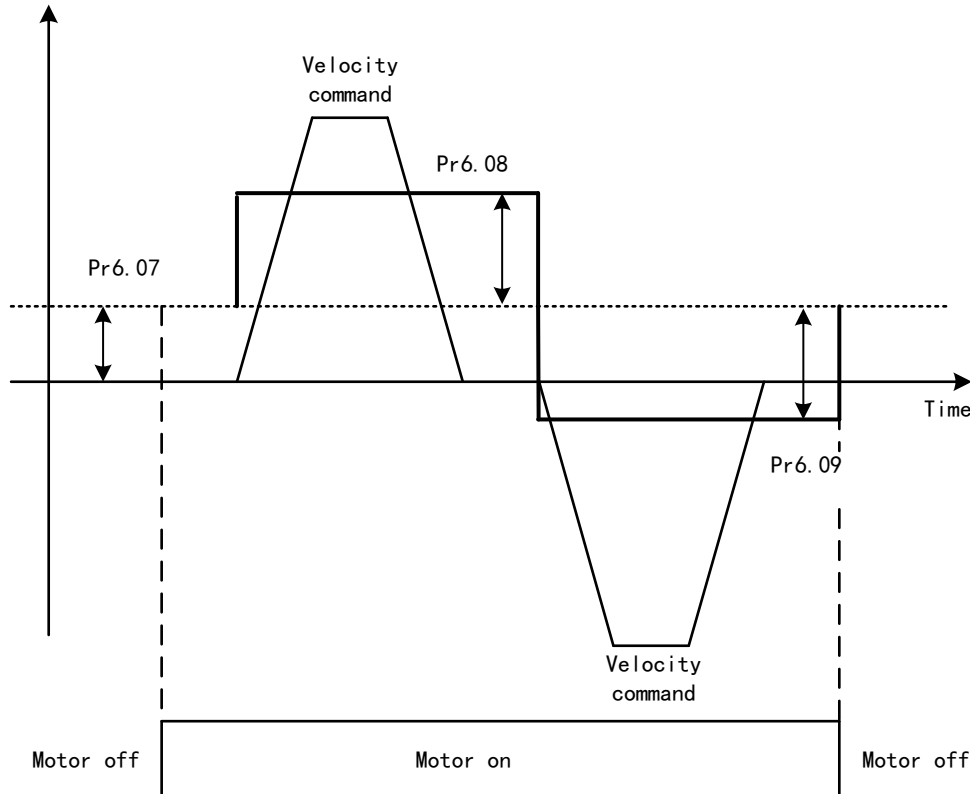


Steps to tuning:

3. Increase Pr1.12 to increase responsiveness but velocity overshoot might occur during acc-/deceleration.
4. By reducing Pr1.13, torque feedforward would be more effective and vice versa. Pr1.12 and Pr1.13 need to be tuned to a balance and reduce noise.

5.8 Friction compensation function

This function is to compensation for changes in load to reduce the effect of friction in motion. The compensation value is directional.



Vertically loaded axis: A constant eccentric load torque is applied on the motor. By adjusting Pr6.07, positioning deviation due to different motional direction can be reduced.

Belt-driven axis: Due to large radial load with dynamic frictional torque. Positioning time delay and deviation can be reduced by adjusting Pr6.08 and Pr6.09.

| Pr6.07 | Label | Torque command additional value | | | Valid mode(s) | P | S | T |
|--|-------------|--|-----------|-----|---------------|--------|---|---|
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x060F | | |
| | Valid | Immediate | | | | | | |
| To set torque forward feed additional value of vertical axis. Applicable for loaded vertical axis, compensate constant torque. Application: When load move along vertical axis, pick any point from the whole motion and stop the load at that particular point with motor enabled but not rotating. Record output torque value from d04, use that value as torque command additional value (compensation value) | | | | | | | | |
| Pr6.08 | Label | Positive direction torque compensation value | | | Valid mode(s) | P | S | T |
| | Range | -100~100 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0611 | | |
| | Valid | Immediate | | | | | | |
| Pr6.09 | Label | Negative direction torque compensation value | | | Valid mode(s) | P | S | T |

| | | | | | | |
|---|--------------------|-----------|------------------|-----|--------------------|--------|
| | Range | -100~100 | Unit | % | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0613 |
| | Valid | Immediate | | | | |
| <p>To reduce the effect of mechanical friction in the movement(s) of the axis. Compensation values can be set according to needs for both rotational directions.</p> <p>Applications:</p> <p>1. When motor is at constant speed, d04 will deliver torque values. Torque value in positive direction = T1; Torque value in negative direction = T2</p> $\text{Pr6.08/Pr6.09} = T_f = \frac{ T1 - T2 }{2}$ <p><i>Positive/Negative compensation corresponds to actual position feedback.</i> <i>Positive torque compensation value = +(Pr6.08=+T_f)</i> <i>Negative torque compensation value = -(Pr6.08=+T_f)</i> <i>Pr6.08 =x, Pr6.09=y; friction compensation value = x-y /2</i></p> | | | | | | |

5.9 Safety Functions

5.9.1 Max. motor rotational speed limitation

Motor rotational speed limits can be set on Pr3.24. If command speed is 1500r/min, but Pr3.24 is set to 1000r/min, motor rotational speed will only go up to 1000r/min.

Motor overspeed threshold value can be set in Pr5.13, if the rotational speed is exceeded during operation, Er1A0 might occur.

| | | | | | | | | |
|--|--------------------|--------------------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr3.24 | Label | Maximum motor rotational speed | | | Valid mode(s) | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0331 | | |
| | Valid | Immediate | | | | | | |
| <p>To set maximum motor rotational speed but not higher than motor rated speed If Pr3.24 = 0, maximum motor rotational speed = max. speed in motor parameter.</p> | | | | | | | | |

| | | | | | | | | |
|---|--------------------|--------------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr5.13 | Label | Overspeed level settings | | | Valid mode(s) | P | S | T |
| | Range | 0~10000 | Unit | r/min | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x051B | | |
| | Valid | Immediate | | | | | | |
| <p>If motor speed exceeds Pr5.13, Er1A0 might occur. When Pr5.13 = 0, overspeed level = max. motor speed x 1.2</p> | | | | | | | | |

5.9.2 Max. duration for motor to stop after disabling

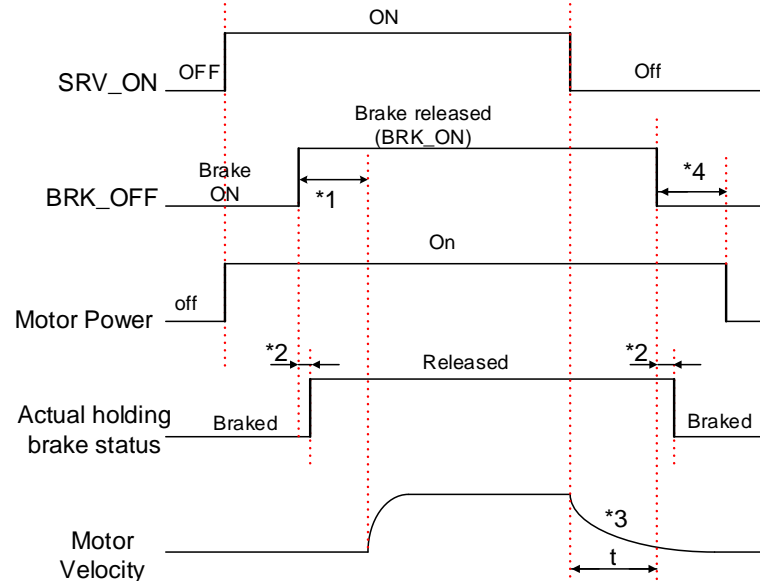
Set max time duration for motor to stop after disabling. If the time taken for motor to stop exceeds the duration set in Pr6.14 and motor speed is still higher than Pr4.39, holding brake will be activated. If motor doesn't have holding brake, dynamic braking will be activated to force stop the motor.

| Pr6.14 | Label | Max. time to stop after disabling | | | Valid mode(s) | P | S | T |
|---|-------------|-----------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~1000 | Unit | ms | Default | 500 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x061D | | |
| | Valid | Immediate | | | | | | |
| <p>To set the max. time allowed for the axis to stop on emergency stop or normal axis disabling. After disabling axis, if motor speed is still higher than Pr4.39 but the time set in Pr6.14 is reached, BRK_ON given and holding brake activated.</p> <p>BRK_ON given time is determined by Pr6.14 or when motor speed goes below Pr4.39, whichever comes first.</p> <p>Applications:</p> <ol style="list-style-type: none"> 1. After disabling axis, if motor speed is still higher than Pr4.39 but the time set in Pr6.14 is reached, BRK_ON given and holding brake activated. 2. After disabling axis, if motor speed is already lower than Pr4.39 but the time set in Pr6.14 is not yet reached, BRK_ON given and holding brake activated. <p>Dynamic brake will be provide the braking function if the function is activated for motors without holding brake.</p> | | | | | | | | |

5.9.3 External brake deactivation output signal BRK-OFF

Please refer to Pr4.11 to set up the I/O output function parameters. When enabled and timing conditions are fulfilled, the set I/O output will deliver ON signal.

| Pr4.37 | Label | Holding brake deactivation delay time | | | Valid mode(s) | P | S | T |
|---|-------------|---------------------------------------|-----------|-----|---------------|--------|---|---|
| | Range | 0~3000 | Unit | 1ms | Default | 150 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x044B | | |
| | Valid | Immediate | | | | | | |
| <p>To set delay time for holding brake to be activated after motor power off to prevent axis from sliding.</p> <p>When Pr5.06 = 0, SRV-ON signal is off, holding brake is activated (delay time is determined by Pr4.39 or Pr6.14). Motor powered-off once delay time set in Pr4.37 is due.</p> | | | | | | | | |
| Pr4.38 | Label | Holding brake activation delay time | | | Valid mode(s) | P | S | T |
| | Range | 0~3000 | Unit | 1ms | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x044D | | |
| | Valid | Immediate | | | | | | |
| <p>To set delay time for holding brake to be released after motor power on.</p> <p>Motor will remain at current position and input command is masked to allow holding brake to be fully released before motor is set in motion.</p> | | | | | | | | |



*1: Delay time set in Pr4.38

*2: Delay time from the moment BRK_OFF signal is given until actual holding brake is released or BRK_ON signal is given until actual holding brake is activated. It is dependent on the holding brake of the motor.

*3: Deceleration time is determined by Pr6.14 or if motor speed goes below Pr4.39, whichever comes first. BRK_OFF given after deceleration time.

*4: Pr4.37 set time value.

Delay time from the moment SRV_ON is given until BRK_OFF switch to BRK_ON, is less than 500ms.

| | | | | | | | | |
|---------------|--------------------|--------------------------------|------------------|-------|----------------------|----------|----------|----------|
| Pr4.39 | Label | Holding brake activation speed | | | Valid mode(s) | P | S | T |
| | Range | 30~3000 | Unit | r/min | Default | 30 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x044F | | |
| | Valid | Immediate | | | | | | |

To set the activation speed for which holding brake will be activated.

When SRV-OFF signal is given, motor decelerates, after it reaches below Pr4.39 and Pr6.14 is not yet reached, BRK_OFF is given.

BRK_OFF signal is determined by Pr6.14 or if motor speed goes below Pr4.39, whichever comes first.

Application:

1. After disabling axis, Pr6.14 has been reached but motor speed is still above Pr4.39, BRK_OFF signal given.
2. After disabling axis, Pr6.14 has not been reached but motor speed is below Pr4.39, BRK_OFF signal given.

Deceleration max duration: 2s. Servo disabled after 2s.

5.9.4 Servo stopping mode

| | | | | | | | | |
|--|-------------|---|-----------|-----|---------------|--------|---|---|
| Pr5.06 | Label | Servo-off mode | | | Valid mode(s) | P | S | T |
| | Range | 0~1 | Unit | — | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x050D | | |
| | Valid | Immediate | | | | | | |
| To set servo driver disable mode and status. | | | | | | | | |
| Set value | | Explanation | | | | | | |
| 0 | | Driver disables after velocity reaching value set in Pr4.39 | | | | | | |
| 1 | | Driver disables immediately, axis in free stopping mode | | | | | | |

5.9.5 Emergency stop function

Emergency stop is used when an alarm occurs or a servo prohibition signal is received when servo driver is enabled.

Method 1: Set up Pr4.43 to enable the function

| Pr4.43 | Label | Emergency stop function | | | Valid mode(s) | P | S | T | | | | | | | | |
|---|---|-----------------------------------|-----------|-----|---------------|--------|---|---|-------|--------------|-----|--|---|---|---|--|
| | Range | 0~1 | Unit | — | Default | 0 | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0457 | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th>Description.</th></tr><tr><td>【0】</td><td>Emergency stop is valid, servo driver will be forced to STOP and Err570 occurs.</td></tr><tr><td>1</td><td>Emergency stop is invalid, servo driver will not be forced to STOP. Servo can be enabled once E-STOP signal is cleared.</td></tr></table> | | | | | | | | | Value | Description. | 【0】 | Emergency stop is valid, servo driver will be forced to STOP and Err570 occurs. | 1 | Emergency stop is invalid, servo driver will not be forced to STOP. Servo can be enabled once E-STOP signal is cleared. | | |
| Value | Description. | | | | | | | | | | | | | | | |
| 【0】 | Emergency stop is valid, servo driver will be forced to STOP and Err570 occurs. | | | | | | | | | | | | | | | |
| 1 | Emergency stop is invalid, servo driver will not be forced to STOP. Servo can be enabled once E-STOP signal is cleared. | | | | | | | | | | | | | | | |
| Pr5.04 | Label | Driver prohibition input settings | | | Valid mode(s) | P | S | T | | | | | | | | |
| | Range | 0/1/2 | Unit | — | Default | 0 | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0509 | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | |
| To set driver prohibition input (POT/NOT) | | | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>POT → Positive direction drive prohibited NOT → Negative direction drive prohibited</td></tr><tr><td>1</td><td>POT and NOT invalid</td></tr><tr><td>2</td><td>Any single sided input from POT or NOT might cause Er260</td></tr></table> | | | | | | | | | Value | Description | 0 | POT → Positive direction drive prohibited NOT → Negative direction drive prohibited | 1 | POT and NOT invalid | 2 | Any single sided input from POT or NOT might cause Er260 |
| Value | Description | | | | | | | | | | | | | | | |
| 0 | POT → Positive direction drive prohibited NOT → Negative direction drive prohibited | | | | | | | | | | | | | | | |
| 1 | POT and NOT invalid | | | | | | | | | | | | | | | |
| 2 | Any single sided input from POT or NOT might cause Er260 | | | | | | | | | | | | | | | |

Method 2: Using RS485 address through master device to activate this function.

| | | | | | | | | |
|---|-------------|------------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.11 | Label | Servo braking torque setting | | | Valid mode(s) | P | S | T |
| | Range | 0~500 | Unit | % | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0517 | | |
| | Valid | Immediate | | | | | | |
| To set torque limit for servo braking mode. If Pr5.11 = 0, use torque limit as under normal situation. | | | | | | | | |

Please note that if Pr5.11 set value is too low, emergency stop will take longer.

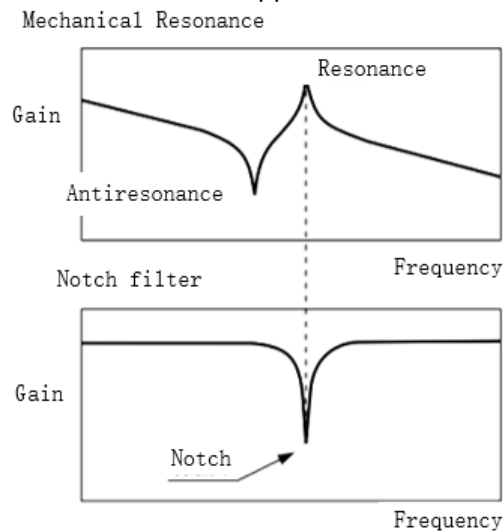
5.10 Vibration Suppression

5.10.1 Mechanical resonance suppression

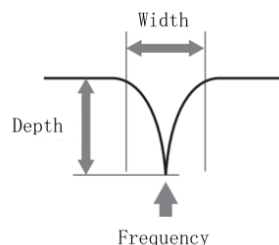
Mechanical system has certain resonance frequencies. When servo gain is increased, resonance might occur at around mechanical resonant frequencies, preventing gain value from increasing. In such situation, notch filter can be used to suppress resonance to set higher gains or lower vibration.

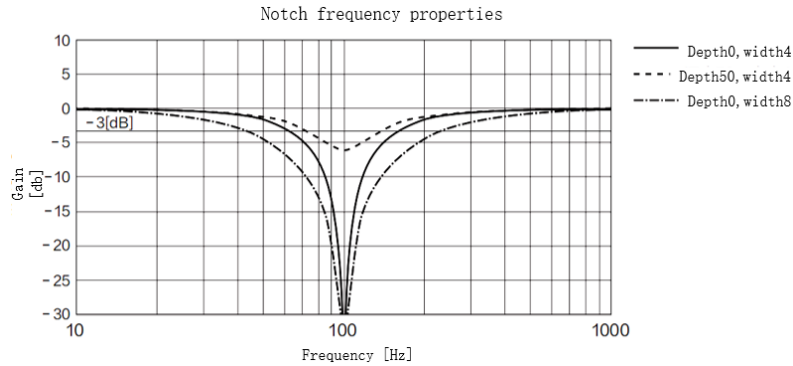
To suppress mechanical resonance:

1. Torque command filter time constant
Set filter time constant to reduce gain at around resonant frequencies
Torque command filter blocked frequencies (Hz) $f_c = 1 / [2\pi \times Pr1.04(0.01ms) \times 0.00001]$
2. Notch filter
Notch filter suppress mechanical resonance by reducing gain at certain frequencies. When notch filter is correctly set, resonance can be suppressed and servo gain can be increased.



- Notch filter bandwidth
Center frequency of the notch filter, frequency bandwidth with reduction of -3dB.
- Notch filter depth
The ratio between input and output of center frequency.
When depth = 0, center frequency output is totally off and when depth = 100,
Hence when notch filter depth is set at lower value, the depth is higher and better at suppressing mechanical resonance but it might cause system instability.





If the analytic result from mechanical properties analysis tool doesn't show any obvious peak but vibration did occur, it might not be due to mechanical resonance, it may be that servo gain has reached its limit. This kind of vibration can't be suppressed by using notch filter, only by reducing gain and torque command filter time.

To use notch filter

Automatic notch filter

1. Set Pr2.00 = 1 for auto notch filter adjustment
2. If Pr0.03 stiffness increases, 3rd group of notch filter (Pr2.07/Pr2.08/Pr2.09) updates automatically when driver is enabled. Pr2.00 = 0, auto adjustments stop.
If resonance is suppressed, it means self-adjusting notch filter is working. If resonance occurs when mechanical stiffness increases, please use manual notch filter, set filter frequency to actual resonant frequency.

Manual notch filter

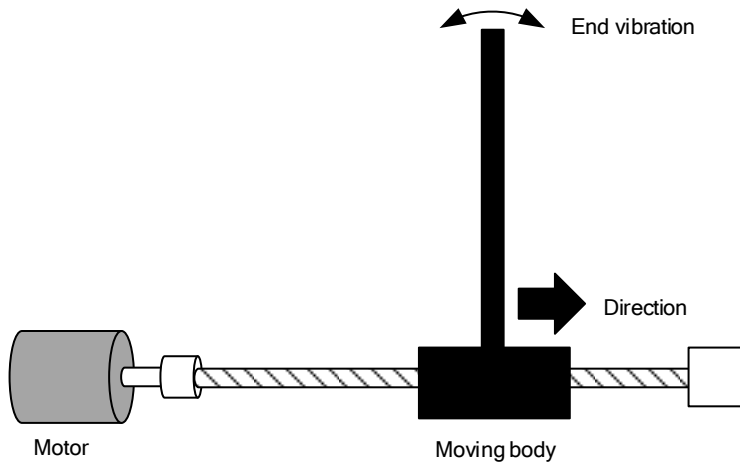
There are 2 ways to use manual notch filter.

1. After enabling self-adjusting notch filter, set the values from 3rd group of filters to 1st group of notch filter (Pr2.01/Pr2.02/Pr2.03), see if resonance is suppressed. If there is other resonance, set Pr2.00 = 1, then set the values from 3rd group of filters to 2nd group of notch filter (Pr2.04/Pr2.05/Pr2.06)
2. Get resonant frequency, notch filter bandwidth and depth and set it into the corresponding parameters through Motion Studio.

| Pr2.00 | Label | Adaptive filtering mode settings | | | Valid mode(s) | P | S | | | | | | | | | | | | | | | | |
|---|---|--|-----------|-----|---------------|--------|---|---|-------|-------------|--|---|--------------------------|---|---|---|--|---|---|--|-----|----------|---|
| | Range | 0~4 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0201 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Value</th><th colspan="2">Description</th></tr><tr><td>0</td><td>Adaptive filter: invalid</td><td>Parameters related to 3rd notch filter remain unchanged</td></tr><tr><td>1</td><td>Adaptive filter: 1 filter valid for once.</td><td>1 adaptive filter becomes valid. 3rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated.</td></tr><tr><td>2</td><td>Adaptive filter: 1 filter remains valid</td><td>1 adaptive filter becomes valid. 3rd notch filter related parameters will keep updating accordingly.</td></tr><tr><td>3-4</td><td>Reserved</td><td>-</td></tr></table> | | | | | | | | | Value | Description | | 0 | Adaptive filter: invalid | Parameters related to 3 rd notch filter remain unchanged | 1 | Adaptive filter: 1 filter valid for once. | 1 adaptive filter becomes valid. 3 rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated. | 2 | Adaptive filter: 1 filter remains valid | 1 adaptive filter becomes valid. 3 rd notch filter related parameters will keep updating accordingly. | 3-4 | Reserved | - |
| Value | Description | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Adaptive filter: invalid | Parameters related to 3 rd notch filter remain unchanged | | | | | | | | | | | | | | | | | | | | | |
| 1 | Adaptive filter: 1 filter valid for once. | 1 adaptive filter becomes valid. 3 rd notch filter related parameters updated accordingly. Pr2.00 switches automatically to 0 once updated. | | | | | | | | | | | | | | | | | | | | | |
| 2 | Adaptive filter: 1 filter remains valid | 1 adaptive filter becomes valid. 3 rd notch filter related parameters will keep updating accordingly. | | | | | | | | | | | | | | | | | | | | | |
| 3-4 | Reserved | - | | | | | | | | | | | | | | | | | | | | | |
| Pr2.01 | Label | 1 st notch frequency | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 50~4000 | Unit | Hz | Default | 4000 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0203 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set center frequency of 1 st torque command notch filter. Set Pr2.01 to 4000 to deactivate notch filter | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.02 | Label | 1 st notch width | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 0~20 | Unit | — | Default | 4 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0205 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set notch bandwidth for 1 st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.01 and Pr2.03, Pr2.02 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.03 | Label | 1 st notch depth | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 0~99 | Unit | — | Default | 0 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0207 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set notch depth for 1 st resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.01 and Pr2.02, Pr2.03 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.04 | Label | 2 nd notch frequency | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 50~4000 | Unit | Hz | Default | 4000 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0209 | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |
| Set center frequency of 2 nd torque command notch filter. Set Pr2.04 to 4000 to deactivate notch filter | | | | | | | | | | | | | | | | | | | | | | | |
| Pr2.05 | Label | 2 nd notch width | | | Valid mode(s) | P | S | T | | | | | | | | | | | | | | | |
| | Range | 0~20 | Unit | — | Default | 4 | | | | | | | | | | | | | | | | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020B | | | | | | | | | | | | | | | | | |
| | Valid | Immediate | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|---|--------------------|---------------------------------|------------------|-----|----------------------|----------------------------|
| Set notch bandwidth for 2 nd resonant notch filter. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.06, Pr2.05 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | |
| Pr2.06 | Label | 2 nd notch depth | | | Valid mode(s) | P S T |
| | Range | 0~99 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020D |
| | Valid | Immediate | | | | |
| Set notch depth for 1 st resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | |
| Pr2.07 | Label | 3 rd notch frequency | | | Valid mode(s) | P S T |
| | Range | 50~4000 | Unit | Hz | Default | 4000 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x020F |
| | Valid | Immediate | | | | |
| Set center frequency of 3 rd torque command notch filter. Set Pr2.07 to 4000 to deactivate notch filter | | | | | | |
| Pr2.08 | Label | 3 rd notch width | | | Valid mode(s) | P S T |
| | Range | 0~20 | Unit | — | Default | 4 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0211 |
| | Valid | Immediate | | | | |
| Set notch depth for 3 rd resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | |
| Pr2.09 | Label | 3 rd notch depth | | | Valid mode(s) | P S T |
| | Range | 0~99 | Unit | — | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0213 |
| | Valid | Immediate | | | | |
| Set notch depth for 3 rd resonant notch filter. When Pr2.06 value is higher, notch depth becomes shallow, phase lag reduces. Under normal circumstances, please use factory default settings. If resonance is under control, in combination with Pr2.04 and Pr2.05, Pr2.06 can be reduced to improve current loop responsiveness which allows higher mechanical stiffness settings. | | | | | | |

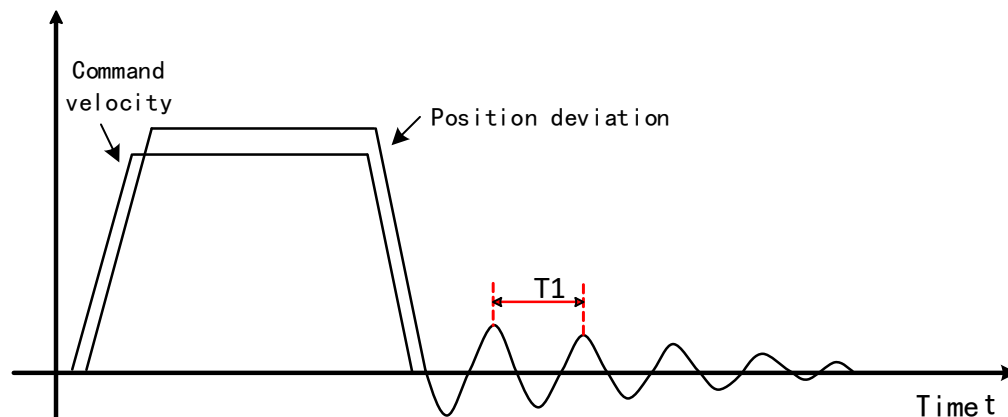
5.10.2 End vibration suppression



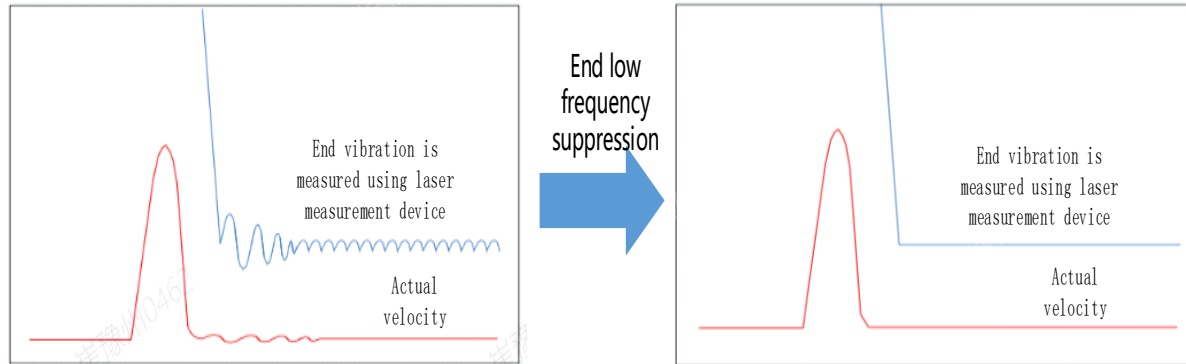
If the mechanical has an end that is long and heavy, it might cause end vibration at emergency stop and affect the positioning. Usually happens on long armed axis with loose end. The frequency is usually within 100Hz which is lower than mechanical resonant frequencies. It is called low-frequency resonance which can be prevented by applying low frequency suppression function.

To apply low frequency suppression

1. Trace current/ position deviation waveform when motion stops.
2. Measure the vibration cycle $T1$ of current waveform.
3. Convert $T1$ into low frequency resonance by $F1 = 1/T1$
4. Write $F1$ into Pr2.14
5. If some other low frequency resonance occurs, please repeat step 1-3 and write $F2$ into Pr2.16.



The result of suppressing low frequency resonance



| | | | | | | | |
|---|--------------------|-----------------------------------|------------------|-------|----------------------|----------|--|
| Pr2.14 | Label | 1 st damping frequency | | | Valid mode(s) | P | |
| | Range | 0/10~2000 | Unit | 0.1Hz | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x021D | |
| | Valid | Immediate | | | | | |
| Set Pr2.16 to 0 to deactivate this parameter. To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set Pr2.15 to wobble frequency (wobble frequency can be determined using tracing function of Motion Studio) | | | | | | | |
| Pr2.16 | Label | 2 nd damping frequency | | | Valid mode(s) | P | |
| | Range | 0/10~2000 | Unit | 0.1Hz | Default | 0 | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0221 | |
| | Valid | Immediate | | | | | |
| Set Pr2.16 to 0 to deactivate this parameter. To suppress wobble at load end. Often used when wobble of flexible structure due to high deceleration upon stopping. Especially effective for wobble with frequencies under 100Hz. Set Pr2.16 to wobble frequency (wobble frequency can be determined using tracing function of Motion Studio) | | | | | | | |

5.11 Multiturn absolute encoder

Multiturn absolute encoder records the position and the revolution counts of the motor. When driver is powered-off, multiturn absolute encoder will backed up the data using battery and after powering on, the data will be used to calculated absolute mechanical position and there is no need for a mechanical homing process. Use widely in robotic arms and CNC machines.

If it is the first time using the encoder, please home the mechanical axis and initialize the absolute position of the encoder to zero. Set up a homing point and only home when there is an alarm. Please stop the axis before reading any position data to prevent inaccuracy.

5.11.1 Parameters setting

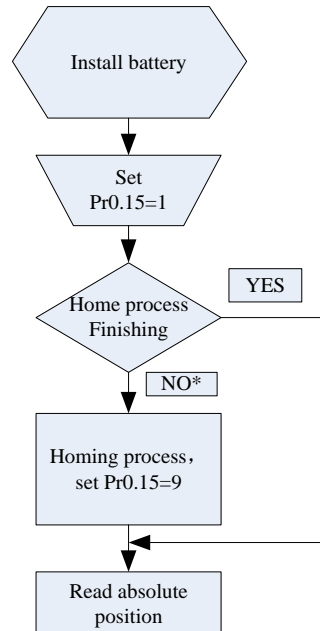
| | | | | | | | | |
|---------------|--------------------|---------------------------|------------------|-----|----------------------|----------|----------|----------|
| Pr0.15 | Label | Absolute encoder settings | | | Valid mode(s) | P | S | T |
| | Range | 0~15 | Unit | - | Default | 0 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x001F | | |

| Valid | | After restart | | | |
|-------|---------------------------|--|--|--|--|
| Value | Mode | Description | | | |
| 【0】 | Incremental | Doesn't retain position data on power off. Unlimited travel distance. | | | |
| 1 | Multiturn absolute linear | Retrain position data on power off. For applications with fixed travel distance and no multiturn data overflow. | | | |
| 2 | Multiturn absolute rotary | Retrain position data on power off. Actual data feedback in between 0-(Pr6.63+1). Unlimited travel distance. | | | |
| 3 | Single turn absolute | Used when travel distance is within 1 revolution of the encoder. Data overflow will trigger alarm. | | | |
| 5 | Multi turn absolute | Clear multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 5 after 3s, please solve according to Er153. | | | |
| 9 | | Clear multiturn position, reset multiturn alarm and activate multiturn absolute function. Will switch to multiturn mode once alarm cleared, if remains at 9 after 3s, please solve according to Er153. Please disable axis before setting to 9 and home the axis before using. | | | |

5.11.2 Read absolute position

1、Steps:

- 1) First, select a motor with multiturn absolute encoder, install battery and confirm whether the driver version supports the specific motor;
- 2) Set Pr0.15 = 1. If it is the first time of installation, Err153 will occur because battery is newly installed and position data is invalid. Please home the axis and initialize the absolute position of the encoder to zero.
- 3) When absolute homing point is set and there is no fault with the battery, the alarm will be cleared
- 4) Finally, the user can read the absolute position. Position won't be lost even if the driver is powered off.

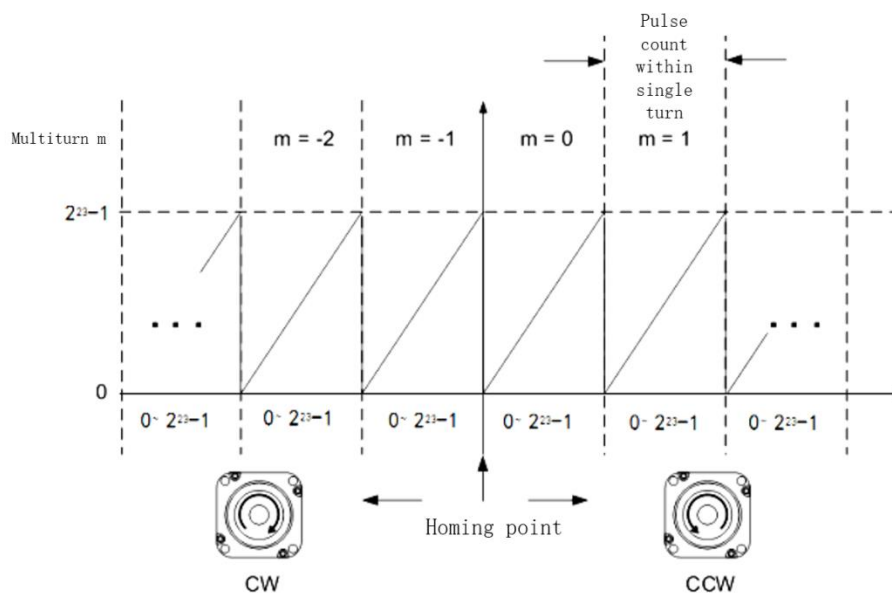


*Note: The newly installed encoder is not initialized and will alarm

2、Read absolute position

When the rotor turns in clockwise direction, the revolution count will be negative; turns in counter clockwise direction, the count will be positive. No. of revolutions will be from -32767 to +32767. If the count number reaches +32767 in counter clockwise direction, the count will revert back to -32768, -32767 and vice versa for clockwise direction.

As for position data, it depends on the precision of the encoder. For 17 bit = 0-131071, 23 bit = 0-8388607



3、Clear multiturn position

Before clearing multiturn position, axis needs to be homed. After clearing multiturn position, revolution count = 0 but absolute position remains unchanged and Err153 alarm will be cleared.

Please make sure the homing point is within the range of 1 revolution of the rotor. Installation and setup of the homing point can be set with the use of auxiliary function D21 on the front panel. By setting Pr0.15 to 9, multiturn position will be cleared.

Please take notice of motor position during power on. Range of motion of a motor depends on the position of the motor during power on (23-bit absolute encoder as example).

5.11.3 Absolute Encoder Related Alarm

The alarm can determine if absolute value encoder is valid. If battery power is low, not a motor with absolute encoder, encoder error etc. occurs, user can find out about the error from alarm output or on the front panel. Controller will stop any operation until alarm is cleared.

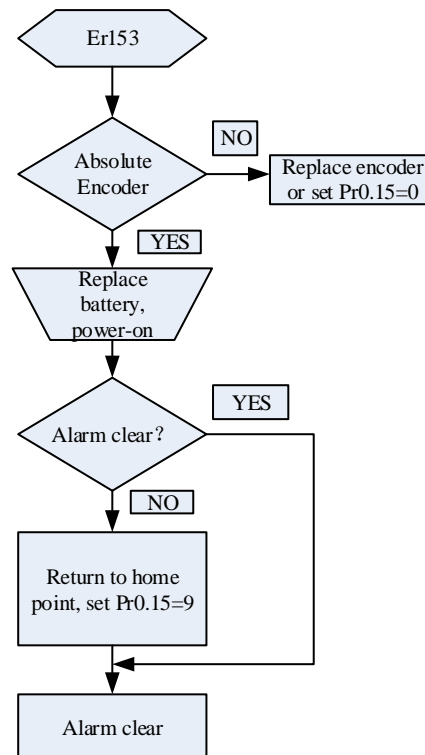
Alarm output:

Err153 will be shown on front panel or by I/O ALM signal and from controller.

Err153 might occur,

- (1) If absolute encoder is used for the first time and due to installation of new batteries Axis needs to be homed and multiturn data needs to be cleared.
- (2) If battery voltage is lower than 3.2v. Replace battery and restart the motor.
- (3) If battery voltage is lower than 2.5v or battery power was cut off. Replacing the battery won't clear the alarm. Axis needs to be homed and multiturn data needs to be cleared.

4、Alarm processing flow chart



5.12 Regenerative resistor settings

When motor torque is acting the opposite direction of the rotational direction (i.e. Deceleration, vertical drop axis), energy will flow back into the drive. This will caused the capacitors inside the drive to increase in voltage which might cause over capacity. Regenerative resistor is required here to prevent over capacity of the capacitors.

Regenerative energy can be reduced by reducing rotational inertia, increasing deceleration time, decrease load torque or reduce max. rotational velocity.

| | | | | | | | | |
|---|-------------|------------------------------------|-----------|-----------------|---------------|--------|---|---|
| Pr0.16 | Label | Regenerative resistance | | | Valid mode(s) | P | S | T |
| | Range | 25~500 | Unit | Ohm | Default | 100 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0021 | | |
| | Valid | Immediate | | | | | | |
| To set resistance value of regenerative resistor Pr0.16 and Pr0.17 set value determine alarm threshold of Er120. If set value > actual regenerative resistance, Er120 occurrence might be delayed. | | | | | | | | |
| Pr0.17 | Label | Regenerative resistor power rating | | | Valid mode(s) | P | S | T |
| | Range | 20~5000 | Unit | W | Default | 50 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x0023 | | |
| | Valid | Immediate | | | | | | |
| To set power rating of regenerative resistor. Please refer to table below | | | | | | | | |
| Drives | | Resistance (Ω) | | Power rating(W) | | | | |
| ELD2-RS7005B | | 10 | | 30 | | | | |
| ELD2-RS7010B | | 10 | | 50 | | | | |
| ELD2-RS7015B | | 10 | | 50 | | | | |
| ELD2-RS7020B | | 10 | | 100 | | | | |
| ELD2-RS7030B | | 10 | | 100/150 | | | | |
| ELD2-RS7040B | | 10 | | 150/200 | | | | |
| ELD2-RS7060B | | 10 | | 150/200 | | | | |
| Pr0.16 and Pr0.17 determines the threshold value of Er120. Please set accordingly or it might trigger false alarm or damage to servo drive. Note: If external regenerative resistor is used, please set according to its labeled power rating. | | | | | | | | |

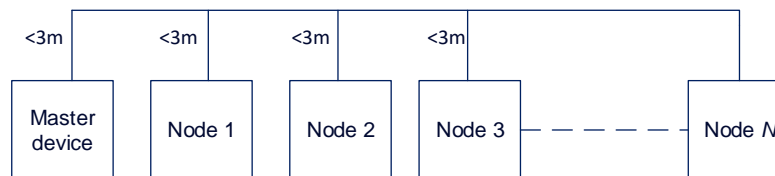
Chapter 6 Modbus communication

6.1 Communication connection

- RS232 tuning port – Connect to PC tuning software (CN7)
- RS485 communication – Connect to other drives or master device (CN5)

RS485 network of multiple servo drives

If there is a need to connect multiple ELD2-RS series servo drives together, it is recommended to connect the drivers in series and no longer than 3 meters of CABLE-TX*M*-LD2 cable between each nodes (drivers) as shown below.



- Keep the connection cable between each node as short as possible. Not longer than 3m.
- Install a terminal resistor each end. Recommended resistance: 120 Ohm.
- Please use shielded twisted pair connection cables.
- Connect to reference ground of the driver.
- Connect shielded foil of the cables to Protective Earth PE terminal.
- Please separate them from power cable or any cable with strong interference.

6.2 Modbus RS485 communication parameters and ports

Communication parameters

| | | | | | | | | |
|--------|-------------|--------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.29 | Label | RS485 communication mode | | | Valid mode(s) | P | S | T |
| | Range | 0~255 | Unit | — | Default | 5 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053B | | |
| | Valid | After restart | | | | | | |

| Value | Bit | Checksum | Stop |
|-------|-----|----------|------|
| 0 | 8 | Even | 2 |
| 1 | 8 | Odd | 2 |
| 2 | 8 | Even | 1 |
| 3 | 8 | Odd | 1 |
| 4 | 8 | Null | 1 |
| 【5】 | 8 | Null | 2 |

| | | | | | | | | |
|--------|-------------|-------------------------------|-----------|-----|---------------|--------|---|---|
| Pr5.30 | Label | RS485 communication Baud rate | | | Valid mode(s) | P | S | T |
| | Range | 0~15 | Unit | — | Default | 4 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053D | | |
| | Valid | After restart | | | | | | |

| Value | Baud rate |
|-------|-----------|
| 0 | 2400bps |
| 1 | 4800bps |
| 2 | 9600bps |
| 3 | 19200bps |

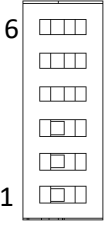
| Value | Baud rate |
|-------|-----------|
| 【4】 | 38400bps |
| 5 | 57600bps |
| 6 | 115200bps |

Baud rate tolerance: 2400~38400bps±0.5%, 57600~115200bps±2%

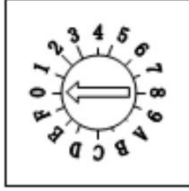
| | | | | | | | | |
|--------|-------------|--------------------|-----------|-----|---------------|--------|---|---|
| Pr5.31 | Label | RS485 axis address | | | Valid mode(s) | P | S | T |
| | Range | 0~127 | Unit | — | Default | 1 | | |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0x053F | | |
| | Valid | After restart | | | | | | |

When controller is connected to multiple axis and controller needs to identify the axis, Pr5.31 can be used to set the axis ID/address.
Please set to a max of 31 if the communication is between RS232 and RS485

Switch SW to modify Baud rate and terminal resistor. Please refer to the table below.

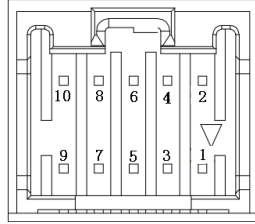
| Diagram | Function | | Pr6.33 | SW4 | Baud rate | SW1 | SW2 | Terminal resistor | SW3 |
|---|-------------------------|---------------|--------|-----|-------------------------|-----|-----|-------------------|-----|
|  | Motor direction | CCW (Default) | 0 | OFF | Pr5.30 Default: 9600 | OFF | OFF | Disconnected | OFF |
| | | CW | | ON | 19200 | ON | OFF | | |
| | Modbus high bit address | Spin dial | 8 | OFF | 38400 | OFF | ON | Connected | ON |
| | | 16+Spin dial | | ON | 57600 | ON | ON | | |

ID spin dial

| | Diagram | Bit | Modbus address | Bit | Modbus address |
|----------------|--|-----|------------------------|-----|----------------|
| RCS-1 RCS-2 |  | 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 |

Communication Port

To be connected to other drives or master device (controller) – CN5

| Port | Diagram | Pin | Signal | Label |
|------|---|--------|--------|-------------------------------|
| CN5 |  | 1 | RS485+ | Modbus Data positive terminal |
| | | 3 | RS485- | Modbus Data negative terminal |
| | | 5 | GND | Power supply ground |
| | | Others | NC | 10 pins are not applicable |

Note:

- Molex 55959-1030 Connector Header (Driver side)
- Molex 51353-1000 10-pin rectangle connector 1pcs for each axis (Provided)
- Molex 56134-9000 female terminal reel 10pcs for each axis (Provided)

6.3 Modbus Protocol

ELD2-RS series servo drives contain 16-bit including function code 0x03, 0x06 and 0x10.

- 0x03: Read data function code
- 0x06: Write single data function code
- 0x10: Write multiple data function code

6.3.1 Read Data 0x03

Read Data function code 0x03 can be used to read 1 – 100 16-bit data. For example, from servo drive to slave as 1 and reading 2 data. (H: High 8-bit, L: Low 8-bit)

| No. | Request frame data (Master->Slave) | | | Reply frame data (Slave->Master) | | |
|-----|------------------------------------|----------------------|---------|----------------------------------|----------------------|---------|
| 1 | ID | Slave | 0x01 | ID | Slave | 0x01 |
| 2 | FC | Function code | 0x03 | FC | Function code | 0x03 |
| 3 | ADDR | Starting address | H | NUM | Data count (byte) | 0x00(H) |
| 4 | | | L | | | 0x04(L) |
| 5 | NUM | Data count (word) | 0x00(H) | DATA1 | Data 1 | H |
| 6 | | | 0x02(L) | | | L |
| 7 | CRC | Checksum | L | DATA2 | Data 2 | H |
| 8 | | | H | | | L |
| 9 | | | | CRC | Checksum | L |
| 10 | | | | | | H |

Request frame and reply frame should have the same set of data as shown below.

| | |
|----------|----------------------------|
| Transmit | 01 03 00 04 00 02 85 CA |
| Receive | 01 03 04 00 00 00 02 7B F2 |

Send Frame: Request Frame. Master device writes a 2-Word (16 bit) data (0x0004) into slave servo drive with ID no. 1. Before frame transmission, 6 byte CRC checksum is 0xCA85

Receive Frame: Reply frame. Master device reads 4 byte (8bit) data from slave servo drive with ID no.1 successfully. Before receiving frame, 7 byte CRC checksum is 0xF27B.

6.3.2 Write single data 0x06

Function code 0x06 is to write single 16-bit data into servo drive. For example, from servo drive to slave station 1 and write 1 data. (H: High 8-bit, L: Low 8-bit).

| No. | Request frame data (Master->Slave) | | | Reply frame data (Slave->Master) | | |
|-----|------------------------------------|---------------|------|----------------------------------|---------------|------|
| 1 | ID | Slave | 0x01 | ID | Slave | 0x01 |
| 2 | FC | Function code | 0x06 | FC | Function code | 0x06 |
| 3 | ADDR | Address | H | ADDR | Address | H |
| 4 | | | L | | | L |
| 5 | DATA | Data | H | DATA | Data | H |
| 6 | | | L | | | L |
| 7 | CRC | Checksum | L | CRC | Checksum | L |
| 8 | | | H | | | H |

Communication data is as shown below (Transmit and receive data should be the same):

| | |
|----------|-------------------------|
| Transmit | 01 06 00 04 00 02 49 CA |
| Receive | 01 06 00 04 00 02 49 CA |

Send Frame: Request Frame. Master device writes a 1 Word (16 bit) data (0x0002) into slave servo drive with ID no. 1 (Address 0x0004). 6-byte CRC value is 0xCA49 before frame sending.

Receive Frame: Reply frame. Master device writes data into slave servo drive with ID no. 1 and get same data frame back.

6.3.3 Write multiple data 0x10

Function code 0x10 is to write multiple 16-bit data into servo drive. For example, from servo drive to slave as 1 and reading 2 data. (H: High 8-bit, L: Low 8-bit).

| No. | Request frame data (Master->Slave) | | | | Reply frame data (Slave->Master) | | |
|-----|------------------------------------|-------------------|---------------|--|----------------------------------|-------------------|------|
| 1 | ID | Slave | 0x01 | | ID | Slave | 0x01 |
| 2 | FC | Function code | 0x03 | | FC | Function code | 0x03 |
| 3 | ADDR | Starting address | H | | ADDR | Address | H |
| 4 | | | L | | | | L |
| 5 | NUM1 | Data count (word) | 0x00(H) | | NUM | Data count (word) | H |
| 6 | | | 0x02(L) | | | | L |
| 7 | NUM2 | Data count (Byte) | 0x04 (2*NUM1) | | CRC | Checksum | L |
| 8 | DATA1 | Data 1 | H | | | | H |
| 9 | | | L | | | | |
| 10 | DATA2 | Data 2 | H | | | | |
| 11 | | | L | | | | |
| 12 | CRC | Checksum | L | | | | |
| 13 | | | H | | | | |

Servo parameters are 32-bit with high 16-bit at the front and low 16-bit at the back. 2 continuous communication addresses will be distributed starting with even number (High 16-bit uses even number address, low 16-bit uses odd number address. Word byte frame word is also with high 8-bit at the front and low 8-bit at the back.

32-bit data written from starting address 0x0000 (Servo driver with axis address 01):

| | |
|---------|--|
| Send | 01 10 00 00 00 02 04 01 00 00 00 F3 A0 |
| Receive | 01 10 00 04 00 02 00 09 |

Send Frame: Request Frame. Master device writes a 2 Word (16 bit), 4 bytes data (0x0000 0000) into slave servo drive with ID no. 1 (Address 0x0000). 11-byte CRC value is 0xAFF3 before frame sending.

Receive Frame: Reply frame. Master device writes a 2 Word value into slave servo drive with ID no. 1 (Address 0x0000). 6-byte CRC value is 0xC841 before frame sending.

6.3.4 Reply error

When driver receives request frame data format with error, driver will feedback error reply data frame to master device.

| No. | Error reply frame data (Slave->Master) | | |
|-----|--|---------------|-----------------------|
| 1 | ID | Slave ID | 0~31 |
| 2 | FC | Function code | (0x03/0x06/0x10)+0x80 |
| 3 | Error code | Address | 0x01/0x02/0x03 |
| 4 | CRC | Checksum | L |
| 5 | | | H |

Error code table:

| Error code | Description |
|------------|--|
| 0x01 | Function code error |
| 0x02 | Address error |
| 0x03 | Data error, i.e. written data over limit |
| 0x08 | CRC checksum error |

Communication data:

Receive frame: Slave servo drive's reply frame. Request frame data CRC from master device, servo drive will not respond to current request.

```
[Send]01 11 00 04 00 02 04 01 00 00 00 F3 A0
[Receive]01 91 01 4C 56
```

Receive frame: Slave servo drive's reply frame. Request frame data function from master device error or slave station does not support this function, unable to respond to current request.

```
[Send]01 11 00 04 00 02 04 01 00 00 00 A2 65
[Receive]01 91 01 8C 50
```

6.3.5 Auxiliary function parameters

Auxiliary functions are activated by sending control word.

Done status can be monitored using status word. Status reset to initialization after reading status word.

Control Word:

| Registry Address | Label | Operation |
|------------------|--------------|-----------|
| 0x1801 | Control word | Write |

| Control Word | Auxiliary Function |
|--------------|---|
| 0x1111 | Reset current alarm |
| 0x1122 | Reset history alarm |
| 0x2211 | Save all parameter to EEPROM |
| 0x2222 | Parameter initialization (not including motor parameters) |

| | |
|--------|---|
| 0x2233 | Reset all parameters to factory default |
| 0X4001 | JOG left (once every 100ms)* |
| 0X4002 | JOG right (once every 100ms)* |

Note: Continuous JOG motion is only possible if signal is triggered with interval time under 100ms. Step motion if interval time >100ms.

Parameter saving status word:

| Registry Address | Label | Operation |
|------------------|-------------|-----------|
| 0x1901 | Status word | Read |

| Status word | Description |
|-------------|--------------------|
| 0x5555 | Successfully saved |
| 0xAAAA | Failed to save |

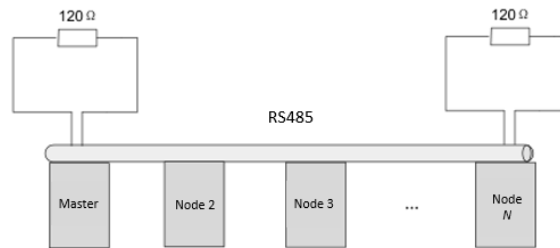
6.3.6 Alarm info parameters

| Registry Address | Label | Operation |
|------------------|---------------|-----------|
| 0x2203 | Current Alarm | Read |

| Servo Alarm: Addr. 0x2203 | | | |
|--|------------------------------|--|--|
| Effective bit[11:0]value(Hex) High 4-bit[15:12] <i>masked</i> | Alarm | Effective bit[11:0]value(Hex) High 4-bit[15:12] <i>masked</i> | Alarm |
| 0x000 | Normal | 0x190 | Excessive motor vibration |
| 0x0E1/ 0x0E0 | Overcurrent | 0x150 | Encoder disconnected |
| 0x100 | Overload | 0x151/0x170 | Encoder data error |
| 0x180 | Excessive position deviation | 0x152 | Encoder HALL signal error |
| 0x1A0 | Overspeed | 0x240 | Parameter saving error |
| 0x1A1 | Motor out of control | 0x570 | Emergency stop |
| 0x0D0 | Undervoltage | 0x120 | Regenerative energy overload |
| 0x0C0 | Overvoltage | 0x153 | Encoder battery error |
| 0x171/0x172 | Encoder parameter error | 0x210/0x211/0x212 | Input configuration error (Repeated/wrong input) |
| Others | Please refer to Chap. 9 | | |

6.4 Frequently occurred issues and solutions with RS485 communication.

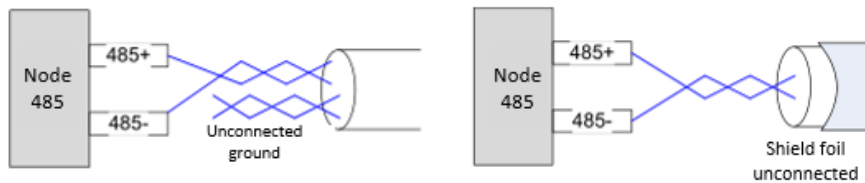
Terminal resistor



Terminal resistor is to be connected at the start and end of the device network. Recommended resistance of the terminal resistor: 120 Ohm. Measure the resistance within the network using a multimeter and refer to the table below.

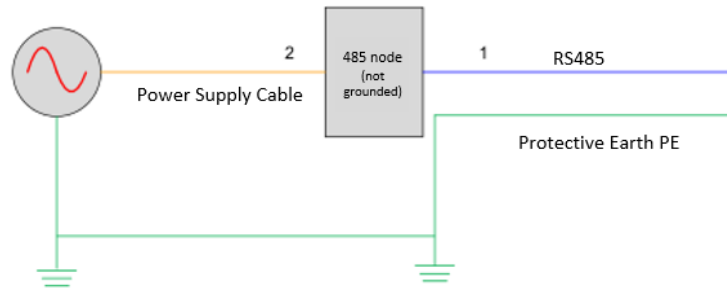
| Measured resistance (Ohm) | Normal: 60 Ohm | Description |
|---------------------------|----------------|---|
| 0 | | Short circuit |
| Much lower than 60 | | Might be other resistor within the network; incorrect terminal resistor is used |
| Much higher than 60 | | Might be due to damaged/faulty node communication port |

Incorrect wiring connection

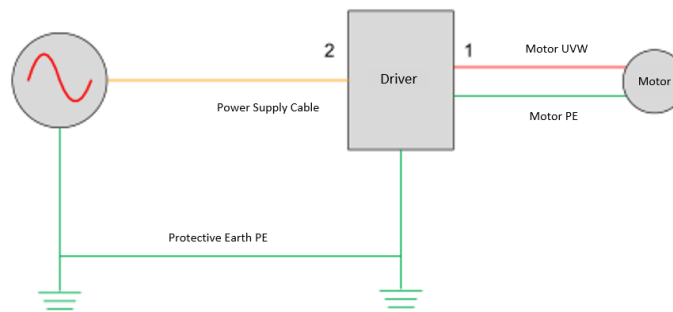


Please make sure RS485 communication connection is normal using a multimeter. Then, make sure the reference ground is corrected connected. If there is not no reference ground, please leave it unconnected. Same goes for cable shield foil.

Signal interference



External interference: Magnetic ring can be intertwined within cable 1 and 2 to prevent external interference.

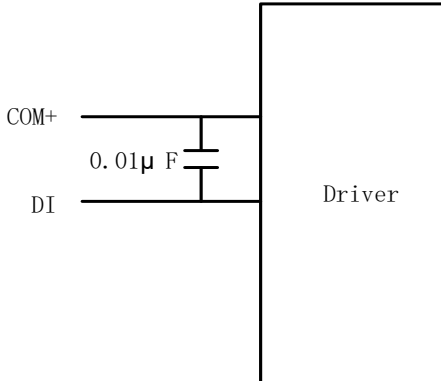


Driver interference: If interference occurs within the driver, please intertwine magnetic rings on cable 1 and 2. Please loop UVW cables around the magnetic ring for at least 3 rounds. Do not loop PE wire into the magnetic ring.

Step-by-step problem solving

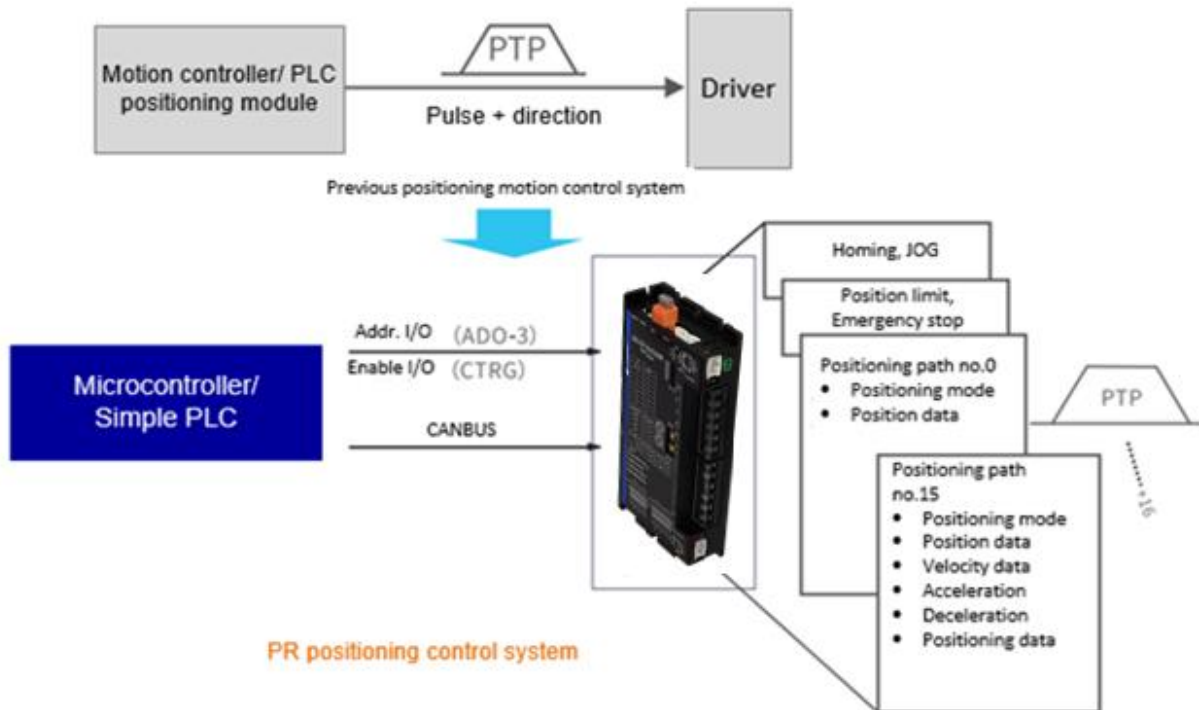
- 1: Verify if communication parameters setting are correct (ID not repeated, uniform Baud rate and data format);
- 2: If terminal resistor used is correct;
- 3: If wiring connection is correct;
- 4: Verify grounding and PE connection;
- 5: Communication cables should be separated from power cables.

Servo drives are devices of good anti-interference. However, during installation, interference still might occur due to wiring and grounding issues. Please refer to the table below if such problems persist.

| Steps | Solutions |
|-------|--|
| 1 | Use shielded wire cable for I/O signals, connect shield foil to PE. |
| 2 | Connect motor PE to PE terminals on drivers, connect driver PE to PE terminals of electrical network. |
| 3 | Ground master device and servo drives together. |
| 4 | Loop UVW motor power cable around magnetic ring for 2-3 times. |
| 5 | Loop signal cable around magnetic ring for 1-2 times. |
| 6 | Use shielded cable for power cables. Connect shield foil to ground. |
| 7 | <p>Connect a capacitance filter onto DI input. Max capacitance: 0.1 μF</p>  |

Chapter 7 PR mode

PR function is a control module in servo drive that controls single axis motion using PProcedure program. Main single axis motion control functions included homing, path, position limit and emergency stop. Using PR functions can save the resources on the main controller.



Please set Pr0.01 = 6 when using PR functions. All position unit: 10000 Pulse/r

7.1 PR functions introduction

| Function | Description |
|-------------------|---|
| Homing | <p>Driver seeks origin signal through homing to determine zero point of the mechanical motion coordination system</p> <ol style="list-style-type: none"> 1. Homing mode configurable. Can be chosen between position limit signal homing, origin signal homing and manually set home; 2. Homing direction configurable; 3. Specific position can be set after homing completed; 4. Homing velocity, acceleration and deceleration configurable. 5. High homing velocity to locate origin and low homing velocity to look for Z-signal |
| JOG | <p>Forward/Reverse JOG through I/O control. Used for tuning.</p> <ol style="list-style-type: none"> 1. JOG direction: forward JOG, reverse JOG 2. JOG velocity and acceleration configurable |
| Position limit | <p>Prevent mechanical damage by limiting the range of motion</p> <ol style="list-style-type: none"> 1. Positive/Negative position limit input through I/O 2. Software position limit 3. Position limit deceleration configurable |
| Emergency stop | Emergency stop input signal through I/O. To stop any operating motion |
| Path motion | <p>Select path ID through IO (ADD0-3) , then trigger path motion through enable IO (CTRG) ; or directly through I/O combination mode; path motion can be controlled directly through 485 communication as well</p> <ol style="list-style-type: none"> 1. Path motion includes positioning, velocity and homing modes. 2. I/O trigger includes rising edge, double edges trigger 3. Supports continuous positioning; 4. Max. 16 paths; 5. Configurable position, velocity and acceleration/deceleration; 6. Pause time/ timer configurable |
| 485 communication | PR parameter R/W through 485 communication. Control PR functions such as homing, JOG, path motion, emergency stop, etc. |

7.2 Control parameters

All PR motion related parameters including trigger, status output, limits, emergency stop, JOG, homing, etc.

| Parameter | Label | Description | 485 Addr. |
|-----------|---------------------------|---|-----------|
| Pr8.00 | PR Control | PR control functions Bit 0: =0, CTRG rising edge trigger =1, double edges trigger ; Bit 1: =1, software position limit valid, =0, software position limit not valid; Bit 2: =1, homing upon power on , =0, no homing upon power on Bit 3: =1, absolute value memory, =0, absolute value with no memory, | 0X6000 |
| Pr8.01 | Path count | 16 paths | 0X6001 |
| Pr8.02 | Control Operation | -- | 0X6002 |
| Pr8.06 | Software positive limit H | High 16-bit of software positive limit | 0X6006 |
| Pr8.07 | Software positive limit L | Software positive limit (Only able to read low 16-bit using 485 communication) | 0X6007 |
| Pr8.08 | Software negative limit H | High 16-bit of software negative limit | 0X6008 |
| Pr8.09 | Software negative limit L | Software negative limit (Only able to read low 16-bit using 485 communication) | 0X6009 |
| Pr8.10 | Homing mode | Homing method in PR mode Bit 0: Homing direction =0 : Reverse; =1: Forward Bit 1: Specific position after homing =0: No; =1: Yes Bit2~7: Homing mode =0: Position limit homing =1: Origin homing =2: Single turn Z homing =3: Torque homing =8: Immediate homing Bit 8: =1: Homing with Z-signal = 0: Homing without Z-signal <i>Single turn Z homing is homing method within 1 revolution, has nothing to do with Bit 8 Z-signal.</i> | 0X600A |
| Pr8.11 | Zero position H | High 16-bit of zero position | 0X600B |
| Pr8.12 | Zero position L | Zero position (Only able to read low 16-bit using 485 communication) | 0X600C |
| Pr8.13 | Home position offset H | High 16-bit of home position offset | 0X600D |
| Pr8.14 | Home position offset L | Home position offset (Only able to read low 16-bit using 485 communication) | 0X600E |

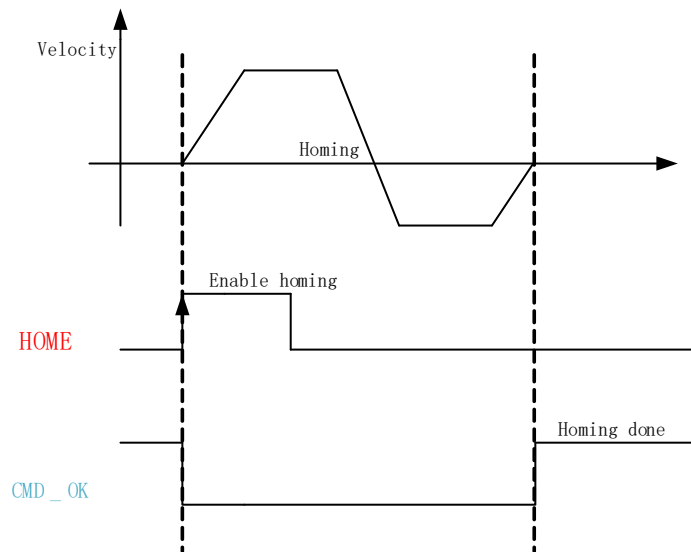
| | | | |
|-----------------------|--------------------------------------|--|-----------------------|
| Pr8.15 | High homing velocity | Set high homing velocity | 0X600F |
| Pr8.16 | Low homing velocity | Set low homing velocity | 0X6010 |
| Pr8.17 | Homing acceleration | Set homing acceleration | 0X6011 |
| Pr8.18 | Homing deceleration | Set homing deceleration | 0X6012 |
| Pr8.19 | Homing torque holding time | Set homing torque holding time | 0X6013 |
| Pr8.20 | Homing torque | Set homing torque value | 0X6014 |
| Pr8.21 | Homing overtravel alarm range | Set homing overtravel alarm threshold, set to 0 to deactivate the alarm | 0X6015 |
| Pr8.22 | Emergency stop at limit deceleration | Set position limit emergency stop deceleration | 0X6016 |
| Pr8.23 | STP emergency stop deceleration | Set STP emergency stop deceleration | 0X6017 |
| Pr8.26 | I/O combination trigger mode | 0: Disable I/O combination trigger mode. Uses I/O CTRG signal edge trigger. 1: Enable I/O combination trigger. Valid when HOME-OK signal is valid. 2: Enable I/O combination trigger. HOME-OK signal not required. | 0X601A |
| Pr8.27 | I/O combination filter | Set I/O combination filter time | 0X601B |
| Pr8.28 | S-code current output value | Display S-code output | 0X601C |
| Pr8.29 | PR warning | =0: Reset new command automatically; =0x100; Position limit error during homing =0x101; Emergency stop. Homing not completed; =0x20x; Position limit error on Path <i>N</i> | 0X601D |
| Pr8.39 | JOG velocity | Set JOG velocity | 0X6027 |
| Pr8.40 | JOG acceleration | Set JOG acceleration | 0X6028 |
| Pr8.41 | JOG deceleration | Set JOG deceleration | 0X6029 |
| Pr8.42 | Command position H | High 16- bit of command position | 0X602A |
| Pr8.43 | Command position L | Command position (Only able to read low 16-bit using 485 communication) | 0X602B |
| Pr8.44 | Motor position H | High 16- bit of motor position | 0X602C |
| Pr8.45 | Motor position L | Motor position (Only able to read low 16-bit using 485 communication) | 0X602D |
| Pr8.46 | Input | Input status | 0X602E |
| Pr8.47 | Output | Output status | 0X602F |
| Pr8.48 - Pr8.63 | S-code setting | Path <i>N</i> S-code output settings | 0x6030 ~ 0x603F |

7.3 PR Motion

7.3.1 Homing

Homing is divided into 5 methods according to home signal: Single turn Z-phase homing, position limit homing, origin homing, torque homing, manually set home. Position limit homing, origin homing and torque homing can be with or without Z-signal. Homing can be triggered upon power on or using I/O after servo enabled.

Homing sequence diagram

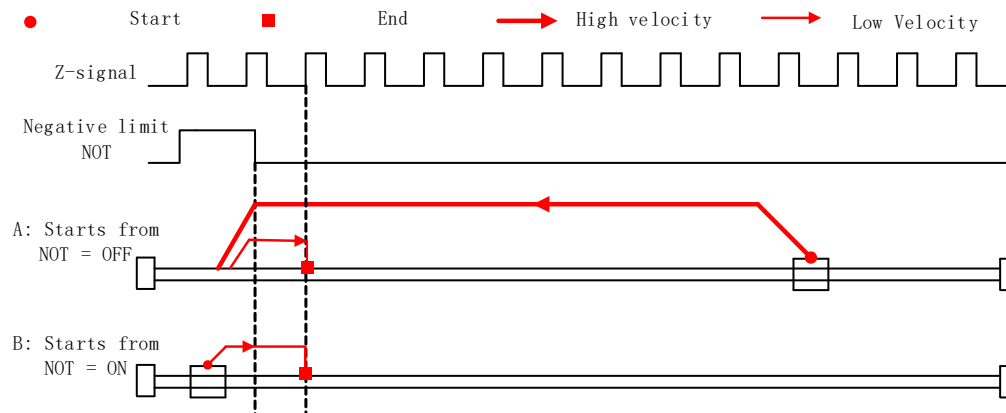


1. **HOME**: Homing trigger signal. When HOME is valid, homing will be done according to set homing method.
2. **CMD_OK**: Command completed signal. Invalid when command is being carried out, valid when command is done.
3. Please refer to Pr8.10 to set homing methods and other homing mode related settings. It is recommended to use Motion Studio to modify the control parameters in PR mode.

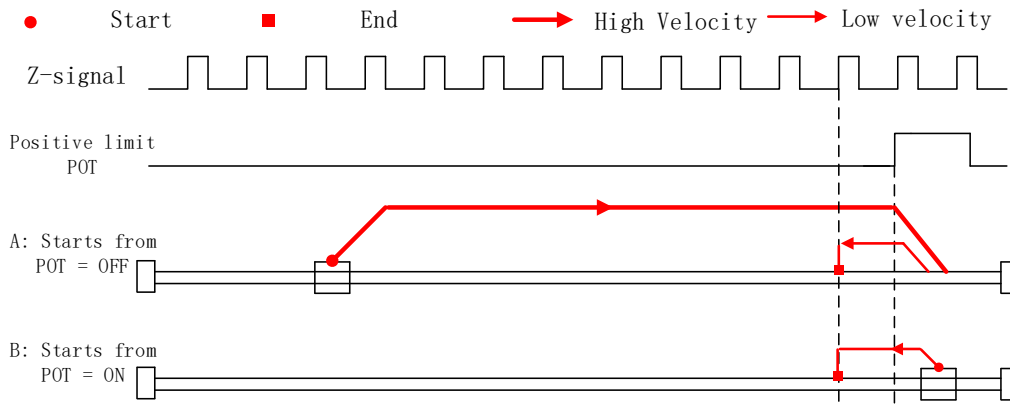
| Pr8.10 | Label | Homing mode | | | Valid mode(s) | PR |
|---|-------------|---|---|------------------------------------|----------------------------|--------|
| | Range | 0~ 0xFFFF | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X600A |
| To set homing method in PR mode. It is recommended to modify PR control parameters using Motion Studio. | | | | | | |
| | Bit | 8 (Z-signal homing) | 2-7 (Homing mode) | 1 (Specific position after homing) | 0 (Homing direction) | |
| | Description | =1, homing with Z-signal =0, homing without Z-signal | =0 Limit homing =1 Origin homing =2 Single turn Z homing =3 Torque homing =8 Immediate homing | =1, Yes =0, No | =1, Forward =0, Reverse | |

Position limit, origin and torque homing with Z-signal

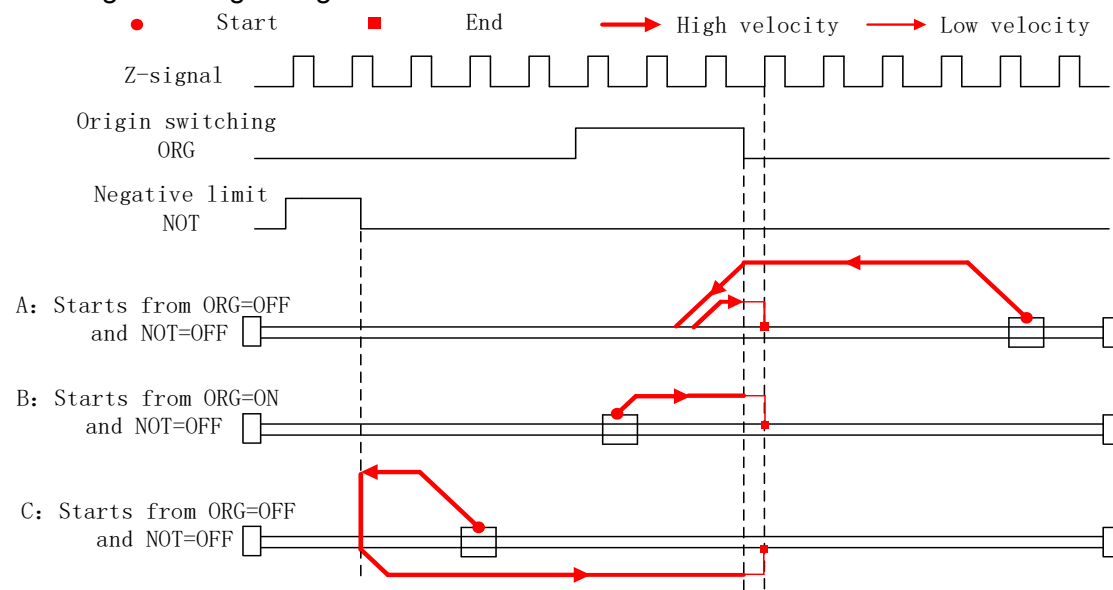
1. Negative limit homing



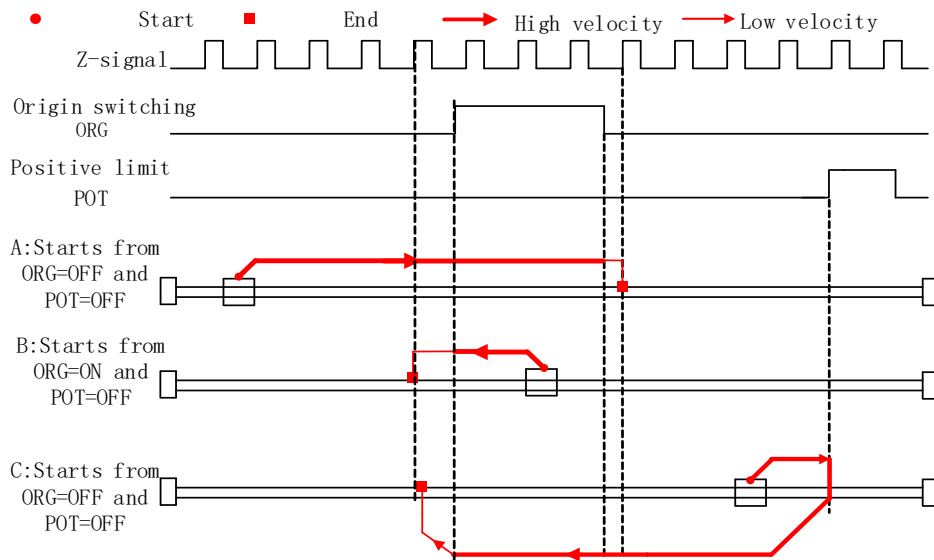
2. Positive limit homing



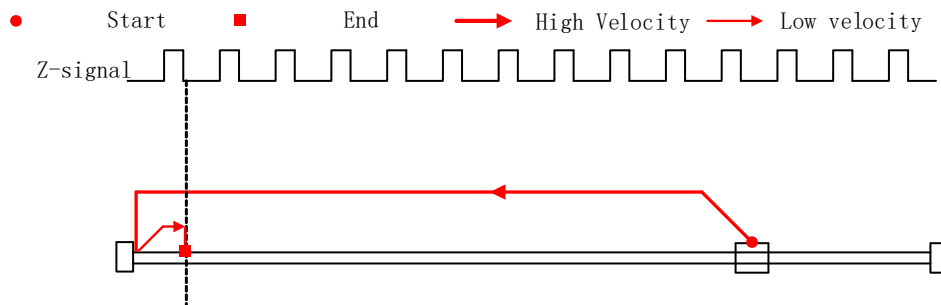
3. Origin homing – Negative direction



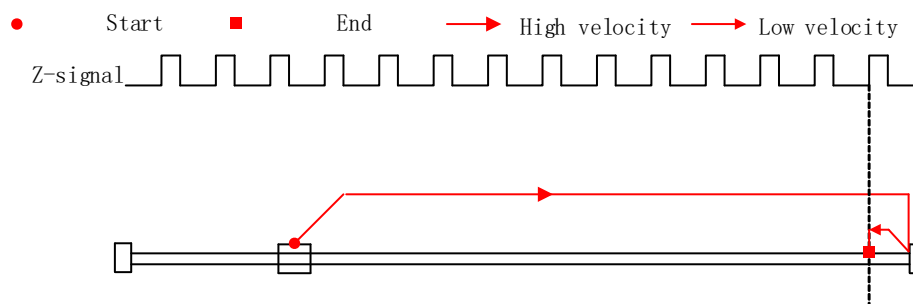
4. Origin homing – Positive direction



5. Torque homing – Negative direction



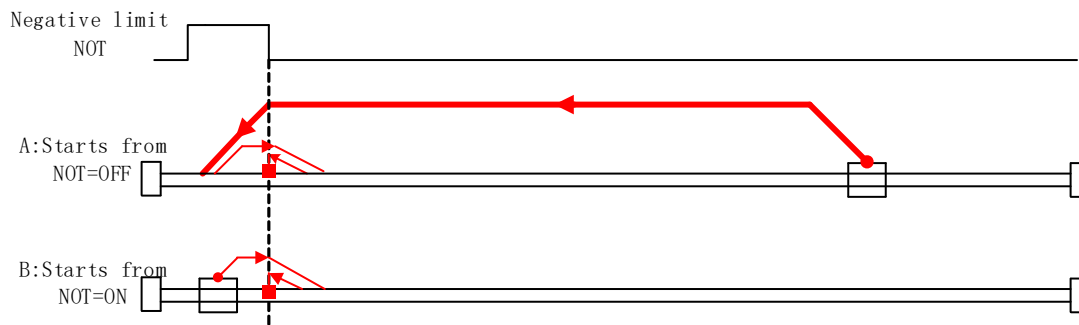
6. Torque homing – Positive direction



Position limit, origin, torque and manual set home (Homing with single condition)

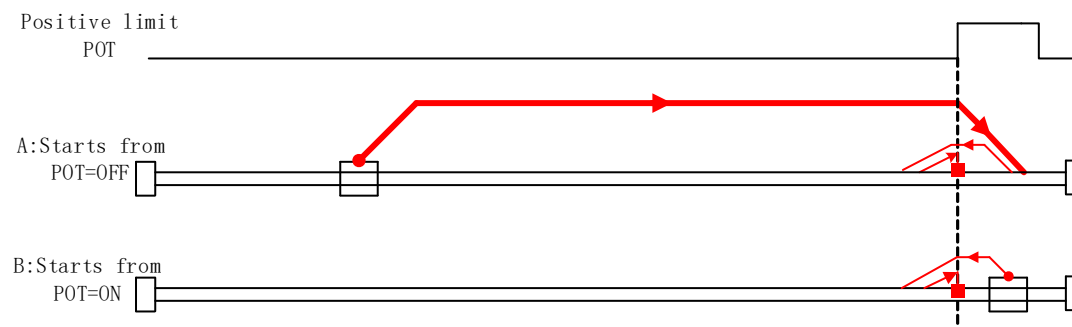
1. Negative limit homing

● Start ■ End → High velocity → Low velocity



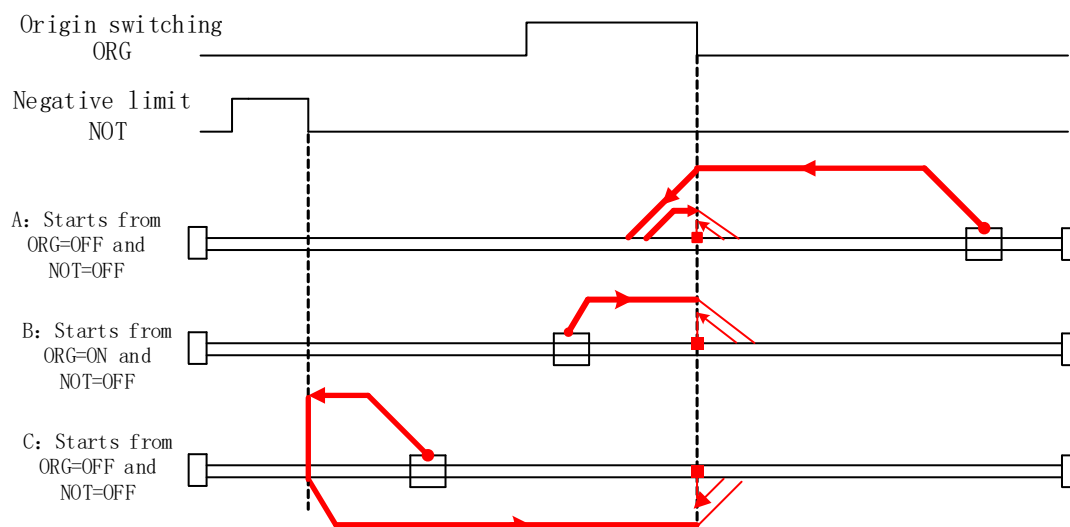
2. Positive limit homing

● Start ■ End → High velocity → Low velocity

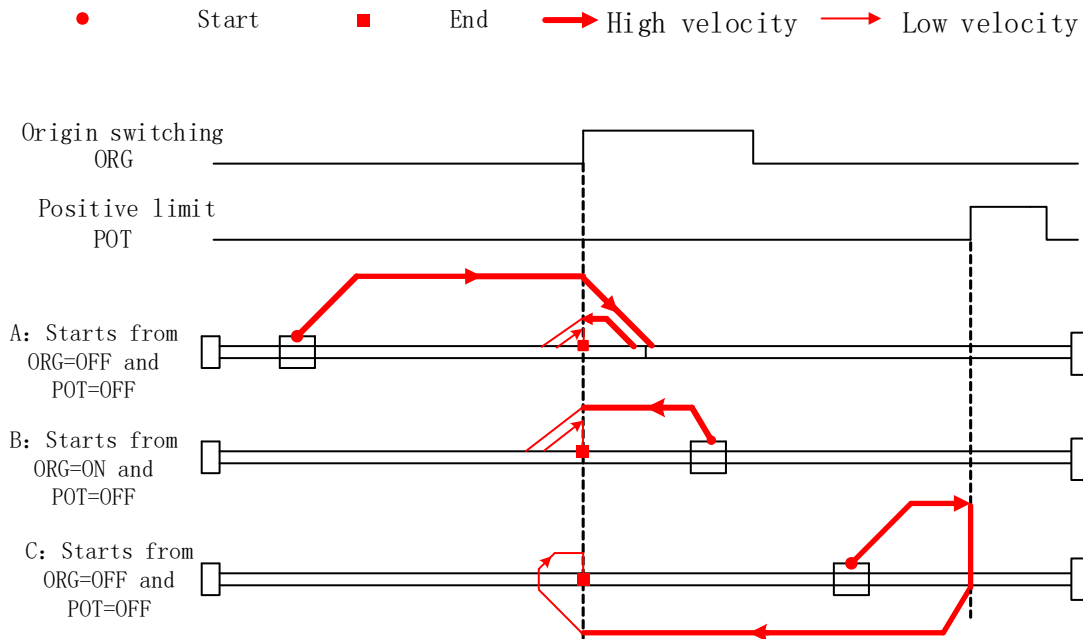


3. Origin homing – Negative direction

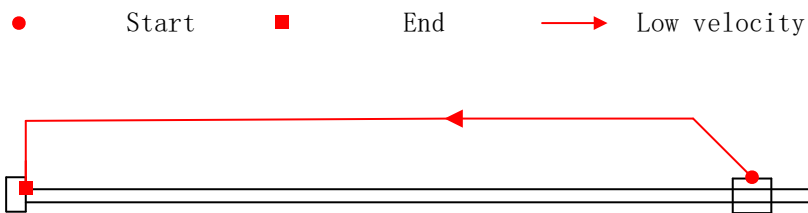
● Start ■ End → High velocity → Low velocity



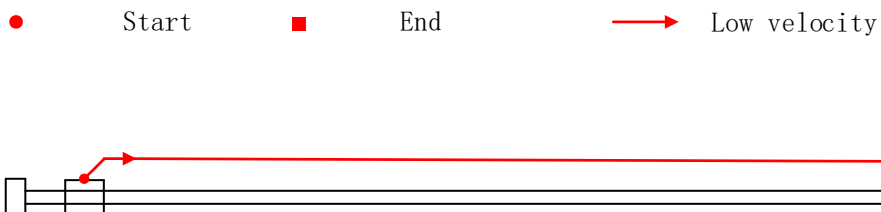
4. Origin homing – Positive direction



5. Torque homing – Negative direction

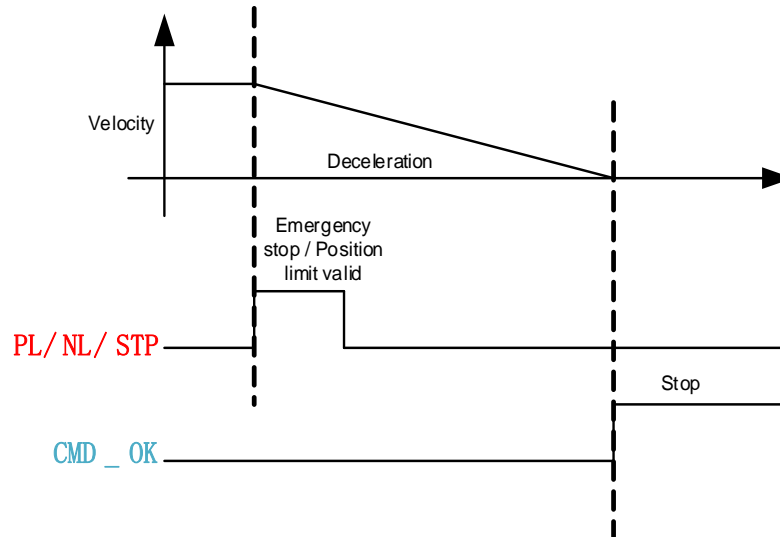


6. Torque homing – Positive direction



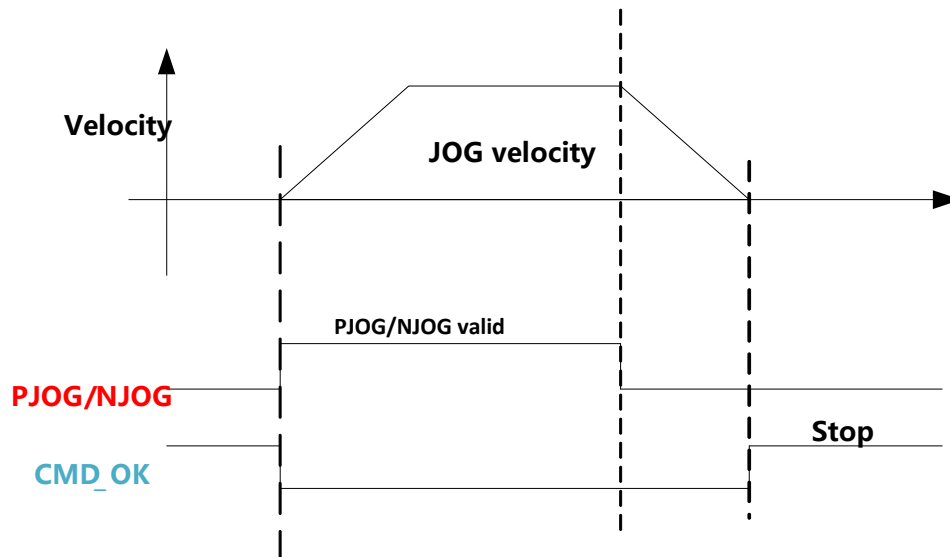
7.3.2 Position limit and emergency stop

For safety concerns, PR mode is designed to trigger emergency stop when position limit or emergency stop signal is valid. Please refer to the sequence diagram below.



7.3.3 JOG

JOG is used to make tuning more convenient. Please refer to the sequence diagram below for motion profile during JOG



7.3.4 Path motion

Path motion: Segmented, continuous, interrupted. Path positioning: Position, velocity, homing.

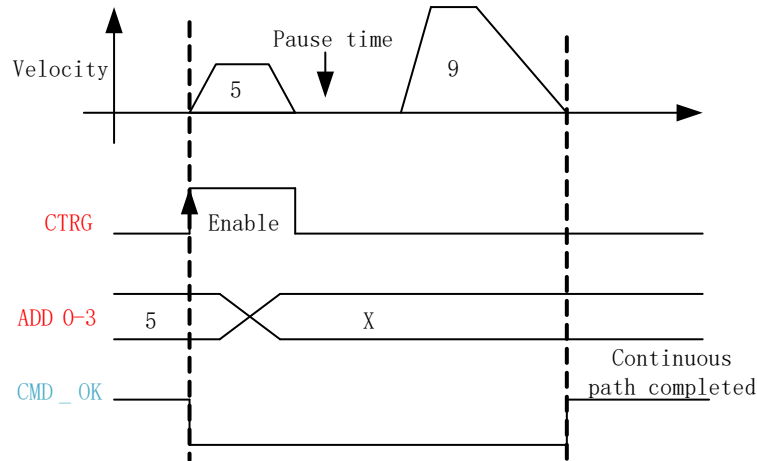
PR path is to a total of 16 paths. Every path can be set with motion type, positioning mode, velocity, acceleration, deceleration and pause time independently.

| Parameter | Label | Description | 485 addr. |
|------------------|-------------------|---|-----------|
| Pr9.00 | PR mode | Attribute of PR path is determined by its mode. Bit 0-3: type : 0: null 1: Positioning 2: Velocity 3: Homing 4: Emergency stop <i>Indicates using P/V/H/S</i> Bit 4: 0: Can be Interrupted 1: Can't be Interrupted, indicates using ! Bit 5: OVLP: 0: No overlap, indicates with SJ 1: Overlap, indicated with CJ Bit 6-7: 0: absolute 1: relative command 2: relative motor <i>Corresponding to ABS/INC/REL</i> Bit8-13: 0-15: Jump to corresponding path <i>Indicates using SJ0x or CJ0x</i> Bit 14: JUMP: 0: No Jump, indicates with END 1: Jump. Jump to SJ or CJ | 0X6200 |
| Pr9.01 | PR position H | High 16-bit of PR path position | 0X6201 |
| Pr9.02 | PR position L | PR position (Only able to read low 16-bit using 485 communication) | 0X6202 |
| Pr9.03 | Velocity | Velocity, rpm | 0X6203 |
| Pr9.04 | Acceleration time | Unit ms/1000rpm | 0X6204 |
| Pr9.05 | Deceleration time | Unit ms/1000rpm | 0X6205 |
| Pr9.06 | Pause time | Pause time after command completed | 0X6206 |
| Pr9.07 | Special parameter | Mapped to Pr8.02 | 0X6207 |
| Pr9.08 ~ Pr9.127 | | 8 parameters for each path. Please refer to Class 9 parameter in Chapter 3 | |

Path motion

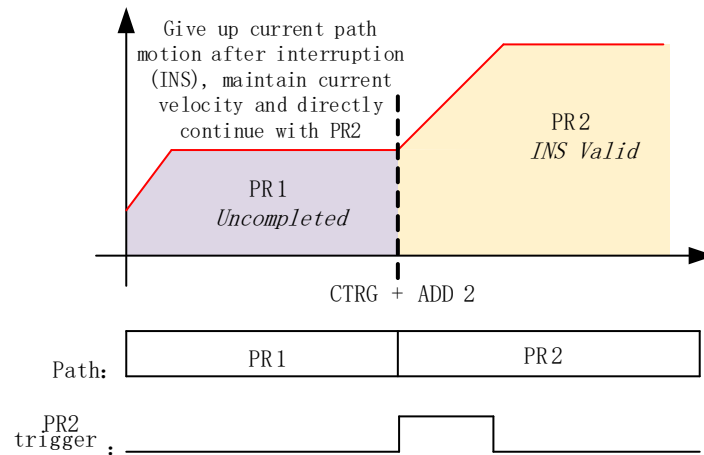
Segmented trigger

CTRG rising edge/double edges trigger (Pr8.00) a segmented motion. Please refer to the sequence diagram below with rising edge trigger of path 5.



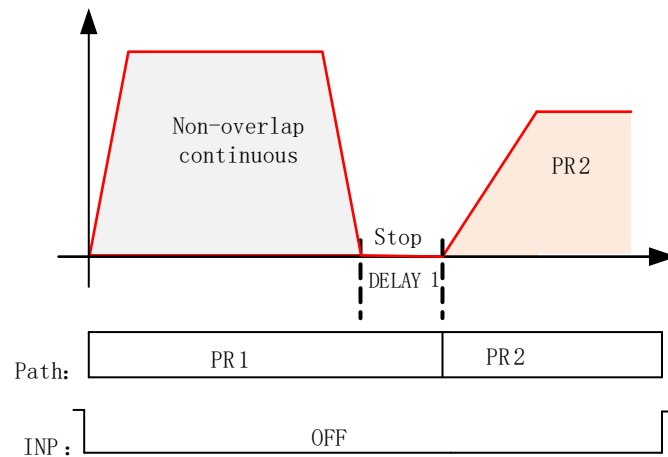
Multi-path interrupted motion

In multi-path motion, path motion that is triggered later will interrupt path motion that has already started. Please refer to the sequence diagram below



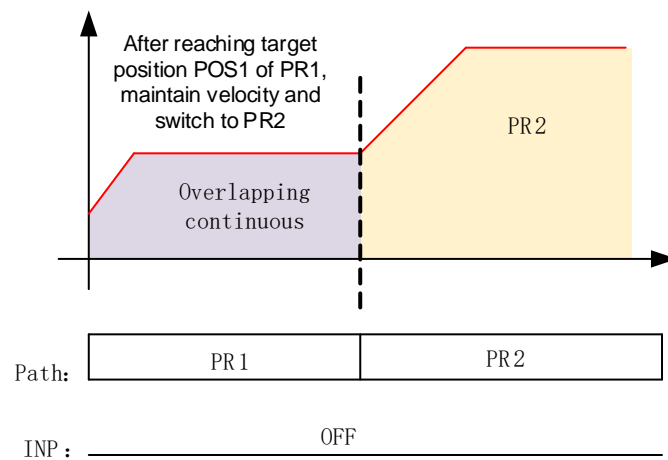
Non-overlap continuous motion

Path motion continues by another, no trigger needed for the next one to start.



Overlapping continuous motion

Path motion starts immediate after the previous path motion is completed without deceleration or trigger in between.



7.4 PR Control

7.4.1 PR module in Motion Studio

Using Pr-Motion function in Motion Studio, PR parameters can be set including trigger settings, software position limit, JOG, homing, emergency stop, etc. Manual triggering of homing, path motion or emergency stop can also be triggered on this interface.

| Control Parameters | Path Parameters | Manual | Parameter List | Online Path Loop |
|--|-----------------|--------|----------------|------------------|
| <div> <div> <h3>Control Config</h3> <p>CTRG(Pr8.0)</p> <div> <input type="radio"/> Rising edge trigger <input type="checkbox"/> Homing after power on </div> <div> <input type="radio"/> Rising/falling edge trigger <input type="checkbox"/> Absolute data memory </div> <div> <input type="checkbox"/> Trigger </div> <div> <input type="checkbox"/> Software Limit Position(Pr8.0,Pr8.6-Pr8. <div> Software Positive Limit Position(Pulse) <input type="text"/> </div> <div> Software Negative Limit Position(Pluse) <input type="text"/> </div> </div> </div> </div> <div> <h3>Homing Config</h3> <div> <div> Homing Direction(Pr8.10) <div> <input type="radio"/> Homing Direction(Negative) <input type="checkbox"/> Moves to specified location after Homing(Pulse) </div> <div> <input type="radio"/> Homing Direction(Positive) <input type="checkbox"/> Z-signal Homing </div> </div> <div> <div> Homing Method <div> <div>(Pr8.10)</div> <input type="text"/> </div> <div> Homing Position(Pulse) <div> <div>(Pr8.11-Pr8.12)</div> <input type="text"/> </div> <div> <div>(Pr8.17)</div> <input type="text"/> </div> </div> <div> <div>(Pr8.10)</div> <div>0</div> <div>(Pr8.15)</div> <input type="text"/> </div> <div> <div>(Pr8.11-Pr8.12)</div> <div>0</div> <div>(Pr8.16)</div> <input type="text"/> </div> <div> <div>(Pr8.17)</div> <div>0</div> <div>(Pr8.18)</div> <input type="text"/> </div> </div> </div> </div> <div> <h3>E-stop Config(Pr8.22-Pr8.23)</h3> <div> <div>0</div> <div> <input type="text"/> </div> <div>0</div> <div> <input type="text"/> </div> </div> </div> </div> | | | | |

Most of PR control related parameters can be set on this page.

[illegible]

Control Parameters
Path Parameters
Manual
Parameter List
Online Path Loop

Motion Operation

Pr9.02
Position(P)
0

Pr9.03
Velocity()
0

Pr9.04
Acceleration()
0

Pr9.05
Deceleration()
0

Pr9.06
Pause Time(ms)
0

Pr9.00
Positioning Mode
Pos: 1

Start

Homing

Pr8.46
Input
0x0000

Pr8.47
Output
0x0000

Pr8.43
Command
0

Pr8.45
Motor Position(Pulse)
0

Refresh

☐ Auto Refresh

Homing

Manual Homing

Emergency Stop

Trigger Pr-Mode

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

[illegible]

All PR mode and control parameters can be found on this list for convenience of tuning

Control Parameters | Path Parameters | Manual | Parameter List | Online Path Loop

Loop triggering

Pr8.43
 Command position (P) Current path Outer loop count

Pr8.45
 Motor position (P) Current loop count

| Path | Path loop count | Interval(ms) | Jump interval(ms) |
|------------------------------------|-----------------|--------------|-------------------|
| 0 | 1 | 100 | 100 |
| 1 | 1 | 100 | 100 |
| Right click: the list to add a ... | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Tip: When the path loop is running, it is recommended to close the trial run, oscilloscope, status monitoring. Otherwise the jump delay time will be affected.

7.4.2 Physical I/O

Path motion, feedback status, etc can be triggered through I/O in PR mode. Please refer to the table below for I/O assignments in PR mode.

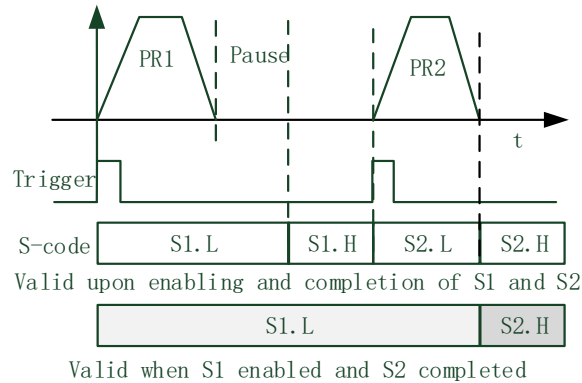
| Input | | | | Output | | | |
|-------------------------|--------|-------|-----|-------------------|---------|-------|-----|
| Label | Signal | Value | | Label | Signal | Value | |
| | | NO | NC | | | NO | NC |
| Command trigger | CTRG | 20h | A0h | Command completed | CMD_OK | 20h | A0h |
| Homing | HOME | 21h | A1h | Path completed | PR_OK | 21h | A1h |
| Forced emergency stop | STP | 22h | A2h | Homing completed | HOME_OK | 22h | A2h |
| Positive JOG | PJOG | 23h | A3h | S-code 0 | SD0 | 23h | A3h |
| Negative JOG | NJOG | 24h | A4h | S-code 1 | SD1 | 24h | A4h |
| Positive position limit | PL | 25h | A5h | S-code 2 | SD2 | 25h | A5h |
| Negative position limit | NL | 26h | A6h | S-code 3 | SD3 | 26h | A6h |
| Origin | ORG | 27h | A7h | S-code 4 | SD4 | 27h | A7h |
| Path address 0 | ADD0 | 28h | A8h | S-code 5 | SD5 | 28h | A8h |
| Path address 1 | ADD1 | 29h | A9h | S-code 6 | SD6 | 29h | A9h |
| Path address 2 | ADD2 | 2ah | Aah | PR warning | PRWAR | 2Ah | AAh |
| Path address 3 | ADD3 | 2bh | Abh | | | | |
| Torque switching | TC-SEL | 09h | 89h | | | | |

S-code

S-code (Status code) is the S-code of currently operating PR positioning data.

Every PR path has a S-code setting.

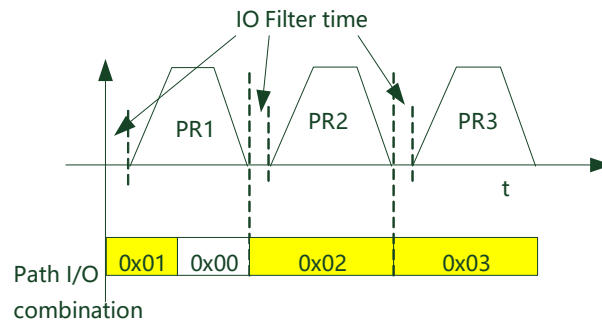
| S-code | Sx.H | | Sx.L | |
|-------------|---|------------------------|--|------------------------|
| Bit | 15 | 8-14 | 7 | 0-6 |
| Description | S-code valid when completed. 0: Invalid, retain previous value 1: Valid | S-code upon completion | S-code valid upon activation 0: Invalid 1: Valid | S-code upon activation |



| S-code bit | bit0/8 | bit1/9 | bit2/10 | bit3/11 | bit4/12 | bit5/13 | Bit6/14 |
|------------|--------|--------|---------|---------|---------|---------|---------|
| SDx | SD0 | SD1 | SD2 | SD3 | SD4 | SD5 | SD6 |

I/O trigger

Path motion trigger: Edge trigger/combination trigger(Pr8.26). Edge trigger is triggering path combination motion using I/O. I/O combination trigger uses electrical level as trigger rather than signal edge. No valid motion for path 0 and I/O combination triggers motion once after I/O filter when converted to non-zero paths.



****Path combination 0 is invalid because I/O combination $x > 0 \rightarrow x$ can be triggered for multiple times when using incremental position.**

***In I/O combination trigger mode 2, path motion will be triggered upon servo drive power on if I/O combination not set to 0. Please be careful.**

| Pr8.26 | Label | I/O combination trigger mode | | | Valid mode(s) | PR |
|--------|--|--|-----------|-----|---------------|--------|
| | Range | 0 ~ 65535 | Unit | / | Default | 0 |
| | Byte length | 16bit | Attribute | R/W | 485 address | 0X601A |
| | Value | Description | | | | |
| | 【0】 | Disable I/O combination trigger mode. Uses I/O CTRG signal edge trigger. | | | | |
| | 1 | Enable I/O combination trigger. Valid when HOME-OK signal is valid. | | | | |
| | 2 | Enable I/O combination trigger. HOME-OK signal not required. | | | | |
| | IO combination trigger select path using ADD0~ADD3. Trigger mode is set in Pr8.26. | | | | | |

| ADD3 | ADD2 | ADD1 | ADD0 | Path selection |
|------|------|------|------|---------------------|
| OFF | OFF | OFF | OFF | Path 0 (Non-action) |
| OFF | OFF | OFF | ON | Path1 |
| OFF | OFF | ON | OFF | Path2 |
| OFF | OFF | ON | ON | Path3 |
| OFF | ON | OFF | OFF | Path4 |
| OFF | ON | OFF | ON | Path5 |
| OFF | ON | ON | OFF | Path6 |
| OFF | ON | ON | ON | Path7 |
| ON | OFF | OFF | OFF | Path8 |
| ON | OFF | OFF | ON | Path9 |
| ON | OFF | ON | OFF | Path10 |
| ON | OFF | ON | ON | Path11 |
| ON | ON | OFF | OFF | Path12 |
| ON | ON | OFF | ON | Path13 |
| ON | ON | ON | OFF | Path14 |
| ON | ON | ON | ON | Path15 |

7.4.3 485 communication

485 communication can be used to achieve the same functions as with I/O, modifying PR related parameters and trigger path motions. Through this communication protocol, controlling of multiple axes can be realized, saving wiring works with flexibility in the system. 485 communication includes 2 kinds of mode: Fixed trigger and immediate trigger.

485 communication parameters

| Parameter | Label | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|--------------------|--|-----------|--------------------|-------------|-----------|-------|--------------------|-------|----------|-------|---------|-------|---|---|---------|------|-----------|---|----------|-----|---|---|---|------|---|-----|---|------|---|
| Pr5.29 | Communication mode | 485 communication mode data | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table><tr><th>Value</th><th>Bit</th><th>Checksum</th><th>Stop</th></tr><tr><td>0</td><td>8</td><td>Even</td><td>2</td></tr><tr><td>1</td><td>8</td><td>Odd</td><td>2</td></tr><tr><td>2</td><td>8</td><td>Even</td><td>1</td></tr><tr><td>3</td><td>8</td><td>Odd</td><td>1</td></tr><tr><td>4</td><td>8</td><td>Null</td><td>1</td></tr><tr><td>【5】</td><td>8</td><td>Null</td><td>2</td></tr></table> | Value | Bit | Checksum | Stop | 0 | 8 | Even | 2 | 1 | 8 | Odd | 2 | 2 | 8 | Even | 1 | 3 | 8 | Odd | 1 | 4 | 8 | Null | 1 | 【5】 | 8 | Null | 2 |
| | | Value | Bit | Checksum | Stop | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 8 | Even | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 8 | Odd | 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2 | 8 | Even | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | 8 | Odd | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | 8 | Null | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 【5】 | 8 | Null | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.30 | Baud rate | To set communication speed of RS485 communication | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table><tr><th>Value</th><th>Baud rate</th><th>Value</th><th>Baud rate</th></tr><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></table> | Value | Baud rate | Value | Baud rate | 0 | 2400bps | 【4】 | 38400bps | 1 | 4800bps | 5 | 57600bps | 2 | 9600bps | 6 | 115200bps | 3 | 19200bps | | | | | | | | | | |
| | | Value | Baud rate | Value | Baud rate | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 2400bps | 【4】 | 38400bps | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 4800bps | 5 | 57600bps | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 9600bps | 6 | 115200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 19200bps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr5.31 | ID | Modbus slave ID address | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pr8.02 | PR trigger | <table><tr><th>Attribute</th><th>Index</th><th>Description</th></tr><tr><td>Write</td><td>0x01P</td><td>N path positioning</td></tr><tr><td>Write</td><td>0x020</td><td>Reset</td></tr><tr><td>Write</td><td>0x021</td><td>Manually set currently position as 0 (Origin)</td></tr></table> | Attribute | Index | Description | Write | 0x01P | N path positioning | Write | 0x020 | Reset | Write | 0x021 | Manually set currently position as 0 (Origin) | | | | | | | | | | | | | | | | |
| | | Attribute | Index | Description | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Write | 0x01P | N path positioning | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Write | 0x020 | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Write | 0x021 | Manually set currently position as 0 (Origin) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | |
|--|--|-------|---------------------------|--|
| | | Write | 0x040 | Emergency stop |
| | | Read | 0x000P | Positioning completed. Ready to receive new data |
| | | Read | 0x01P, 0x020, 0x040 | Yet to respond to command |
| | | Read | 0x10P | Path motion undergoing |
| | | Read | 0x200 | Command completed. Waiting for positioning |

PR mode communication address:

Class 8 parameters: $0x6000 + (\text{Param-ID} - 800)$. For example Pr8.06: $0x6000 + (806 - 800) = 0x6006$

Class 9 parameters: $0x6200 + (\text{Param-ID} - 900)$. For example Pr9.06: $0x6200 + (906 - 900) = 0x6206$

7.4.4 Path trigger

Fixed trigger

Fixed triggering method is to set all 16 paths homing and other settings, then through Pr8.02 (trigger register to replace CTRG and HOME) to enable path. Recommended for simple applications with fixed motions.

Steps:

1. Set homing and path attributes using Motion Studio. Power on driver for parameters to be valid.
2. Write corresponding command into 0x6002(Pr8.02) to realize required motions.

| Attribute | Index | Description |
|-----------|---------------------------|--|
| Write | 0x01P | N path positioning |
| Write | 0x020 | Reset |
| Write | 0x021 | Manually set currently position as 0 (Origin) |
| Write | 0x040 | Emergency stop |
| Read | 0x000P | Positioning completed. Ready to receive new data |
| Read | 0x01P, 0x020, 0x040 | Yet to respond to command |
| Read | 0x10P | Path motion undergoing |
| Read | 0x200 | Command completed. Waiting for positioning |

Immediate trigger

Immediate trigger is more flexible while fixed triggering is restricted by 16 paths position. Path motion is triggered immediately once path is written. Motions such as position, velocity or homing are realized through data frame.

This triggering method uses PR0 with 8 datum from which Pr9.07 mapped into Pr8.02. When 0x10 is written into Pr8.02, it will trigger PR0 motion immediately.

Steps:

1. Set homing and path attributes using Motion Studio. (Homing parameters must be set) Power on driver for parameters to be valid.
2. Control specific path using Pr8.02.
3. Realize path motion by writing into Pr9.00 – Pr9.07 with Pr9.07 = 0x10

Master device request frame byte data

| No. | Data | Description | Value |
|-----|--------|-------------------|--------|
| 1 | ID | Slave ID | 1~127 |
| 2 | FC | Function code | 0x10 |
| 3 | ADDR | Address | 0x62 |
| 4 | ADDR | Address | 0x00 |
| 5~6 | NUM1 | Data count (Word) | 0x0008 |
| 7 | NUM2 | Data count (Byte) | 0x10 |
| 8-9 | Pr9.00 | Mode | XXXX |

| | | | |
|-------|--------|-------------------|--------|
| 10-11 | Pr9.01 | Position high bit | XXXX |
| 12-13 | Pr9.02 | Position low bit | XXXX |
| 14-15 | Pr9.03 | Velocity | 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 | Checksum Lo | |
| 25 | | Checksum Hi | |

Slave response frame byte data

| No. | Data | Description | Value |
|-----|------|-------------------|-------|
| 1 | ID | Slave ID | 1~127 |
| 2 | FC | Function code | 0x10 |
| 3 | ADDR | Address | 0x62 |
| 4 | ADDR | Address | 0x00 |
| 5 | NUM | Data count (Word) | 0x08 |
| 6 | CRC | Checksum Lo | 0XXX |
| 7 | | Checksum Hi | 0XXX |

7.5 PR motion

7.5.1 Trigger using physical I/O

1. Set up servo drive parameter such as Pr0.01 = 6. Required PR I/Os are set in Pr4.00-Pr4.15
2. Set up PR control parameters such as trigger, homing, emergency stop, velocity, etc as shown below
3. Set PR path parameter such as motion type, S-code, etc as shown below. The interface is divided into 3 parts:

Function buttons: Upload, download parameters to/from drives, save parameter, backup and reset to factory default.

Parameters: Set PR path related parameters here

Descriptions: Short explanation on each PR path motion types

Remember to upload parameters to drive and save to drive after parameters setup.

4. Set up homing, trigger, I/O in PR mode as shown below:

***Please select required path when using edge trigger. Make sure the corresponding path is chosen in I/O path selection*

**Please set up I/O combination filter time when using I/O combination trigger. Make sure I/O signal filter time covers the change in signal level.*

7.5.2 Control using 485 communication

485 communication data frame format

| Byte (x) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------------|----|---------------|------------------|-----------------|-----------------|----------------|------------------------|-------------------------|
| Definition | ID | Function code | Addr. High 8-bit | Addr. Low 8-bit | Data High 8-bit | Data Low 8-bit | CRC checksum Low 8-bit | CRC checksum High 8-bit |

Please refer to Modbus communication in Chapter 6 to use Word function code writing. The request and respond frame data format is similar.

1. Set PR0 to travel to absolute position = 200000 (10000 pulse/rev)

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 62 00 00 01 57 B2 | Set PR0 mode as absolute position |
| 2 | 01 06 62 01 00 03 87 B3 | Set PR0 position high bit |
| 3 | 01 06 62 02 0D 40 32 D2 | Set PR0 position low bit |
| 4 | 01 06 62 03 02 58 66 E8 | Set PR0 velocity |
| 5 | 01 06 62 04 00 32 56 66 | Set PR0 acceleration |
| 6 | 01 06 62 05 00 32 07 A6 | Set PR0 deceleration |
| 7 | 01 06 60 02 00 10 37 C6 | Trigger PR0 motion |
| 8 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

2. Set PR0 to travel relative distance = 10000 (10000 pulse/rev)

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 62 00 00 41 56 42 | Set PR0 mode as relative position |
| 2 | 01 06 62 01 00 00 C7 B2 | Set PR0 position high bit |
| 3 | 01 06 62 02 27 10 2D 8E | Set PR0 position low bit |
| 4 | 01 06 62 03 02 58 66 E8 | Set PR0 velocity |
| 5 | 01 06 62 04 00 32 56 66 | Set PR0 acceleration |
| 6 | 01 06 62 05 00 32 07 A6 | Set PR0 deceleration |
| 7 | 01 06 60 02 00 10 37 C6 | Trigger PR0 motion |
| 8 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

3. Set PR0 as velocity mode with velocity = 600rpm

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 62 00 00 02 17 B3 | Set PR0 as velocity mode |
| 2 | 01 06 62 03 02 58 66 E8 | Set PR0 velocity |
| 3 | 01 06 62 04 00 32 56 66 | Set PR0 acceleration |
| 4 | 01 06 62 05 00 32 07 A6 | Set PR0 deceleration |
| 5 | 01 06 60 02 00 10 37 C6 | Trigger PR0 motion |
| 6 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

4. Set PR1 to travel to absolute position = 200000 (10000 pulse/rev)

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 62 08 00 01 D6 70 | Set PR1 mode |
| 2 | 01 06 62 09 FF FC 07 C1 | Set PR1 position high bit |
| 3 | 01 06 62 0A F2 C0 F3 40 | Set PR1 position low bit |
| 4 | 01 06 62 0B 02 58 E7 2A | Set PR1 velocity |
| 5 | 01 06 62 0C 00 32 D7 A4 | Set PR1 acceleration |
| 6 | 01 06 62 0D 00 32 86 64 | Set PR1 deceleration |
| 7 | 01 06 60 02 00 11 F6 06 | Trigger PR1 motion |
| 8 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

5. Set PR1 as velocity mode with velocity = 300rpm

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 62 08 00 02 96 71 | Set PR1 as velocity mode |
| 2 | 01 06 62 0B 01 2C E7 FD | Set PR1 velocity |
| 3 | 01 06 60 02 00 11 F6 06 | Set PR1 acceleration |
| 4 | 01 06 62 0C 00 32 D7 A4 | Set PR1 deceleration |
| 5 | 01 06 62 0D 00 32 86 64 | Trigger PR1 motion |
| 6 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

6. Homing

| No. | 485 communication data frame | Description |
|-----|------------------------------|--|
| 1 | 01 06 60 0A 00 00 B7 C8 | Set homing method |
| 2 | 01 06 60 0F 00 64 A6 22 | Set high homing velocity |
| 3 | 01 06 60 10 00 1E 16 07 | Set low homing velocity |
| 4 | 01 06 60 02 00 20 37 D2 | Trigger homing |
| 5 | 01 06 60 02 00 40 37 FA | Send Emergency stop datagram when required |

Chapter 8 Warning and Alarm

8.1 Servo Drive alarm indicator

Green LED: Power ON/Motor enable

ON for once: Power ON

Always ON: Motor Enable

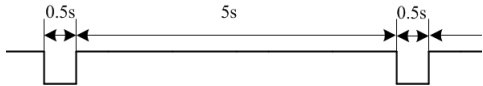
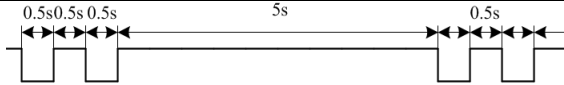
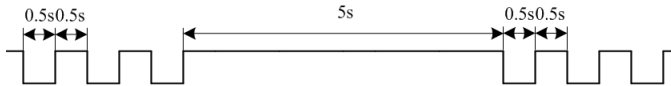
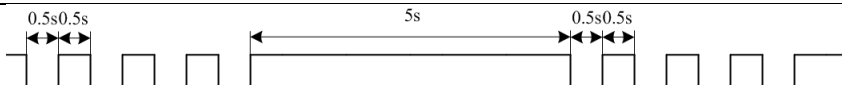
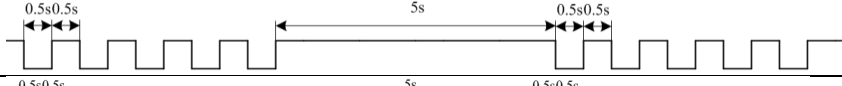
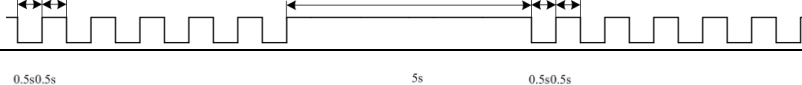

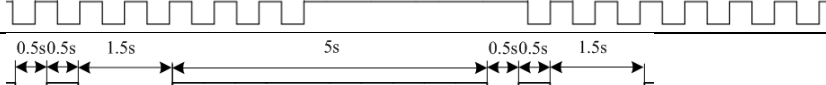
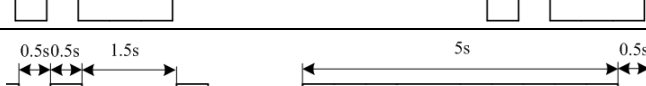

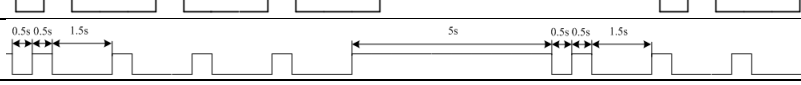
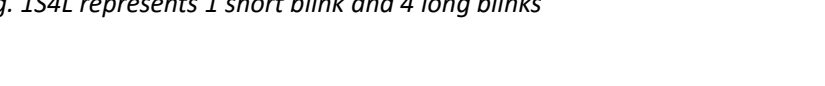
Blinking: Motor Disable

OFF: Power OFF

Red LED: Alarm indicator (Motor stops when alarm indicator is ON)

Blink for 5s/cycle (Please refer to the table below)

OFF: Alarm cleared

| Error | Blink | Sequence | Error |
|-------------|-------|--|-------------------------------|
| 0E1/ 0E0 | 1S |  | Hardware/software overcurrent |
| 0C0/ 0D0 | 2S |  | Under-/overvoltage |
| 81B | 3S |  | CANopen communication timeout |
| 0A3 | 4S |  | Motor phase missing |
| 150/ 151 | 5S |  | Encoder error |
| 100 | 6S |  | Overload |
| 180 | 7S |  | Excessive position deviation |
| 0F0 | 8S |  | Over-temperature |
| 1A0/ 1A1 | 1S1L |  | Motor loses speed |
| 0A0/ 0A1 | 1S2L |  | Hardware initialization error |
| 240 | 1S3L |  | Parameter saving error |
| | 1S4L |  | Other error |

S: Short, L: Long. 1S4L represents 1 short blink and 4 long blinks

8.2 Servo drive alarm

Table 8.1 Error Code List

| Error code | | Content | Attribute | | |
|------------|-------|---|-----------|--------|-----------|
| Main | Sub | | Save | E.Stop | Clearable |
| 09 | 0~F | FPGA communication error | ● | | |
| 0A | 0~1 | Circuit current detection error | ● | | |
| | 2 , 4 | Analog input error | ● | | |
| | 3 | Motor power cable not connected | ● | | |
| | 5 | DC bus error | ● | | |
| | 6 | Temperature measuring error | ● | | |
| 0b | 0 | Control circuit power supply voltage too low | | | |
| | 1 | Control circuit power supply voltage too high | | | ● |
| 0c | 0 | DC bus overvoltage | ● | | ● |
| 0d | 0 | DC bus undervoltage | ● | | ● |
| 0E | 0 | Overcurrent | ● | | |
| | 1 | Intelligent Power Module (IPM) overcurrent | ● | | |
| | 2 | Power output to motor shorted to ground | ● | | |
| | 4 | Phase overcurrent | ● | | |
| 0F | 0 | Driver overheated | ● | ● | |
| 10 | 0 | Motor overloaded | ● | | ● |
| | 1 | Driver overloaded | ● | | ● |
| | 2 | Motor rotor blocked | ● | | ● |
| 12 | 0 | Regenerative resistor overvoltage | ● | ● | |
| | 1 | Holding brake error | ● | | |
| | 2 | Regenerative resistor value too low | ● | | |
| 15 | 0 | Encoder disconnected | ● | | |
| | 1 | Encoder communication error | ● | | |
| | 2 | Encoder initial position error | ● | | |
| | 3 | Multiturn encoder error | ● | | |
| | 4 | Encoder parameter settings error | ● | | |
| | 5 | Encoder data overflow | ● | | ● |
| | 6 | Encoder overheated | ● | | ● |
| 17 | 0 | Encoder data error | ● | ● | |
| | 1 | Encoder parameter initialization error | ● | | |
| 18 | 0 | Excessive position deviation | ● | ● | ● |
| | 1 | Excessive velocity deviation | ● | ● | ● |
| 19 | 0 | Motor vibration too strong | ● | ● | ● |
| | 1 | Excessive hybrid position deviation | ● | | ● |
| 1A | 0 | Overspeed | ● | | ● |
| | 1 | Velocity out of control | ● | | ● |
| 1b | 0 | Bus input signal dithering | ● | | ● |
| | 1 | Incorrect electronic gear ratio | ● | | ● |
| | 4 | Excessive synchronous position command | ● | | ● |
| 21 | 0 | I/O input interface assignment error | ● | | |

| | | | | | |
|----|---|--|---|---|---|
| | 1 | I/O input interface function assignment error | • | | |
| | 2 | I/O output interface function assignment error | • | | |
| 24 | 0 | CRC correction during EEPROM parameter saving | | | |
| 26 | 0 | Positive/Negative position limit triggered under non-homing mode | • | • | • |
| 27 | 0 | Analog 1 input overrun limit | • | | • |
| 29 | 0 | Control mode not match under full closed loop mode | • | | |
| | 1 | Encoder mode not match under full closed loop mode | • | | |
| 57 | 0 | Forced alarm input valid(E-stop) | • | • | • |
| 5F | 0 | Motor model no. detection error | | | |
| | 1 | Driver power module detection error | | | |
| 60 | 0 | Main loop interrupted timeout | | | |
| | 1 | Velocity loop interrupted timeout | | | |
| 70 | 0 | Encryption error | | | |
| 88 | 0 | Communication timeout | • | • | |
| 89 | 0 | Homing error | | | • |

8.3 Alarm Handling

****When error occurs, please solve accordingly. Then, restart. If the solutions described don't work, please consider replacing the driver.**

| Error code | Main | Sub | Display: "Er 090"--"Er 09F" | | |
|----------------------------------|------|-----|-----------------------------------|--|--|
| | 09 | 0~F | Content: FPGA communication error | | |
| Cause | | | Diagnosis | Solution | |
| DC-,DC+ terminal voltage too low | | | Verify DC-,DC+ terminal voltage | Make sure DC-,DC+ terminal voltage is within recommended range | |

| Error code | Main | Sub | Display: "Er 0A0"--"Er 0A1" | | |
|--------------------------------|------|-----|--|---|--|
| | 0A | 0~1 | Content: Circuit current detection error | | |
| Cause | | | Diagnosis | Solution | |
| Motor power cable wiring error | | | Verify motor power cable wiring | Make sure U,V,W terminal wired properly | |
| Main power supply undervoltage | | | Verify DC-,DC+ terminal voltage | Increase main power supply voltage | |

| Error code | Main | Sub | Display: "Er 0A2" / "Er 0A4" | | |
|---------------------------|------|-------|------------------------------|---|--|
| | 0A | 2 / 4 | Content: Analog input error | | |
| Cause | | | Diagnosis | Solution | |
| Analog input wiring error | | | Verify analog input wiring | Make sure of analog input wiring connection | |

| Error code | Main | Sub | Display: "Er 0A3" |
|---------------------------------|------|-----|--|
| | 0A | 3 | Content: Motor power cable not connected |
| Cause | | | Diagnosis |
| Motor power cable not connected | | | Verify motor power cable wiring |
| | | | Solution |
| | | | Measure resistance values between U, V, W terminals , make sure the values are almost equal. If not, might be due to damaged motor or motor winding open circuit. |
| Motor fault | | | / |
| | | | Replace motor |

| Error code | Main | Sub | Display: "Er 0A5" |
|----------------------------------|------|-----|---|
| | 0A | 5 | Content: DC Bus error |
| Cause | | | Diagnosis |
| DC-,DC+ terminal voltage too low | | | Verify DC-,DC+ terminal voltage. Check if power on indicator light on servo drive is on and d27 DC bus voltage. |
| | | | Solution |
| | | | Make sure DC-,DC+ terminal voltage is within recommended range |

| Error code | Main | Sub | Display: "Er 0A6" |
|----------------------------------|------|-----|--|
| | 0A | 6 | Content: Temperature measuring error |
| Cause | | | Diagnosis |
| DC-,DC+ terminal voltage too low | | | Verify DC-,DC+ terminal voltage |
| | | | Solution |
| | | | Make sure DC-,DC+ terminal voltage is within recommended range |

| Error code | Main | Sub | Display: "Er 0c0" |
|--|------|-----|---|
| | 0c | 0 | Content: DC bus overvoltage |
| Cause | | | Diagnosis |
| Main power supply overvoltage | | | Verify DC-,DC+ terminal voltage |
| Acceleration/deceleration time too short | | | Verify if the time is actually too short |
| Regenerative brake parameter anomaly | | | Verify Pr7.32/Pr7.33 |
| Inner brake circuit damaged | | | / |
| | | | Solution |
| | | | Decrease main power supply voltage |
| | | | Increase the duration time or change to a regenerative resistor with higher resistance. |
| | | | Modify vent overload parameter |
| | | | Replace driver |

| Error code | Main | Sub | Display: "Er 0d0" |
|--------------------------------|------|-----|-------------------------------------|
| | 0d | 0 | Content: DC bus undervoltage |
| Cause | | | Diagnosis |
| Main power supply undervoltage | | | Verify DC-,DC+ terminal voltage |
| | | | Solution |
| | | | Increase main power supply voltage |

| Error code | Main | Sub | Display: "Er 0E0" | |
|-----------------------------------|------|---|----------------------|--|
| | 0E | 0 | Content: Overcurrent | |
| Cause | | Diagnosis | | Solution |
| Driver power output short circuit | | Verify if there is short circuit between UVW terminals, or shorted to PG. | | 1. Make sure there is no circuit. 2. Make sure motor is not damaged |
| Motor wiring error | | Verify motor wiring | | Reconnect motor wiring |
| IGBT module short circuit | | Disconnect motor output cable. Then, enable servo driver to check for overcurrent | | Replace driver |
| Control parameter anomaly | | Verify if parameter exceeds recommended range | | Set parameter within recommended range. |
| Control command anomaly | | Verify if command motion is too acute | | Modify control command; use filter |

| Error code | Main | Sub | Display: "Er 0E1" | |
|-----------------------------------|------|---|---|--|
| | 0E | 1 | Content: Intelligent Power Module (IPM) overcurrent | |
| Cause | | Diagnosis | | Solution |
| Driver power output short circuit | | Verify if there is short circuit between UVW terminals, or shorted to PG. | | 1. Make sure there is no circuit. 2. Make sure motor is not damaged |
| Motor wiring error | | Verify motor wiring | | Reconnect motor wiring |
| IGBT module short circuit | | Disconnect motor output cable. Then, enable servo driver to check for overcurrent | | Replace driver |
| IGBT module undervoltage | | / | | Replace driver |
| Control parameter anomaly | | Verify if parameter exceeds recommended range | | Set parameter within recommended range. |
| Control command anomaly | | Verify if command motion is too acute | | Modify control command; use filter |

| Error code | Main | Sub | Display: "Er 0F0" | |
|--|------|---|----------------------------|---|
| | 0F | 0 | Content: Driver overheated | |
| Cause | | Diagnosis | | Solution |
| Temperature of power module exceeded upper limit | | Measure the temperature of driver radiator. | | 1. Improve cooling condition. Please check installation guide; 2. Replace driver and motor with higher power rating; 3. Increase duration time for acceleration and deceleration; 4. Decrease load |

| Error code | Main | Sub | Display: "Er 100" |
|-------------------------------------|------|---|---|
| | 10 | 0 | Content: Motor overloaded |
| Cause | | Diagnosis | Solution |
| Load too heavy | | Verify if actual load exceeds maximum value allowed | 1. Decrease load 2. Adjust limit values |
| Strong mechanical vibration | | Look for mechanical vibration from machine system | 1. Adjust gain value of control loop 2. Increase duration time for acceleration and deceleration |
| Motor or encoder cable wiring error | | Verify motor and encoder wiring | 1. Reconnect wiring 2. Replace motor and encoder cable |
| Holding brake engaged | | Verify holding brake terminal voltage | Cut off holding brake |

| Error code | Main | Sub | Display: "Er 101" |
|--------------------------------|------|----------------------------|---|
| | 10 | 1 | Content: Driver overloaded |
| Cause | | Diagnosis | Solution |
| Motor power cable wiring error | | UVW terminals wiring error | Make sure motor power cable wiring connection is correct |
| Motor not matched | | Motor current is too high | Motor rated current is higher than driver rated current. Please change to a driver with higher rated current. |

| Error code | Main | Sub | Display: "Er 102" |
|---|------|-------------------------------|------------------------------|
| | 10 | 2 | Content: Motor rotor blocked |
| Cause | | Diagnosis | Solution |
| Motor rotor blocked | | Look for mechanical blockages | Check the machinery |
| Motor rotor blocking time threshold value too low | | Verify value of Pr6.57 | Adjust value of Pr6.57 |

| Error code | Main | Sub | Display: "Er 120" |
|--|------|--|---|
| | 12 | 0 | Content: Regenerative resistor overvoltage |
| Cause | | Diagnosis | Solution |
| Regenerative energy exceeded capacity of regenerative resistor | | 1. Verify if velocity is too high 2. Verify if load is too large | 1. Decrease motor rotational velocity; 2. Decrease load inertia; 3. Add an external regenerative resistor; |
| Power supply voltage too high | | 1. Verify if power supply voltage is within the rated range. 2. Interval regenerative resistor value is too low | 1. Decrease power supply voltage 2. Increase regeneration resistance value(add external regenerative resistor) |
| Unstable power supply voltage | | Verify if power supply voltage is stable | Add a surge suppressor to main power supply. |
| Regenerative energy discharge circuit damaged | | / | 1. Add an external regenerative resistor; 2. Replace driver |

| Error code | Main | Sub | Display: "Er 121" |
|-------------------------------|------------------------------------|-----|-------------------------------------|
| | 12 | 1 | Content: Holding brake error |
| Cause | | | Solution |
| Holding brake circuit damaged | Regenerative resistor disconnected | | Replace regenerative resistor |
| | Holding brake IGBT damaged | | Replace driver |

| Error code | Main | Sub | Display: "Er 122" |
|--|------|-----|---|
| | 12 | 2 | Content: Regenerative resistor value too low |
| Cause | | | Solution |
| External regenerative resistor value is less than the minimum value allowed by the drive | | | Replace the regenerative resistor with the right resistance value which meets the specification of the driver |

| Error code | Main | Sub | Display: "Er 150" |
|-----------------------------------|------|-----|--|
| | 15 | 0 | Content: Encoder disconnected |
| Cause | | | Solution |
| Encoder cable disconnected | | | Make sure encoder cable properly connected |
| Encoder cable wiring error | | | Reconnect encoder wiring |
| Encoder damaged | | | Replace motor |
| Encoder measuring circuit damaged | | | Replace driver |

| Error code | Main | Sub | Display: "Er 151" |
|---|------|-----|---|
| | 15 | 1 | Content: Encoder communication error |
| Cause | | | Solution |
| Encoder wire shielding layer is missing | | | Replace with standard encoder cable |
| Encoder cable wiring error | | | Reconnect encoder wiring |
| Encoder damaged | | | Replace motor |

| Error code | Main | Sub | Display: "Er 152" |
|-----------------------------|------|-----|---|
| | 15 | 2 | Content: Encoder initial position error |
| Cause | | | Solution |
| Communication data abnormal | | | <ol style="list-style-type: none"> 1. Verify if encoder power supply voltage is $DC5V \pm 5\%$; 2. Verify if encoder cable and shielded layer is not damaged; 3. Verify if encoder cable is close to high-powered power supply cable |
| | | | <ol style="list-style-type: none"> 1. Make sure encoder power supply voltage is stable 2. Make sure encoder cable is not damaged. 3. Make sure encoder cable shielded layer is grounded to frame 4. Make sure encoder cable is away |

| | | |
|-----------------------------------|---|--------------------------------------|
| | | from high-powered power supply cable |
| Encoder damaged | / | Replace motor |
| Encoder measuring circuit damaged | / | Replace driver |

| Error code | Main | Sub | Display: "Er 153" |
|--|------|---|--|
| | 15 | 3 | Content: Multiturn encoder error |
| Cause | | Diagnosis | Solution |
| Initial use | | Origin calibration not performed | Perform origin positioning and multiturn position initialization, calibrate the origin of coordinate system. |
| Encoder without multiturn absolute function used | | Verify if encoder has multiturn absolute function | 1. Replace the motor with a multiturn absolute encoder. 2. Set Pr0.15 = 0 to deactivate multiturn absolute function. |
| Low battery power | | Replace battery and restart driver to clear alarm | Replace battery |
| Battery has no power or has been dismantled | | Alarm not cleared after replacing battery and restart | Absolute position lost. Return to origin and perform multiturn initialization, calibrate the origin of coordinate system |

| Error code | Main | Sub | Display: "Er 154" |
|---|------|---|--|
| | 15 | 4 | Content: Encoder parameter settings error |
| Cause | | Diagnosis | Solution |
| Absolute encoder mode is incorrectly set. | | Verify if encoder has multi-turn absolute value function. | Modify absolute encoder mode settings |

| Error code | Main | Sub | Display: "Er 155" |
|---|------|----------------------------------|---|
| | 15 | 5 | Content: Encoder data overflow |
| Cause | | Diagnosis | Solution |
| Encoder data overflow | | Verify if encoder is not damaged | Initialize multiturn data |
| Absolute value applications, motor rotates in one direction | | Verify if encoder is not damaged | Adjust absolute value application mode, set to turntable mode |

| Error code | Main | Sub | Display: "Er 156" |
|--------------------------------------|------|---|------------------------------------|
| | 15 | 6 | Content: Encoder overheated |
| Cause | | Diagnosis | Solution |
| The encoder temperature is too high. | | Verify if motor temperature is too high | Reduce encoder temperature. |

| Error code | Main | Sub | Display: "Er 157" |
|---|------|----------------------------------|---|
| | 15 | 7 | Content: Encoder counter error |
| Cause | | Diagnosis | Solution |
| Encoder data overflow | | Verify if encoder is not damaged | Initialize multiturn data |
| Absolute value applications, motor rotates in one direction | | Verify if encoder is not damaged | Adjust absolute value application mode, set to turntable mode |

| Error code | Main | Sub | Display: "Er 170" |
|-----------------------------------|------|--|--|
| | 17 | 0 | Content: Encoder data error |
| Cause | | Diagnosis | Solution |
| Communication data abnormal | | 1. Verify if encoder power supply voltage is $DC5V \pm 5\%$; 2. Verify if encoder cable and shielded layer is not damaged; 3. Verify if encoder cable is close to high-powered power supply cable | 1. Make sure encoder power supply voltage is stable 2. Make sure encoder cable is not damaged. 3. Make sure encoder cable shielded layer is grounded to frame 4. Make sure encoder cable is away from high-powered power supply cable |
| Encoder damaged | | / | Replace motor |
| Encoder measuring circuit damaged | | / | Replace driver |

| Error code | Main | Sub | Display: "Er 171" |
|---|------|---|--|
| | 17 | 1 | Content: Encoder parameter initialization error |
| Cause | | Diagnosis | Solution |
| Driver and motor not matched | | Verify driver and motor models. | Replace with matching driver and motor |
| Error while getting parameters from encoder | | 1. Verify if encoder cable is standard. 2. Verify if encoder has no peeled insulator, broken connection or improper contact. | Use standard encoder cable, verify the connection of both sides of driver and motor, change encoder cable if necessary |

| Error code | Main | Sub | Display: "Er 180" |
|--------------------------------------|------|---|--|
| | 18 | 0 | Content: Excessive position deviation |
| Cause | | Diagnosis | Solution |
| Improper position deviation settings | | Verify if value of Pr_014 is too low | Increase value of Pr_014 |
| Position gain setting too low | | Verify if values of Pr1.00 & Pr1.05 are too low | Increase values of Pr1.00 & Pr1.05 |
| Torque limit too low | | Verify if values of Pr0.13 & Pr5.22 are too low | Increase values of Pr0.13 & Pr5.22 |

| | | |
|-------------------------|--|--|
| Excessive external load | 1. Verify if acceleration and deceleration duration time is too low. 2. Verify if rotational velocity is too high 3. Verify if load is too large | 1. Increase duration time for acceleration and deceleration 2. Decrease rotational velocity 3. Decrease load |
|-------------------------|--|--|

| Error code | Main | Sub | Display: "Er 181" |
|---|------|--|--|
| | 18 | 1 | Content: Excessive velocity deviation |
| Cause | | Diagnosis | Solution |
| Deviation between set velocity and actual velocity is too great | | Verify if value of Pr6.02 is too low | 1. Increase value of Pr6.02; 2. Set Pr6.02 to 0, position error detection off. |
| Acceleration and deceleration duration time for set velocity is too low | | Verify if value of Pr3.12 and Pr3.13 are too low | 1. Increase value of Pr3.12, Pr3.13; 2. Adjust velocity gain to reduce velocity lag error |

| Error code | Main | Sub | Display: "Er 190" |
|-----------------------------|------|--|---|
| | 19 | 0 | Content: Vibration too strong |
| Cause | | Diagnosis | Solution |
| Resonance | | Mechanical stiffness is too high, resonance occurs | Reduce mechanical stiffness or use filter |
| Current loop gain too large | | Verify current loop gain value | Reduce current loop gain |

| Error code | Main | Sub | Display: "Er 191" |
|--|------|---|---|
| | 19 | 1 | Content: Excessive hybrid position deviation |
| Cause | | Diagnosis | Solution |
| Driver UVW terminal output single phasing or wiring error | | Verify if UVW terminal wiring connection is right | Make sure UVW terminals are correctly connected to UVW of motor; change motor power cable. |
| Motor rotor blocked | | Look for mechanical blockages | Check the machinery |
| Driver stiffness too low | | Verify if position loop and velocity loop gain is too low | Increase position loop and velocity loop gain |
| Full closed loop position deviation (Deviation between external encoder feedback position and motor feedback position) exceeds Pr0.33 | | Verify if Pr0.33 is set too low | Increase Pr0.33 set value accordingly but please aware that doing so might cause the position deviation to be higher. |

| Error code | Main | Sub | Display: "Er 1A0" |
|--|------|--|---|
| | 1A | 0 | Content: Overspeed |
| Cause | | Diagnosis | Solution |
| Motor velocity exceeded first speed limit (Pr3.21) | | 1. Verify if velocity command is too high; 2. Verify if simulated velocity command voltage is too high; 3. Verify if parameter value of Pr3.21 is too low; 4. Verify if input frequency and division frequency coefficient of pulse train is proper; 5. Verify if encoder is wired correctly | 1. Adjust velocity input command; 2. Increase Pr3.21 value; 3. Adjust pulse train input frequency and division frequency coefficient; 4. Verify encoder wiring; |

| Error code | Main | Sub | Display: "Er 1A1" |
|---|------|---|--|
| | 1A | 1 | Content: Velocity out of control |
| Cause | | Diagnosis | Solution |
| Motor velocity out of control, Excessive velocity error | | Verify encoder phase sequence; Verify if UVW cable is connected to the right terminal | Reconnect UVW if wrongly connected. If still remains unsolved, please contact technical support. |

| Error code | Main | Sub | Display: "Er 1b0" |
|--------------------------------------|------|-----------|-------------------------------------|
| | 1b | 0 | Content: Bus input signal dithering |
| Cause | | Diagnosis | Solution |
| Controller synchronization dithering | | / | Increase alarm threshold value |

| Error code | Main | Sub | Display: "Er 210" |
|---|------|---|--|
| | 21 | 0 | Content: I/O input interface assignment error |
| Cause | | Diagnosis | Solution |
| Input signal assigned with two or more functions. | | Verify values of Pr4.00-Pr4.09, Pr4.44-4.47 | Set proper values for Pr4.00-Pr4.09, Pr4.44-4.47 |

| Error code | Main | Sub | Display: "Er 211" |
|-------------------------------|------|---|--|
| | 21 | 1 | Content: I/O input interface function assignment error |
| Cause | | Diagnosis | Solution |
| Input signal assignment error | | Verify values of Pr4.00-Pr4.09, Pr4.44-4.47 | Set proper values for Pr4.00-Pr4.09, Pr4.44-4.47 |

| Error code | Main | Sub | Display: "Er 212" |
|---|------|--------------------------------|--|
| | 21 | 2 | Content: I/O output interface function assignment error |
| Cause | | Diagnosis | Solution |
| Input signal assigned with two or more functions. | | Verify values of Pr4.10-Pr4.15 | Set proper values for Pr4.10-Pr4.15 |
| Input signal not assigned | | Verify values of Pr4.10-Pr4.15 | Set proper values for Pr4.10-Pr4.15 |

| Error code | Main | Sub | Display: "Er 240" |
|-------------------------------|------|---|---|
| | 24 | 0 | Content: CRC correction error during EEPROM parameter saving |
| Cause | | Diagnosis | Solution |
| r, t terminal voltage too low | | Verify if r, t terminal voltage too low | Make sure r, t terminal voltage is within recommended range |
| Parameter saving anomaly | | Save parameter again and restart | Save parameter again |

| Error code | Main | Sub | Display: "Er 260" |
|--|------|------------------------------|--|
| | 26 | 0 | Content: Positive/Negative position limit triggered under non-homing mode |
| Cause | | Diagnosis | Solution |
| Positive/negative position limit triggered | | Verify position limit signal | / |

| Error code | Main | Sub | Display: "Er 270" -- "Er 272" |
|---------------------------|------|--|---|
| | 27 | 0~2 | Error description: Analog input 1-3 out of range |
| Cause | | Diagnosis | Solution |
| Analog value out of range | | Verify if analog input value is out of range | Adjust analog input voltage |

| Error code | Main | Sub | Display: " Er 570" |
|------------------------------------|------|----------------------------------|--|
| | 57 | 0 | Error description: Forced alarm input valid |
| Cause | | Diagnosis | Solution |
| Forced alarm input signal occurred | | Verify forced alarm input signal | Verify if the input wiring connection is correct |

| Error code | Main | Sub | Display: "Er 5F0" |
|--|------|-----------|---|
| | 5F | 0 | Content: Motor model no. detection error |
| Cause | | Diagnosis | Solution |
| Automatically detected motor doesn't match set motor | | / | Please contact our technical support |

| | | | | |
|---------------------------------------|------|-----|--|--------------------------------------|
| Error code | Main | Sub | Display: "Er 5F1" | |
| | 5F | 1 | Error description: Driver power module detection error | |
| Cause | | | Diagnosis | Solution |
| Driver power rating not within range. | | | Restart driver | Please contact our technical support |

| | | | | |
|--|------|-----|---|--|
| Error code | Main | Sub | Display: “Er 600” | |
| | 60 | 0 | Error description: Main loop interrupted timeout | |
| Cause | | | Diagnosis | Solution |
| The motor control loop calculation time overflow | | | Check for interference from devices releasing electromagnetic field | Ground driver and motor to reduce interference |
| | | | Restart driver | Replace driver |

| | | | | |
|--|------|-----|--|------------------------------------|
| Error code | Main | Sub | Display: "Er 601" | |
| | 60 | 1 | Error description: Velocity loop interrupted timeout | |
| Cause | | | Diagnosis | Solution |
| Motor control loop calculation time overflow | | | Verify if encoder connection is and that the encoder cable is too not long (more than 20 meters) | Replace encoder cable if necessary |
| | | | Restart driver | Replace the drive with a new one |

| | | | | |
|---|------|-----|-------------------------------------|--------------------------------------|
| Error code | Main | Sub | Display: "Er 700" | |
| | 70 | 0 | Error description: Encryption error | |
| Cause | | | Diagnosis | Solution |
| Encryption error during initialization upon power-on. | | | Restart driver | Please contact our technical support |

| | | | | |
|-----------------------|------|-----|---|---|
| Error code | Main | Sub | Display: "Er 880" | |
| | 88 | 0 | Error description: Modbus communication timeout | |
| Cause | | | Diagnosis | Solution |
| Communication timeout | | | Please check if the communication cable is properly connected | Make sure the communication connection is secured |

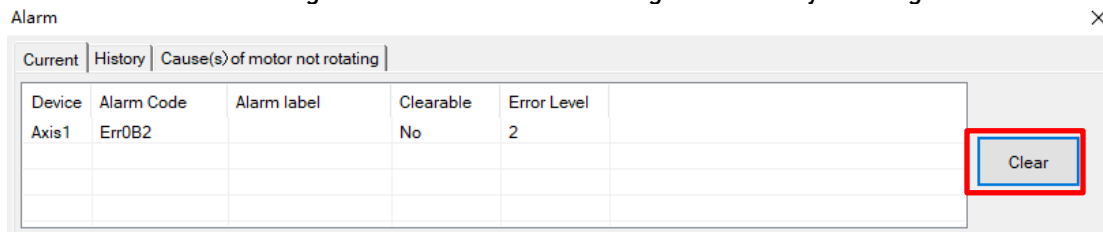
| Error code | Main | Sub | Display: "Er 890" |
|--|------|--|---|
| | 89 | 0 | Error description: Homing error |
| Cause | | Diagnosis | Solution |
| 1. Excess homing velocity 2. Homing mode is different from given signal 3. Sensor signal edge inconsistent | | 1. Verify if homing velocity is too high 2. Verify if homing mode is set correctly 3. Verify if sensor signal edge is consistent | 1. Set an optimal homing velocity 2. Make sure sensor signal edge is consistent. |
| Inconsistent origin status | | 1. Homing acceleration/ deceleration is set too low 2. Electronic gear ratio is low which causes acceleration/ deceleration to be too low | 1. If electronic gear ratio cannot be changed, please set a suitable 609A. 2. Increase electronic gear ratio |

8.4 Alarm clearing

8.4.1 Servo Drive Alarm Clearing

Clearable Alarm

Please clear alarm using Motion Studio after solving the error by clicking on the "Clear" button.



Non-clearable Alarm

Please restart drive to clear alarm

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