



MSD-PULSE-01 Series Rotary Pulse Servo Drive User Manual

Document Version: 02



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Revision History

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Preface

Overview

Thank you for choosing MX On Corporation products. The MSD-PULSE-01 series rotary pulse servo drive is an essential component of servo systems. By receiving and responding to commands from the upper-level controller, it accurately controls the position, velocity, and output torque of the rotary motor, meeting the application needs of customers in various production scenarios. The MSD-PULSE-01 series rotary pulse servo drive is rich in features, excellent in performance, has a high control bandwidth, and supports various command formats such as pulse command and analog input. It supports user-friendly functions such as automatic adjustment, adaptive vibration suppression, inertia recognition, low-frequency jitter suppression, error compensation, etc. It can also be optimized through MX On Corporation Servo Configuration software, making it widely applicable in fields such as consumer electronics, semiconductors, lithium batteries, photovoltaics, and more.

This manual provides detailed instructions to the commissioning methods and functions of the MSD-PULSE-01 series rotary pulse servo drive.

The content provided in this manual serves as general guidance and does not guarantee coverage of all usage scenarios for all product models. Due to reasons such as version upgrades, different equipment models, and different configuration files, the information provided in the manual may not correspond exactly to the actual device interface used by the user. Therefore, users should refer to the actual information on the device interface for accuracy. The manual does not further explain the differences caused by the aforementioned situations.

For functionality introduction and configuration examples, this manual may use IP addresses, URLs, domain names, etc. If not specifically stated, the aforementioned content is provided as examples and does not represent any actual significance.

Intended Audience

This document is primarily intended for readers who wish to understand the usage of the MSD-PULSE-01 series rotary pulse servo drive, including electrical engineers, mechanical engineers, etc. It is assumed that readers have a certain level of knowledge in the following areas:

- ◆ Principles of automatic control
- ◆ Basic electrical knowledge
- ◆ Principles of servo system's functionalities
- ◆ Applications of sensors

Format Conventions

This manual follows the following content formatting conventions:

Content	Description
Bold	Bold represents the names and contents of various controls on the software interface. For example, "Select Window/Current Window Properties from the menu bar to enter the Modify Window page, and select the Timer tab."
/	When describing the operation steps on the software interface, slash is used to isolate the clicked objects (menu item, sub-menu, button, etc.). For example, "Select Component/Switch/Bit Set from the menu bar, and create a new bit set switch component".

Content	Description
<i>Italic</i>	Variables, must be replaced by actual values accordingly. For example, “Enter ‘ftp:// <i>the IP of HMI</i> ’ in the browser address bar, and press Enter to enter the file directory interface of the HMI.”

This manual follows the icon formatting conventions below.

Icon	Description
	Tips, operation tips for users to solve problems.
	Description, supplementary and explanatory information for the main text.
	Caution, reminders for operation precautions, improper operation may cause potential device damage or data loss.
	Warning, the content following this icon requires special attention, otherwise it may result in personal injury.

Getting Help

If you encounter any problems during use, please dial the service hotline at +82-31-465-3366.

For more documents, please visit https://www.mxon.co.kr/eng/service/download.php#link_point

Contact Information

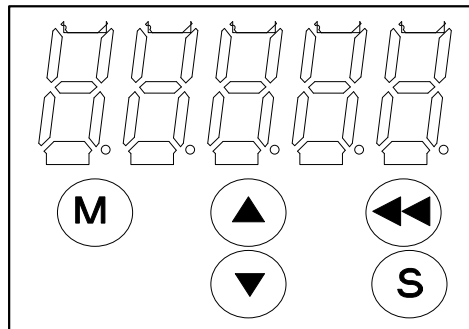
Address: 11-35, Simin-daero 327 beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14055, Republic of Korea

Zip Code: 14055

Website: <https://www.mxon.co.kr/eng/>

1 Panel Display and Operation

1.1 Panel Button Introduction

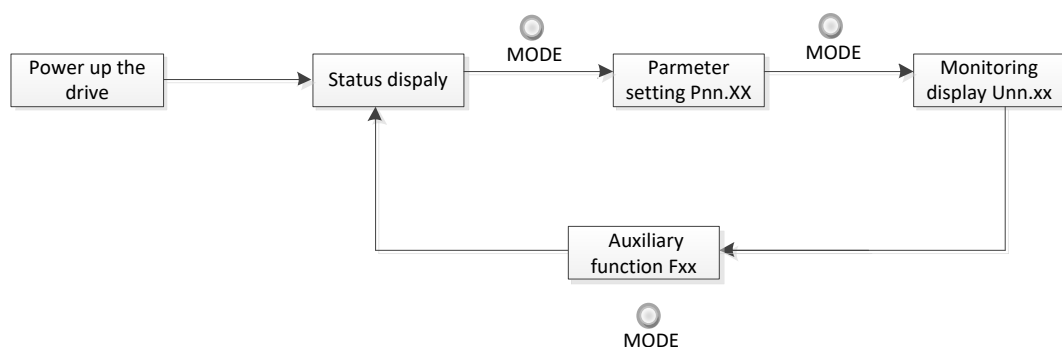


The panel of the servo drive consists of a display (LED Segment Display) and buttons. It can be used for various displays of the servo drive. Taking the P group parameters as an example, the functions of the buttons are as follows:

Name		Regular Function
	MODE Key	Change operation mode and parameters
	UP Key	Increase the selected number (blinking number)
	DOWN Key	Decrease the selected number (blinking number)
	SHIFT Key	Short-press this key to shift left; long-press this key to toggle between higher and lower decimal digits.
	SET Key	Enter the next level menu or set parameters

1.2 Use of Operation Mode

The panel defaults to display the servo operating status.



Pressing the MODE key switches the panel to the first-level menu. After power-up, the default panel display is the status display menu.

Status Display: Shows the current status of the servo. See the table below for details.

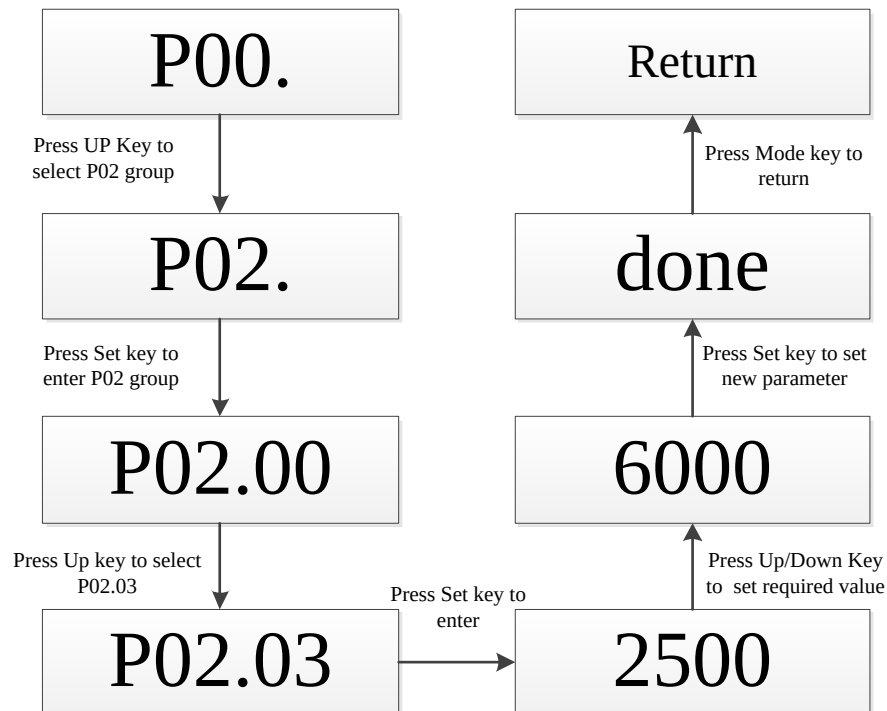
Servo Status / Operating Mode	Panel Display
Servo power-up / software reset	reset
Servo not ready / velocity mode	0ndy
Servo ready / position mode	1rdy
Servo runs / torque mode	2run
Servo fault status	E-053
Servo alarm status	ALOCO

The number before the servo status indicates the operating mode: 0 for velocity mode; 1 for position mode; 2 for torque mode; 3 for DI switch mode.

“ndy” indicates that servo is not ready, please check if the drive's power supply voltage is below the operating voltage range.

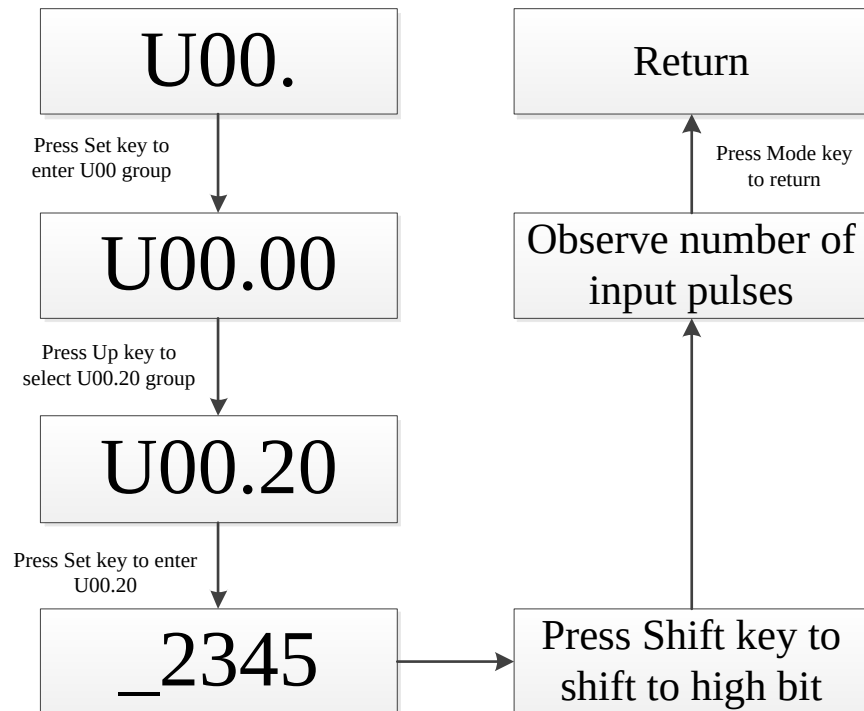
1.3 Group P Parameter Setting

Parameter Setting: To enter the parameter setting mode and change the servo parameters, you need to use the P Group parameters. Takes setting P02.03 as an example:

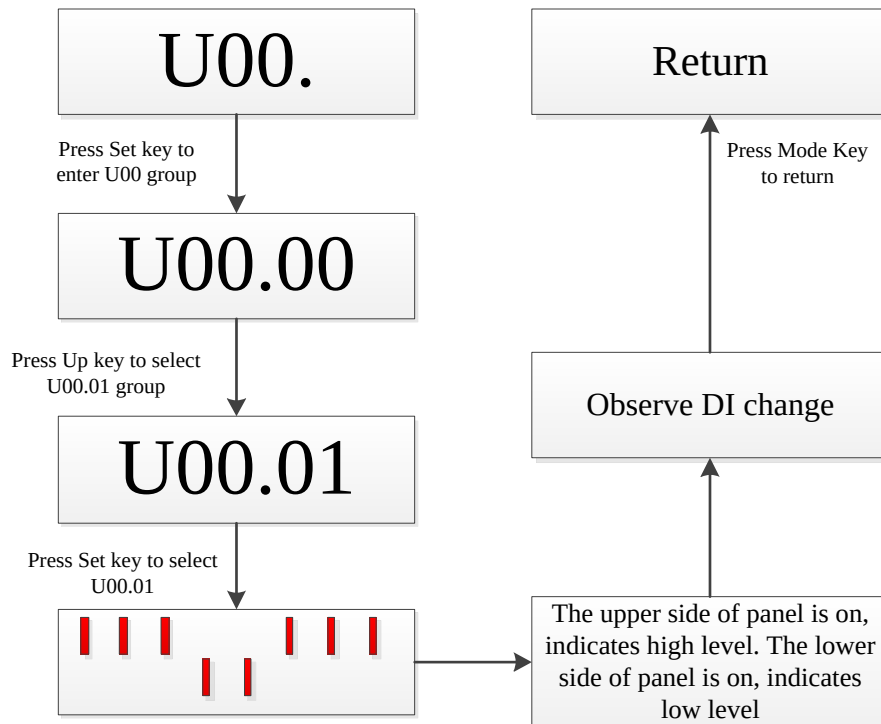


1.4 Group U Parameter Display

- ◆ For example: selecting U00.20 will display the servo input pulse count. The operation process is as shown in the figure below.



- ◆ For example: Selecting U00.01 displays the input DI status of the servo. The operation process is as shown in the figure below.

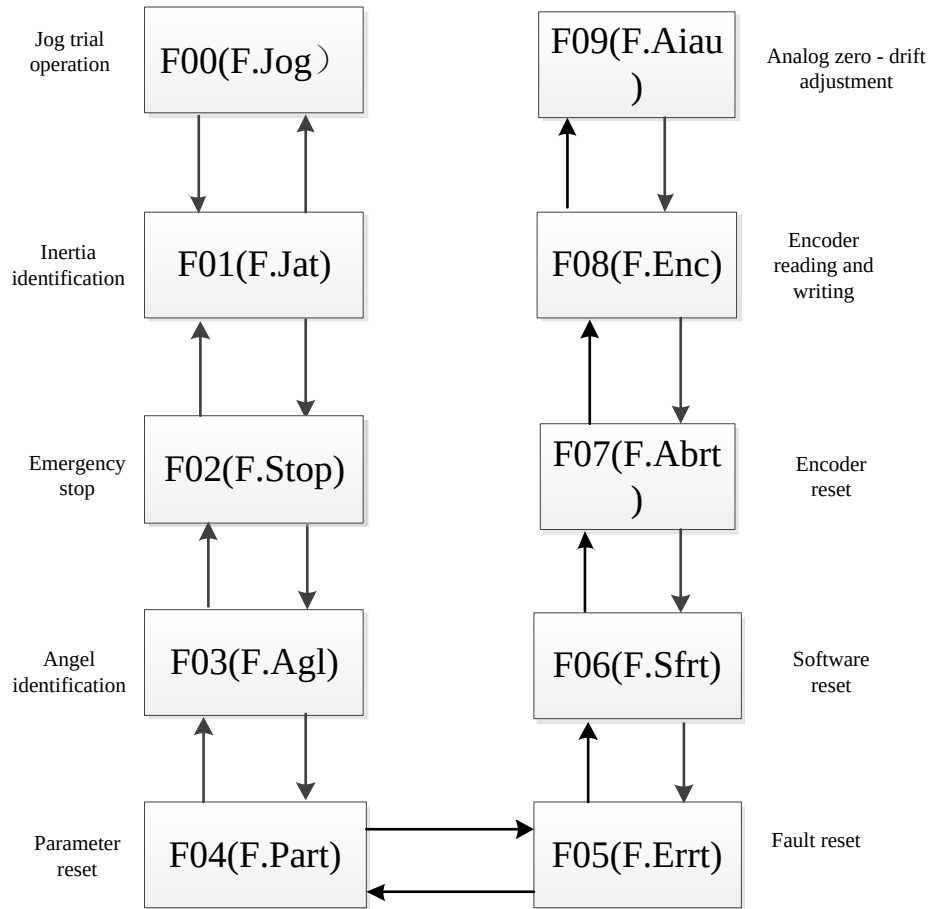


The DI status display indicates the status of the DI channels, with the rightmost indicating the status of DI1, the

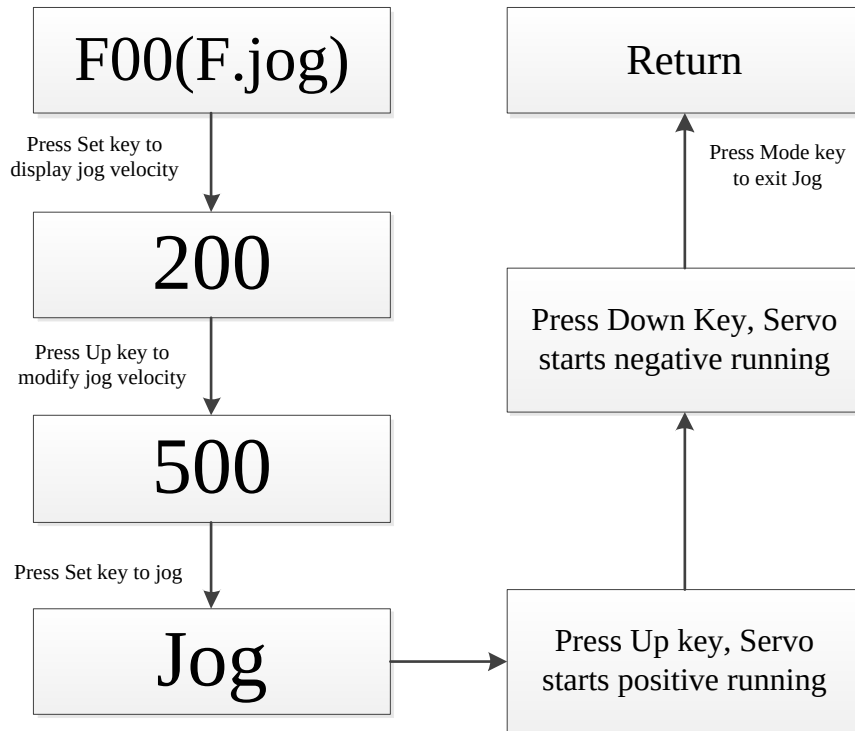
second from the right indicating the status of DI2, and so on, with DI1 to DI8 corresponding from right to left.

1.5 F Group Parameter Usage

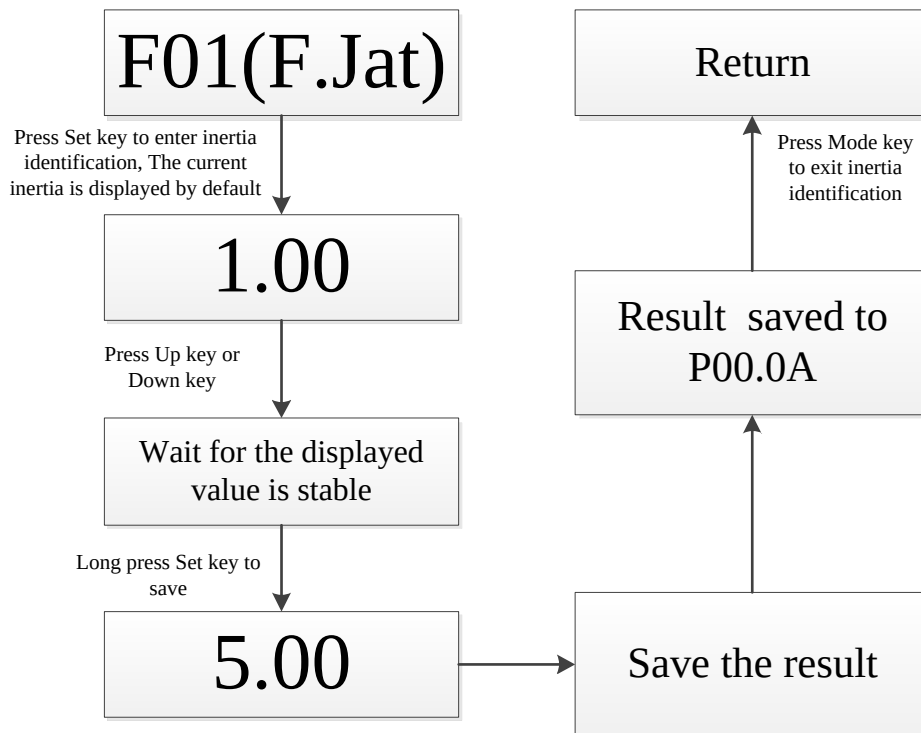
Group F parameters are used for monitoring display, serving as the auxiliary function group for the servo.



◆ For example: To use the panel jog function, please refer to the following diagram for the operating process.

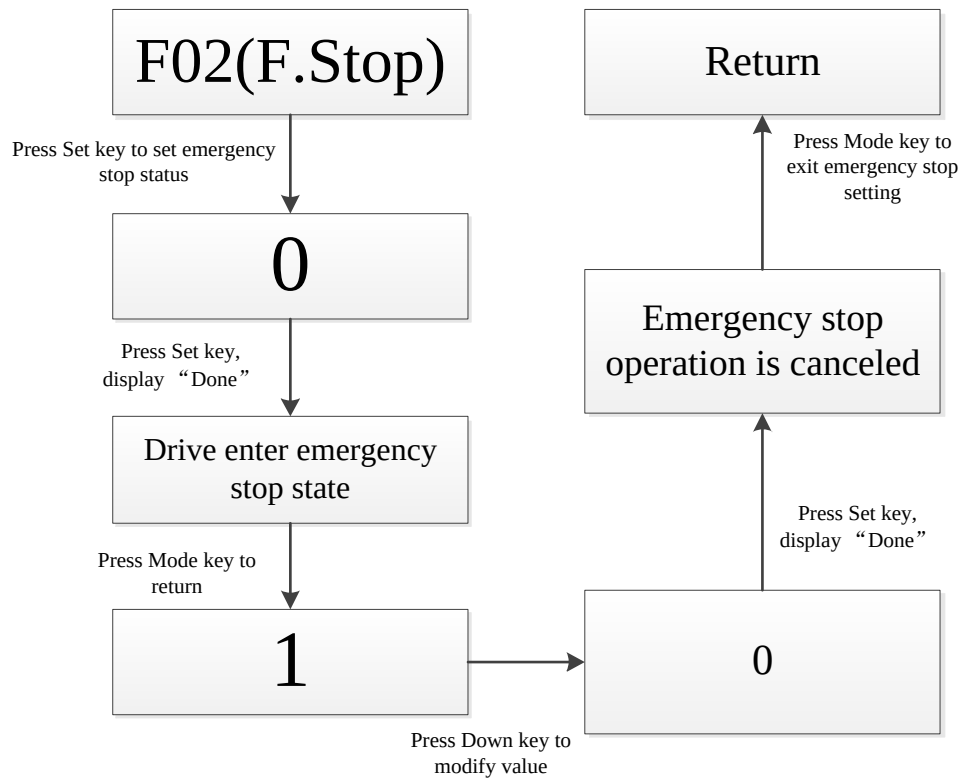


- ◆ For example: For the inertia identification function, please refer to the following diagram for the operating process.

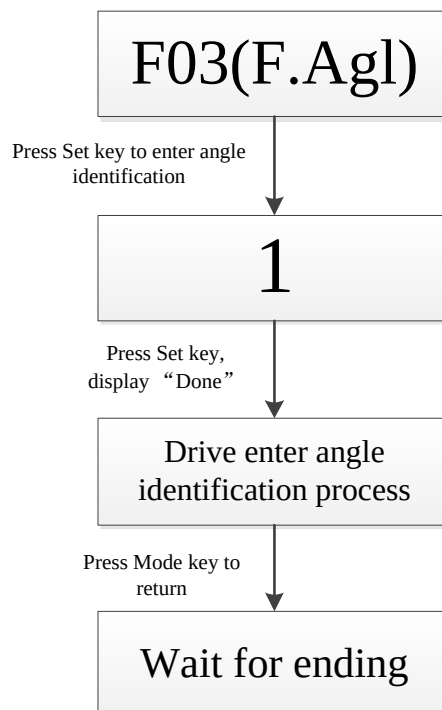


Explanation: A fluctuation of less than 15% is considered stable.

- ◆ For example: For the emergency stop function, please refer to the following diagram for the operating process.



- ◆ For example: For the pole identification function, please refer to the following diagram for the operating process.



1.6 Fault Display

Error display: Er.XX.Y, where XX represents the major error category, and Y represents the sub-error code.

Display	Name	Content
Er.10.1	Current Alarm Code	Er.: The drive currently has a fault or alarm. 10.1: Fault code (encoder fault)

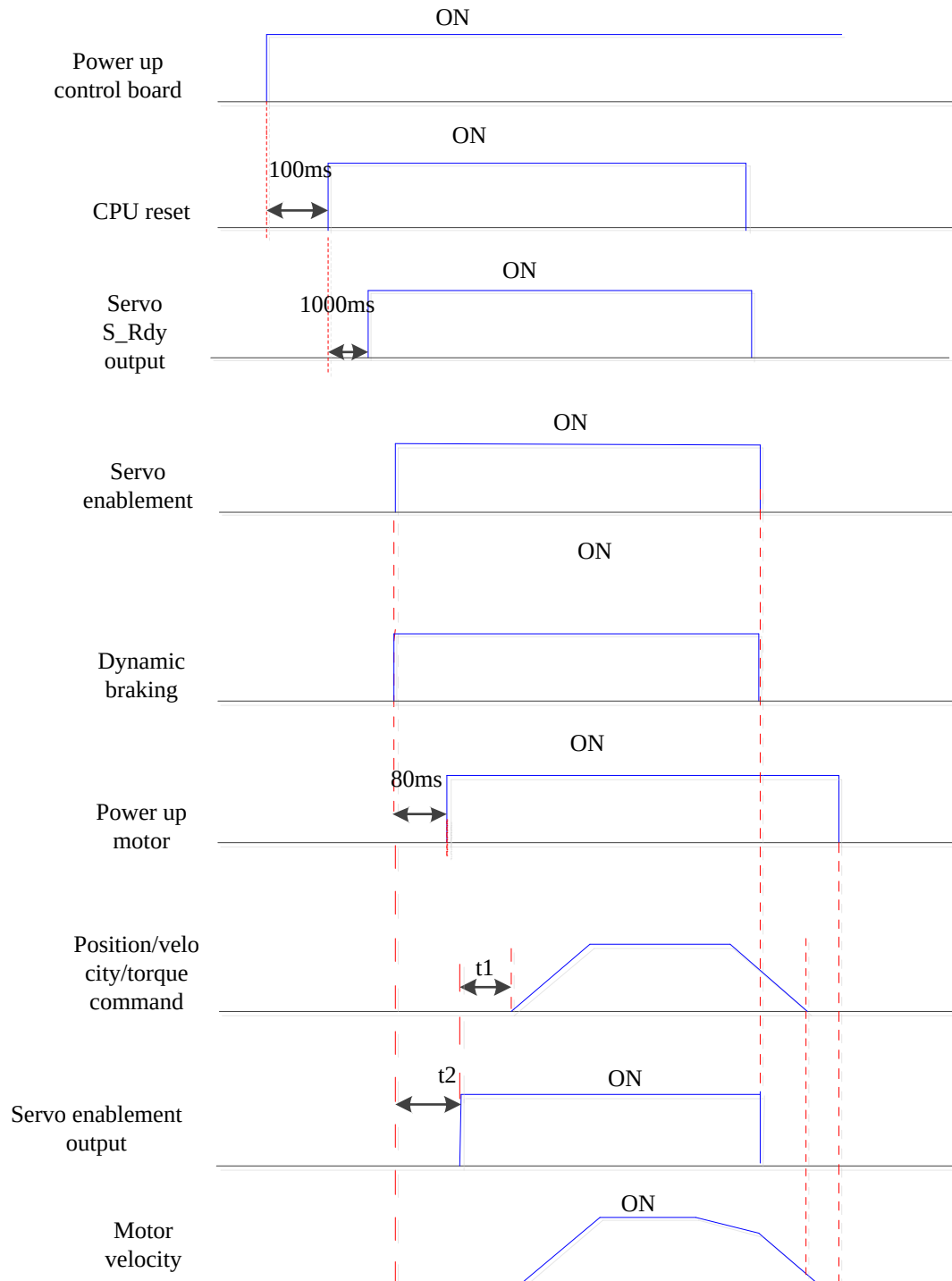
Alarm display: AL.XX.Y, where XX represents the major alarm category, and Y represents the sub-alarm code.

Display	Name	Content
AL.0C.0	Current Alarm Code	AL.: The driver currently has a alarm 0C.0: Alarm code, indicating a power cycle is required

2 Control and Timing

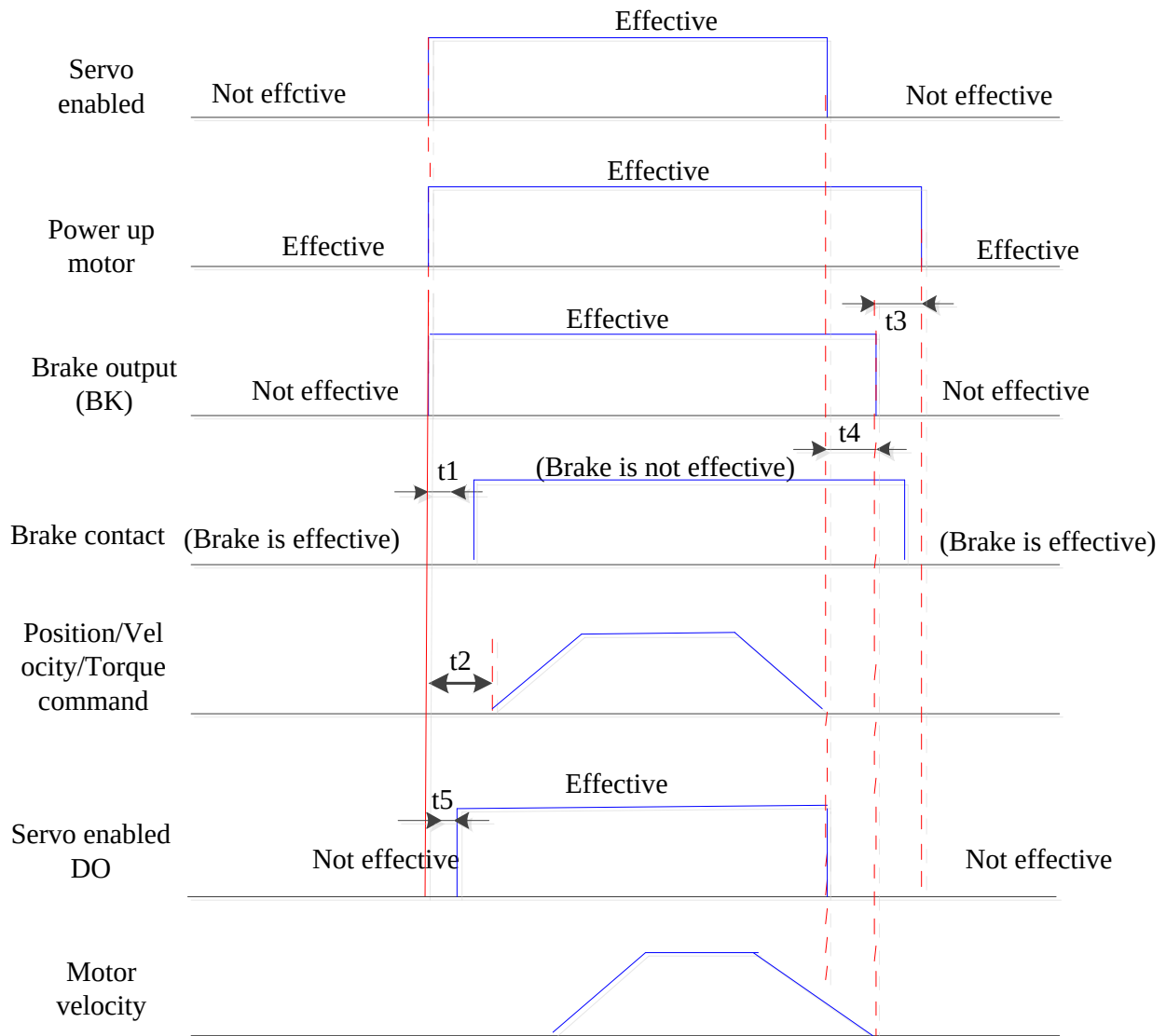
2.1 Power-On Timing Diagram

When power-on (timing for receiving servo enable signal)



The t_2 time is the internal bootstrap charging time of the drive (80ms). The host computer needs to receive the servo feedback enable DO before it can send commands, or delay sending commands for more than 80ms.

2.2 Brake Enablement Timing Diagram



Time t_1 is the brake action time.

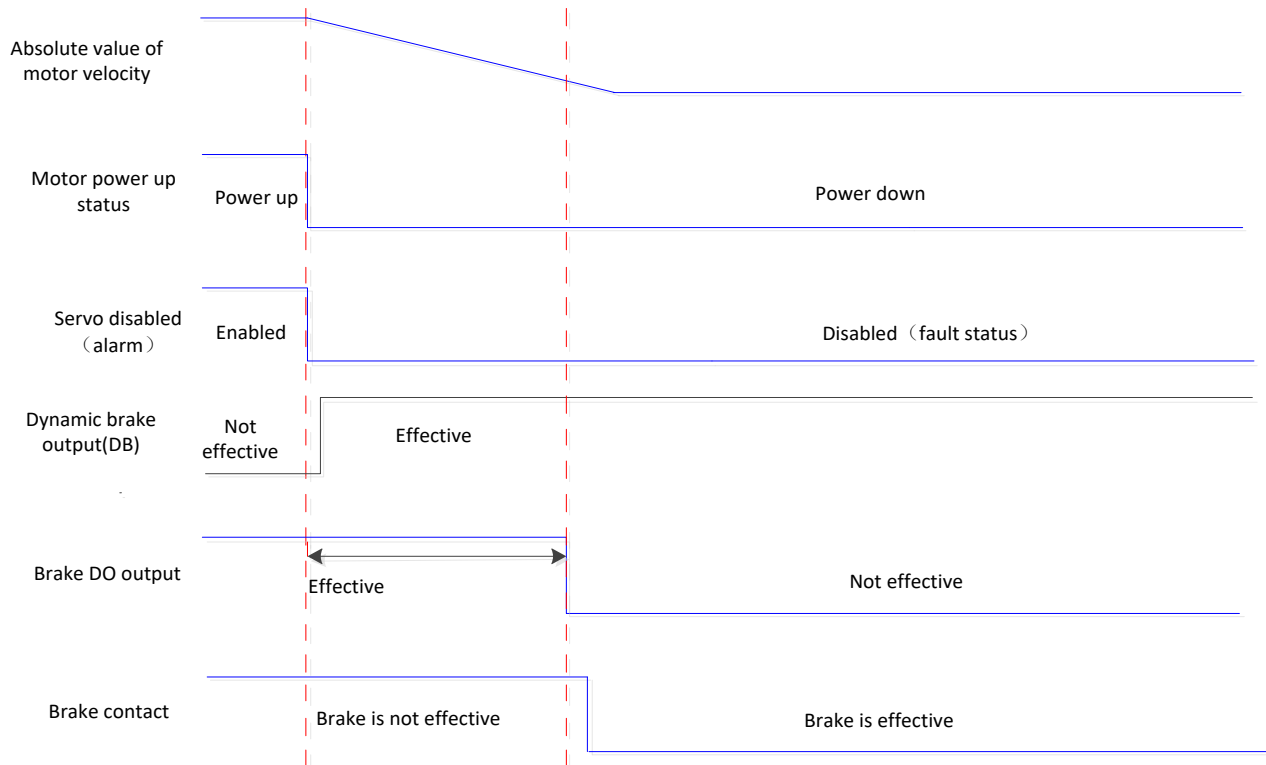
Time t_2 is the time set by P0B.30. Before this time, no commands can be received from the upper-level computer.

Time t_3 is the time set by P0B.31, during which the brake output is effective until the motor is power off.

When the servo is disabled, the brake out is effective until it reaches the delay time t_4 set by P0B.33.

Time t_5 is the internal servo bootstrap circuit charging time.

2.3 Stopping Timing Diagram



Stopping Related Function Codes

P02.10 Stop mode when servo off	Setting Range	Unit	Factory Default	Related Modes		
	-3~2	-	1	P	S	T
Description: The stopping method after servo disable can be modified according to actual conditions: ◆ 3: Zero-speed stop and stay in DB state ◆ -2: Ramp stop and stay in DB state ◆ -1: DB stop and stay in DB state ◆ 0: Free stop and stay in free state ◆ 1: Ramp stop and stay in free state ◆ 2: Zero-speed stop and stay in free state						

P02.11 Overtravel stop mode	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	1	P	S	T
Description: ◆ 0: Free stop and stay in free state ◆ 1: Zero stop and stay in position locked state						

- ◆ 2: Velocity ramp stop and stay in position locked state

P02.12 Stop mode in case of uncontrollable fault	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	2	P	S	T
Description: Stop mode when uncontrollable fault occurs. ◆ 0: Free stop and stay in stop state ◆ 1: DB stop and stay in free state ◆ 2: DB stop and stay in DB state						

P02.13 Stop mode in case of controllable fault	Setting Range	Unit	Factory Default	Related Modes		
	-4~3	-	-3	P	S	T
Description: Stop mode when controllable fault occurs: ◆ -4: Emergency torque stop and stay in DB state ◆ -3: Zero-velocity stop and stay in DB state ◆ -2: Ramp stop and stay in DB state ◆ -1: DB stop and stay in DB state ◆ 0: Free stop and stay in free state ◆ 1: Ramp stop and stay in free state ◆ 2: Zero-velocity stop and stay in free state ◆ 3: Emergency torque stop and stay in free state						

P02.14 Stop Completion Threshold	Setting Range	Unit	Factory Default	Related Modes		
	10~1000	mm/s	20	P	S	T
Description: When the actual running speed of the motor is less than this threshold, it is considered to be in a stop state						

P0B.20 Ramp stop Acceleration/Deceleration Time	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	ms	50	P	S	T

Description:

Ramp stop acceleration/deceleration time during fault shutdown or servo OFF shutdown

P0B.22 Emergency Torque Stop Deceleration	Setting Range	Unit	Factory Default	Related Modes		
	0~3000	%	500	P	S	T
Torque change amount of the emergency torque stop ramp.						

2.4 Discharge Function Settings

When the external load inertia is large (more than 5 times the inertia of the motor) and there is large deceleration, the discharge function needs to be used to discharge excessive energy stored in the bus capacitor. Follow the instructions to select the appropriate power and resistance value for the discharge resistor.

Related function codes for regenerative braking settings

P02.20 Regenerative Resistor Operating Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	1	P	S	T
Explanation: ◆ 0: Internal regenerative resistor ◆ 1: External regenerative resistor ◆ 2: No discharge						

P02.23 External Regenerative Resistor Power	Setting Range	Unit	Factory Default	Related Modes		
	1~65535	W	800	P	S	T
Explanation: If the power is too small, it may cause the discharge resistor to overheat or overload						

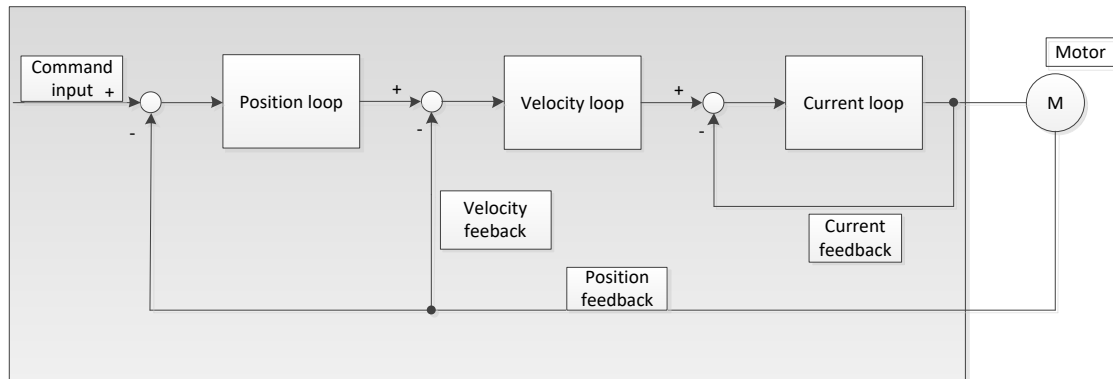
P02.24 External Regenerative Resistor Resistance	Setting Range	Unit	Factory Default	Related Modes		
	1~1000	Ω	80	P	S	T
Explanation: The selection of the discharge resistor resistance should be appropriate, generally ranging from 40 ohms to 50 ohms. If it is too small, it may cause the drive to overload, while if it is too large,						

it may affect discharge effectiveness

	P02.26 Resistor Heat Dissipation Coefficient	Setting Range	Unit	Factory Default	Related Modes		
		1~100	%	60	P	S	T
Explanation: The thermal coefficient of the discharge resistor. A larger setting of this value indicates better heat dissipation for the discharge resistor, which can help limit the discharge resistor from overloading to some extent.							

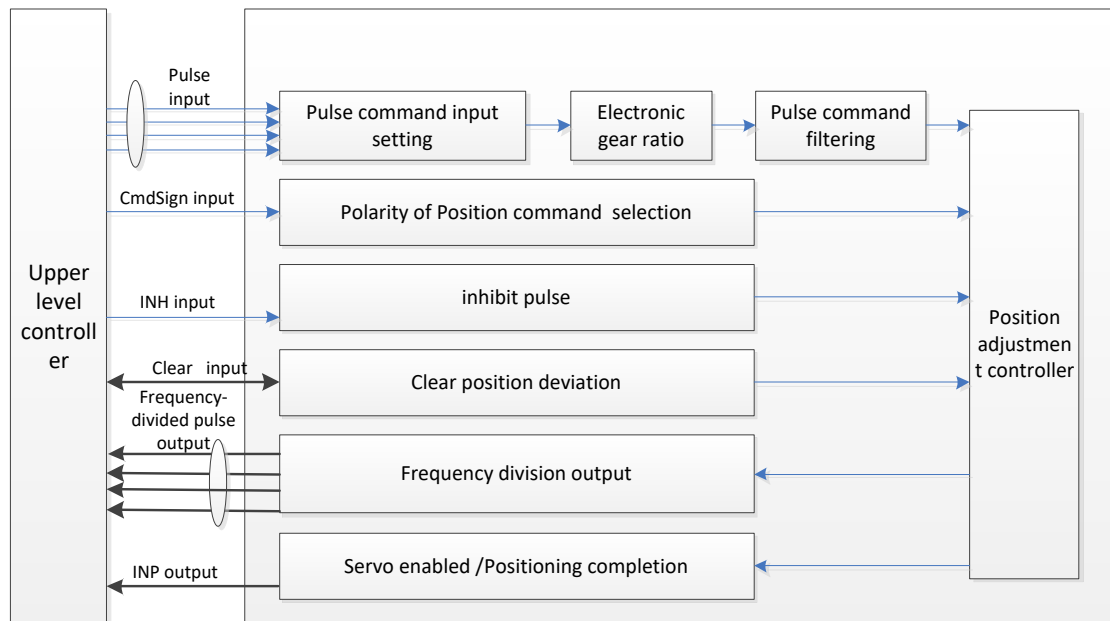
3 Control Mode

The implementation mechanism of each control mode is illustrated in the following diagram.



By processing input signals (such as pulses, analog signals, communication data, etc.) and feedback signals, the drive can accurately and quickly control the position, velocity, and torque of the motor, and supports real-time switching of control modes. Among them, position control is the most widely used in servo systems.

3.1 Position Control Pulse Mode



The main steps for position control pulse mode are as follows:

1. Wiring installation. The pins that need to be wired include: servo enable (SRV_ON), pulse input (Puls+, Pulse-, Sign+, Sign-), positioning completion (INP), servo enable output (Son), etc.
2. Set the operation mode (P02.00 to 1) to position mode.
3. Set the pulse input method (P03.02), electronic gear ratio, etc.
4. Set DI, DO related functions.
5. Other basic settings (discharge resistor, stop mode, etc.).

3.1.1 Position Control Pulse Mode Input Settings



P03.00 Source of Position Command	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T
Explanation: ◆ 0: Pulse command ◆ 1: Position task mode						

P03.02 Command Pulse Format	Setting Range	Unit	Factory Default	Related Modes		
	0~3	-	0	P	S	T

Explanation:

Command form setting	Pulse form	Positive pulse diagram	Negative pulse diagram
0	Pulse + Direction Positive Logic		
1	Pulse + Direction Negative Logic		
2	A Phase + B Phase Quadrature Pulse		
3	CW + CCW		

P03.04 Input Pulse Hardware Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
	0~255	25ns	10	P	S	T
Explanation: The hardware filtering time can be set according to the frequency of the input pulses. It can be filter out external high-frequency interference signals to some extent. Typically, the settings are as follows: ◆ If the input pulse frequency is greater than 3MHz, set it to 3 ◆ If the input pulse frequency is between 1MHz and 3MHz, set it to 4. ◆ If the input pulse is less than 1MHz, set it to 10. ◆ If the input pulse is less than 500kHz, set it to 20.						

P03.05 Source of Pulse	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	-	P	S	T
Description: ◆ 0: Use high-speed pulse port ◆ 1: Use low-speed pulse port						

3.1.2 Position Control Pulse Mode Electronic Gear Ratio

Actual number of pulses the motor runs:

$$\text{the number of the input command pulse} * \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear denominator}} = \text{Number of encoder pulses actually running}$$

P03.10 The Number of Pulses per Revolution of the Motor	Setting Range	Unit	Factory Default	Related Modes		
	0~8388608	-	10000	P	S	T
Explanation: Specifies the number of command pulses needed for the motor to complete one revolution (prioritized over the electronic gear ratio) Equivalent to setting the electronic gear ratio numerator as the encoder feedback pulses per motor revolution (in encoder units), and the denominator as parameter P03.10.						

If P03.10 is set to 0, then P03.12 and P03.14 take effect.

P03.12	Numerator of Electronic Gear Ratio 1	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	1	P	S	T
Description: Set the numerator for the first group of electronic gear ratios.							

P03.14	Denominator	of	Setting Range	Unit	Factory Default	Related Modes			
			1~1072741824	-	1	P	S	T	
Description: Set the denominator for the first group of electronic gear ratios.									

P03.16	Numerator	of	Setting Range	Unit	Factory Default	Related Modes		
			1~1072741824	-	10	P	S	T
Description: Set the numerator for the 2nd group of electronic gear ratios.								

P03.18	Denominator of Electronic Gear Ratio 2	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	1	P	S	T
Description: Set the denominator for the 2nd group of electronic gear ratios.							

Electronic gear ratio supports DI switching:

DI input function FunIN.17 (GearSw) is used to switch between gear ratios. When GearSw is ineffective, the first group of electronic gear ratios is used. When GearSw is effective, the second group of electronic gear ratios is used.

Range of electronic gear ratio settings:

$$0.001 \leq \frac{\text{Electronic gear ratio numerator}}{\text{Electronic gear ratio denominator}} \leq 100000$$

Otherwise, an alarm Er.06.5 (Electronic gear ratio setting error) will be triggered.

3.1.3 Position Command Filtering Settings

When smoothing of the upper computer pulse is required, software filtering can be applied:

P03.06 Commands Low-pass Filtering Time Constant	Setting Range	Unit	Factory Default	Related Modes		
	1.00~655.35	ms	0.00	P	S	T
Explanation: Set the time constant for the low-pass filter applied to position commands						

P03.07 Average Filtering Time Constant	Setting Range	Unit	Factory Default	Related Modes		
	1.0~120.0	ms	0.0	P	S	T
Explanation: Set the time constant for the moving average filter applied to position commands (in encoder units)						

3.1.4 Position Control Pulse Mode Input/Output Settings

Position DI input pulse inhibition function:

DI Input Function FunIN.18 (INH), when INH is effective, pulse commands are no longer accepted.

Frequency division output settings.

P02.02 Encoder Pulse Output Logic Flip	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T
Description: Set the phase relationship between the phase A pulse and the phase B pulse of the pulse output. ◆ 0: A ahead of B ◆ 1: B ahead of A						

P02.03 Number of Encoder Output pulse per pole pitch	Setting Range	Unit	Factory Default	Related Modes		
	10~1073741824	-	2500	P	S	T
Description: The number of phase A and phase B pulses output when the motor runs one pole pitch. The number of pulses after frequency quadrupling is 4 * P02.03.						

P02.09 Ratio of Frequency Division Output Pulses to Encoder Pulses	Setting Range	Unit	Factory Default	Related Modes		
	0~65535	-	0	P	S	T
Description: If this parameter is set to 0, P02.03 takes effect. If this parameter is not 0, this parameter takes effect. The number of frequency division output pulses = Encoder resolution / this parameter setting For example, with a motor resolution of 23 bits: ◆ When this parameter is set to 1, the ratio is 1:1 (one divided output pulse per encoder pulse). ◆ When this parameter is set to 10, the ratio is 1:10 (one divided output pulse per 10 encoder pulses). Cannot be frequency multiplied.						

P02.05 Z Pulse Output Level Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	1	P	S	T
Description: Set the output level when the phase Z pulse is effective. ◆ 0: High level when Z pulse is effective ◆ 1: Low level when Z pulse is effective						

Position DO Output Related Function Codes

P05.2C Positioning deviation threshold to determine whether positioning is completed	Setting Range	Unit	Factory Default	Related Modes		
	1~65535	-	100	P	S	T
Description: When the position command is issued, and the absolute value of the position deviation is less than or equal to P05.2C, and the duration is maintained for the P05.2D time, the positioning completion signal FunOut.3 (INP) is outputted. The unit of this parameter is determined by P05.2E: ◆ P05.2E=0: Command unit ◆ P05.2E=1: Encoder unit						

P05.2D Time window to determine whether positioning is completed	Setting Range	Unit	Factory Default	Related Modes		
	0~2000	ms	0	P	S	T

Description:

When the position command is completed, and the absolute value of the position deviation is less than or equal to P05.2C, and the duration is maintained for the P05.2D time, the positioning completion signal FunOut.3 (INP) is outputted.

The unit of this parameter is determined by P06.2E:

- ◆ P05.2E=0: Command unit
- ◆ P05.2E=1: Encoder unit

P05.2E Position Reached Threshold Unit Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T
Description: Set the unit of the position arrival threshold. ◆ 0: Command unit ◆ 1: Encoder unit						

P03.25 Position Deviation Excessive Threshold Unit Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	2	P	v	
Description: ◆ 0: Command unit ◆ 1: Encoder unit ◆ 2: Mechanical travel unit(mm)						

3.2 Internal Position Function

Internal position mode is a function of operation control that is set, planned and executed by the servo drive. This function can achieve some simple logical motion, is suitable for the scenarios in which servo drive are not controlled by upper device (such as PLC), or in the field where there are no upper device.

The features of the internal position mode are as follows:

- ◆ Internal position mode is the drive internal control mode, which does not need the upper device to issue commands, it operates according to the default parameters.
- ◆ Up to 20 task plans, 7 operate mode, customize task parameters to meet the needs of different application scenarios.
- ◆ Supports interrupting the operation of tasks by capturing DIs. Two groups of capture DI can be configured arbitrarily. Capture DI can be triggered by ring edge or falling edge. You can jump to any task by capturing DI. Each task controls the speed trajectory individually, and the speed trajectory linking method between each task can also be set separately. You can set the operating times of each task and the wait time between each task.

Easily change the running parameters of each task through the visual interface of the servo configure software, you can view the current number of running segments via P10.05.

Related function code:

P10.00 Starting segment selection	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	0	P	S	T

Explanation:

To execute internal command, you need to set P02.00 to 1 and P03.00 to 1. After giving the servo enable signal and setting FunIN.6(Execute_PP), the operating mode is based on the parameters set in group P10.

- ◆ When P10.00 is set to 0, it is triggered to start from the first segment.
- ◆ When P10.00 is set to 1, it triggered to start from the DI specified by (FunIN.28*8+FunIN.27*4+FunIN.26*2+FunIN.25).
- ◆ When P10.00 is set to 2, segments to run is determined by P10.02.

P10.02 Set starting segment value	Setting Range	Unit	Factory Default	Related Modes		
	0~19	-	0	P	S	T

Explanation:

After triggering the internal position mode, it operates based on the parameters set in P10.08 to P10.A7 for displacement, speed, and other parameters. The starting segment should be set according to the requirements.

P10.05 Current operating segment	Setting Range	Unit	Factory Default	Related Modes		
	Only display	-	-	P	S	T

Explanation:

This parameter is shown as 16, and the meaning of it as follows(convert to binary).

bit	Description
bit0	Set to 1, indicates that commands can be received.
bit1	Set to 1, indicates that position command is reached
bit2	Set to 1, indicates that it is in operating state
bit3	Set to 1, indicates that it is in halt state
bit4~5	Reserved
bit6~11	Next operating segment, up to 31
bit12~15	Reserved

P10.0E Segment 1 Attribute	Setting Range	Unit	Factory Default	Related Modes
----------------------------	---------------	------	-----------------	---------------

	configuration	0~65535	-	0	P	S	T
--	----------------------	---------	---	---	---	---	---

Explanation:

Bit Number	Description
bit0~3	Positioning Mode
bit4~bit5	Next Segment Linking Method
bit6~bit7	Triggering Mode Setting
bit8	Source Selection for Running Velocity, 0: Function code setting; 1: AI setting
bit9	Enable Capture Position Function, 0: Disabled; 1: Enabled
bit10	DI Capture Selection, 0: Capture using DI FunIN.31; 1: Capture using DI FunIn.32
bit11~bit12	DI Capture Trigger Edge Selection, 0: Rising edge; 1: Falling edge; 2: Both rising and falling edges

Positioning Mode (Type):

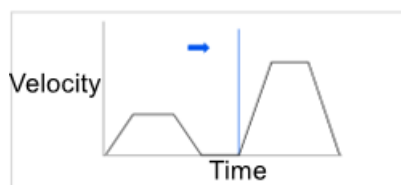
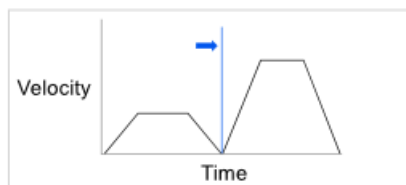
- ◆ 0: Absolute Positioning
- ◆ 1: Relative Positioning
- ◆ 2: Relative to the Last Target Position (used in cases where the target operation is unexpectedly interrupted)
- ◆ 3: Incremental Operation Relative to DI Captured Position
- ◆ 4: Positioning with modulus in Positive Direction
- ◆ 5: Positioning with modulus in Negative Direction
- ◆ 6: Positioning with modulus in Nearest Direction

a. When using positioning with modulus, if it is DDR or the mechanical gear ratio is 1, there is no need to set P02.29 to 2. The program uses absolute positioning of the encoder single turn. Absolute value encoders need to set P02.29 to 2 and correctly set the mechanical gear ratio P02.2A and P02.2B.

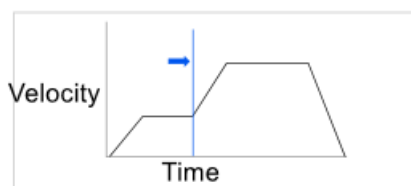
b. Incremental encoders such as ABZ encoders do not support positioning with modulus.

Next Segment Linking Method (Constraints):

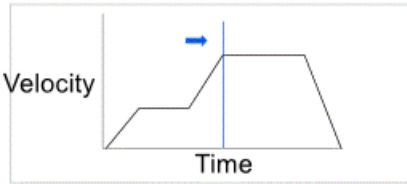
- ◆ 0: Lower the command to 0 and then run the next segment. The left figure is for the case where the waiting time is 0, and the right figure is for the case where the waiting time is not 0.



- ◆ 1: Command merged into acceleration area:



- ◆ 2: Command merged into velocity :



Trigger Mode Setting (TriggerType):

- ◆ 0: Reject Trigger During Operation
- ◆ 1: Accept Trigger During Operation and Immediately Enter the Next Segment
- ◆ 2: Accept Trigger During Operation, Need to Finish the Current Segment Before Moving to the Next One

Capture DI Function Explanation:

- ◆ Set segment 1 as follows: Type = 0, TriggerType = 1; position is 100,000. Segment 1 operates once, set $P10.0F = 2 * 256 + 1 = 513$ (201h), jump to segment 2.
- ◆ Set segment 2 as follows: Type = 0, TriggerType = 1; position is 0. Segment 2 operate once, set $P10.17 = 1 * 256 + 1 = 257$ (101h), jump to segment 1.
- ◆ Set segment 10 as follows: Type = 3, CapEn = 1; position is 5000, CapConfig=0, CapEdge=1.

After triggering the operation, it will run within the absolute position range of 0 to 100000. When DI (FunIn.31) triggers a falling edge, it will immediately jump to the tenth segment and execute the incremental position relative to the captured DI position. Subsequent position settings determine whether to wait or jump.

P10.0F Operating times of this segment and the next operating segment	Setting Range	Unit	Factory Default	Related Modes		
	16#1~16#FFFF	-	1	P	S	T

Explanation:

Bit Number	Description
bit0~7	Operating times of this segment
Bit8~bit13	The next operating segment

It is recommended to use the servo configuration software for setting functions.

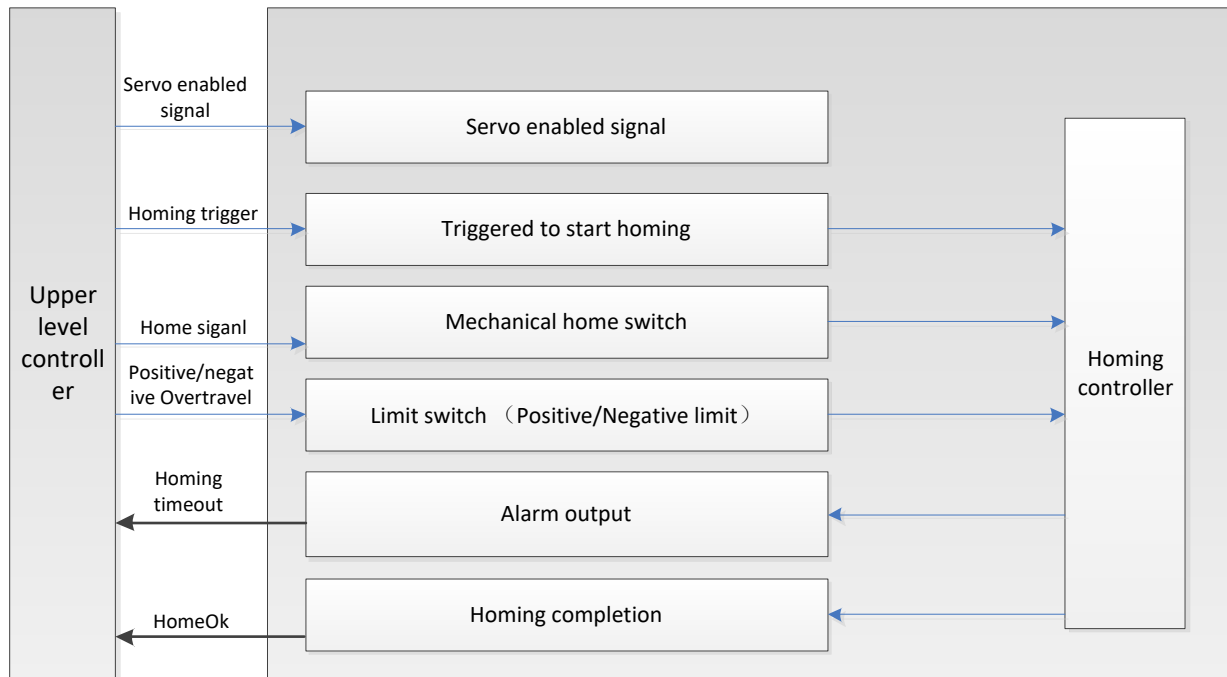
For manual setting: calculate as follows: Operating times of this segment + Jumping Segment Number * 256.

For example, if each segment runs once and jumps sequentially from the first segment to the fifth segment, the settings are as follows:

- ◆ $P10.0F = 2 * 256 + 1 = 513$; jump to the second segment
- ◆ $P10.17 = 3 * 256 + 1 = 769$; jump to the third segment

- ◆ $P10.1F=4*256+1=1025$; jump to the fourth segment
- ◆ $P10.27=5*256+1=1281$; jump to the fifth segment
- ◆ $P10.2F=1*256+1=257$; jump to the first segment

3.3 Position Control in Homing Mode



The homing mode is used to seek the mechanical home, motor Z signal, or specify a fixed position as the home, to set the initial position for operation.

3.3.1 Introduction to the Homing Function

Related function codes:

P03.31 Homing Mode	Setting Range	Unit	Factory Default	Related Modes		
	-5~35	-	1	P	S	T
Explanation: Homing mode. For details, please refer to the following section.						

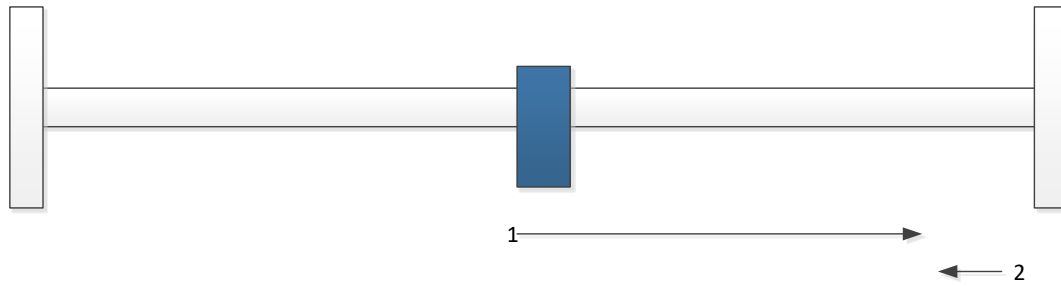
Homing mode -4

Homing on negative limit and specified distance

Homing mode -5

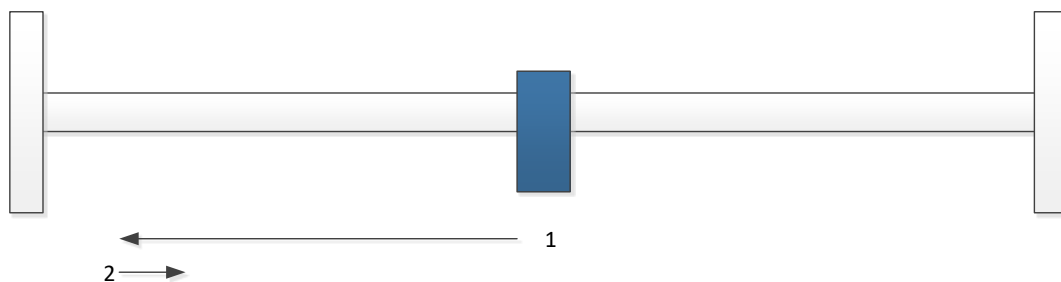
Homing on positive limit and specified distance

Homing mode - 2



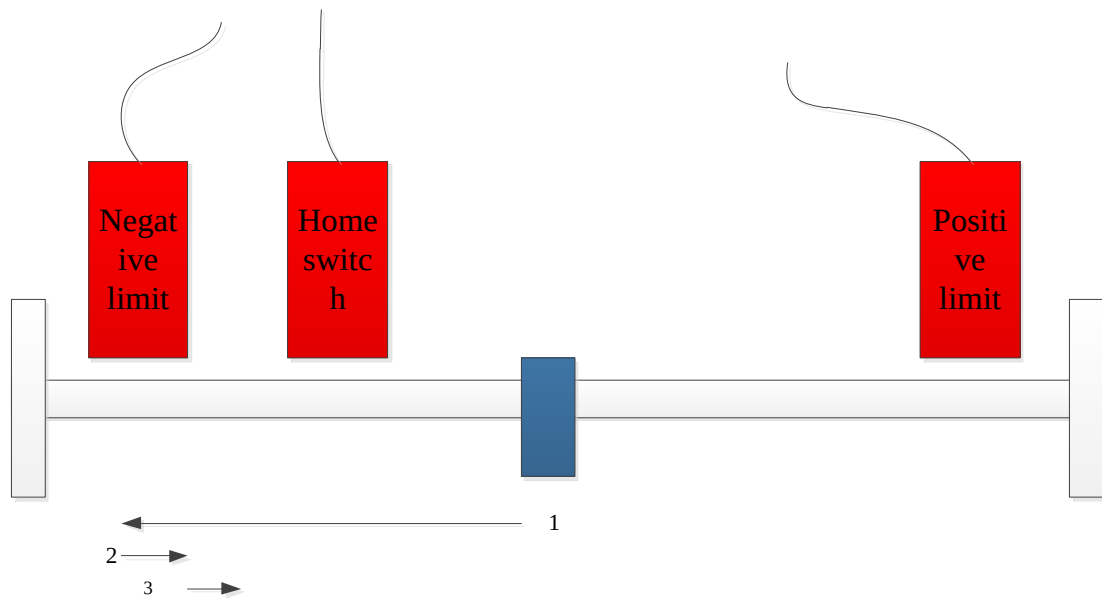
1. Run forward until encounter the rising edge of the negative mechanical limit (switch from high speed to low speed).
2. Run in the reverse direction until encounter the Z signal.

Homing mode - 1



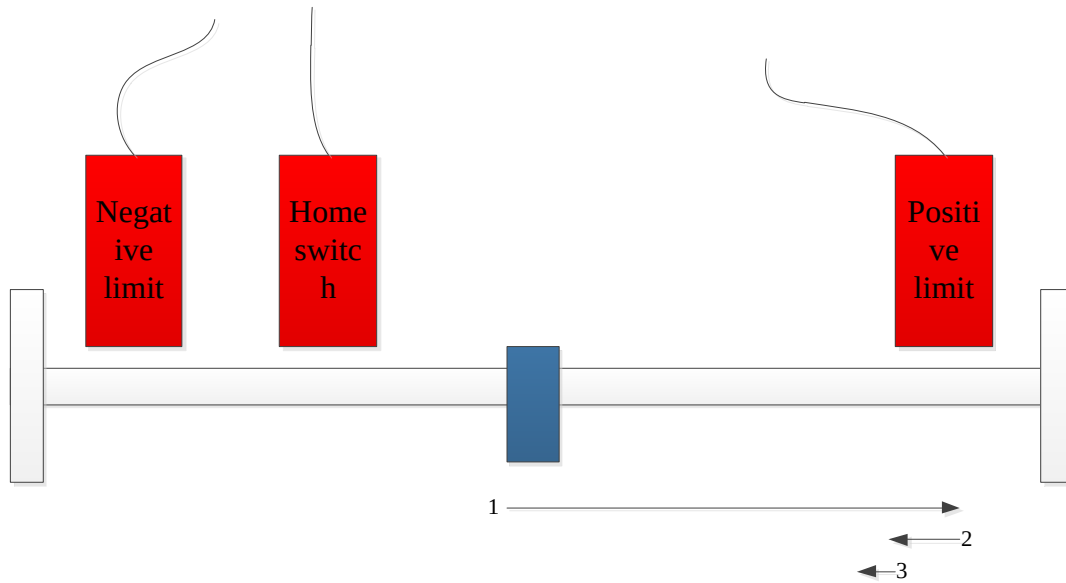
1. Run in the reverse direction until encounter the rising edge of the negative mechanical limit (switch from high speed to low speed).
2. Run forward until encounter the Z signal.

Homing Method 1 (Method 17)



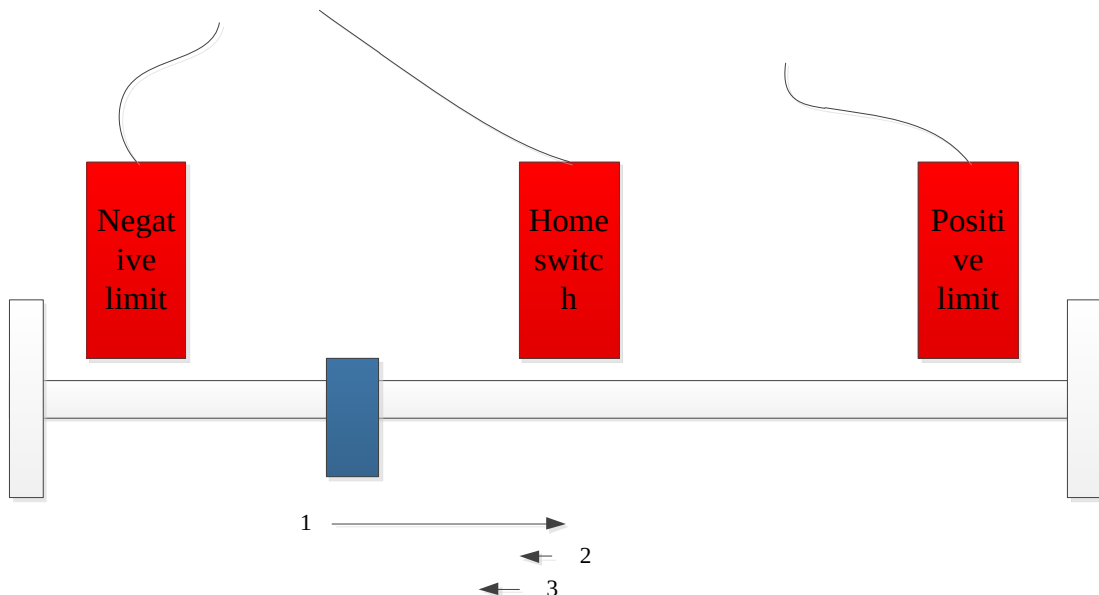
1. Run in the reverse direction until encounter the rising edge of the negative limit switch (switch from high speed to low speed).
2. Run forward until encounter the falling edge of the negative limit switch.
3. Run forward until encounter the Z signal (Method 17 does not find Z signal).

Homing Method 2 (Method18)



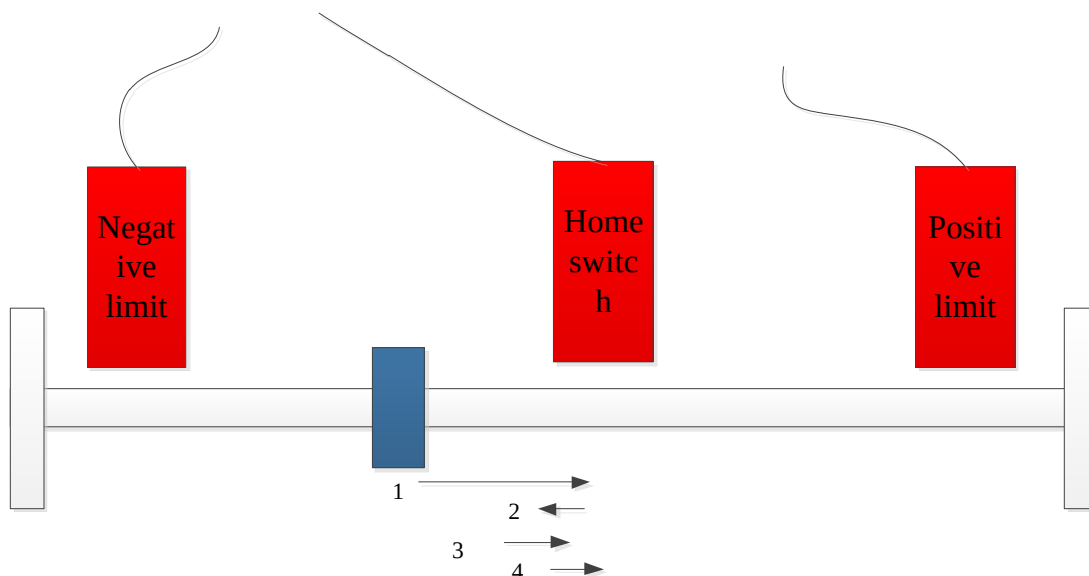
1. Run forward until encounter the rising edge of the positive limit switch (switch from high speed to low speed).
2. Run in the reverse direction until encounter the falling edge of the positive limit switch.
3. Run in the reverse direction until encounter the Z signal (Method 18 does not find Z signal).

Homing Method 3 (Method 19)



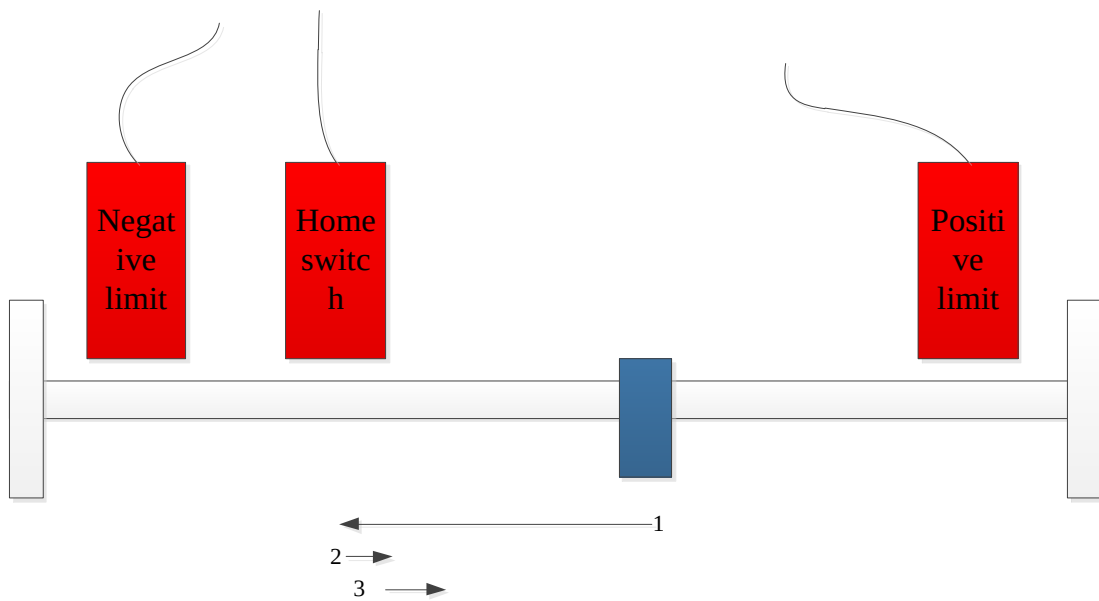
1. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run in the negative direction until encounter the falling edge of the home switch (same side).
3. Run in the reverse direction until encounter the Z signal (Method 19 does not find Z signal).

Homing Method 4 (Method 20)



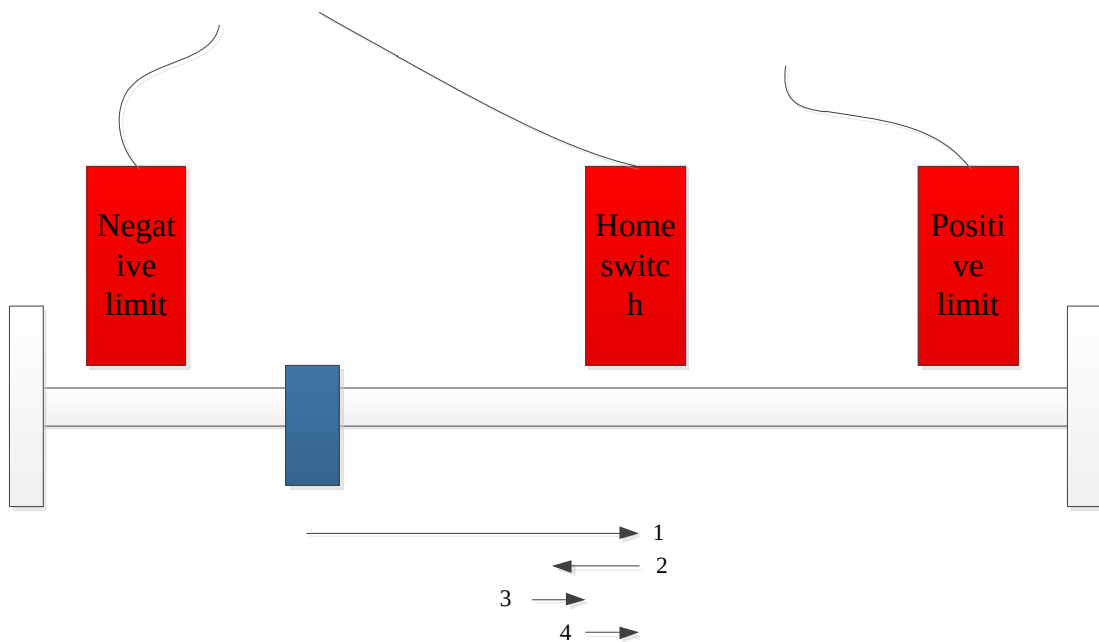
1. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run in the reverse direction until encounter the falling edge of the home switch .
3. Run froward until encounter the rising edge of the home switch.
4. Run forward until encounter the Z signal (Method 20 does not find Z signal).

Homing Method 5 (Method 21)



1. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run forward until encounter the falling edge of the home switch.
3. Run forward until encounter the Z signal (Method 21 does not find Z signal).

Homing Method 6 (Method 22)

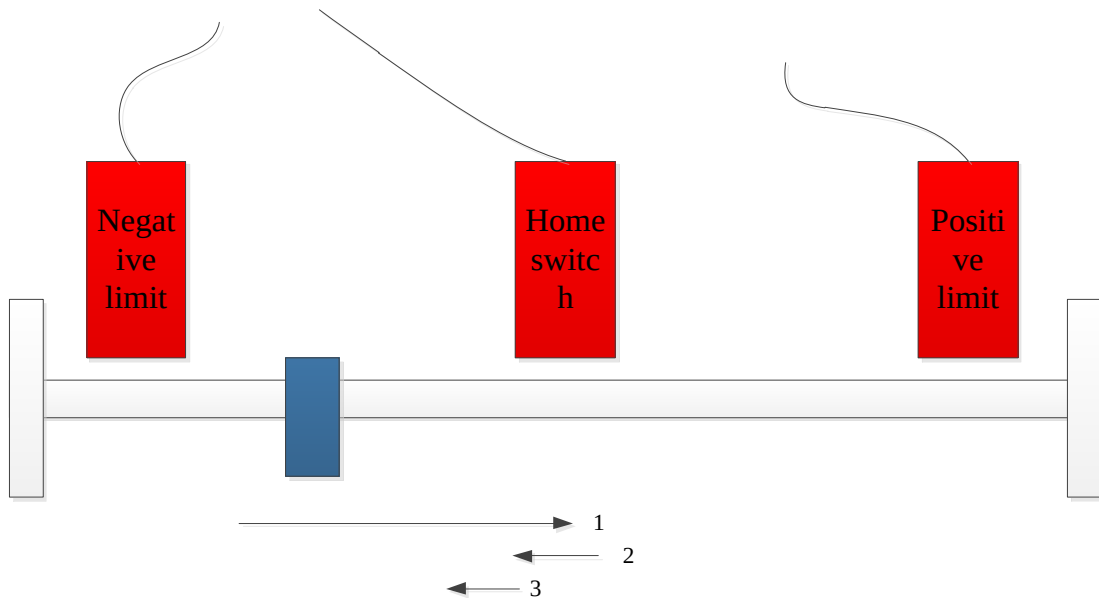


1. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).

speed).

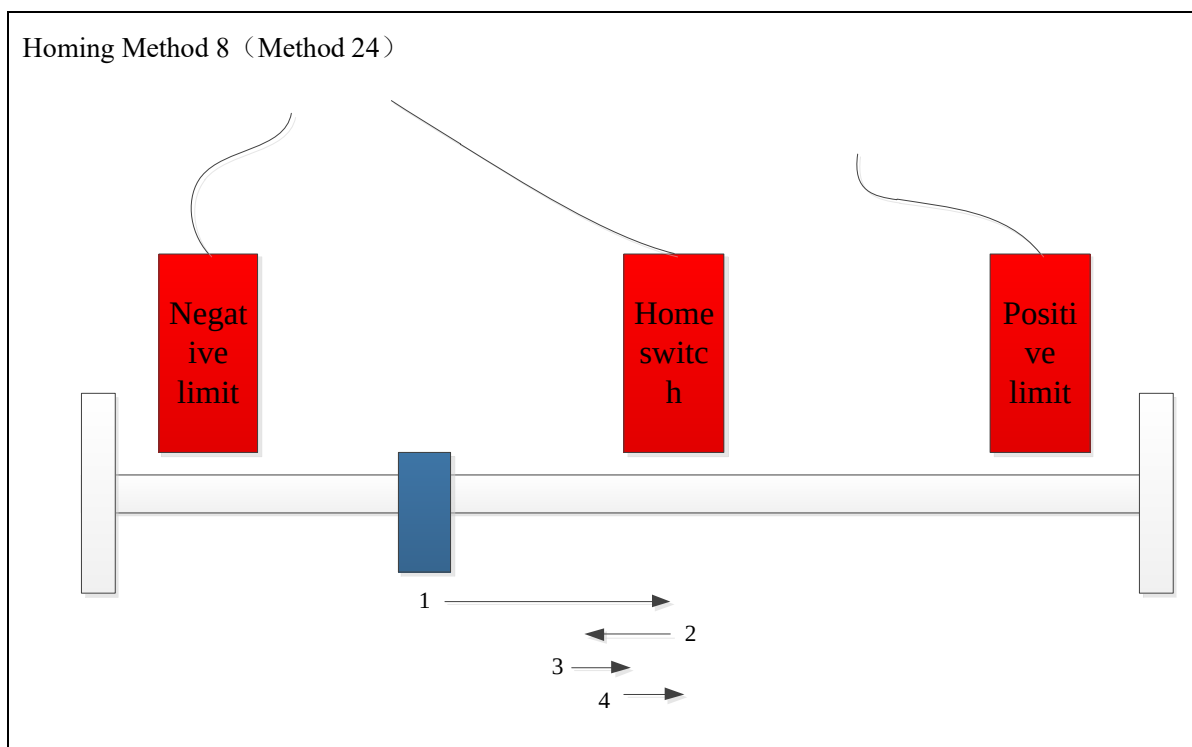
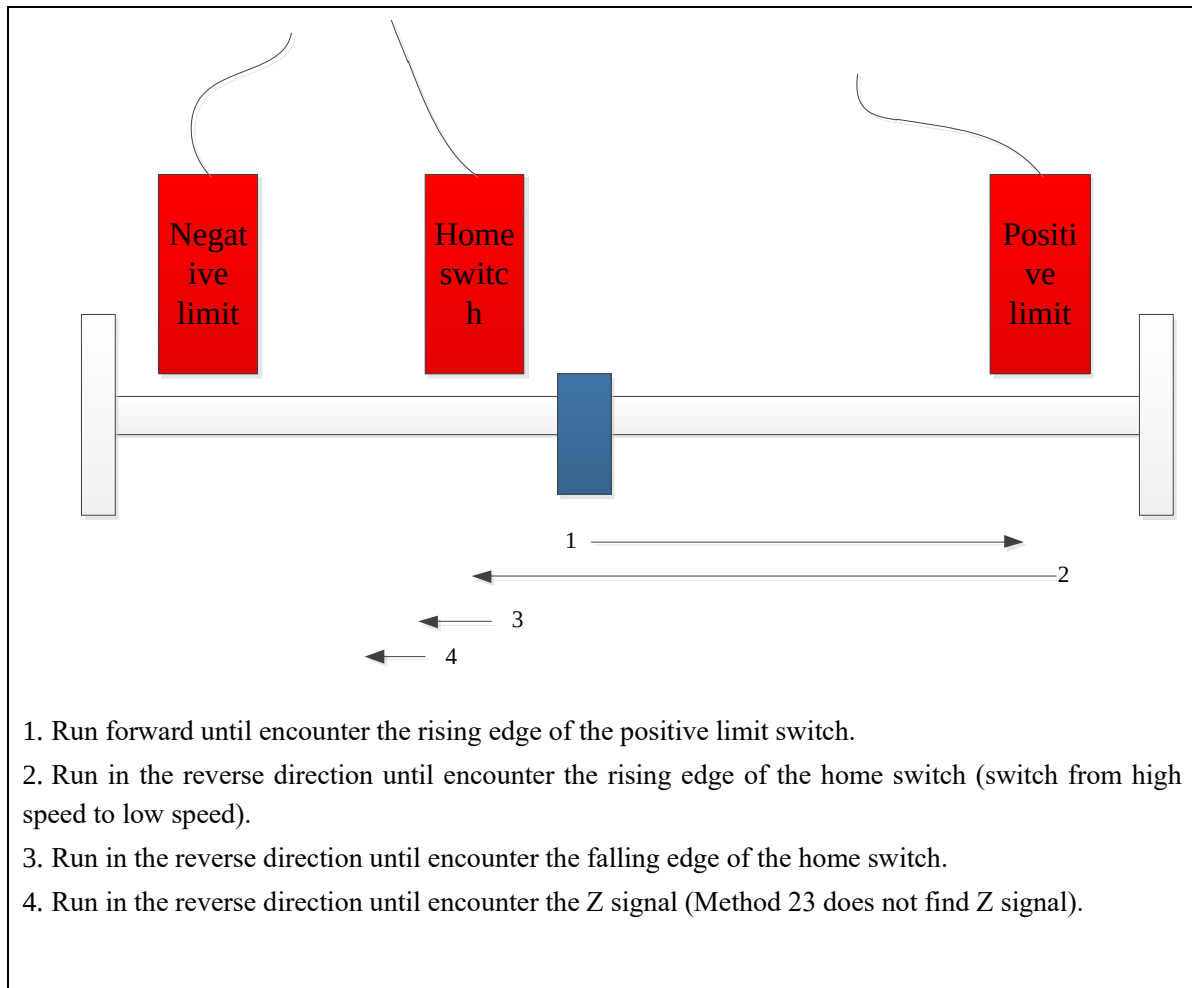
2. Run in the reverse direction until encounter the falling edge of the home switch.
3. Run forward until encounter the rising edge of the home switch.
4. Run forward until encounter the Z signal (Method 22 does not find Z signal).

Homing Method 7(Method 23)



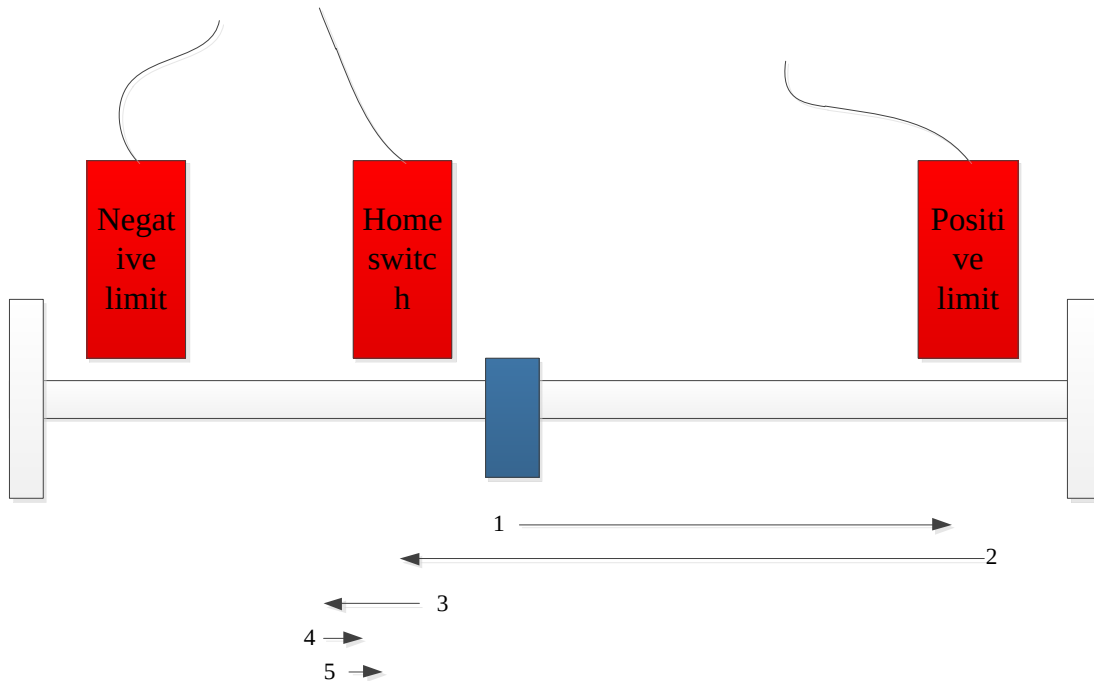
1. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run in the reverse direction until encounter the falling edge of the home switch.
3. Run in the reverse direction until encounter the Z signal (Method 23 does not find Z signal).

or



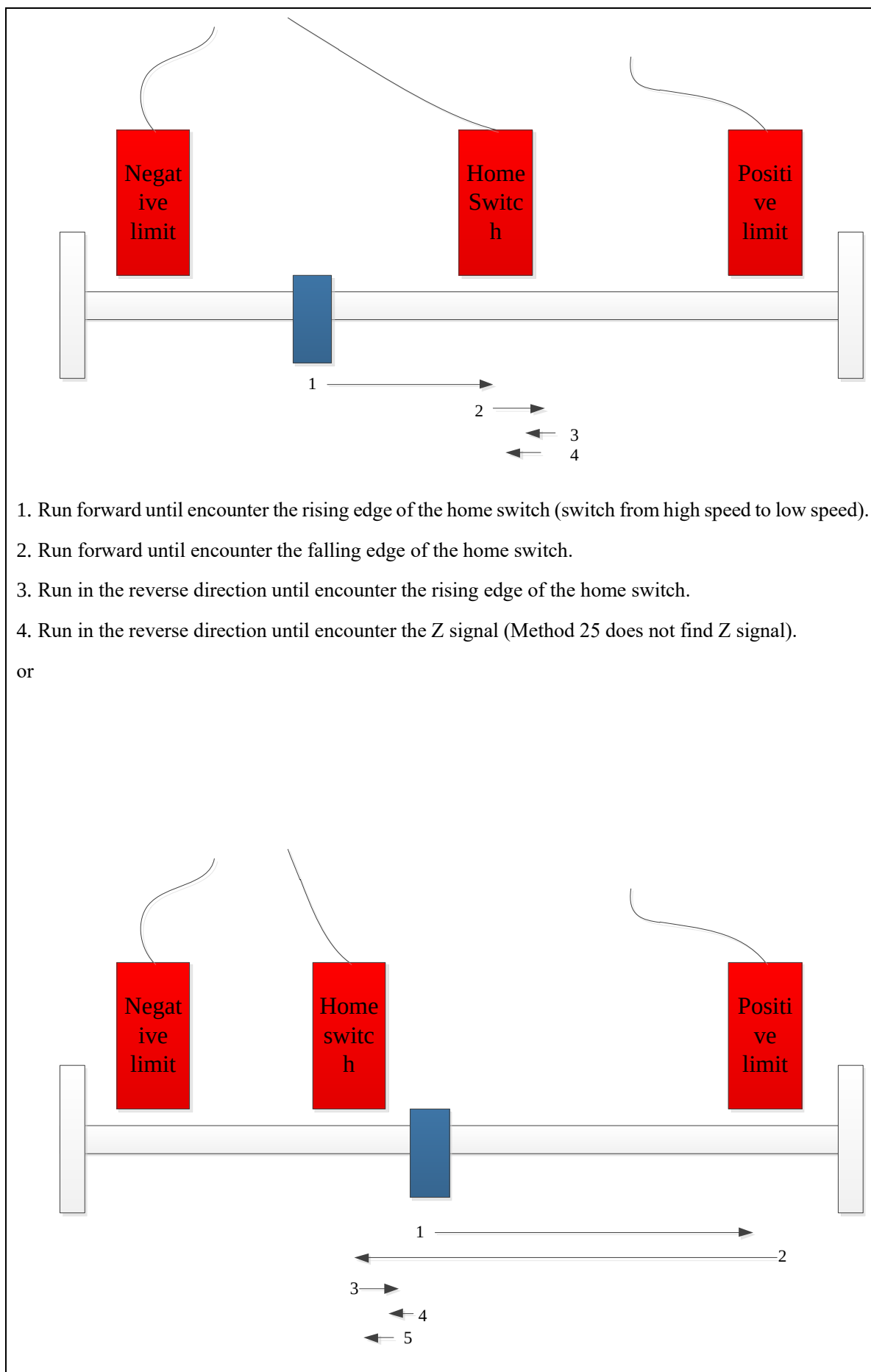
1. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run in the reverse direction until encounter the falling edge of the home switch.
3. Run forward until encounter the rising edge of the home switch.
4. Run in the reverse direction until encounter the Z signal (Method 24 does not find Z signal).

or



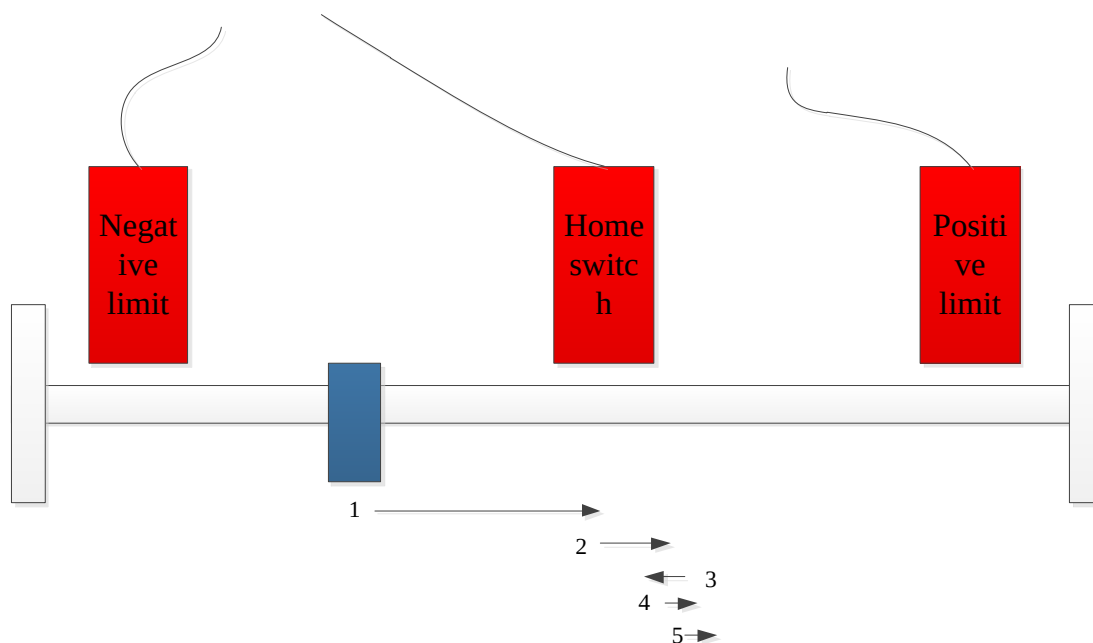
1. Run forward until encounter the rising edge of the positive limit switch.
2. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
3. Run in the reverse direction until encounter the falling edge of the home switch.
4. Run forward until encounter the rising edge of the home switch.
5. Run forward until encounter the Z signal (Method 24 does not find Z signal).

Homing Method 9 (Method 25)



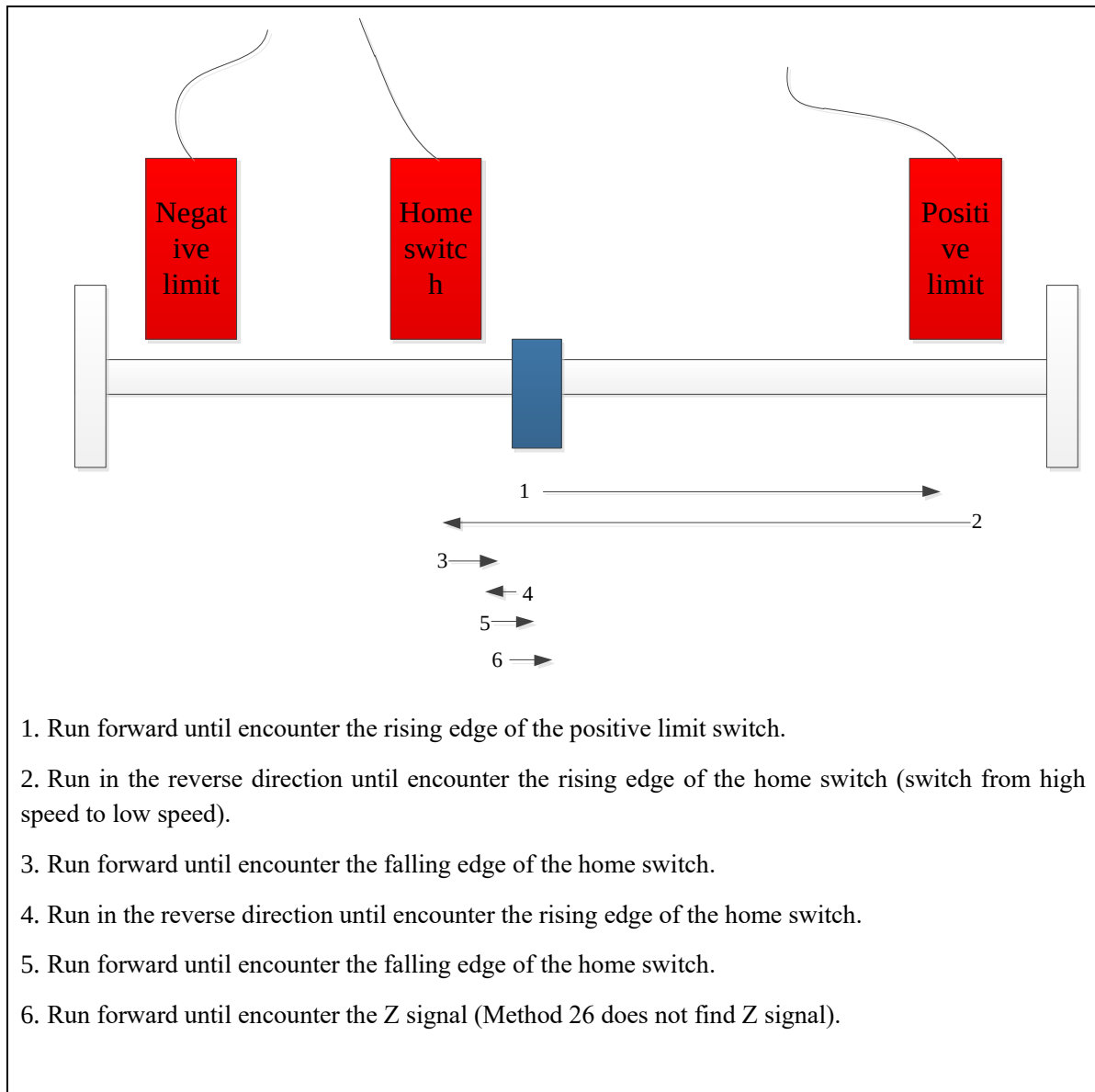
1. Run forward until encounter the rising edge of the positive limit switch.
2. Run in reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
3. Run froward until encounter the falling edge of the home switch.
4. Run in the reverse direction until encounter the rising edge of the home switch.
5. Run in the reverse direction until encounter the Z signal (Method 25 does not find Z signal).

Homing Method10 (Method 26)

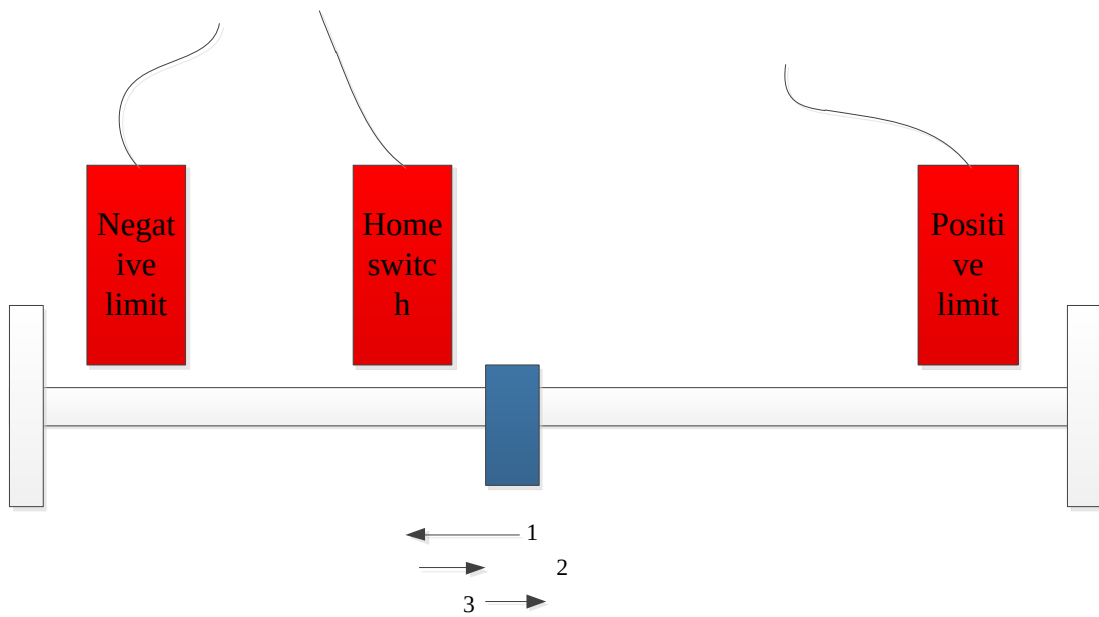


- 1.Run forward until encounter the rising edge of home switch(switch from high speed to low speed)
- 2.Run forward until encounter the falling edge of home switch(the other side).
- 3.Run in the reverse direction until encounter the rising edge of home switch.
- 4.Run forward until encounter the falling edge of home switch.
- 5.Run forward until encounter Z signal(Method 26 does not find Z signal).

or

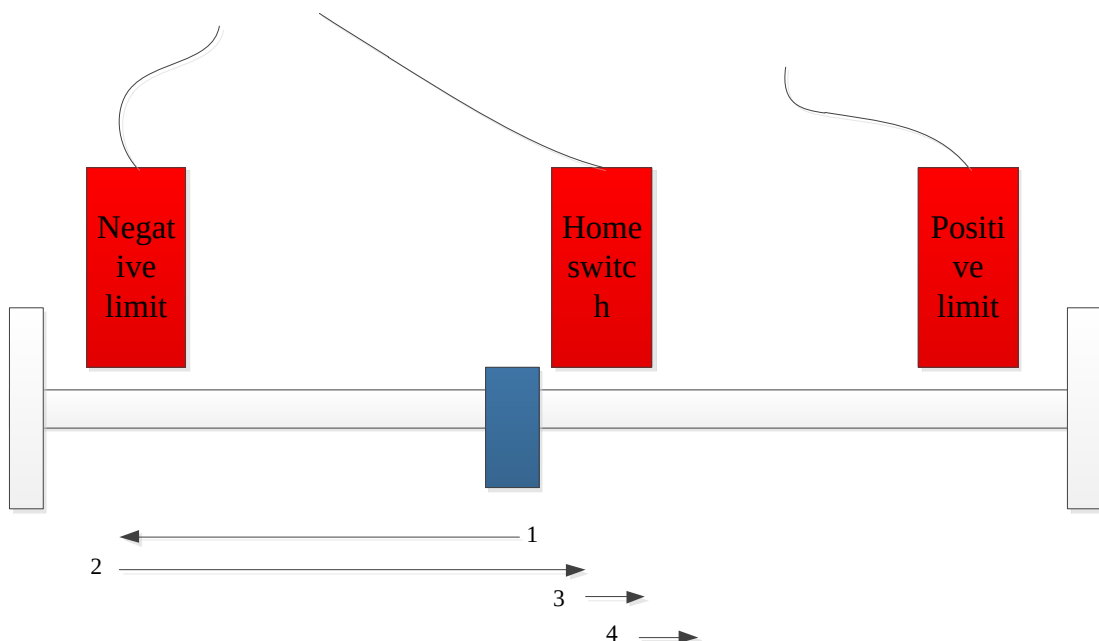


Homing Method 11 (Method 27)



1. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run forward until encounter the falling edge of the home switch.
3. Run forward until encounter the Z signal (Method 27 does not find Z signal).

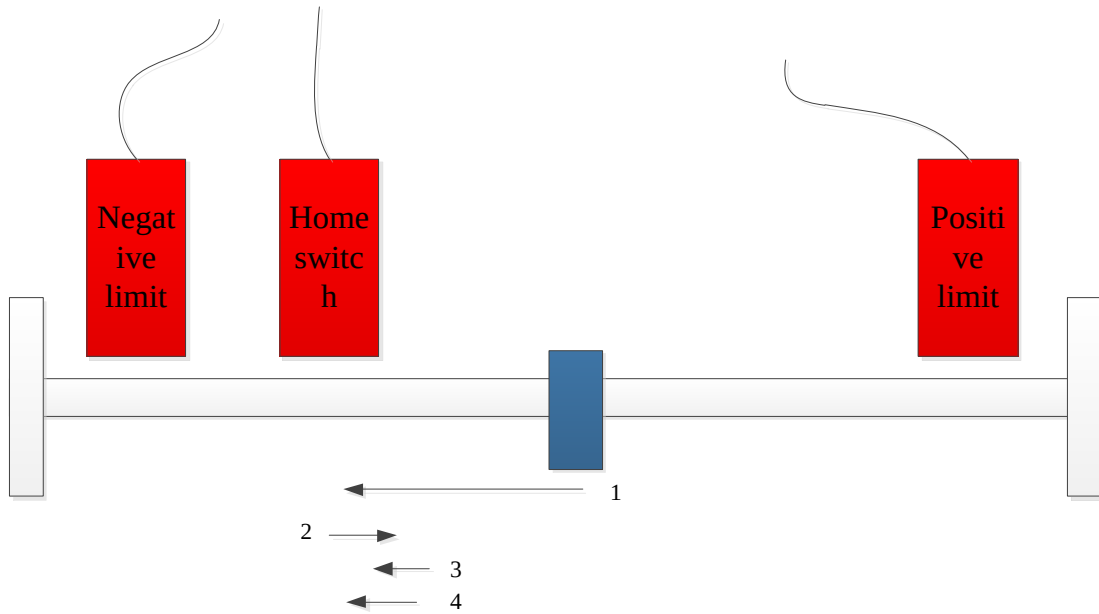
or



1. Run in the reverse direction until encounter the rising edge of the negative limit switch.
2. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).

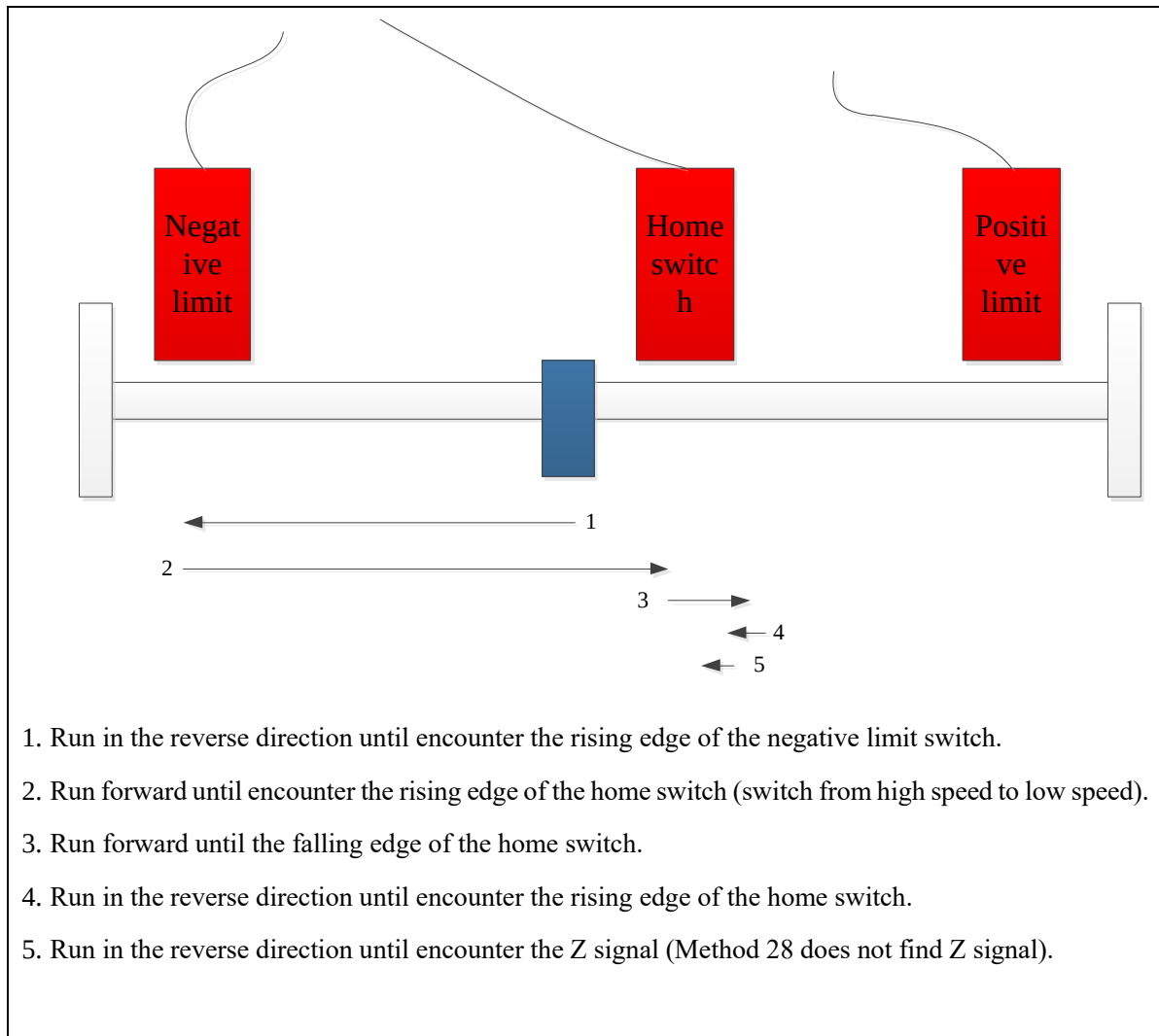
3. Run forward until encounter the falling edge of the home switch.
4. Run forward until encounter the Z signal (Method 27 does not find Z signal).

Homing Method 12 (Method 28)

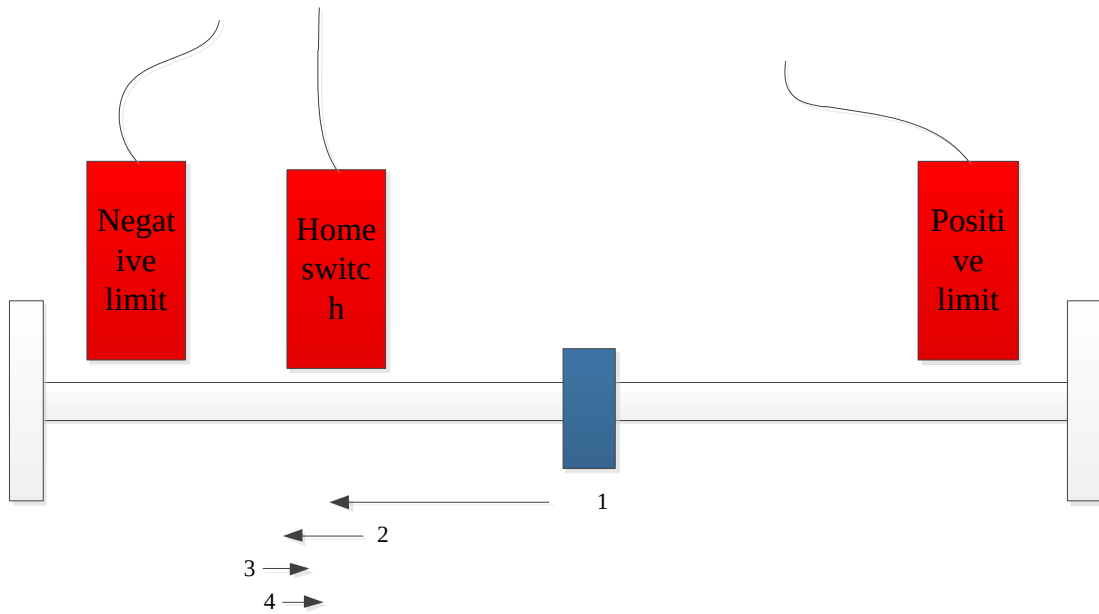


1. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run forward until encounter the falling edge of the home switch.
3. Run in the reverse direction until encounter the rising edge of the home switch.
4. Run in the reverse direction until encounter the Z signal (Method 28 does not find Z signal).

or

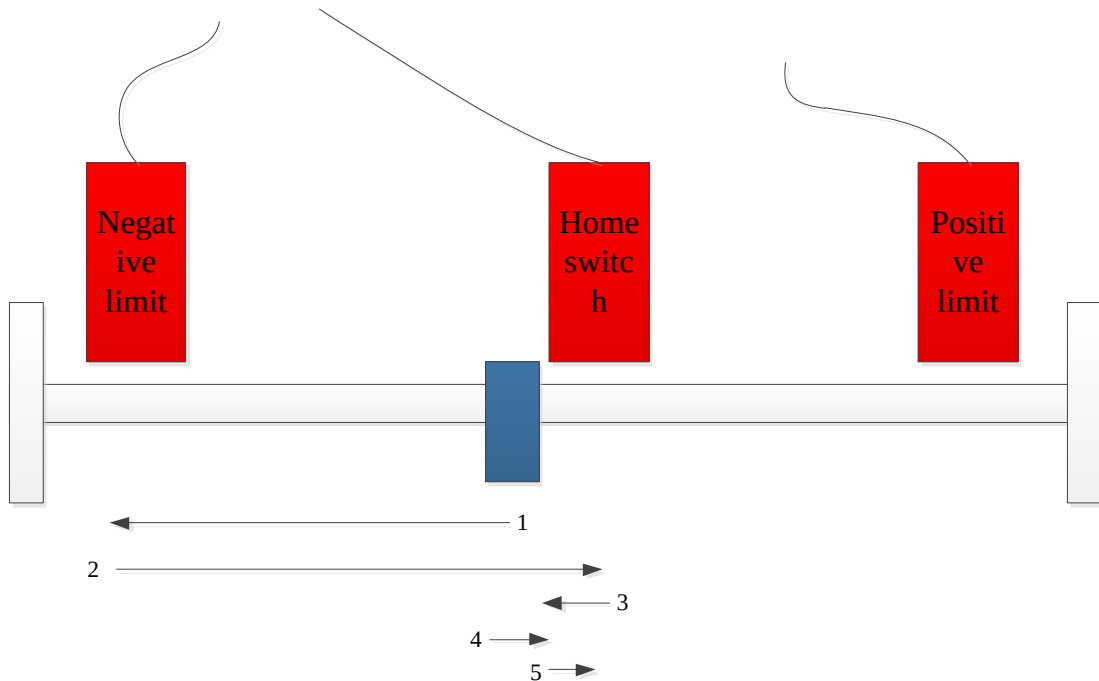


Homing Method 13 (Method 29)



1. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
2. Run forward until encounter the falling edge of the home switch.
3. Run forward until encounter the rising edge of the home switch.
4. Run forward until encounter the Z signal (Method 29 does not find Z signal).

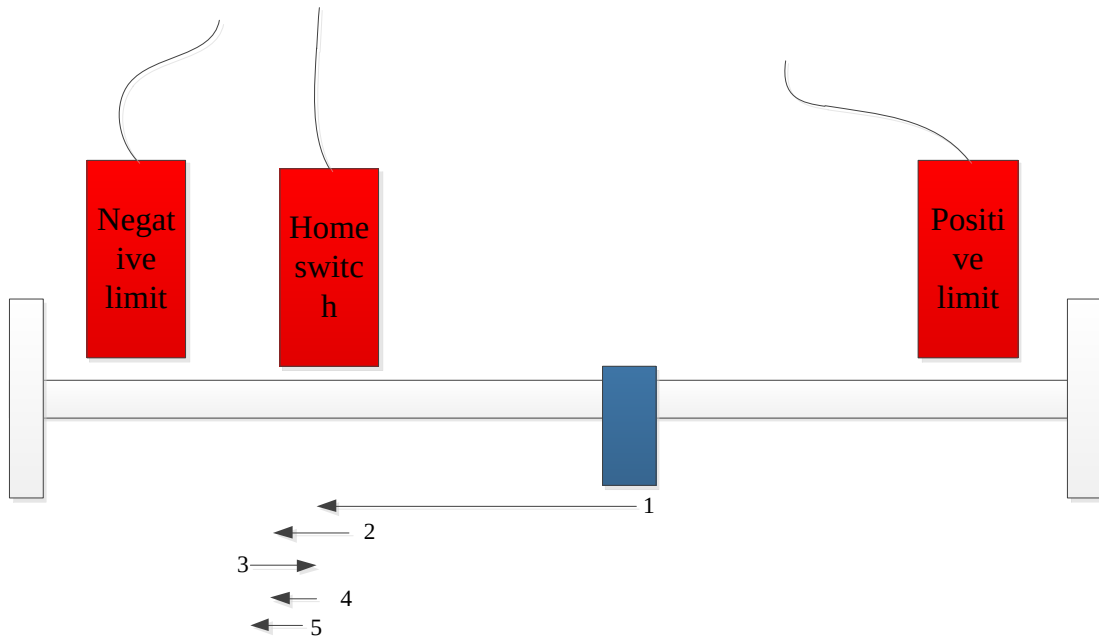
or



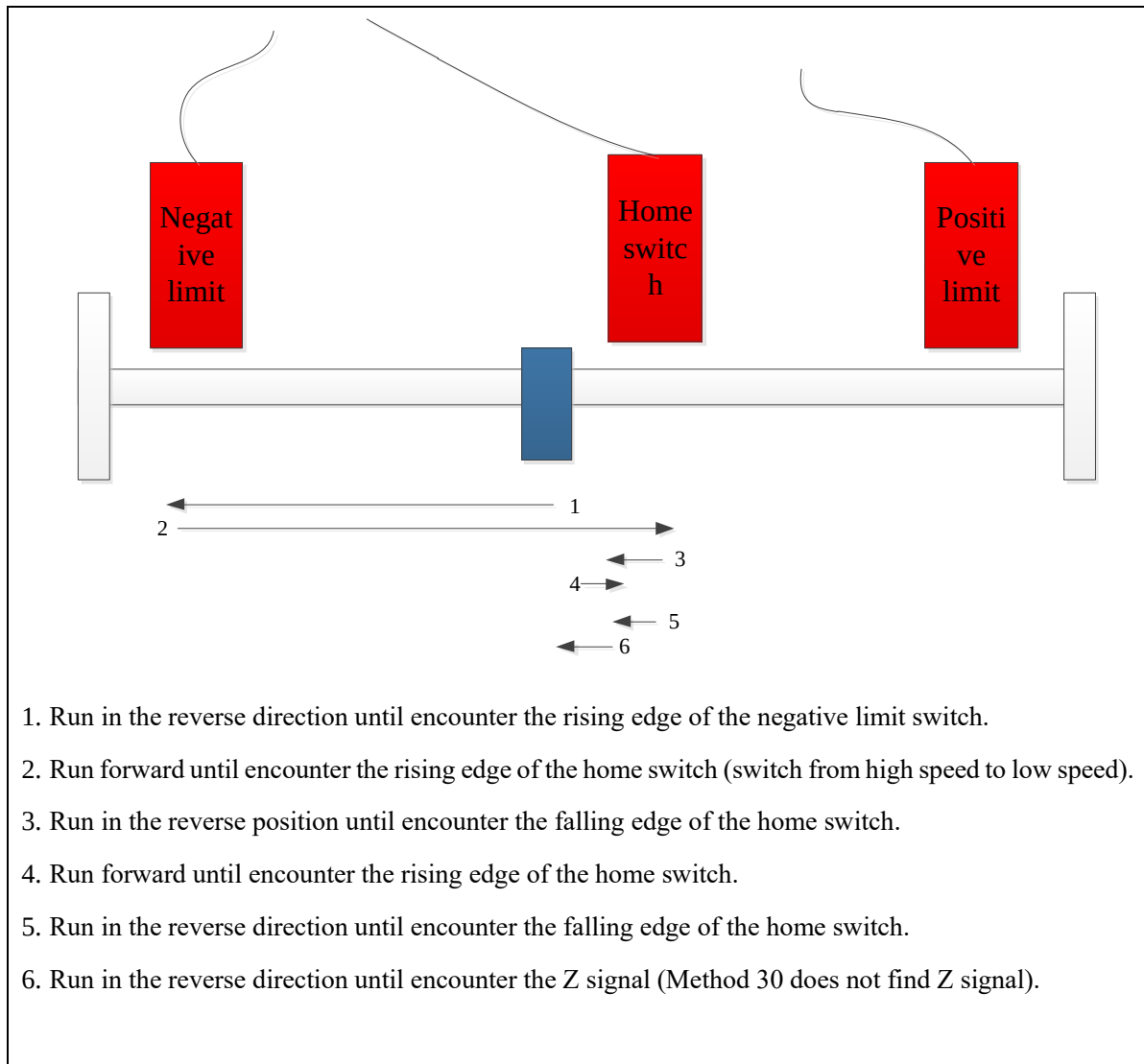
1. Run in the reverse direction until encounter the rising edge of the negative limit switch.

2. Run forward until encounter the rising edge of the home switch (switch from high speed to low speed).
3. Run in the reverse direction until encounter the falling edge of the home switch.
4. Run forward until encounter the rising edge of the home switch.
5. Run forward until encounter the Z signal (Method 29 does not find Z signal).

Homing Method 14 (Method 30)



1. Run in the reverse direction until encounter the rising edge of the home switch (switch from high speed to low speed).
 2. Run in reverse direction until encounter the falling edge of the home switch .
 3. Run forward until encounter the rising edge of the home switch.
 4. Run in the reverse direction until encounter the falling edge of the home switch.
 5. Run in the reverse direction until encounter the Z signal (Method 30 does not find Z signal).
- or



Homing mode 33

Homing in the negative position, Using the motor Z signal as home position.

Homing mode 34

Homing in the positive position, Using the motor Z signal as home position.

Homing mode 35

Using the current position as the home position.

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

P03.32 High-Velocity during Homing	Setting Range	Unit	Factory Default	Related Modes
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		10~6000	mm/s	100	P	S	T
Description: Velocity during the high-speed stage of homing.							

P03.33 during homing	Low-Velocity	Setting Range	Unit	Factory Default	Related Modes		
		0~6000	mm/s	10	P	S	T
Description: Velocity during the low-speed stage of homing.							

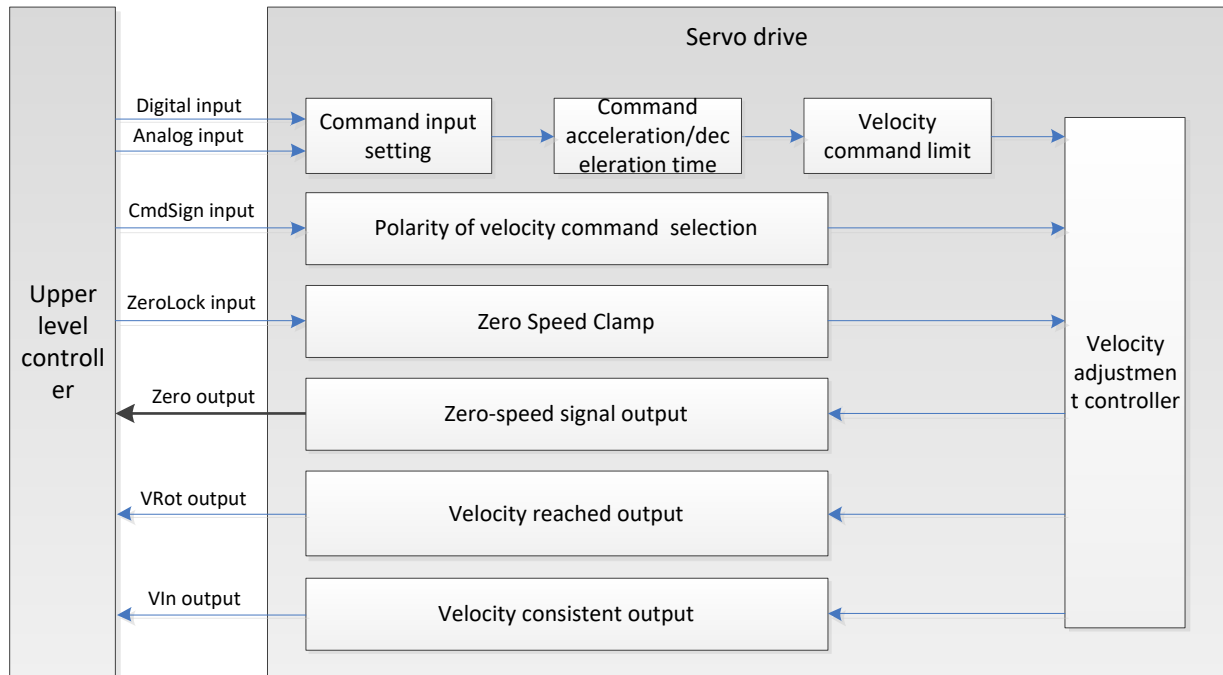
P03.34 Homing Acceleration/Deceleration Time	Setting Range	Unit	Factory Default	Related Modes		
	0~1000	ms	10	P	S	T
Description: Set the acceleration and deceleration time for homing speed.						

	P03.35 Maximum allowed time for homing	Setting Range	Unit	Factory Default	Related Modes		
		1~65535	10ms	50000	P	S	T
Description: Homing timeout alarm Er.054, meaning the homing operation needs to be re-performed after stopping.							

	P03.36 Homing Mechanical Offset	Setting Range	Unit	Factory Default	Related Modes		
		-1073807359~1073807359	Encoder unit	0	P	S	T
Description: The offset distance after homing, in encoder units.							

3.4 Velocity Mode

The implementation mechanism of the velocity mode is shown in the following diagram.



3.4.1 Source of Velocity Command

P03.40 Velocity Command Input Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~5	-	0	-	S	-
Description: ◆ 0: Internal Digital input ◆ 1: Analog input ◆ 2: Analog DI control ◆ 5: Internal speed function						

3.4.2 DI

P03.41 Velocity Set by digital input	Setting Range	Unit	Factory Default	Related Modes		
	-6000~6000	mm/s(RPM)	300	-	S	-
Description: Set the velocity command value through digital input						

P03.43 Velocity Command Acceleration Ramp Time	Setting Range	Unit	Factory Default	Related Modes		
	0~65535	ms	20	-	S	T

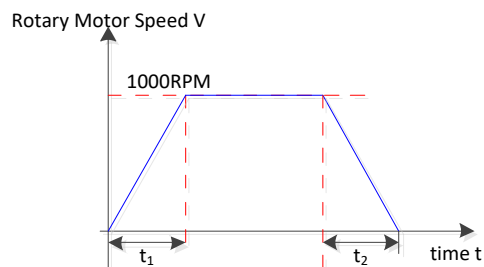
Description:

The time taken for the motor to accelerate by 1000 RPM

P03.44 Velocity Command Deceleration Ramp Time	Setting Range	Unit	Factory Default	Related Modes		
	0~65535	ms	20	-	S	-
Description: The time taken for the motor to decelerate by 1000 RPM						

Velocity Acceleration/Deceleration Time:

When the control mode of the servo drive is in position mode or speed mode, the speed acceleration/deceleration is as shown in the following diagram. The set acceleration time is t_1 , and the deceleration time is t_2 , corresponding to the time to accelerate to 1000mm/s. Therefore, the acceleration is $1000/t_1$, and the deceleration is $1000/t_2$.



3.4.3 DI Jog

P03.42 DI Jog Velocity Setting Value	Setting Range	Unit	Factory Default	Related Modes		
	-6000~6000	RPM	300		S	T
Description: Velocity setting value when using DI jog						

P03.46 Jog Velocity Acceleration Ramp Time	Setting Range	Unit	Factory Default	Related Modes		
	0~65535	ms	20	-	S	-
Description: Time for the linear motor to accelerate by 1000 RPM						

3.4.4 AI

P03.47 Analog 10V	Setting Range	Unit	Factory	Related
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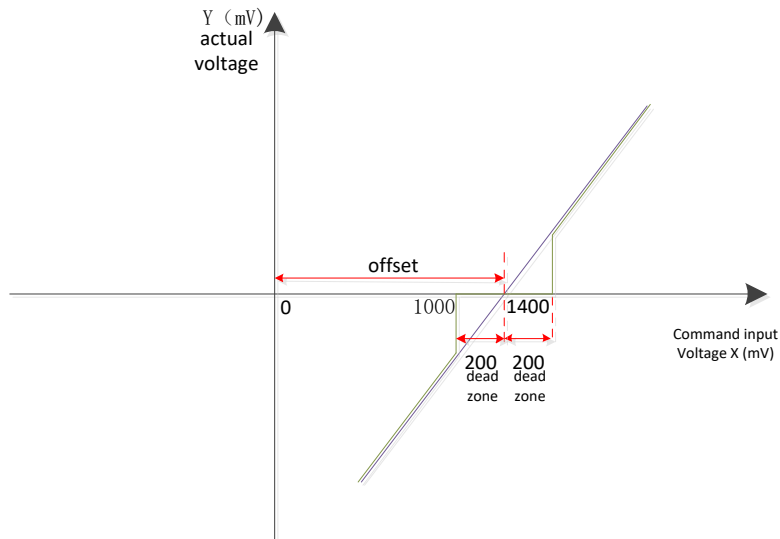
	Corresponding Velocity			Default	Modes		
		-10000~10000	RPM	3000	-	S	-
Description: Velocity corresponding to 10V voltage when using analog input.							

	P04.30 Analog Input Offset	Setting Range	Unit	Factory Default	Related Modes		
		-5000~5000	mV	0	-	S	T
Description: Analog offset, added to the actual analog value and then converted to the corresponding velocity/torque							

P04.31 Analog Input Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
	0.00~655.35	ms	2.00	-	S	T
Description: Can suppress "glitches" in the analog input, eliminating operational noise						

	P04.32 Analog Input Deadband	Setting Range	Unit	Factory Default	Related Modes		
		0.0~1000.0	mV	10.0	-	S	T
Description: When the input voltage is below this value, the command is 0							

P04.33 Analog Input Zero Drift	Setting Range	Unit	Factory Default	Related Modes		
	-500.0~500.0	mV	0.0	-	S	T
Description: Can set F09 to 1 to automatically adjust the analog input zero drift						



3.4.5 DO

	P05.30 Zero Velocity Clamp Velocity Command Threshold	Setting Range	Unit	Factory Default	Related Modes		
		0~6000	RPM	10	P	S	T
Description: Set the threshold for the zero speed clamp speed command. When the signal FunIn.15(z_Lock) is valid, and the command is less than P05.30, the speed command is 0.							

	P05.34 Zero-speed Output Signal Threshold	Setting Range	Unit	Factory Default	Related Modes		
		1~6000	RPM	10	P	S	T
Description: When Motor Velocity ≤ P05.34, and holds for 5ms, the zero-speed signal FunOut.13(VZero) output is valid.							

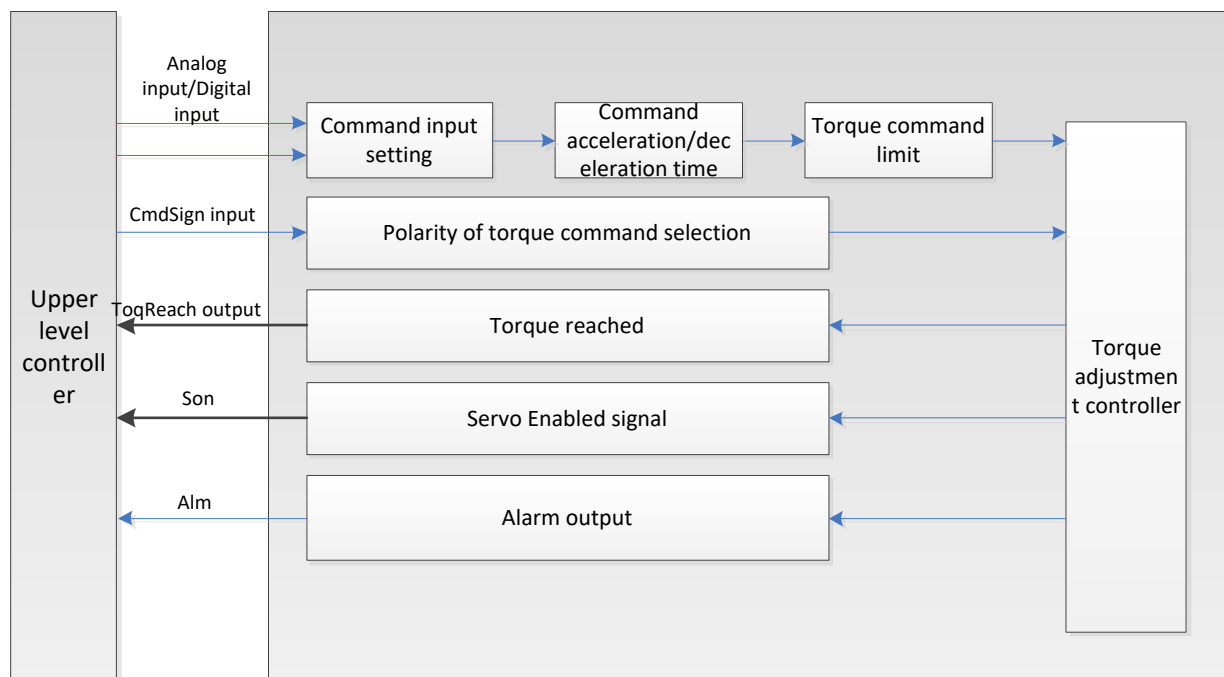
	P05.34 Zero-speed Output Signal Threshold	Setting Range	Unit	Factory Default	Related Modes		
		1~6000	RPM	10	P	S	T
Description: When Motor Velocity ≤ P05.34, and holds for 5ms, the zero-speed signal FunOut.13(VZero) output is valid.							

P05.35 Velocity DO Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
	0~65535	ms	10	P	S	T
Description: Set the filtering time for velocity feedback, using the filtered velocity feedback to determine the velocity consistent signal.						

P05.36 Velocity Consistent Signal Hold Time	Setting Range	Unit	Factory Default	Related Modes		
	0~1000	ms	0	P	S	T
Description: When $ \text{Actual Velocity Command} - \text{Actual Velocity Feedback} \leq \text{P05.32}$, and holds for P05.36 time, the velocity consistency signal FunOut.14(VIn) output is valid						

3.5 Torque Mode

The implementation mechanism of the torque mode is shown in the following diagram.



3.5.1 Torque Mode Related Function Codes

P03.4A Torque Command Selection	Setting Range	Unit	Factory Default	Related Modes
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		0~1	-	0	-	-	T
Description: Control the motor operation through the given torque command ◆ 0: Internal Digital input ◆ 1: External Analog input							

P03.4B Torque Command Setting	Setting Range	Unit	Factory Default	Related Modes		
	-300.0~300.0	%	0.0	-	-	T
Description: Set the torque (percentage of rated torque) through digital input						

P03.4C Analog 10V Corresponding Torque Command	Setting Range	Unit	Factory Default	Related Modes		
	-800.0~800.0	%	100.0	-	-	T
Description: Torque corresponding to 10V voltage (percentage of rated torque) for analog input						

P03.4F Emergency Stop Torque	Setting Range	Unit	Factory Default	Related Modes		
	0.0~300.0	%	100.0	P	S	T
Description: Emergency stop torque value when using the emergency stop torque stop method						

P03.50 Positive limit of velocity	Setting Range	Unit	Factory Default	Related Modes		
	0~8000	RPM	6000	P	S	
Description: Positive speed limit in velocity or position mode.						

P03.51 Negative limit of	Setting	Unit	Factory	Related
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velocity	Range		Default	Modes		
	0~8000	RPM	6000	P	S	
Description: Reverse speed limit in velocity or position mode.						

P03.52 Positive limit of torque	Setting Range	Unit	Factory Default	Related Modes		
	0.0~600.0	%	300.0	P	S	T
Description: Maximum positive torque limit value in torque control mode (percentage of rated current)						

P03.53 Negative limit of Torque	Setting Range	Unit	Factory Default	Related Modes		
	0.0~600.0	%	300.0	P	S	T
Description: Maximum negative torque limit value in torque control mode (percentage of rated current)						

P03.54 Positive limit of internal velocity in torque mode	Setting Range	Unit	Factory Default	Related Modes		
	0~6000	RPM	3000	-	-	T
Description: Positive limit of velocity in torque mode.						

P03.55 Negative limit of internal velocity in torque mode	Setting Range	Unit	Factory Default	Related Modes		
	0~6000	RPM	3000	-	-	T
Description: Negative limit of velocity in torque mode.						

Torque DO output related function codes

P05.3A Torque Reached Reference Value	Setting Range	Unit	Factory Default	Related Modes		
	0.0~300.0	%	0	P	S	T
Description: Reference value for determining whether the torque arrival signal is valid, used for comparison with actual torque						

P05.3B Effective Torque Reached Signal Threshold	Setting Range	Unit	Factory Default	Related Modes		
	20.0~300.0	%	20.0	P	S	T
Explanation: When actual torque command >P05.3A+P05.3B, the torque reached signal output is effective.						

P05.3C Ineffective Torque Reached Signal Threshold Value	Setting Range	Unit	Factory Default	Related Modes		
	10.0~300.0	%	10.0	P	S	T
Explanation: When actual torque command <P05.3A+P05.3C, the torque reached signal is ineffective.						

3.6 Mode switching

When P02.00=3, you can use DI to switch the operation mode. As shown in the table below:

ModSel1 (FunIn.11)	ModSel2 (FunIn.12)	Mode
0	0	Position mode
0	1	Torque mode
1	0	Velocity mode
1	1	Position mode

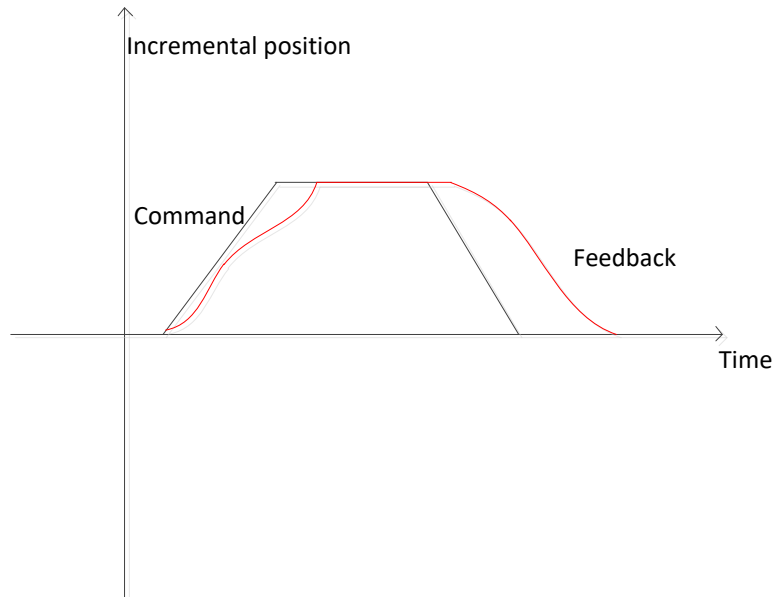
Using DI terminals for mode switching, if only two modes are needed, the upper computer can choose to control one DI function, and the other DI function can be set to default valid or invalid.

4 Gain Adjustment

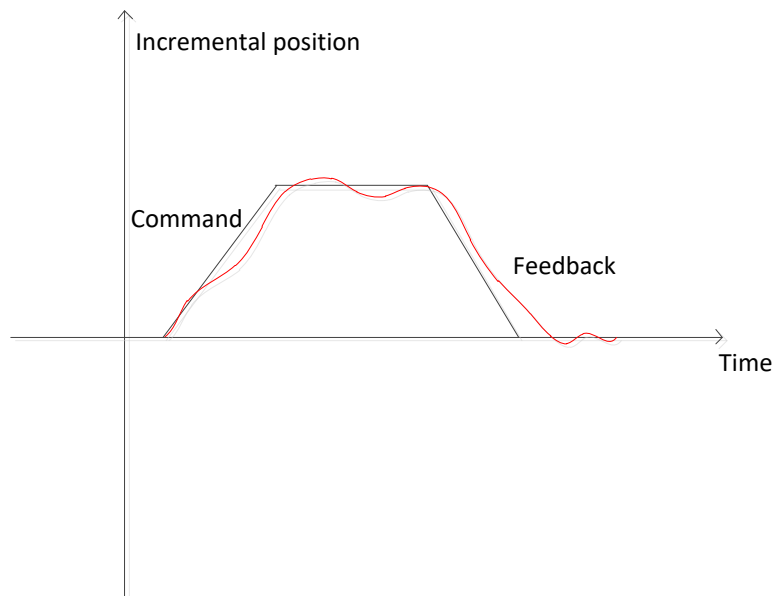
4.1 Objective of Gain Adjustment

Gain adjustment aims to ensure that the motor operates without delay according to the commands from the upper-level computer, allowing the mechanical performance to be fully utilized. Users often need to adjust the gains related to position and velocity control loops.

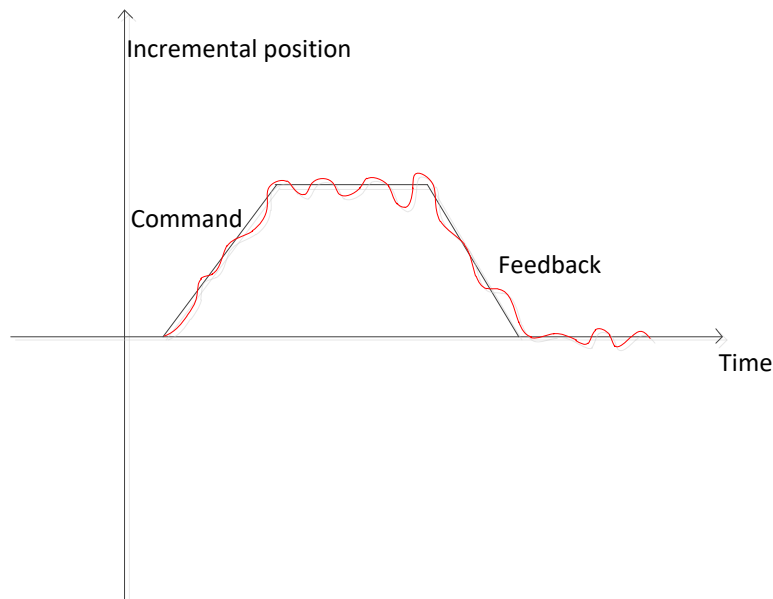
The figure below are several common types of debugging waveforms.



The servo response is slow due to relatively weak gain adjustments, resulting in a long delay in response.

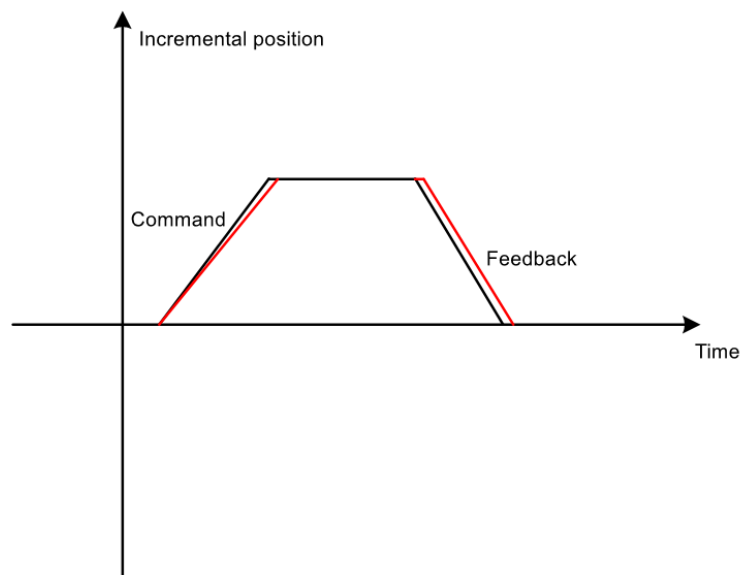


The servo's weak gain adjustment results in slow response and a delay. The mismatched gains between the position and speed control loops lead to overshoot.



The excessive gain in either the position or speed control loop leads to oscillations.

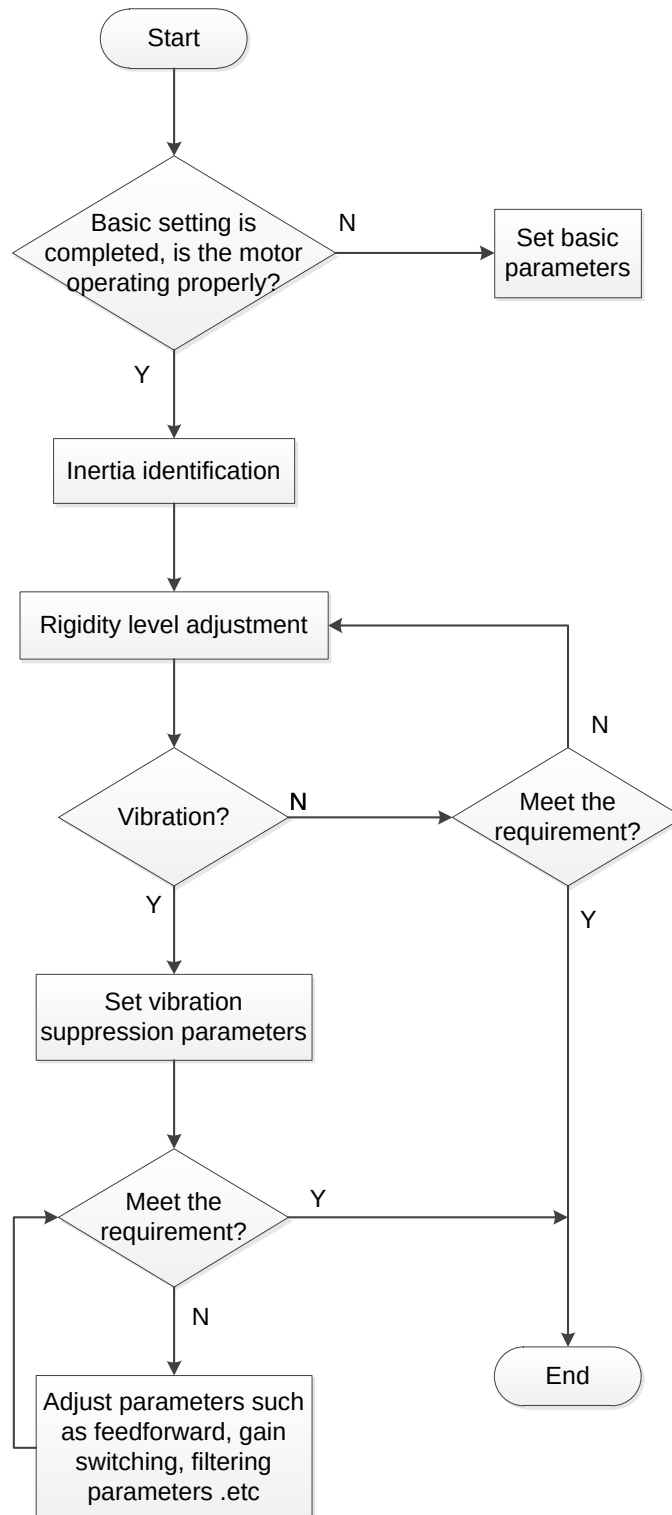
By increasing the gains in the position and speed control loops, as well as adjusting other parameters such as feedforward, the desired position response can be achieved.



During actual debugging, due to mechanical factors, it's difficult for the position feedback to perfectly coincide with the command. In such cases, as long as the response is free from overshoot and oscillations, and the positioning time is less than the required value, it suffices.

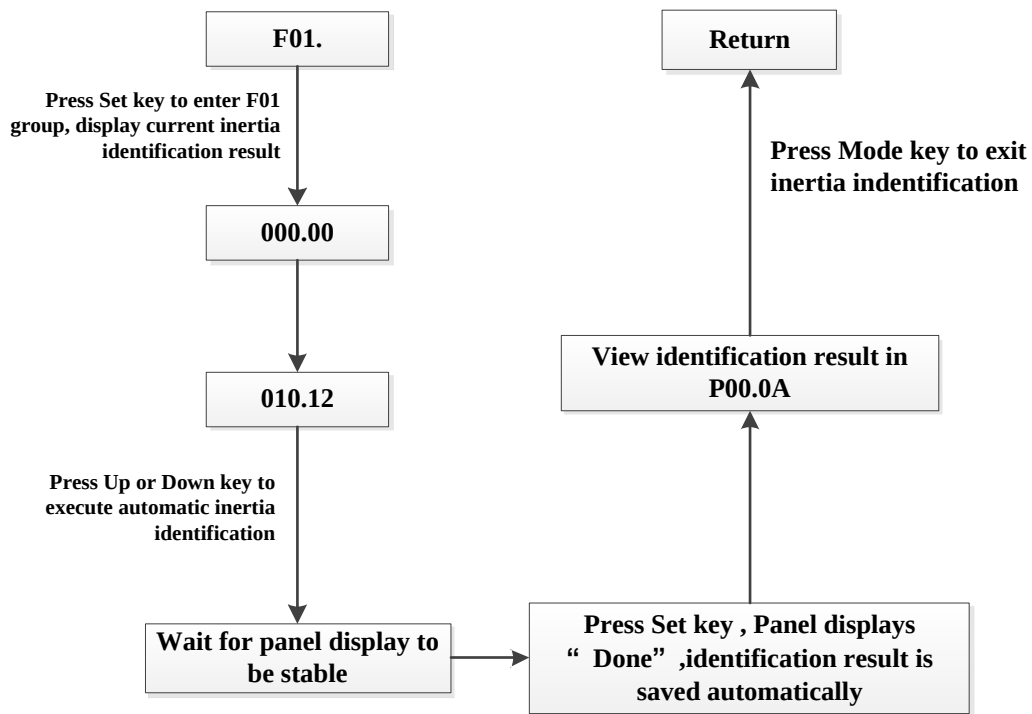
4.2 Manual Gain Adjustment

The gain adjustment should follow the following process.



4.2.1 Inertia Identification

Inertia identification is the first step in parameter adjustment. It can be performed through the panel or through the MX On Corporation Servo Configuration software. If using MX On Corporation Servo Configuration software for inertia identification, it can be completed through a wizard. If operating through the panel, the process is as follows:



Inertia identification related function codes

P00.0A Load Inertia Ratio	Setting Range	Unit	Factory Default	Related Modes		
	0.00~120.00	-	1.00	P	S	T
Description: Load inertia ratio = External load mass / Motor rotor mass						

P02.30 Inertia Identification Operation Mode	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T
Description: ◆ 0: Positive /negative operation mode (limited mechanical travel, motor runs in forward and reverse direction) ◆ 1: Jog mode (unlimited mechanical travel, motor runs in one direction)						

4.2.2 Rigidity Level Adjustment

During initial parameter setup, you can choose the self-adjustment mode by setting P00.00 to a non-zero parameter. This is used to set the gain parameters by group, and then set P00.01 to gradually strengthen the servo response.

The function codes affected by different modes of Pn00.00 are shown in the table below ("○" indicates support; "×" indicates not support).

Function Code	Name	Rigidity Mode	Table	Positioning Mode	Single-click Adjustment Mode
P00.02	The First Velocity Loop Gain	○		○	○
P00.03	The First Velocity Loop Integral Time Constant	○		○	○
P00.04	The First Position Loop Gain	○		○	○
P00.05	The First Torque Filtering Constant	○		○	○
P00.06	The Second Velocity Loop Gain	×		○	○
P00.07	The Second Velocity Loop Integral Time Constant Group 2	×		○	○
P00.08	The Second Position Loop Gain	×		○	○
P00.09	The Second Torque Filtering Constant	×		○	○
P00.10	Velocity Feedforward Gain	×		○	○
P00.12	PDF Control Coefficient	×		×	○
P00.14	Torque Feedforward Gain	×		×	○
P00.19	Gain Switching Mode	×		○	○
P00.31	Friction Compensation Percentage	×		×	○

Gain setting related function codes

P00.00 Automatic Adjustment Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~3	-	1	P	S	T
Description: ◆ 0: Manual gain adjustment ◆ 1: Automatically adjust rigidity table ◆ 2: Positioning mode ◆ 3: One-key adjustment mode						

Select different adjustment methods according to load conditions and operating modes to achieve the best system responsiveness and stability.

P00.01 Rigidity Level Selection	Setting Range	Unit	Factory Default	Related Modes		
	1~31	-	11	P	S	T
Description: The higher the rigidity, the better the system responsiveness, but too high rigidity can cause system oscillation. Set according to actual conditions.						

P00.02 1st Velocity Loop Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~2000.0	Hz	18.0	P	S	T
Description: The larger the velocity loop proportional gain, the faster the speed loop response, but too large may cause system oscillation.						

P00.03 1st Velocity Loop Integral Time	Setting Range	Unit	Factory Default	Related Modes		
	0.15~512.00	ms	31.00	P	S	T
Description: The larger the velocity loop integral time constant, the smaller the integral effect of the speed loop.						

P00.04 1st Position Loop Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~2000.0	Hz	32.0	P	S	T
Description: The larger the position loop proportional gain, the faster the position following.						

P00.05 1st G Torque Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
	0.00~30.00	ms	1.26	P	S	T

Description:
Low-pass filtering time for torque command.

P00.06 2nd Velocity Loop Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~2000.0	Hz	40.0	P	S	T

Description:
The larger the velocity loop proportional gain, the faster the speed loop response, but too large may cause system oscillation.

P00.07 2nd Velocity Loop Integral Time	Setting Range	Unit	Factory Default	Related Modes		
	0.15~512.00	ms	20.00	P	S	T

Description:
The larger the speed loop integral time constant, the smaller the integral effect of the speed loop.

P00.08 2nd Position Loop Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~2000.0	Hz	64.0	P	S	T

Description:
The larger the position loop proportional gain, the faster the position following.

P00.09 2nd Torque Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
	0.00~30.00	ms	1.26	P	S	T

Description:
Low-pass filtering time for torque command.

P00.10 Velocity Feedforward Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	%	0.0	P	S	-

Description:
Set the value of speed feedforward compensation.

P00.12 PDFF Control Coefficient	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	%	100.0	P	S	T
Description: This parameter can adjust the overshoot of the speed response.						

P00.19 Gain Switching Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~4	-	0	P	S	T
Description: ◆ 0: No gain switching ◆ 1: DI switch P/PI mode ◆ 2: DI switch between 1st and 2nd group ◆ 3: Position command + velocity feedback mode ◆ 4: Position command three-group gain switching mode						

When setting different rigidity levels P00.00, the corresponding loop gains are as follows:

Rigidity level	First group				Second group			
	P00.04	P00.02	P00.03	P00.05	P00.08	P00.06	P00.07	P00.09
	1st position loop gain(Hz)	1st velocity loop gain(Hz)	1st velocity loop integer time(ms)	1st torque filtering time (ms)	2nd position loop gain(Hz)	2nd velocity loop gain(Hz)	2nd velocity loop integer time(ms)	2nd torque filtering time (ms)
0	2.0	1.5	370.00	15.00	3.0	1.5	512.00	15.00
1	2.5	2.0	280.00	11.00	4.0	2.0	512.00	11.00
2	3.0	2.5	220.00	9.00	4.5	2.5	512.00	9.00
3	4.0	3.0	190.00	8.00	5.5	3.0	512.00	8.00
4	4.5	3.5	160.00	6.00	7.5	3.5	512.00	6.00
5	5.5	4.5	120.00	5.00	9.5	4.5	512.00	5.00
6	7.5	6.0	90.00	4.00	11.5	6.0	512.00	4.00
7	9.5	7.5	70.00	3.00	14.0	7.5	512.00	3.00
8	11.5	9.0	60.00	3.00	17.5	9.0	512.00	3.00
9	14.0	11.0	50.00	2.00	32.0	11.0	512.00	2.00
10	17.5	14.0	40.00	2.00	39.0	14.0	512.00	2.00

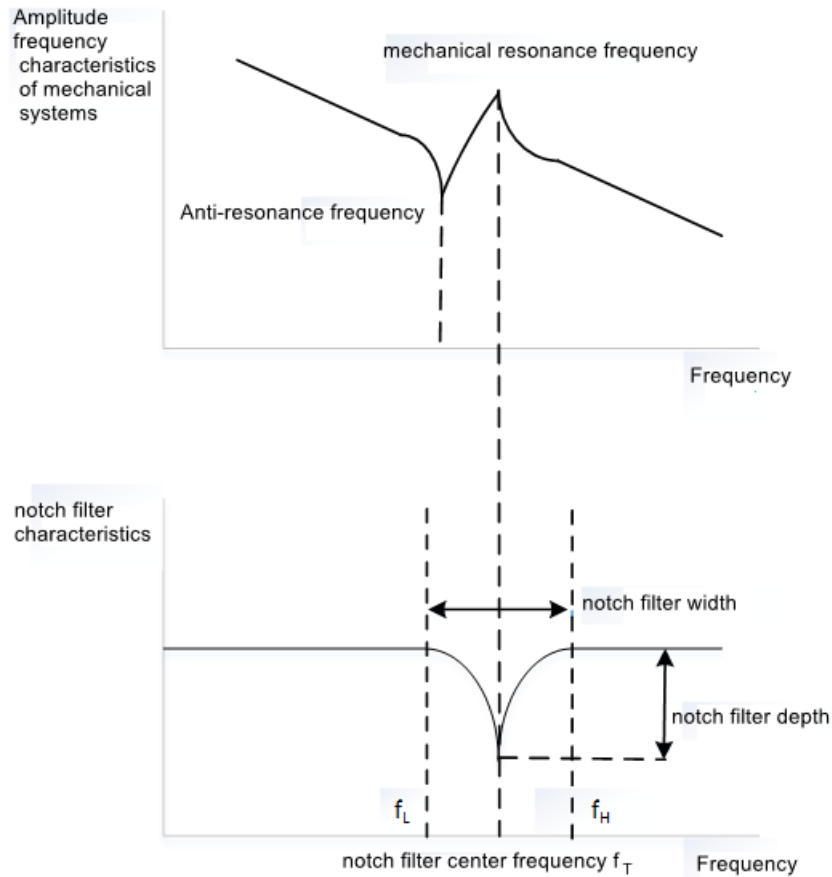
Rigidity level	First group				Second group			
	P00.04	P00.02	P00.03	P00.05	P00.08	P00.06	P00.07	P00.09
	1st position loop gain(Hz)	1st velocity loop gain(Hz)	1st velocity loop integer time(ms)	1st torque filtering time (ms)	2nd position loop gain(Hz)	2nd velocity loop gain(Hz)	2nd velocity loop integer time(ms)	2nd torque filtering time (ms)
11	32.0	18.0	31.00	1.26	48.0	18.0	512.00	1.26
12	39.0	22.0	25.00	1.03	63.0	22.0	512.00	1.03
13	48.0	27.0	21.00	0.84	72.0	27.0	512.00	0.84
14	63.0	35.0	16.00	0.65	90.0	35.0	512.00	0.65
15	72.0	40.0	14.00	0.57	108.0	40.0	512.00	0.57
16	90.0	50.0	12.00	0.45	135.0	50.0	512.00	0.45
17	108.0	60.0	11.00	0.38	162.0	60.0	512.00	0.38
18	135.0	75.0	9.00	0.30	206.0	75.0	512.00	0.30
19	162.0	90.0	8.00	0.25	251.0	90.0	512.00	0.25
20	206.0	115.0	7.00	0.20	305.0	115.0	512.00	0.20
21	251.0	140.0	6.00	0.16	377.0	140.0	512.00	0.16
22	305.0	170.0	5.00	0.13	449.0	170.0	512.00	0.13
23	377.0	210.0	4.00	0.11	500.0	210.0	512.00	0.11
24	449.0	250.0	4.00	0.09	560.0	250.0	512.00	0.09
25	500.0	280.0	3.50	0.08	610.0	280.0	512.00	0.08
26	560.0	310.0	3.00	0.07	660.0	310.0	512.00	0.07
27	610.0	340.0	3.00	0.07	720.0	340.0	512.00	0.07
28	660.0	370.0	2.50	0.06	810.0	370.0	512.00	0.06
29	720.0	400.0	2.50	0.05	900.0	400.0	512.00	0.05
30	810.0	450.0	2.00	0.05	900.0	450.0	512.00	0.05
31	900.0	500.0	2.00	0.04	900.0	500.0	512.00	0.04

By default, the rigidity level is set to level 11 in factory state.

4.2.3 Vibration Suppression Setting

4.2.3.1 Resonant Frequency Manually Setting

In situations where the servo parameters continuously strengthen gains, the mechanical system may exhibit insufficient rigidity, leading to mechanical resonance. The vibration frequency may vary, with some being high-frequency vibrations and others low-frequency vibrations. In such cases, a notch filter needs to be set at the resonant frequency to suppress mechanical resonance in the system. The amplitude characteristics of the system during resonance are illustrated in the following figure.



The servo drive provides 5 sets of notch filter parameters for resonance frequency suppression. Each set of notch filter parameters can be configured with resonance frequency, anti-resonance frequency, notch filter width, and notch filter depth, as illustrated in the graph above. There are generally two methods for obtaining mechanical resonance frequency. One method involves observing the vibration cycle of the torque command waveform in the MX On Corporation Servo Configuration software and then calculating it using $f_0 = \frac{1}{T}$. The other method involves using the frequency sweep function of Console to obtain the mechanical resonance frequency.

The function codes for setting each notch filter are as follows:

P01.04 Anti-resonance Frequency of the 1st Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
	10~5000	Hz	5000	P	S	T
Explanation: Corresponding system anti-resonance frequency						

	P01.05 Frequency of the 1st Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		50~5000	Hz	5000	P	S	T
Explanation: Corresponding system resonance frequency.							

	P01.06 Bandwidth of the 1st Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~9	-	2	P	S	T
Explanation: Set the frequency range of the 1st Notch Filter to suppress the system resonance.							

	P01.07 Depth of the 1st Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~99	-	0	P	S	T
Explanation: Set the depth of suppression for the system resonance frequency.							

	P01.08 Anti-resonance Frequency of the 2nd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		10~5000	Hz	5000	P	S	T
Explanation: Corresponding system anti-resonance frequency							

	P01.09 Frequency of the 2nd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		50~5000	Hz	5000	P	S	T
Explanation: Corresponding system resonance frequency.							

P01.0A Bandwidth of the 2nd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
	0~9	-	2	P	S	T
Explanation: Set the frequency range of the 2nd Notch Filter to suppress the system resonance.						

	P01.0B Depth of the 2nd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~99	-	0	P	S	T
Explanation: Set the depth of suppression for the system resonance frequency.							

	P01.0C Anti-resonance Frequency of the 3rd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		10~5000	Hz	5000	P	S	T
Explanation: Corresponding system anti-resonance frequency							

P01.0D Frequency of the 3rd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
	50~5000	Hz	5000	P	S	T
Explanation: Corresponding system resonance frequency.						

	P01.0E Bandwidth of the 3rd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~9	-	2	P	S	T

Explanation:

Set the frequency range of the 3rd Notch Filter to suppress the system resonance.

	P01.0F Depth of the 3rd Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~99	-	0	P	S	T

Explanation:

Set the depth of suppression for the system resonance frequency.

	P01.10 Anti-resonance Frequency of the 4th Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		10~5000	Hz	5000	P	S	T

Explanation:

Corresponding system anti-resonance frequency.

	P01.11 Frequency of the 4th Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		50~5000	Hz	5000	P	S	T

Explanation:

Corresponding system resonance frequency.

	P01.12 Bandwidth of the 4th Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
		0~9	-	2	P	S	T

Explanation:

Set the frequency range of 4th Notch Filter to suppress the system resonance.

	P01.13 Depth of the 4th Notch Filter	Setting Range	Unit	Factory Default	Related Modes		
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		0~99	-	0	P	S	T
Explanation: Set the depth of suppression for the system resonance frequency.							

	P01.14 Anti-resonance Frequency of Notch Filter for Velocity Feedback	Setting Range	Unit	Factory Default	Related Modes		
		10~5000	Hz	5000	P		
Explanation: Set the system's anti-resonance frequency.							

	P01.15 Frequency of Notch Filter for Velocity Feedback	Setting Range	Unit	Factory Default	Related Modes		
		10~5000	Hz	5000	P		
Explanation: Set filtering frequency of the notch filter which is used to filter velocity feedback.							

	P01.16 Bandwidth of Notch Filter for Velocity Feedback	Setting Range	Unit	Factory Default	Related Modes		
		0~9	-	2	P		
Explanation: Set the effective frequency range of the notch filter which is used to filter velocity feedback.							

	P01.17 Depth of Notch Filter for Velocity Feedback	Setting Range	Unit	Factory Default	Related Modes		
		0~99	-	0	P	V	
Explanation: Set the suppression depth of resonance frequency of the notch filter which is used to filter velocity feedback.							

	P01.18 Number of vibrations per mechanical cycle	Setting Range	Unit	Factory Default	Related Modes		
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		0.00~50.00	Hz	0.00	P	v	
Explanation: The number of vibrations occurring when the motor completes one revolution.							

In the above function codes, the definition of width is as follows in the table below.

Width Setting	Notch Filter's Actual Suppression Width
0	$0.3 * f_0$
1	$0.5 * f_0$
2	$0.7 * f_0$
3	$0.9 * f_0$
4	$1.1 * f_0$
5	$1.3 * f_0$
6	$1.5 * f_0$
7	$1.7 * f_0$
8	$1.9 * f_0$
9	$2 * f_0$

Depth represents the ratio of the output amplitude to the input amplitude at resonance frequency points. The smaller the value, the deeper the suppression; conversely, the larger the value, the shallower the suppression. The formula for calculating depth is: Output Amplitude / Input Amplitude = Depth Level / 100.

When the depth value is set lower, the notch filter depth becomes deeper.

4.2.3.2 Automatically Set Resonance Frequency

If you do not want to manually set the function code to suppress resonance, you can enable the adaptive filter to automatically suppress the resonance frequency. This feature automatically configures the parameters of the third and fourth group notch filters. If no resonance point is detected after enabling, the system will automatically exit the adaptive mode after 30 minutes. If a resonance point is identified and the notch filter is applied, but the vibration becomes more severe, the adaptive function will also automatically deactivate and reset the notch filter parameters.

The function codes related to the adaptive filter are as follows:

P01.00 Adaptive Filter Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~4	-	0	P	S	T
Description: ◆ 0: Disable the adaptive filter ◆ 1: Automatically update the 3rd notch filter parameters ◆ 2: Automatically update the 3rd and 4th notch filter parameters						

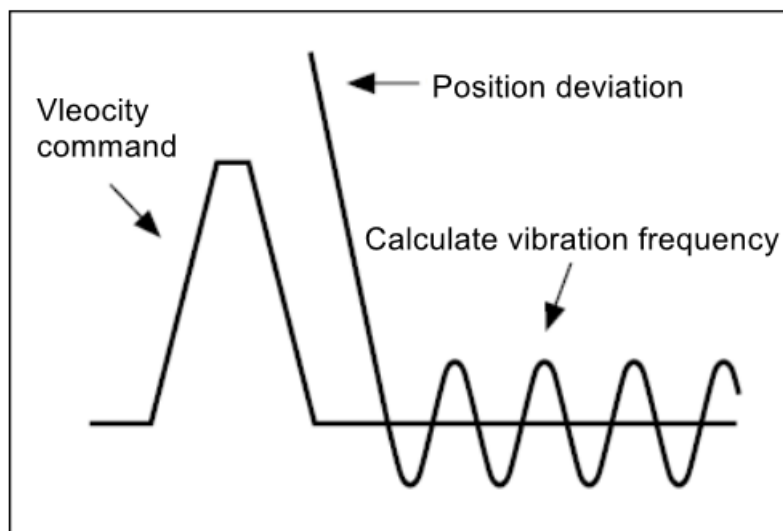
- ◆ 3: Only test the resonance frequency and display it in P01.02
- ◆ 4: Reset the 3rd and the 4th group notch filters

P01.01 Vibration Determination Threshold	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	%	2.0	P	S	T
Description: 100% corresponds to the motor rated torque						

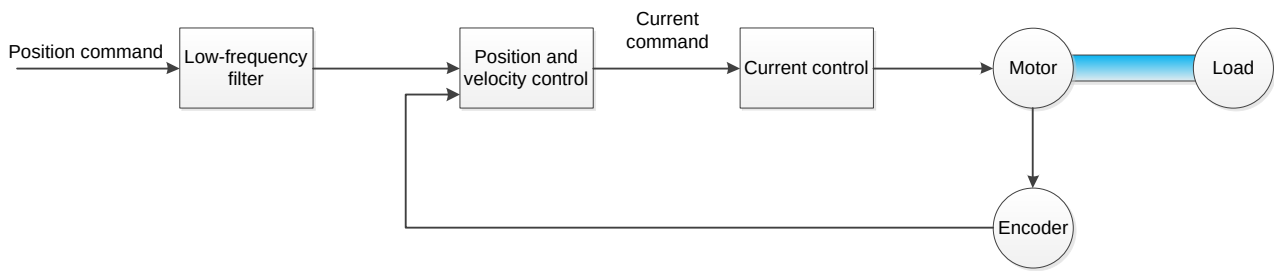
P01.02 Resonance Frequency Identification Result	Setting Range	Unit	Factory Default	Related Modes		
	Only display	Hz	-	P	S	T
Description: Displays the detected resonance frequency value						

4.2.3.3 Low-frequency Jitter Suppression

In some flexible loads such as robotic arms, when the motor follows a command to reach a given position, the load, not being rigidly connected, may overshoot, causing the motor to overshoot as well, resulting in low-frequency jitter, as illustrated in the following figure.



At this point, you can suppress this jitter by setting a low-frequency vibration frequency. This filter directly acts on the position command, as shown in the following diagram.



The function codes related to the low-frequency filter are as follows:

P01.1F Low-Frequency Vibration Suppression Mode	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	-	-
Description: ◆ 0: No suppression ◆ 1: Suppress one low-frequency vibration point						

P01.21 Low-Frequency Vibration Frequency	Setting Range	Unit	Factory Default	Related Modes		
	1.0~100.0	Hz	100.0	P	-	-
Description: Measured low-frequency vibration frequency						

P01.22 Filtering Bandwidth of Low-Frequency Vibration	Setting Range	Unit	Factory Default	Related Modes		
	0~10	-	2	P	-	-
Description: The larger the value, the wider the filtering width, but the greater the delay						

P01.23 Low-Frequency Resonance Frequency Attenuation Ratio	Setting Range	Unit	Factory Default	Related Modes		
	1.2~10.0	-	1.2	P	-	-
Description: The larger the value, the deeper the filtering depth, the smaller the position command delay						

4.2.3.4 Full Closed-loop Vibration Suppression

In a full closed-loop system, the servo controls velocity via the motor encoder and controls position via the encoder on the load. Due to the torque between the motor and the load, the velocity feedback from these two encoders are not synchronized, resulting in oscillations at the load end. To suppress this oscillation caused by asynchrony, you can use the parameter settings below.

P06.04 Full Closed Loop Vibration Suppression Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~300.0	Hz	0.0	P	-	-
Explanation: Used to adjust the vibration suppression rate, which is particularly effective when there is large torque between the motor and the load.						

P06.05 Full Closed Loop Vibration Suppression Filter Cut-off Frequency	Setting Range	Unit	Factory Default	Related Modes		
	10~5000	Hz	500	P	-	-
Explanation: Vibration suppression filtering cut-off frequency setting						

P06.06 Full Closed Loop Velocity Correction Coefficient	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	%	0.0	P	-	-
Explanation: Compensates the feedback of the load-end encoder velocity to the actual velocity control loop.						

P06.07 Filtering Time for Position Deviation between Internal and External Loop	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	ms	0.0	P	-	-
Explanation: Filters the position feedback from both the load end and the motor end.						

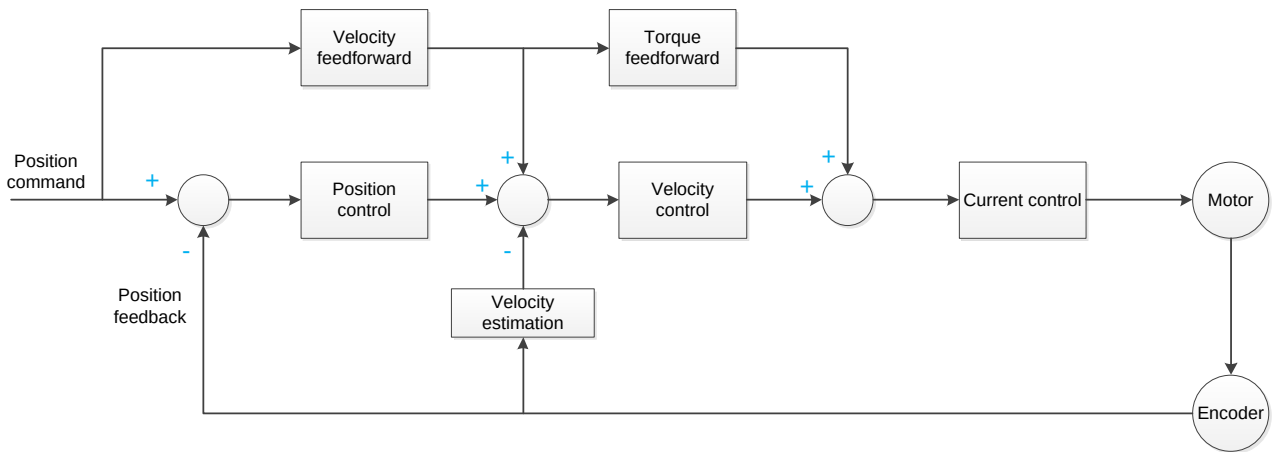
4.2.4 Practical Application of Gain Adjustment

4.2.4.1 Feedforward Function

In position control, the velocity command needed for the next cycle is estimated based on the position command, which can be directly compensated into the velocity control loop. By outputting torque in advance, it effectively reduces position deviation during position control.

Similarly, in speed control, the torque command needed for the next cycle is estimated based on the velocity command, which can be directly compensated into the current control loop, effectively improving the response of velocity control.

The control loop is illustrated in the following diagram:



The function codes used for debugging are as follows:

P00.0F Velocity Control Feedforward Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	1	P	S	-
Explanation: ◆ 0: No velocity feedforward ◆ 1: Internal velocity feedforward ◆ 2: External velocity feedforward						

P00.10 Velocity Feedforward Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.0~100.0	%	0	P	-	-
Explanation: Only valid in position mode. A larger velocity feedforward results in better following-performance of the position command and smaller position deviation. However, excessive feedforward can lead to system overshoot. It should be set according to the actual situation.						

	P00.11 Velocity Feedforward Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
		0.00~64.00	ms	0.50	P	-	-
Explanation: Applies low-pass filtering to the velocity feedforward to prevent abrupt changes.							

	P00.13 Torque Feedforward Control Selection	Setting Range	Unit	Factory Default	Related Modes		
		0~2	-	1	P	S	-
Explanation:							
◆ 0: No torque feedforward							
◆ 1: Internal torque feedforward							
◆ 2: External torque feedforward							

	P00.14 Torque Feedforward Gain	Setting Range	Unit	Factory Default	Related Modes		
		0.0~100.0	%	0.0	P	S	-
Explanation: The larger the torque feedforward, the faster it follows the velocity command. However, excessive feedforward can lead to system overshoot, deteriorated stability, and other issues. It should be set according to the actual situation.							

	P00.15 Torque Feedforward Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
		0.00~64.00	ms	0.50	P	S	-
Explanation: Applies low-pass filtering to the torque feedforward to prevent abrupt changes in torque command.							

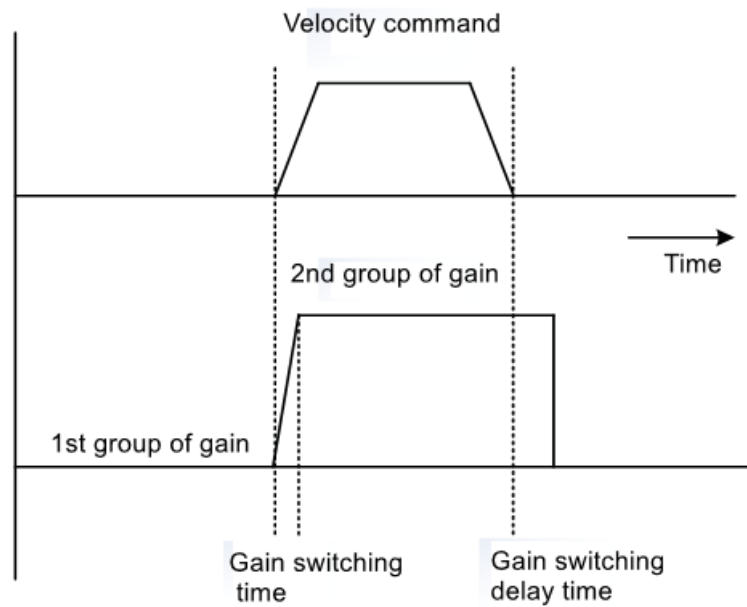
4.2.4.2 Gain Switching

During servo operation and stop, the servo often needs different response characteristics, namely:

- ◆ Low gain is required when stopping to avoid zero position vibration.
- ◆ High gain is required when stopping to improve servo locking capability.
- ◆ High gain is required during operation to improve servo following capability.

To meet the requirements of both operation and stopping, gain switching functionality needs to be introduced, as

illustrated in the following figure:



The function codes used for gain switching mainly switch between the first group of gain and the second group of gain. Other function codes used in addition to gain are as follows:

P00.19 Gain Switching Method Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~4	-	0	P	-	-
Description: ◆ 0: Fixed at the 1st group gain ◆ 1: Keep the 1st group gain, DI switch integral time is 0 ◆ 2: Use DI to switch between the 1st and 2nd group gains ◆ 3: Use position command + speed feedback switching ◆ 4: Position command three-group gains switching						

P00.1A Gain Switching Delay Time	Setting Range	Unit	Factory Default	Related Modes		
	0.0~1000.0	ms	5.0	P	-	-
Description: Used to set the delay time for switching from the 2nd group gain to the 1st group gain						

P00.1B Gain Switching Level	Setting Range	Unit	Factory Default	Related Modes		
	0~20000	-	50	P	-	-

Description:

When the switching condition is greater than $P00.1B + P00.1C$, switch to the second group of gains.
When the switching condition is less than $P00.1B + P00.1C$, switch to the first group of gains.

P00.1C Gain Switching time-lag	Setting Range	Unit	Factory Default	Related Modes		
	0~20000	-	30	P	-	-

Description:

When the switching condition is greater than $P00.1B + P00.1C$, switch to the second group of gains.
When the switching condition is less than $P00.1B + P00.1C$, switch to the first group of gains.

P00.1D Position Gain Switching Time	Setting Range	Unit	Factory Default	Related Modes		
	0.0~1000.0	ms	3.0	P	-	-

Description:

Used to set the time required to switch from the 1st group gain to the 2nd group gain

P00.1E 3rd Group Gain Coefficient	Setting Range	Unit	Factory Default	Related Modes		
	10~1000	%	100	P	-	-

Description:

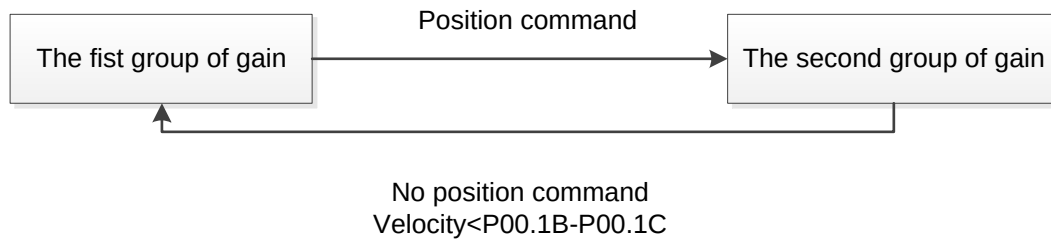
Used to set the amplification coefficient of the 3rd group gain to the 1st group gain when stopping.
It only amplifies the position proportional gain and velocity proportional gain

P00.1F 3rd Group Gain Switching Wait Time	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	0.1ms	0	P	-	-

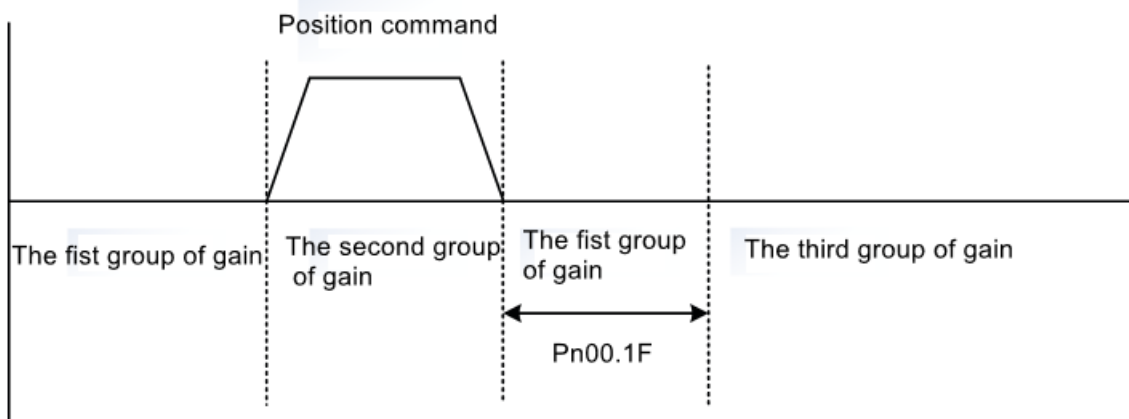
Description:

Used to set the hold time of the 1st group gain

When the gain switching mode selection is set to 3, the switching process is as shown in the following diagram.



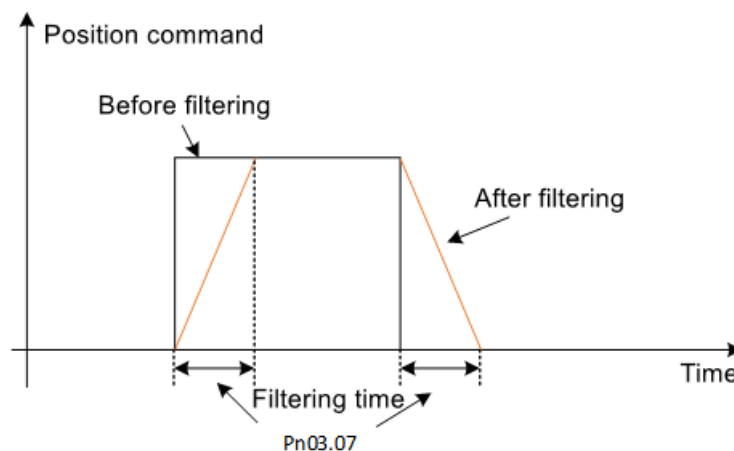
When the gain switching mode selection is set to 4, a new group of gains is introduced based on 3. The amplification factor P00.0E of the third group gain only applies to the position proportional gain and speed proportional gain of the first group gain. The velocity integral time and torque filtering coefficient remain consistent with the first group. The switching process is as shown in the following figure.



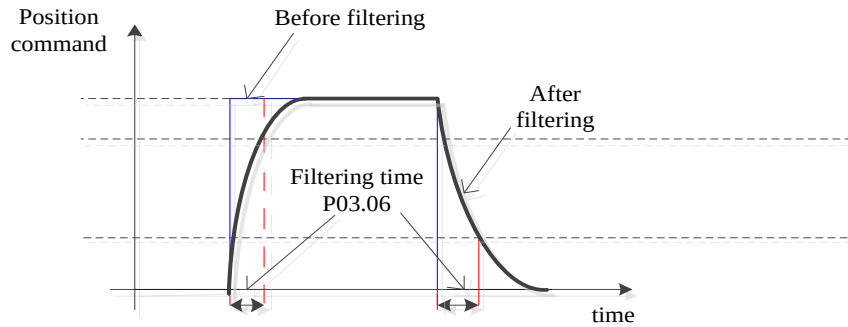
4.2.4.3 Command Filtering Function

During position control, if the command sent by the upper computer is too often, exceeding the overload capacity of the servo motor, or if the command from the upper computer fluctuates significantly, causing obvious starting shock sounds from the servo motor, it is necessary to filter the position command to ensure smooth servo startup, reduce the impact on the load, and decrease the servo load rate.

Position command smoothing filtering, when the filtering time is set, the change in position command is as shown in the following diagram.



The position command low-pass filter, when the filter time is set, significantly reduces the command variation during acceleration to maximum speed and deceleration to minimum speed, as shown in the figure below.



4.2.4.4 External Disturbance Suppression

4.2.4.4.1 Disturbance Observer

During the operation of a servo motor, if the load suddenly experiences external forces, it may cause velocity fluctuations in the servo motor, resulting in mechanical noise or vibration. To suppress this load fluctuation and reduce velocity fluctuations, a disturbance observer can be used. The adjustment function codes are as follows:

The torque disturbance observer is strongly correlated with inertia and requires accurate inertia identification.

P00.2E Torque Disturbance Observer Cut-off Frequency Adjustment Percentage	Setting Range	Unit	Factory Default	Related Modes		
	10~200	%	100	P	V	
Explanation: This setting adjusts the coefficient for adjusting the cut-off frequency of the torque disturbance compensation. A larger coefficient will result in faster compensation, but setting it too high may lead to oscillations.						

P00.2F Torque Disturbance Observer Inertia Compensation Coefficient	Setting Range	Unit	Factory Default	Related Modes		
	10~1000	%	100	P	V	
Explanation: This setting adjusts the coefficient for dynamic compensation of inertia in the torque disturbance observer. If the inertia is correctly set, it can be defaulted to 100%.						

P00.30 Torque Disturbance Observer Filtering Frequency	Setting Range	Unit	Factory Default	Related Modes		
	0.0~1000.0	Hz	0.0	P	V	
Explanation: This setting adjusts the compensation filtering frequency of the torque disturbance observer. When oscillations occur due to compensation, increasing the filtering frequency appropriately can help suppress the oscillations.						

P00.31 Torque Disturbance Observer Compensation Percentage	Setting Range	Unit	Factory Default	Related Modes		
	0~200	%	0	P	V	
Explanation: This setting adjusts the percentage of compensation for the torque disturbance observer. Setting it to 0 means that the torque disturbance compensation has no effect.						

4.2.4.4.2 Instantaneous Velocity Observation and Velocity Filtering

When the resolution of the motor encoder is low, increasing the loop gain may result in strong noise, and even mechanical vibration when fixed at the zero position. To suppress this noise, the speed feedback needs to be processed to reduce velocity fluctuations.

P00.20 Number of times the velocity feedback is filtered by moving average filter	Setting Range	Unit	Factory Default	Related Modes		
	0~5	-	0	P	S	T
Explanation: ◆ 0: No moving average filtering ◆ 1: moving average filtering for 2 times ◆ 2: moving average filtering for 4 times ◆ 3: moving average filtering for 8 times ◆ 4: moving average filtering for 16 times ◆ 5: moving average filtering for 32 times						

P00.21 Velocity Feedback Low-pass Filtering Cut-off Frequency	Setting Range	Unit	Factory Default	Related Modes		
	50~5000	Hz	5000	P	S	T
Explanation: When set to 5000, it has no filtering effect. The smaller the set value, the stronger the filtering effect.						

To address the noise caused by running encoder with low resolution and large encoder feedback delay, you can use a velocity feedback robust regulator to reduce noise and increase bandwidth.

	P00.0B Velocity Feedback Robust Enablement	Setting Range	Unit	Factory Default	Related Modes		
					P	S	T
		0~1	-	0			
Description: 0: Disable 1: Enable Default is the most basic M speed measurement, using a robust algorithm for speed measurement, which can effectively suppress noise caused by the encoder.							

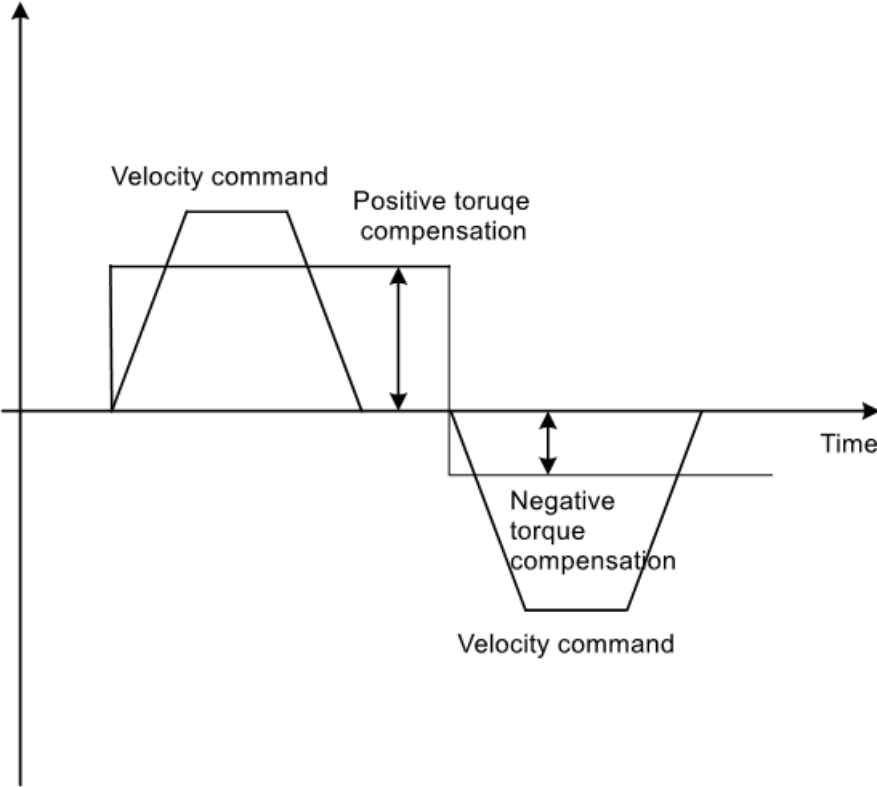
	P00.22 Velocity Feedback Robust Regulator Gain	Setting Range	Unit	Factory Default	Related Modes		
					P	S	T
		10~2000	Hz	60			
Description: Used to adjust the bandwidth of the velocity feedback regulator. Generally, adjust it within 50~200Hz.							

	P00.23 Velocity Feedback Robust Regulator Dynamic Coefficient	Setting Range	Unit	Factory Default	Related Modes		
					P	S	T
		10~10000	%	100			
Description: Accurate inertia identification is required, this parameter generally does not need to be changed.							

	P00.24 Velocity Feedback Robust Regulator Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
					P	S	T
		0.00~20.00	ms	0.40			
Description: This is the filtering time for velocity feedback measured by robust algorithm. Increasing the parameter can reduce noise, but it may cause delay and lead to vibration.							

4.2.4.4.3 Friction Compensation

Friction compensation is used to address the startup delay caused by frictional forces. By applying friction compensation, the servo motor can start quickly, reducing startup position deviation. The compensation method is shown in the following diagram.



The related function codes are set as follows:

	P01.1D Positive Friction Compensation	Setting Range	Unit	Factory Default	Related Modes		
		-100.0~100.0	%	0.0	P	S	-
Explanation: Positive direction rotation compensation value							

	P01.1E Negative Friction Compensation	Setting Range	Unit	Factory Default	Related Modes		
		-100.0~100.0	%	0	P	S	-
Explanation: Negative direction rotation compensation value							

5 Multi-turn Absolute Position

The drive uses a multi-turn absolute encoder to record the position of the motor, to prevent the loss of absolute position when power off. After powering on, the machine does not need to perform homing operation before motion, widely used in robotics, machine tools and other industries.

Precautions:

- ◆ To use this function, you need use encoder cable with battery, and the encoder of motor must be multi-turn absolute encoder.
- ◆ When modifying P02.01 (rotation direction setting) and F07 (absolute encoder reset operation), the absolute position of the encoder changes, resulting in a change in the mechanical absolute home position. Therefore it requires a mechanical homing operation. When using the drive internal homing feature, The absolute position deviation of the machine and the absolute position deviation of the encoder are automatically calculated . and the deviations are assigned to P02.5A and P02.5C and saved in EEPROM.

5.1 Usage of Absolute Encoder Battery Box

Absolute position mode requires the usage of encoder cable with battery box. It report Er.10.6(encoder battery failure) when the battery is connected at first time , you need to set the F07 to 2 to reset multi-turn position and reset fault, repower up the drive then perform absolute position operation.

If the Er.10.6 alarm can not be eliminated, please refer to trouble-shooting for this alarm code.

The encoder battery should be stored at the specified ambient temperature during storage, and ensure that the battery contact is reliable and the power is sufficient, otherwise it may result in loss of encoder position information.

5.2 Calculation method of Encoder Feedback Position

The parameters involved in the feedback position of the encoder are shown in the following table.

Function code	Name	Setting(display)range	Unit	Setting mode	Activate mode
U00.23	Number of encoder multi-turn	0~65535	-	Display	Real-time
U00.24	Encoder single-turn position	0~8388608	Encoder unit	Display	Real-time
U00.26	Low 32-bit of absolute position in encoder unit	0~4294967295	Encoder unit	Display	Real-time
U00.28	High 32-bit of absolute position in encoder unit	0~4294967295	Encoder unit	Display	Real-time

If the encoder resolution is R_E (for example: 2^{23}) , encoder absolute position is P_E , $P_E = U00.28 \times R_E + U00.26$

Record the number of multi-turn after homing, when $U00.23 < 32768$, $P_E = U00.23 \times R_E + U00.24$;

When $U00.23 \geq 32768$, the format of value of $U00.28 + U00.26$ is Two's Complement, need to be converted to

decimal. $P_E = -(2^{64} - U00.28 \times 2^{32} - U00.26)$; $P_E = (U00.23 - 65536) \times R_E + U00.24$.

5.3 Absolute Linear Mode

The absolute linear mode (P02.29=1) is primarily used in scenarios where the equipment load operates linearly and travel limit protection is not required. The parameters related to this mode are shown in the table below.

Function code	Name	Setting (display) range	Unit	Setting mode	Activate mode
P03.12	Numerator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P03.14	Denominator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P02.5A	Absolute position offset	-2147483648 ~2147483647	Encoder unit	stop	Real-time
P02.5C	High 32-bit of absolute position offset	-2147483648 ~2147483647	Encoder unit	Stop	Real-time
U00.07	Absolute position counting	-2147483648 ~2147483647	Command unit	Display	Real-time
U00.23	Number of encoder multi-turn	0~65535	-	Display	Real-time
U00.24	Encoder single-turn position	0~8388608	Encoder unit	Display	Real-time
U00.2A	Low 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time
U00.2C	High 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time

When $U00.2C < 2,147,483,648$, absolute mechanical position $P_M = U00.2C \times 2^{32} + U00.2A$

When $U00.2C \geq 2,147,483,648$, absolute mechanical position $P_M = -(2^{64} - U00.2C \times 2^{32} - U00.2A)$

Encoder absolute position P_E , absolute position offset(P02.5A and P02.5C) is P_o , $P_M = P_E - P_o$ (The number of turns does not change from 32767 to 32768 during forward rotation or from 32768 to 32767 during reverse rotation)

Absolute position counter(U00.07) Indicates the current absolute position of the mechanism(in encoder unit), absolute position counter(U00.07) $\times$ Electronic gear ratio = P_M

Among them, electronic gear ratio=numerator of the first electronic gear ratio / Denominator of the first electronic gear ratio

This mode disable multi-turn overflow alarm.

Function code	Name	Setting (Display) Range	Unit	Factory default	Setting mode	Activate mode
P0B.03	Multi-turn encoder overflow alarm enablement	0: Enable 1: Disable	-	0	Stop	Real-time

5.4 Absolute Rotary Mode

Absolute rotary mode (P02.29=2) is primary used in the scenarios where the travel range of the equipment load is not restricted. The parameters related to this mode are listed in the table below.

Function code	Name	Setting (display) range	Unit	Setting mode	Activate mode
P03.12	Numerator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P03.14	Denominator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P02.5A	Absolute position offset	-2147483648~2147483647	Encoder unit	Stop	Real-time
P02.5C	High 32-bit of absolute position offset	-2147483648~2147483647	Encoder unit	Stop	Real-time
U00.07	Absolute position counting	-2147483648~2147483647	Command unit	Display	Real-time
U00.23	Number of encoder multi-turn	0~65535	-	Display	Real-time
U00.24	Encoder single-turn position	0~8388608	Encoder unit	Display	Real-time

Function code	Name	Setting (display) range	Unit	Setting mode	Activate mode
U00.2A	Low 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time
U00.2C	High 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time
U00.32	Rotary load single -turn position	-	Command unit	Display	Real-time
P02.2A	Numerator of mechanical load gear ratio	1~65535	-	Stop	Real-time
P02.2B	Denominator of mechanical load gear ratio	1~65535	-	Stop	Real-time

If the resolution of encoder is R_E ($R_E = 2^{23}$), the value range of rotary load single-turn position(in command unit, U00.32) is $0 \sim [R_E / (\text{Numerator of the first electronic gear ratio} / \text{Denominator of the first electronic gear ratio}) \times (\text{Numerator of mechanical load gear ratio} / \text{Denominator of mechanical load gear ratio})]$

Rotary load single-turn position(in encoder unit)= rotary load single-turn position (in command uni, U00.32) $\times$ (numerator of the first electronic gear ratio / denominator of the first electronic gear ratio)

Absolute mechanical position $P_M = (U00.2C \times 2^{32} + U00.2A)$

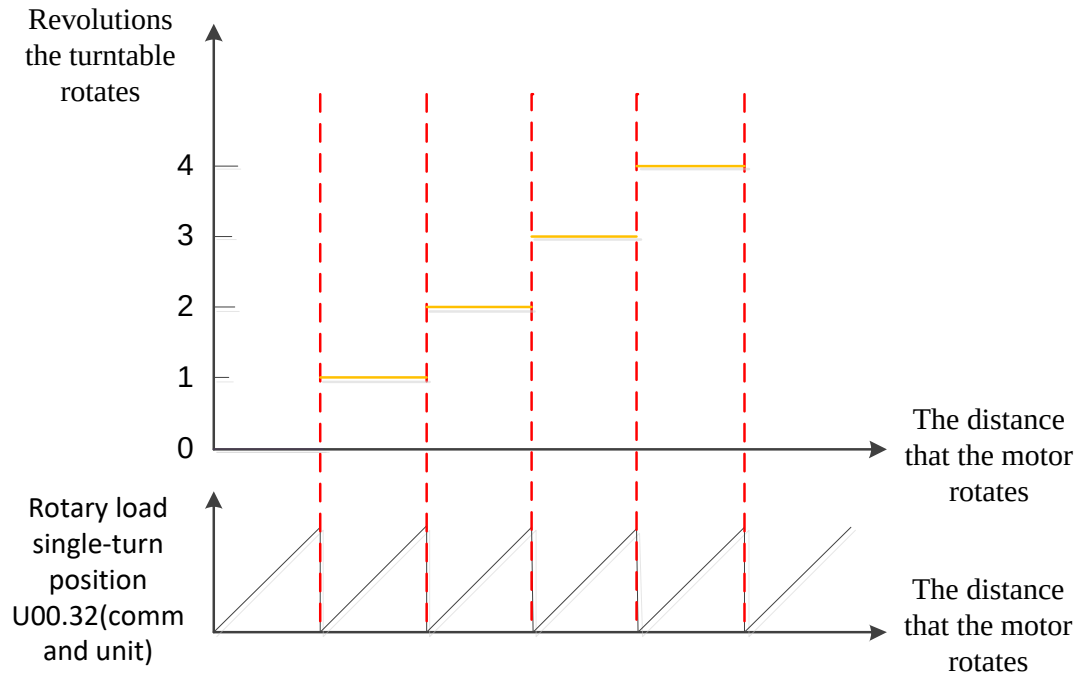
$P_M = \text{Rotary load single-turn position(in encoder unit)} + \text{the number of revolutions of the turntable} \times \text{The number of pulses corresponding to one revolution of the rotary load } R_M$

$R_M = R_E \times (\text{numerator of mechanical load gear ratio} / \text{denominator of mechanical load gear ratio})$

Absolute position counter(U00.07) = $P_M / \text{numerator of the first electronic gear ratio} \times \text{denominator of the first electronic gear ratio}$

In absolute position rotation mode, the multi-turn data range is unlimited, and the Er10.8 alarm (encoder multi-turn count overflow fault) is disabled.

The relationship between the single-turn position of the rotary load and the number of revolutions of the turntable is shown in the figure below.



5.5 Linear Mode

linear mode(P02.29=3)is mainly used in scenarios with limited travel or requiring positioning protection. The parameters related to this mode are shown in the table below.

Function code	Name	Setting (display) range	Unit	Setting mode	Activate mode
P03.12	Numerator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P03.14	Denominator of the first electronic gear ratio	0~1073741824	-	Any	Real-time
P02.5A	Absolute position offset	-2147483648 ~2147483647	Encoder unit	stop	Real-time
P02.5C	High 32-bit of absolute position offset	-2147483648 ~2147483647	Encoder unit	Stop	Real-time
U00.07	Absolute position counting	-2147483648 ~2147483647	Command unit	Display	Real-time
U00.23	Number of encoder multi-turn	0~65535	-	Display	Real-time
U00.24	Encoder single-turn position	0~8388608	Encoder unit	Display	Real-time

Function code	Name	Setting (display) range	Unit	Setting mode	Activate mode
U00.2A	Low 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time
U00.2C	High 32-bit of absolute mechanical position	0~4294967295	Encoder unit	Display	Real-time

When $U00.2C < 2,147,483,648$, absolute mechanical position $P_M = U00.2C \times 2^{32} + U00.2A$

When $U00.2C \geq 2,147,483,648$, absolute mechanical position $P_M = -(2^{64} - U00.2C \times 2^{32} - U00.2A)$

Encoder absolute position P_E , absolute position offset(P02.5A and P02.5C) is P_o , $P_M = P_E - P_o$ (The number of turns does not change from 32767 to 32768 during forward rotation or from 32768 to 32767 during reverse rotation)

Absolute position counter(U00.07) Indicates the current absolute position of the mechanism(in encoder unit), absolute position counter(U00.07) $\times$ Electronic gear ratio = P_M

Among them, electronic gear ratio = numerator of the first electronic gear ratio / denominator of the first electronic gear ratio

In linear mode, the actual value range for the encoder's multi-turn data is -32768 to 32767. This means that if the number of turns (U00.23) during forward rotation increases by more than 32767 turns compared to that when homing, or decreases by more than 32768 turns during reverse rotation compared to that when homing, a fault Er.10.8 (encoder multi-turn count overflow fault) will be triggered.

5.6 Configuration Method

Step 1. Select operation mode of absolute encoder through P02.29(Select according to the actual application scenario).

Function code	Name	Setting range	Unit	Factory default	Setting mode	Activate mode
P02.29	Operation mode of absolute encoder	◆ 0: Incremental mode ◆ 1: Absolute linear mode ◆ 2: Absolute rotary mode ◆ 3: linear mode	-	0	Any	Restart

Step 2. Set F07 to 2 to reset multi-turn value and fault, restart the drive(After the operation is completed, errors such as Er.10.6, Er.10.7, and Er.10.8 may be displayed. Simply perform step 2 again to resolve the issue).

Function code	Name	Setting range	Unit	Factory Default	Setting mode	Activate mode
F07	Reset operation of absolute encoder	◆ 0: Disable ◆ 1: Reset fault ◆ 2: Reset multi-turn value and fault ◆ 3: Operate fails (When the value is set to 1 or 2, the parameter will automatically reset to 0 after a successful reset; otherwise, it will be set to 3)	-	0	Stop	Real-time

Step 3. After performing the reset operation for the encoder's multi-turn value, the absolute position of the encoder will change, and a homing operation is required(Please refer to [Position Control in Homing Mode](#)).

6 Communication Protocol

The MSD-PULSE-01 series rotary pulse servo drive supports Modbus RTU serial communication, adopting the RS-485 and RS-232 hardware interface standards. The communication function enables reading and modifying the servo drive's parameters. Both RS-485 and RS-232 communication functions can be used simultaneously.

The RS-485 interface is CN8. Please refer to the *MSD-PULSE-01 Series Rotary Pulse Servo Drive Installation Guide* for wiring methods.

The RS-232 interface is CN2. Please refer to the *MSD-PULSE-01 Series Rotary Pulse Servo Drive Installation Guide* for wiring methods. You can use a USB Type-C cable to connect to a PC.

Modbus-related function settings

P08.00 RS485 Communication Station Number Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~127	1	1	P	S	T
Explanation: When using RS-232/RS-485 communication, only one station number can be set for a servo drives. Setting the same station number repeatedly will result in communication failure.						

P08.01 RS485 Communication Baud Rate Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~6	-	6	P	S	T
Explanation: ◆ 0: 2400 ◆ 1: 4800 ◆ 2: 9600 ◆ 3: 19200 ◆ 4: 38400 ◆ 5: 57600 ◆ 6: 115200						

P08.02 RS485 Communication Data Format	Setting Range	Unit	Factory Default	Related Modes		
	0~3	-	3	P	S	T
Explanation: Must match the communication format of the host computer. ◆ 0: No parity, 2 stop bits ◆ 1: Even parity, 1 stop bit ◆ 2: Odd parity, 1 stop bit ◆ 3: No parity, 1 stop bit						

	P08.0A RS232 Communication Baud Rate Setting	Setting Range	Unit	Factory Default	Related Modes		
		0~1	-	1	P	S	T
Explanation:							
◆ 0: 115200							
◆ 1: 750000							

	P08.0F EEPROM storage prohibited	Setting Range	Unit	Factory Default	Related Modes		
		0~0xFFFF	-	1	P	S	T
Explanation: ◆ 0: Parameters are allowed to save to EEPROM during RS485 communication ◆ 1: Parameters are prohibited to save to EEPROM during RS485 communication Since EEPROM storage has a limited number of writing and reading, it is recommended to set this parameter to 1 when parameters (function codes) are frequently read or written during communication. No need to change if reads and writes are infrequent. This parameter setting does not affect panel settings.							

6.1 Modbus Communication Protocol

RTU (Remote Terminal Unit) mode in Modbus communication begins with a start signal and ends with another stop signal. Between these signals, there are communication addresses, function codes, data content, error checking such as CRC (Cyclical Redundancy Check), and more.

RTU mode:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Communication address, length of 1 byte
Function	Function code, length of 1 byte
Data (0)	Data content, length of 2n byte (n≤10)
.....	
Data (n-1)	
CRC	Error checking, length of 1 byte
End	Static signal beyond 10ms

6.2 RTU Function Command

6.2.1 Function: 0x03 Read Function Code

Taking Function Code P04.10 as an example with station number 1:

Master station sends:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Station number: 0x01
Function	Function: 0x03
Data (0)	Starting address group number: 0x04
Data (1)	Starting address offset: 0x10
Data (2) (word)	High byte of the number of read function codes: 0x00
Data (3) (word)	Low byte of the number of read function codes: 0x01
CRC Check Low	0x84
CRC Check High	0xFF
End	Static signal beyond 10ms

Slave station responds:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Station number: 0x01
Function	Function: 0x03
Data Type (byte)	Data: 0x02
Data (0)	Address offset: 0x17
Data (1)	Starting data low byte: 0x70
CRC Check Low	0xB6
CRC Check High	0x50
End	Static signal beyond 10ms

Frame sent: 01 03 04 10 00 01 84 FF

Response frame: 01 03 02 17 70 B6 50

6.2.2 Function: 0x06 Write Function Code

For example, write a 16-bit function code P02.19 value of 300 with station number 1. This function cannot write a 32-bit function code.

Master station sends:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Station number: 0x01
Function	Function: 0x06
Data (0)	Address group number: 0x02
Data (1)	Address offset: 0x19
Data (2)	High byte of the written function code value: 0x01
Data (3)	Low byte of the written function code value: 0x2C
CRC Check Low	0x59
CRC Check High	0xF8
End	Static signal beyond 10ms

Slave station responds:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Station number: 0x01
Function	Function: 0x06
Data (0)	Address group number: 0x02
Data (1)	Address offset: 0x19
Data (2)	High byte of the written function code value: 0x01
Data (3)	Low byte of the written function code value: 0x2C
CRC Check Low	0x59
CRC Check High	0xF8
End	Static signal beyond 10ms

Frame sent: 01 06 02 19 01 2C 59 F8

Response frame: 01 06 02 19 01 2C 59 F8

6.2.3 Function: 0x10 Write 32-bit Function Code

For example, with station number 1, writing a 32-bit function code P03.12 with a value of 1048576. This function cannot be used to write 16-bit function codes.

Master station sends:

Parameters	Explanation
start	Static signal beyond 10ms

Parameters	Explanation
Slave Address	Station number: 0x01
Function	Function: 0x10
Data (0)	Address group number: 0x03
Data (1)	Address offset: 0x12
Data (2)	High byte of the written function code value (word): 0x00
Data (3)	Low byte of the written function code value (word): 0x02
Data (4)	Low byte of the number of bytes to write (word): 0x04
Data (5)	Value of bit 8 to bit 15 of the function code: 0x00
Data (6)	Value of bit 0 to bit 7 of the function code: 0x00
Data (7)	Value of bit 24 to bit 31 of the function code: 0x00
Data (8)	Value of bit 16 to bit 23 of the function code: 0x10
CRC Check Low	0x66
CRC Check High	0x46
End	Static signal beyond 10ms

Slave station responds:

Parameters	Explanation
start	Static signal beyond 10ms
Slave Address	Station number: 0x01
Function	Function: 0x10
Data (0)	Address group number: 0x03
Data (1)	Address offset: 0x12
Data (2)	High byte of the number of function codes to be written: 0x00
Data (3)	Low byte of the number of function codes to be written: 0x02
CRC Check Low	0xE1
CRC Check High	0x89
End	Static signal beyond 10ms

Frame sent: 01 10 03 12 00 02 0400 00 00 10 66 46

Response frame: 01 10 03 12 00 02 E1 89

6.3 Modbus Function Code Communication Address

For the function code parameter Pxx.YY, xx represents the starting address group number, and YY represents the starting address offset. The corresponding basic Modbus address is 0xxxYY (hexadecimal xxYY).

- ◆ For P00.YY, the corresponding Modbus address: the starting address group number is 0x00, and the starting address offset is 0xYY.
- ◆ For P01.YY, the corresponding Modbus address: the starting address group number is 0x01, and the starting address offset is 0xYY..
- ◆ For P02.YY, the corresponding Modbus address: the starting address group number is 0x02, and the starting address offset is 0xYY.
- ◆ For P03.YY, the corresponding Modbus address: the starting address group number is 0x03, and the starting address offset is 0xYY.
- ◆ For P04.YY, the corresponding Modbus address: the starting address group number is 0x04, and the starting address offset is 0xYY.
- ◆ For P05.YY, the corresponding Modbus address: the starting address group number is 0x05, and the starting address offset is 0xYY.
- ◆ For P06.YY, the corresponding Modbus address: the starting address group number is 0x06, and the starting address offset is 0xYY.
- ◆ For P07.YY, the corresponding Modbus address: the starting address group number is 0x07, and the starting address offset is 0xYY.
- ◆ For P08.YY, the corresponding Modbus address: the starting address group number is 0x08, and the starting address offset is 0xYY.
- ◆ For P0B.YY, the corresponding Modbus address: the starting address group number is 0x0B, and the starting address offset is 0xYY.
- ◆ For P0F.YY, the corresponding Modbus address: the starting address group number is 0x0F, and the starting address offset is 0xYY
- ◆ For P10.YY, the corresponding Modbus address: the starting address group number is 0x10, and the starting address offset is 0xYY
- ◆ For P11.YY, the corresponding Modbus address: the starting address group number is 0x11, and the starting address offset is 0xYY

For example: P05.01, 0x05 is starting address group, 0x01 is starting address offset, the corresponding basic Modbus address is 0x501(hexadecimal 0501 is equal to decimal 1281)

For observing group function codes (read-only), the corresponding communication addresses are:

- ◆ Modbus address corresponding to U00.YY: starting address group is 0x1A, starting address offset is 0xYY. For example, read drive running time U00.1D, starting address group is 0x1A, starting address offset is 0x1D, basic Modbus address is 0x1A1D(hexadecimal 1A1D is equal to decimal 6685).
- ◆ Modbus address corresponding to U01.YY: starting address group is 0x1B, starting address offset is 0xYY. For example, encoder version U01.05, starting address group is 0x1B, starting address offset is 0x05.
- ◆ Modbus address corresponding to U02.YY: starting address group is 0x1C, starting address offset is 0xYY.

Modbus address corresponding to auxiliary function code FYY: starting address group is 0x1F, starting address offset is 0xYY.

7 Troubleshooting

Please refer to the table below for alarm information.

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
Er.01.0	Overvoltage	Resettable error (Fault 1 shutdown)	Power supply voltage is too high	Confirm the input power supply specification of the drive, use multimeters to measure the voltage between L1 and L2 or R, S, T. Ensure that the measured voltage of the drive with rated voltage 220V is 200V~240V, for drive with rated voltage 380V, the measured voltage is 380V~440V.	Replace power supply according to the power supply specification
			Power supply is not stable	Measure voltage of the input power supply to confirm whether there are large fluctuations in the input power supply	Optimize power quality: Power up the drive by using independent power supply, ensure that the drive input voltage and wiring is normal, if it still fails, replace the drive or return it to the factory for repair
			Shorter deceleration time, maximum brake energy exceeds absorbable value	High load rate, frequent positive and negative rotating, running too fast, frequent alarm during the deceleration process	1. Decrease running speed, increase acceleration and deceleration time 2. Increase smoothing coefficient 3. Add the proper brake resistor
			The resistance value of the external brake resistor is too large	Brake resistor is not hot	Replace the external brake resistance with the recommended resistance value
			The power of the external resistor is too small	Brake resistor is too hot	Replace external resistors with more power

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
Er.01.1	undervoltage	Resettable error (Fault 2 shutdown)	Power supply voltage is too low	Confirm the input power supply specification of the drive, use multimeters to measure the voltage between L1 and L2 or R, S, T. Ensure that the measured voltage of the drive with rated voltage 220V is 200V~240V, for drive with rated voltage 380V, the measured voltage is 380V~440V.	Replace or change power supply according to power supply specification
			Power supply is not stable	Measure voltage of the input power supply to confirm whether there are large fluctuations in the input power supply	Optimize power quality: Power up the drive by using independent power supply, ensure that the drive input voltage and wiring is normal, if it still fails, replace the drive or return it to the factory for repair
Er.01.2	Power failure	Resettable error (Fault 2 shutdown)	External power supply power off when servo is enabled. Or Servo is power off for short time during operating	1. Check wiring of L1, L2 or R, S, T 2. Check whether the connection of main circuit terminals is reliable	1. Increase power supply capacity 2. Replace power cable and connect to the main circuit power supply
Er.01.3	Power phase loss	Resettable error (Fault 2 shutdown)	External power supply powers off when servo is enabled	Confirm the input power supply specification of the drive, use multimeters to measure the voltage between L1 and L2 or R, S, T. Ensure that the measured voltage of the drive with rated voltage 220V is 200V~240V, for drive with rated voltage 380V, the measured	Optimize power supply quality, improve power supply capacity

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				voltage is 380V~440V.	
			Use single-phase 220V power supply to power up the drive of three-phase 220 V power supply	Check whether the wiring is reliable, the default value of P0B.06 is 0(detect AC input and disable phase loss alarm)	Set P0B.05 to 2 after ensuring that the wiring is reliable, do not detect AC input and disable phase loss alarm
Er.01.5	Phase sequence error	Non-resettable error (Fault 1 shutdown)	Motor power line U, V and W wiring error	Ensure that Motor power line U, V and W phase sequence is correct	Compare U, V, W on motor drawing with U, V, W terminal wiring
			Motor internal power line phase sequence anomaly	Verify that the power line U, V, W phase sequence are correct, but it still alarm, motor internal abnormalities	Replace the drive or return it to the factory for repair
Er.01.6	Control power undervoltage	Resettable error(Fault 2 shutdown)	Power supply voltage is too low	Confirm the input power supply specification of the drive, use multimeters to measure the voltage between L1 and L2C. Ensure that the measured voltage of the drive with rated voltage 220V is 200V~240V, for drive with rated voltage 380V, the measured voltage is 380V~440V.	Optimize power supply quality, improve power supply capacity
			L1C and L2C wiring error or control power error	Control power for drive with rated 220V requires 220 V input, Control power for drive with rated 380V requires 380 V input	Control power input is consistent with the specification of the drive ,or parallel to the main circuit power input terminal L1 and or R, S, and T
Er.02.0	Bus phase p	Non-resettable	Brake resistor overcurrent	Resistance of the brake resistor is too	1.Replace the resistor 2.Rewire

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	overcurrent	error (Fault 1 shutdown)		small or the brake resistor is shorted, remove the brake resistor, measure the resistance of resistor	
			Gain parameters are set incorrectly	Check whether there is jitter and noise during starting-up and operating	1.Motor parameters are set incorrectly, modify motor parameters 2.Gain is too large, decrease rigidity and gain appropriately
Er.02.1	Bus phase overcurrent	Non-resettable error (Fault 1 shutdown)	Brake resistor overcurrent	Resistance of the brake resistor is too small or the brake resistor is shorted, remove the brake resistor, measure the resistance of resistor	1.Replace the resistor 2.Rewire
			Gain parameters are set incorrectly	Check whether there is jitter and noise during starting-up and operating	1.Motor parameters are set incorrectly, modify motor parameters 2.Gain is too large, decrease rigidity and gain appropriately
Er.02.2	Phase U overcurrent	Non-resettable error (Fault 1 shutdown)	Poor contact in power cable	Check whether there is poor contact in power cable connected to the drive and motor	Compare the U, V W wiring with U, V, W wiring in motor drawing, secure the cable, re-plug
			The motor is in poor insulation	Shorted to ground(U, V, W is shorted to PE), disconnect power cable, measure the resistance between motor U,V,W and PE, it is MΩ level in normal state	The motor is in poor insulation, replace the motor
			Motor is burnout	Disconnect power cable, measure the resistance between U and V(U and W, V and W), check whether these three is balanced	Unbalanced winding, replace the motor
Er.02.3	Phase V	Non-	Poor contact in	Check whether there is	Compare the U, V W

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	overcurrent	resettable error (Fault 1 shutdown)	power cable	poor contact in power cable connected to the drive and motor	wiring with U, V, W wring in motor drawing, secure the cable, re-plug
			The motor is in poor insulation	Shorted to ground(U, V, W is shorted to PE), disconnect power cable, measure the resistance between motor U, V, W and PE, it is MΩ level in normal state	The motor is in poor insulation, replace the motor
			Motor is burnout	Disconnect power cable, measure the resistance between U and V(U and W, V and W), check whether these three is balanced	Unbalanced winding, replace the motor
Er.02.4	Shorted to ground	Non-resettable error (Fault 1 shutdown)	Power cable is shorted to ground	Disconnect the power cable, measure the resistance between U and PE(V and PE, W and PE),no resistance value can be measured in normal state	Wire again or replace power cable
			The motor is in poor insulation	Shorted to ground(U, V, W is shorted to PE), disconnect power cable, measure the resistance between motor U, V, W and PE, it is MΩ level in normal state	The motor is in poor insulation, replace the motor
			Drive failure	Power up after the drive disconnects the motor and power cable, still faulty	Replace the drive or return it to the factory for repair
Er.02.5	Discharge overcurrent	Non-resettable error (Fault 1 shutdown)	Brake resistor is shored	1.Check whether the wiring of brake resistor is normal 2.Remove the brake resistor, measure the resistance of the resistor, check whether	Use the brake resistance of the recommended specifications, ensure that the wiring of the resistor is right

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				it is consistent with the specification	
			Resistance of the brake resistor is too small	The recommended resistance value for brake resistance selection is not less than P19.18, the default brake resistance minimum	Ensure that the wiring is right, replace with the brake resistor with recommended resistance value
Er.02.7	Temperature of the drive is too high	Non-resettable error (Fault 2 shutdown)	Excessive ambient temperature or poor heat dissipation	Measure ambient temperature, check drive operating environment	Decrease ambient temperature, Increase heat dissipation space
			Frequent overload	View fault logs for frequent overloads alarm	Extended stop time, increase acceleration time, decrease average load rate
Er.02.8	Drive overload	Non-resettable error (Fault 1 shutdown)	Load rate of the drive is too high	Check for excessive friction or stuck	1.Increase smoothing coefficient 2.Decrease acceleration or deceleration or increase acceleration time or deceleration time 3.Reinstall machinery to eliminates installation problems
			Gain parameters is set incorrectly	1.Rigidity is too high 2.Resonance, jitter, noise of the motor	Adjust gain parameters
			Accelerate too often	1.Inertia of load is too large 2.High frequently high speed start and stop operation	1.Increase smoothing coefficient 2.Decrease acceleration or deceleration or increase acceleration time or deceleration time 3.If the load is undiminished, disable the alarm by setting parameter P0B.01 to 2 when it is confirmed that it will be stable for a

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
					long time
Er.02.9	Motor overload	Non-resettable error (Fault 1 shutdown)	Power cable U, V, W wiring anomaly	Alarm as soon as it runs, check for the correct power line U, V, W wiring	Wire the U, V, W according to the motor drawing
			Motor is stall	1.Disable the servo, release the brake, manually push the machine, check whether it is smooth 2.Reach mechanical limit	Exclude alarms caused by mechanical stuck
			Acceleration time or deceleration time is too short, frequent acceleration or deceleration operation or the inertia of the load is too large	Confirm servo motor cycle time and application conditions	1.The upper device adjusts the running curve, or increases the wait time, increases the smoothing coefficient, and reduces the average running current 2.When the motor is not hot, properly increase P0B.11(motor overload protection gain) 3.Replace with the drive and motor with more power
			Gain parameters is set incorrectly	1.Rigidity is too high 2.Resonance, jitter, noise of the motor	Adjust gain parameters
Er.02.A	Motor stall	Non-resettable error (Fault 1 shutdown)	Mechanical jamming	1.Disable the servo, release the brake, manually push the machine, check whether it is smooth 2.Release the brake of motor, manually push the machine, check whether it is smooth	Reinstall machine
			Power cable is broken	Check whether the wiring of power cable U, V, W is normal	Secure the power cable, re-plug , replace the cable
Er.02.B	PTC	Non-	PTC monitor	When you do not use	1.The upper device

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	motor temperature is too high	resettable error (Fault 1 shutdown)	enablement parameter is set incorrectly	the PTC feature, check if the PTC parameter is enabled incorrectly	adjusts the running curve, or increases the wait time, increases the smoothing coefficient, and reduces the average running current 2. Replace with the motor and drive with more power
			PTC alarm level Pn0B.0A is set incorrectly	Check PTC alarm level P0B.0A setting	Set P0B.0A to 0 (default value)
			External thermistor anomalies	1.Check if the wiring is correct 2.Check the pins for false welding abnormalities 3.Check if the thermistor specifications meet the requirements	2.3k Ohm is in the range of resistance corresponding to the response temperature $\pm 5^{\circ}\text{C}$
Er.02.D	Discharge resistor overload	Warning	Parameter is set incorrectly	1.Check if Brake resistance related parameters P02.21 ~ P02.26 is the set consistent with the actual resistance parameters 2.Resistor is not hot	Set P02.21~P02.26 refer to the specification of the resistor
			The resistance of the brake resistor is too small	1.Parameter is set to be consistent with the actual situation, alarm frequently 2.Resistor is too hot	Replace with the brake resistor with lager power
Er.02.E	Drive current zero drift is too high	Warning	Abnormal phase current sampling	-	Ask MX On Corporation technical support engineer for help

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
Er.04.0	Pulse input abnormalities	Non-resettable error (Fault 2 shutdown)	The frequency of pulses that the upper device sends is greater than 4M Hz	Check the frequency of the pulse that the upper device sends	1.Decrease the frequency of pulse that the upper device sends 2.Modify the number of pulse for per revolution or electronic gear ratio
			high-frequency interference	Check if the pulse input cable, shield cable and grounding is correct	Ensure that the pulse input cable is shielded twisted pair and grounded
Er.04.3	EEPROM read abnormality	Resettable error (Fault 2 shutdown)	Read or write function code too frequent	Check if the reading and writing function code is too frequent, if the restart still alarm can unplug the RS485 wiring reboot to confirm that it is related to the RS485 port, check the control program	1.Restart to reset alarm 2.Modify unreasonable control program, avoid reading or writing parameters too frequent 3.Set P08.0F to 1, do not write to EEPROM when modify parameters
			Reach the limit of reading and writing EEPROM	Frequently read and write function codes cause EEPROM life to run out, For the function code triggers the alarm, modify the function code via panel or debug software, after the restart, re-read to see if the function code is normal, to confirm that whether the hardware is abnormal	Replace the drive or return it to the factory for repair
Er.04.4	EEPROM write error	Resettable error (Fault 2 shutdown)	Read or write function code too frequently	Check if reading and writing function code too often, if still alarm after restart, unplug the RS485 cable then restart to check if it is related to RS485 port, check control program	1.Restart to reset alarm 2.Modify the unreasonable control program, avoid reading or writing parameters too often 3.Set P08.0F to 1, do not write to EEPROM when

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
					modify parameters
			Reach the limit of reading and writing EEPROM	Frequently read and write function codes cause EEPROM life to run out, For the function code triggers the alarm, modify the function code via panel or debug software, after the restart, re-read to see if the function code is normal, to confirm that whether the hardware is abnormal	Replace the drive or return it to factory for repair
Er.04.5	EEPROM abnormality	Resettable error (Fault 2 shutdown)	Read or write function code too frequently	Check if reading and writing function code too often, if still alarm after restart, unplug the RS485 cable then restart to check if it is related to RS485 port, check control program	1.Restart to reset alarm 2.Modify the unreasonable control program, avoid reading or writing parameters too often 3.Set P08.0F to 1, do not write to EEPROM when modify parameters
			Reach the limit of reading and writing EEPROM	Frequently read and write function codes cause EEPROM life to run out, For the function code triggers the alarm, modify the function code via panel or debug software, after the restart, re-read to see if the function code is normal, to confirm that whether the hardware is abnormal	Replace the drive or return it to factory for repair
Er.04.E	EEPROM write error	Resettable error (Fault 2)	Read or write function code too frequently	Check if reading and writing function code too often, if still alarm after restart, unplug	1.Restart to reset alarm 2.Modify the unreasonable control program, avoid reading

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
		shutdown)		the RS485 cable then restart to check if it is related to RS485 port, check control program	or writing parameters too often 3.Set P08.0F to 1, do not write to EEPROM when modify parameters
			Reach the limit of reading and writing EEPROM	Frequently read and write function codes cause EEPROM life to run out, For the function code triggers the alarm, modify the function code via panel or debug software, after the restart, re-read to see if the function code is normal, to confirm that whether the hardware is abnormal	Replace the drive or return it to factory for repair
Er.04.F	EEPROM read error	Resettable error (Fault 2 shutdown)	Read or write function code too frequently	Check if reading and writing function code too often, if still alarm after restart, unplug the RS485 cable then restart to check if it is related to RS485 port, check control program	1.Restart to reset alarm 2.Modify the unreasonable control program, avoid reading or writing parameters too often 3.Set P08.0F to 1, do not write to EEPROM when modify parameters
			Reach the limit of reading and writing EEPROM	Frequently read and write function codes cause EEPROM life to run out, For the function code triggers the alarm, modify the function code via panel or debug software, after the restart, re-read to see if the function code is normal, to confirm that whether the hardware is abnormal	Replace the drive or return it to factory for repair
A1.05.0	Positive over travel	Warning	Detect external (or software limit)	Check the state of positive limit sensor	Remove the machine from its current position

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
			positive over travel signal, the servo no longer responds to positive command	and logical state of the corresponding DI function terminal	after de-hazard
Al.05.1	Negative over travel	Warning	Detect external (or software limit) negative over travel signal, the servo no longer responds to negative command	Check the state of negative limit sensor and logical state of the corresponding DI function terminal	Remove the machine from its current position after de-hazard
Al.05.2	Emergency stop	Warning	Detect external stop signal	Check the logic state of the corresponding DI terminal	Reset DI terminal state after de-hazard
Er.05.3	Position deviation is too large	Non-resettable error (Fault 1 shutdown)	Input position command is too large	1.Use the MX On Corporation Servo Configuration software to capture running waveforms to see if there are abnormal mutations in command 2.Try Servo internal position mode operation to see if the same exception occurs	1.Decrease position command value that the upper device issues 2.Check the connection of encoder cables and power cables if the same abnormality occurs when operating in internal position mode
			Mechanical stuck	1.Disable the servo(release the brake of the motor that with brake), manually push the machine, check if it is smooth, if it is stuck 2.Check if it reach the mechanical limit during operation	Manually push the machine, remove from the current position
			Position deviation threshold is too small or gain is too small	Theoretical value of following position deviation=operating velocity/P00.04, for example, operating velocity is 1000mm/s, rigidity in level 12, P00.04 is 390,	1.The recommended setting is 20% larger than the theoretical value 2.Check if the unit of position deviation of P03.25 is set correctly

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				Theoretical value of following position deviation= $1000/390 \times 10 = 25.6\text{mm}$	(P03.25 = 2 ,P03.26 position deviation is mm)
Al.05.4	Homing timeout error	Warning	Homing timeout error, time for homing is more than the setting value of P03.35	1.Check if home position limit is normal 2.Check if P03.35 setting is proper	1.Check the wiring of home position limit ,ensure that the home position limit signal is normal 2.Increase P03.35 (home position seeking time) 3.Set P03.35 to 0, disable alarm
Er.05.5	Motor run-away	Non-resettable error (Fault shutdown) 1	Phase sequence error	Check if the wiring of power cable U, V, W is normal	Compare the U, V, W terminal with the U, V W terminal in motor drawing, secure the wire, re-plug
			Gain parameter is set incorrectly	Check the motor for resonance or jitter	Adjust parameters to eliminate resonance jitter
			False alarm	Gain is not adjusted, system vibration, may cause false alarm	Increase alarm threshold(P0B.13) appropriately
			Electrical angle loss	Servo System collision, The motor does remain at a fixed position whenever an alarm occurs	Perform angle identification
			Motor stall	The motor remains at a fixed position whenever an alarm occurs.	Inspect the mechanical structure to prevent jamming
Er.05.6	Overspeed	Non-resettable error (Fault shutdown) 1	Phase sequence error	Check if the wiring of power cable U, V, W is normal	Compare the U, V, W terminal with the U, V W terminal in motor drawing, secure the wire, re-plug
			Motor stuck	Machine is located at the fixed position when alarming	Check mechanical structure and installation, eliminate

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
					mechanical jamming cause motor stuck
			grating ruler feedback abnormality cause incorrect electric angle calculation	1.Check if the grating ruler feedback is normal, manually push the motor (servo is disabled) for specified distance, check if U00.09 feedback pulse is consistent with the actual distance 2.Check encoder feedback circuit, check if grating ruler indicator is normal, check if the wiring is normal(must use shielded twisted pair) 3.Adjust P19.24(feedback filtering) according to the feedback frequency of the grating ruler	1.Check wiring, re-install grating ruler to ensure that the wiring is correct 2.Use shielded twisted pair 3.Adjust P192.4 (feedback filtering)
Er.05.7	Servo enabled failure	Resettable error (Fault 2 shutdown)	Use multiple enablers at the same time	Check servo enabled via DI, Fn group function code setting, Servo enabled during jog, inertia identification, or two position operation	Cancel all servo enabled state or restore the parameter to default, only one servo enabled function is used
Er.05.8	Position command scheduling exception	Resettable error (Fault 1 shutdown)	High speed command are not supported by the software	-	Reset all function code,if it still abnormal after reset, ask MX On Corporation technical support engineer for help
Er.05.9	Internal and external loop deviation is too large in full-	Resettable error (Fault 1 shutdown)	After enabling full-closed loop, the difference between the expected value of full-closed loop feedback calculated by	1. Check P06.02(external encode resolution) 2. Set appropriate deviation range(P06.0V) 3.Check if external	1.Modify P06.02 according to external encoder resolution 2.Increase P06.0C(Maximum deviation between internal loop and

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	closed loop feature		P06.02 and the actual full-closed loop feedback value is more than P06.0C	encoder feedback signal is correct 4.Check if the direction of external encoder feedback is correct 5.Testing machinery for slippage	external loop encoder 3.Use shielded twisted pair cable 4.Re-connect, secure or plug communication cable of the external encoder 5.Re-install the external encoder
Er.05.A	Brake current is too large	Resettable error (Fault 1 shutdown)	Average load ratio is too large	Monitor U00.0E(average load ratio), check if the load ratio is too large or the motor specification is too small	Set P0B.24 to 0 to disable this alarm
			instantaneous load ratio is too large	Monitor U00.10 or samp Q axe current feedback waveform, check if there is abnormal rising current	Set P0B.27 to 0 to disable this alarm
Er.05.B	Position deviation overflow	Non-resettable error (Fault 1 shutdown)	Input position command is too large	1.Sample waveform by debug software, check the command for abnormal mutation 2.Try servo internal position mode to check if there is the same abnormality	1.Decrease position command from the upper device 2.If the same when operating in internal position mode, check encoder cable and power cable for the motor
			Mechanical jamming	1. Disable the servo(release brake for the motor with brake), manually push the machine, check if it is smoothing Check if the machine reach the mechanical limit position	Manually push the machine to remove from the current position
			Position deviation threshold is too small or gain is too small	Theoretical value of following position deviation=operating velocity/P00.04, for	1.The recommended setting is 20% larger than the theoretical value

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				example, operating velocity is 1000mm/s, rigidity in level 12, P00.04 is 390, Theoretical value of following position deviation= $1000/390*10=25.6\text{mm}$	2.Check if the unit of position deviation of P03.25 is set correctly (P03.25 = 2 ,P03.26 position deviation is mm)
Er.05.C	Discharge resistor is too small	Non-resettable error (Fault 1 shutdown)	P02.22or P02.24 setting value is less than P19.18 limit	View parameter setting via panel or debug software	1.Set the resistance of rake resistor P02.24 $\geq$ P19.81 2.Power of brake resistor P0.22 is too small, increase this parameter
Er.06.0	No corresponding drive	Non-resettable error (Fault 1 shutdown)	Drive parameter is abnormal	View P19.00 to check if it is the MX On Corporation drive model	1.Restore the parameter to factory state 2.Replace the drive
Er.06.1	No corresponding motor code	Non-resettable error (Fault 1 shutdown)	Motor code set by P18.02 does not exist	1.Check if the drive model is non-standard 2.View setting of the P18.02	1.Non-standard drive, confirm the motor model with the motor manufacturers, modify P18.02 2.For common model, need to set P18.02 to 0, manually enter the Pn18 group parameter
Er06.2	No corresponding encoder model	Non-resettable error (Fault 1 shutdown)	Encoder model set by P18.00 does not exist or is not supported by the drive	1.Check if the motor is the matched model 2.Check if the resolution of the motor encoder matches the drive	1.Use the motor model recommended by the manufacturer 2.motor with 23 bit resolution requires R3 series drive
Er06.3	Model is not set	Non-resettable error (Fault 1 shutdown)	Lack of drive model information	If it still faulty after restart, return it to factory for repair	Replace the drive or ask Flexm technical support engineer for help
Er.06.4	DI error	Resettable error	Different terminals DI are	Check if there is a duplicate parameter	Reassign DI terminal function

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
		(Fault 2 shutdown)	assigned the same function	setting in the DI terminal P04.04~P04.0A	
Er.06.5	Electronic gear ratio error	Resettable error (Fault 2 shutdown)	Electronic gear ratio is out of the setting range	Check if the setting of P03.12~P03.18 is out of the range of 0.0001~100000	Set electronic gear ratio correctly
Er.06.7	Frequency division setting error	Resettable error (Fault 2 shutdown)	Frequency division pulse for motor is larger than the resolution of the motor encoder	Resolution must be less than resolution that is supported by hardware, view setting of P02.03	Increase the setting value of P02.03
Er.06.9	Software limit setting error	Resettable error (Fault 2 shutdown)	Parameter is set incorrectly	Software upper limit(P03.23) is less than lower limit(P03.21)	Set P03.23 and P03.21 correctly
Er.06.A	Home position setting error	Resettable error (Fault 2 shutdown)	Parameter is set incorrectly	Mechanical home position offset(P03.36) is out of the range of software limit(the upper software limit P03.23, the lower software limit P03.21)	Set P03.36 correctly
Er.06.C	Multi-turn encoder is not supported	Resettable error (Fault 2 shutdown)	Parameter setting conflicts	P18.00 is set to single-turn, but P02.29 is set to enable absolute position	Set P18.00 correctly or set P02.29 to 0 to disable absolute position
Er.07.0	Angle identification failure	Resettable error (Fault 1 shutdown)	P02.3B=2(micro-motion method 1), motor mover does not move when searching for angle	1. Check if the wiring of power cable U, V, W is correct 2. Ensure that P18 parameters is right, especially number of motor pole number, pole distance and encoder resolution 3. Disable the servo, push manually the motor to ensure that feedback is right and feedback pulse matches the pushed	1 Check if the mover is stuck 2. Check if grating feedback is normal 3. Check if motor parameter is right, especially the P18.06(grating ruler resolution) 4. Check if the U, V, W wiring is normal. Set P02.3A to 1, set F03 to enable initial angle identification, if reported alarm Er.01.5,

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				distance 4. Check for external disturbances, including excessive friction, overriding hard limits, or loads drop down due to gravity, etc.	take corresponding measures
			P02.3B=3 (micro-motion method 2) Motor Kinematics Operating Distance Exceeds 90 Degrees (Electric Angle) on First Identification	1 Check if the motor is driven by external forces during identification 2. Check if grating feedback is abnormal 3. Ensure that the motor parameter is right 4. Check if the wiring of U, V W is normal, check for phase loss 5. Motor magnetic tension is not uniform, increasing the P0A.0C(threshold of micro-motion)	1 Check if motor is pushed by external force during identification 2. Check if grating feedback is abnormal. 3. Check if motor parameter is right, especially the P18.06(grating ruler resolution) 4. Check if the U,V W wiring is normal. Set P02.3A to 1, set F03 to enable initial angle identification, if reported alarm Er.01.5, take corresponding measures 5. Distance abnormality during identification action, try to adjust P02.3C, P02.3D, P02.42~P02.44 to optimize identification action
			P02.3B=4 (Hall identification) ,U nable to enter the enable state before running to find the HALL state; 6 HALL status has not been found for more than 16 seconds. Movement	1. Hall signal feedback abnormal, check if Hall signal feedback is abnormal via U00.39 2. Check if grating feedback is abnormal 3. check wiring of power cable U,V, W, check for phase loss 4. Can't get stuck near	P02.3F and P02.41 are set to 0, do not use the Hall function for one angle recognition, oscilloscope add channel "Hall status," "position feedback" and "electrical angle," manually push motor (Servo is disabled) or jog more than one point

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
			distance exceeds 2 poles	the hard limit during hall identification	period distance, Acquisition of waveforms to see if the Hall state is satisfied "in an electrical angle cycle, The motor moves an extreme distance of state 1 ~6 with a total of 6 Hall states. "If a state other than 1 ~ 6 appears or a state value is missing, then check the Hall wiring and check the P18 parameters
Er.07.1	Angle identification failure 1	Resettable error (Fault 1 shutdown)	1、 P02.38 = 1, The action distance exceeds 90 degrees at the second repeat recognition (The micro-motion action distance should be very small, and the action distance exceeds 90 degrees, exceeds 1/4 pole) 2、 P02.38 = 1, the difference between the two repeated identification results exceeds the P02.37 allowable error value;; 3、 Do not detect stop over 2s during micro-motion identification	1 Check if the motor is pushed by external force during identification 2.Check if grating feedback is abnormal 3.Check if motor parameters is correct 4.Check if the wiring of U, V , W is correct, check for phase loss	1.Uneven motor magnetic tension, increase P02.3C(threshold of angle for angle identification micro-motion)。 2.Increase P02.3D (threshold for stop)
Er.07.2	Angle identification failure 2	Resettable error (Fault 1 shutdown)	P02.3B = 3, the identification failed, the micro-motion method repeated recognition, the	Check motor kinematics for external disturbances such as cable pulling, need to be eliminated	Increase P02.3C (micro-motion threshold), Avoid possible misjudgment of external disturbances during identification

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
			difference of the electric angle set in two identification action is more than 70 degree		
Er.07.3	Offline inertia identification failure	Resettable error (Fault 2 shutdown)	U、V、W wiring error	1.Check if the power cable is connected correctly 2.Check for phase sequence for power cable 3.Check power cable for damage	Compare the U,V, W terminals with the U, V, W terminals in motor drawing, secure the cable, re-plug
			Mechanical jamming	1.For motor without brake, manually rotate the machine, check if it is smoothing 2.For motor with brake, release the brake, manually push the machine, check if it is smoothing	Manually push the machine, remove from the current position
Er.07.4	Stuck during angle identification	Resettable error (Fault 1 shutdown)	Motor movements are small or inactive	Check if the motor mover is stuck	Reinstall the machine
				Check if grating is abnormal, manually push the motor to move a specified distance(servo is disabled), view U00.09 (encoder feedback pulse counting) is normal	Wire correctly, replace grating
				Check if P18.06(grating ruler resolution) is normal	Set P18.06 correctly
Er.09.1	ESI check error	Resettable error (Fault 1 shutdown)	Slave station configuration information in ESC EEPROM check error	-	Restart, if still alarm, ask MX On Corporation technical support engineer for help
Er.09.2	ESI file	Non-	ESI file not burned	-	Restart, if still alarm,

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	not burned	resettable error (Fault 1 shutdown)			ask MX On Corporation technical support engineer for help
Er.09.3	ESC EEPROM read or write timeout	Non-resettable error (Fault 1 shutdown)	ESC EEPROM read or write timeout	-	Restart, if still alarm, replace the drive
Er.09.9	Check error on data writing in ESC EEPROM	Non-resettable error (Fault 1 shutdown)	ESC EEPROM write check error	-	Restart, if still alarm, replace the drive
Al.0C.0	Parameter s take effect after restart	Warning	The parameters set take effect after restart	Set the parameters that takes effective after restart	Restart the drive
Al.0C.2	Power supply phase loss	Warning	L1 and L2, or R, S, and T input power supply phase loss	Check if external power supply has phase loss	1.Connect power cable correctly 2.Set P0B.05 to 2 to disable this alarm when specification of external power supply and wiring is normal
Al.0C.3	Homing parameter s setting error	Warning	Homing method is not effective	View the homing methods that are supported by the drive	Check wiring of home position and limit position, set home position, limit position, and state correctly
			Respond to limit switch abnormally during homing	Home position switch, positive limit and negative limit, two or more among the three are triggered at the same time	Rewire , reinstall grating ruler or set the parameters correctly
Al.0C.4	Quadrature encoder feedback interference alarm	Warning	Feedback interference or grating ruler abnormality	1.Check encoder feedback circuit, ensure that grating ruler indicator is normal 2.Wiring	Rewire, reinstall grating ruler or reset parameters

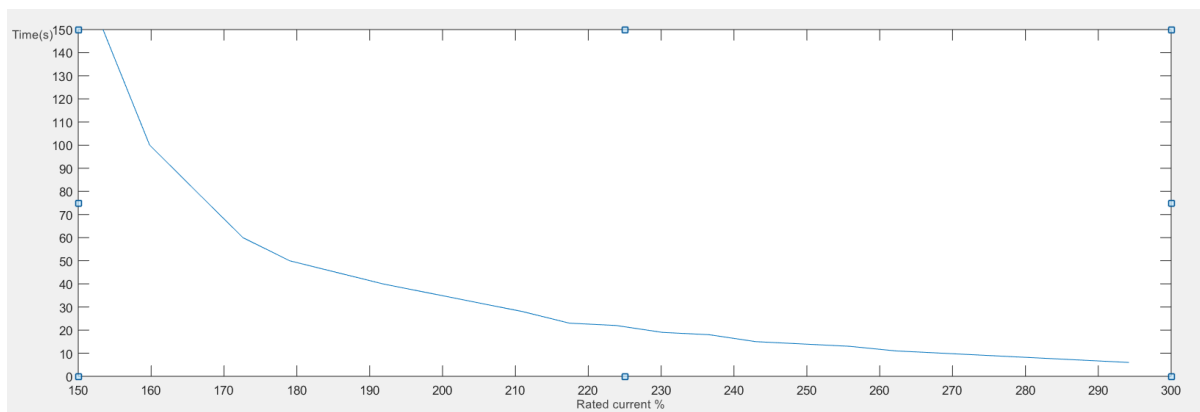
Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
				correctly(must use shielded twisted pair)	
Al.0C.6	External battery of the encoder is undervoltage	Warning	Battery voltage is lower than 2.5V	1.Check if the absolute position is enabled while not using battery 2.Check if the external battery wire of the encoder is normal 3.Remove the battery, measure the voltage of the battery, check if it is lower than 2.5V	Replace the battery, battery box or cable with battery box
Er.10.0	Encoder is disconnected	Non-resettable error (Fault 1 shutdown)	Drive is disconnected with the the encoder at the moment that the drive is powered up	1.Check if P18.00 is set correctly 2.Check if the wiring of encoder is correct	Reset parameter, rewire, if it still alarm after restart, replace the motor
Er.10.1	Encoder parameter error	Non-resettable error (Fault 1 shutdown)	Data check error or parameter is not saved to the motor EEPROM	Non-standard motor not match the drive	If it still alarm after restart, replace the motor
Er.10.2	Encoder communication failure	Non-resettable error (Fault 1 shutdown)	Drive communicate with the motor encoder normally, the communication is suddenly disconnected	1.Check if P18.00 is set correctly 2.Check if the wiring of encoder is normal	Reset the parameter, rewire, if it still alarm after restart, replace the motor
Er.10.3	Encoder calculate incorrectly	Non-resettable error (Fault 1 shutdown)	Bus encoder itself alarm	1.Check if P18.00 is set correctly 2.Check if the wiring of the encoder is correct, generally contaminated with optical encoder disk, causing the encoder to calculate incorrectly	Reset parameters, rewire, if it still alarm after restart, replace the motor
Er.10.4	Encoder increment al-counting	Non-resettable error (Fault 1)	P18.00 is set incorrectly or wiring of the encoder is	1.Check if P18.00 is set correctly 2.Check if the wiring of the encoder is	Reset parameter, rewire, if it still alarm after restart, replace the motor

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	abnormality	shutdown)	incorrect	correct	
Er.10.5	Encoder parameter's write error	Non-resettable error (Fault 1 shutdown)	P18.00 is set incorrectly or wiring of the encoder is incorrect	1.Check if P18.00 is set correctly 2.Check if the wiring of the encoder is correct	Reset parameter, rewire, if it still alarm after restart, replace the motor
Er.10.6	Encoder battery is ineffective	Non-resettable error (Fault 1 shutdown)	The drive switches from incremental mode to absolute mode	Normal alarm prompt after the switching	Set F07 to 1 to reset fault, restart the drive or perform software reset via servo commissioning software
			The voltage of battery is lower than 2.5V	Remove the battery, measure the voltage of the battery, check if it is lower than 2.5V	After replacing the battery, set F07 to 1 to reset fault, restart the drive or perform software reset via servo commissioning software
			External wire of the battery is disconnected	It still alarm after using F07 to reset fault	Re-welding, re-plug motor side encoder cable or replace encoder cable, battery box
Er.10.7	Encoder multi-turn counting error	Non-resettable error (Fault 1 shutdown)	Motor hardware failure	Code disk dirt, etc.	Set F07 to 1 to reset fault, restart the drive or perform software reset via servo commissioning software
Er.10.8	Encoder multi-turn counting overflow	Non-resettable error (Fault 1 shutdown)	Chip of encoder counting overflow	Drive get abnormal multi-turn data from the encoder, check if U002.3 and U00.24 are normal, disable this alarm by setting P0B.03 to 1	Set F07 to 1 to reset fault, restart the drive or perform software reset via servo commissioning software
Er.12.0	FPGA burn	Non-resettable error (Fault 1 shutdown)	FPGA fault	It still alarm after restart	Replace the drive or ask the MX On Corporation technical support engineer for help
Er12.2	Function code abnormality	Non-resettable error	Parameters of P00 group to P17 group exceed the limit	View U00.3E and U00.3F(address of abnormal parameter function code that	1.Modify the function code according to the address

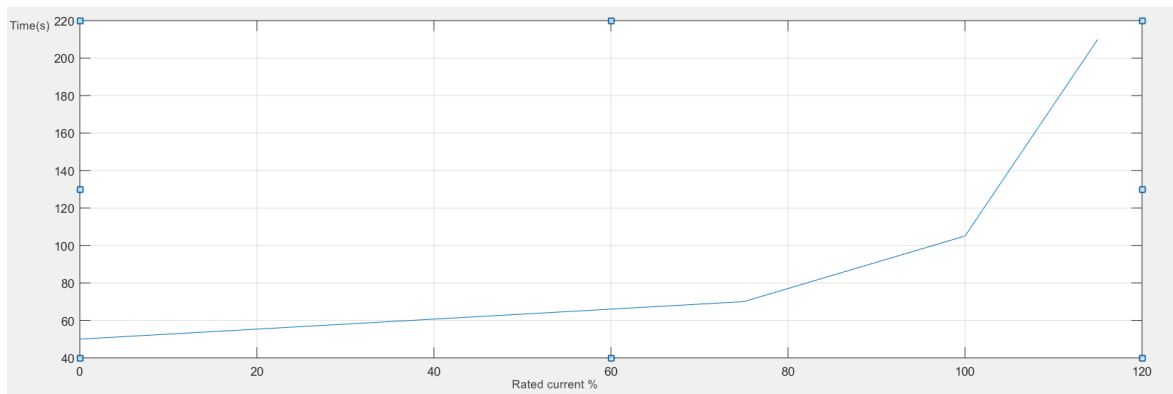
Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
	y	(Fault 1 shutdown)		exceed the limit)	2.Set F04 to 1 to reset function code in group P00 to group P17(firstly save the configuration file), restart the drive
Er.12.3	Manufacture parameter abnormality	Non-resettable error (Fault 1 shutdown)	Parameters in group P18 and P19 exceed the limit	View U00.3E and U00.3F(address of abnormal parameter function code that exceed the limit)	1.Modify the function code according to the address 2.Set F04 to 4 to restore to the factory state(firstly save the configuration file), restart the drive
Er.12.4	EEPROM storage range exceed the limit	Non-resettable error (Fault 1 shutdown)	EEPROM storage range exceed the limit	It still alarm after restart	Replace the drive or ask MX On Corporation technical support engineer for help
Er.12.6	Encryption chip abnormality	Non-resettable error (Fault 1 shutdown)	Encryption chip hardware failure	It still alarm after restart	Replace the drive or ask MX On Corporation technical support engineer for help
Er.12.8	MCU loss	Non-resettable error (Fault 1 shutdown)	Drive internal software program fault	It still alarm after restart	Replace the drive or ask MX On Corporation technical support engineer for help
Er.12.9	System parameter abnormality/FPGA parallel port error	Non-resettable error (Fault 1 shutdown)	The FPGA is not working properly	1.St F10 to 1 to reload FPGA FLASH(load file for about 100s, wait for the drive to automatically restart) 2.Burn the program again	Replace the drive or ask MX On Corporation technical support engineer for help
Er.12.A	Current sampling timeout	Non-resettable error (Fault 1 shutdown)	Internal current sampling chip fault	It still alarm after restart	Replace the drive or ask MX On Corporation technical support engineer for help
Er.12.B	Encoder timeout	Non-resettable	Motor hardware failure	It still alarm after restart	Replace the drive or ask MX On Corporation

Alarm code	Alarm name	Alarm type	Cause of failure	Troubleshooting Procedures	Failure Remediation Actions
		error (Fault 1 shutdown)			technical support engineer for help
Er.12.C	FPGA timeout	Non-resettable error (Fault 1 shutdown)	FPGA failure	It still alarm after restart	Replace the drive or ask MX On Corporation technical support engineer for help

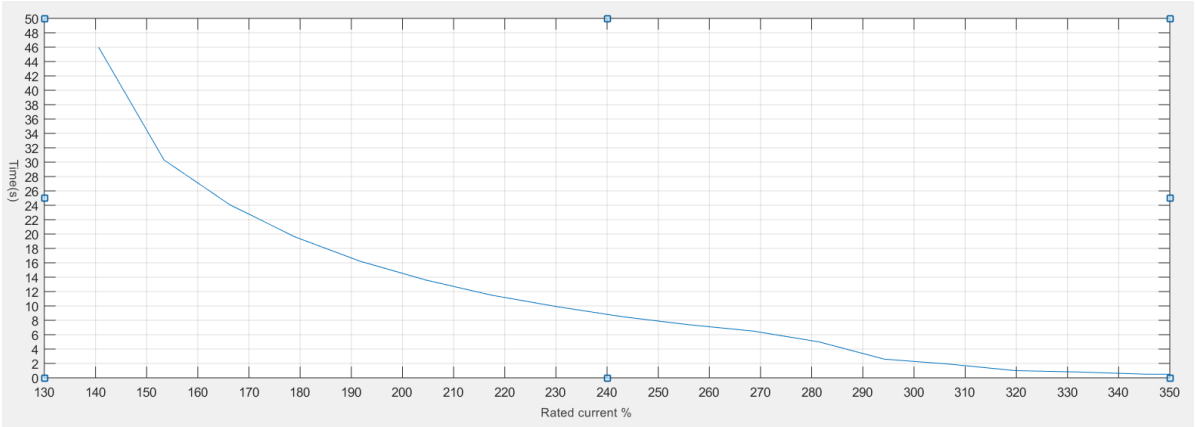
The motor overload protection time is as shown in the following figure. (When alarm ER.02.9 occurs, if the motor heating is not severe, P0B.11 can be adjusted appropriately).



The motor cooling time is as follows.



The overload time for the drive (400W~750W) is as shown in the following figure.



8 Function Code

8.1 P00 Gain Adjustment Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P00	00	Gain adjustment Mode Selection	0: Manual gain adjustment 1: Use of rigidity table 2: Positioning mode	-	1	Any	Real-time	U16
P00	01	Automatically Adjust Mechanical Rigidity Settings	0~31	-	11	Any	Real-time	U16
P00	02	1st Velocity Loop Gain	0.0~2000.0	Hz	18.0	Any	Real-time	U16
P00	03	1st Velocity Loop Integral Time	0.15~512.00	ms	31.00	Any	Real-time	U16
P00	04	1st Position Loop Gain	0.0~2000.0	Hz	32.0	Any	Real-time	U16
P00	05	1st Torque Command Filtering Time Constant	0.00~30.00	ms	1.26	Any	Real-time	U16
P00	06	2nd Velocity Loop Integral Time	0.0~2000.0	Hz	40.0	Any	Real-time	U16
P00	07	2nd Velocity Loop Integral Time	0.15~512.00	ms	20.00	Any	Real-time	U16
P00	08	2nd Position Loop Gain	0.0~2000.0	Hz	64.0	Any	Real-time	U16
P00	09	2nd Torque Command Filtering Time Constant	0.00~30.00	ms	1.26	Any	Real-time	U16
P00	0A	Rotation Inertia Ratio of the Load	0.00~120.00	-	1.00	Any	Real-time	U16
P00	0B	Velocity Feedback Robust regulator Enablement	0: Disable 1: Enable	-	0	Stop	Real-time	U16
P00	0C	Torque Command Filtering Selection	0: First-order low-pass filter 1: Second-order low-pass filter	-	0	Stop	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P00	0F	Velocity Feedforward Control Selection	0: No velocity feedforward 1: Internal velocity feedforward 2: External velocity feedforward	-	-	Stop	Real-time	U16
P00	10	Velocity Feedforward Gain	0.0~100.0	%	0.0	Any	Real-time	U16
P00	11	Velocity Feedforward Filtering Time	0.00~64.00	ms	0.50	Any	Real-time	U16
P00	12	PDFF Control Coefficient	0.0~100.0	%	100.0	Any	Real-time	U16
P00	13	Torque Feedforward Control Selection	0: No torque feedforward 1: Internal torque feedforward 2: External torque feedforward	-	1	Any	Real-time	U16
P00	14	Torque Feedforward Gain	0.0~500.0	%	0.0	Any	Real-time	U16
P00	15	Torque Feedforward Filtering Time	0.00~64.00	ms	0.50	Any	Real-time	U16
P00	16	Current Loop Gain Coefficient	0~500	%	100	Any	Real-time	U16
P00	19	Gain Switching Mode Selection	0: No gain switching 1: DI switch P/PI mode 2: DI switch between the first and second group 3: Position command + velocity feedback mode 4: Position command three-group gain switching mode	-	0	Any	Real-time	U16
P00	1A	Gain Switching	0.0~1000.0	ms	5.0	Any	Real-	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Delay Time					time	
P00	1B	Gain Switching Level	0~20000	-	50	Any	Real-time	U16
P00	1C	Gain Switching Time-lag	0~20000	-	30	Any	Real-time	U16
P00	1D	Position Gain Switching Time	0.0~1000.0	ms	3.0	Any	Real-time	U16
P00	1E	Gain Coefficient of the 3rd Group	10~1000	%	100	Any	Real-time	U16
P00	1F	Gain Switching Wait Time of the 3r Group	0.0~1000.0	ms	0.0	Any	Real-time	U16
P00	20	Number of times the velocity feedback is filtered by moving mean filter	0: No mean filtering 1: mean filtering for 2times 2: mean filtering for 4 times 3: mean filtering for 8 times 4: mean filtering for 16 times 5: mean filtering for 32 times	-	0	Any	Real-time	U16
P00	21	Low-Pass Filtering Cut-off Frequency for Velocity Feedback	50~5000	Hz	5000	Any	Real-time	U16
P00	22	Velocity Feedback Robust Regulator Gain	10~2000	Hz	60	Any	Real-time	U16
P00	23	Velocity Feedback Robust Regulator Dynamic Coefficient	10~10000	%	100	Any	Real-time	U16
P00	24	Velocity Feedback Robust Regulator Filtering Time	0.00~20.00	ms	0.40	Any	Real-time	U16
P00	2E	Torque Disturbance Observer Cut-off Frequency Adjustment Percentage	10~200	%	100	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P00	2F	Torque Disturbance Observer Inertia Compensation Coefficient	0~1000	%	100	Any	Real-time	U16
P00	30	Torque Disturbance Observer Filtering Frequency	0.0~1000.0	Hz	300.0	Any	Real-time	U16
P00	31	Torque Disturbance Observer Compensation Percentage	0~200	%	0	Any	Real-time	U16

8.2 P01 Vibration Suppression Function Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P01	00	Adaptive Filter Mode Selection	0: Disable adaptive filtering 1: 3rd notch filter adaptive 2: 3rd and 4th notch filter adaptive 3: Detection mode, resonance frequency displayed on Pn0102 4: Reset 3rd and 4th notch filter	-	0	Any	Real-time	U16
P01	01	Current Threshold for Determination of Resonance	0.0~100.0	%	2.0	Any	Real-time	U16
P01	02	Resonance Frequency Identification Result	-	Hz	-	Only display	Real-time	U16
P01	03	Resonance frequency determination threshold	80~1000	Hz	120	Any	Real-time	U16
P01	04	Anti-resonance Frequency of the 1st Notch Filter	10~5000	Hz	5000	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P01	05	Frequency of the 1st Notch Filter	50~5000	Hz	5000	Any	Real-time	U16
P01	06	Bandwidth of the 1st Notch Filter	0~9	-	2	Any	Real-time	U16
P01	07	Depth of the 1st Notch Filter	0~99	-	0	Any	Real-time	U16
P01	08	Anti-resonance Frequency of the 2nd Notch Filter	10~5000	Hz	5000	Any	Real-time	U16
P01	09	Frequency of the 2nd Notch Filter	50~5000	Hz	5000	Any	Real-time	U16
P01	0A	Bandwidth of 2nd Notch Filter	0~9	-	2	Any	Real-time	U16
P01	0B	Depth of the 2nd Notch Filter	0~99	-	0	Any	Real-time	U16
P01	0C	Anti-resonance Frequency of the 3th Notch Filter	10~5000	Hz	5000	Any	Real-time	U16
P01	0D	Frequency of the 3th Notch Filter	50~5000	Hz	5000	Any	Real-time	U16
P01	0E	Bandwidth of the 3th Notch Filter	0~9	-	2	Any	Real-time	U16
P01	0F	Depth of the 3th Notch Filter	0~99	-	0	Any	Real-time	U16
P01	10	Anti-resonance Frequency of the 4th Notch Filter	10~5000	Hz	5000	Any	Real-time	U16
P01	11	Frequency of the 4th Notch Filter	50~5000	Hz	5000	Any	Real-time	U16
P01	12	Bandwidth of the 4th Notch Filter	0~9	-	2	Any	Real-time	U16
P01	13	Depth of the 4th Notch Filter	0~99	-	0	Any	Real-time	U16
P01	14	Anti-resonance Frequency of the 5th Notch Filter	10~5000	Hz	5000	Any	Real-time	U16
P01	15	Frequency of the 5th Notch Filter	50~5000	Hz	5000	Any	Real-time	U16
P01	16	Bandwidth of the 5th Notch Filter	0~9	-	2	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P01	17	Depth of the 5th Notch Filter	0~99	-	50	Any	Real-time	U16
P01	18	Vibration times 1 per Revolution/pole pitch	0~65535	-	0	Any	Real-time	U16
P01	19	Vibration times 2 per Revolution/pole pitch	0~65535	-	0	Any	Real-time	U16
P01	1A	Vibration times 3 per Revolution/pole pitch	0~65535	-	0	Any	Real-time	U16
P01	1B	Notch Filter Frequency 2 for Feedback	50~5000	Hz	5000	Any	Real-time	U16
P01	1C	Notch Filter Frequency 3 for Feedback	50~5000	Hz	5000	Any	Real-time	U16
P01	1D	Positive Friction Compensation	-100.0~100.0	%	0.0	Any	Real-time	U16
P01	1E	Negative Friction Compensation	-100.0~100.0	%	0.0	Any	Real-time	U16
P01	1F	Low-frequency Vibration Suppression Mode Selection	0: No suppression 1: One Low-frequency vibration suppression	-	0	Any	Real-time	U16
P01	21	Low-frequency Vibration Frequency	1.0~100.0	Hz	100.0	Any	Real-time	U16
P01	22	Low-frequency Vibration Bandwidth	0~10	-	2	Any	Real-time	U16
P01	23	Low-frequency Vibration Attenuation Coefficient	1.2~10.0	-	1.2	Any	Real-time	U16
P01	26	Vibration Times Unit Selection	0: 0.01 1: 0.1	-	0	Any	Real-time	U16

8.3 P02 Group Basic Parameter Setting

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P02	00	Operation Mode Setting	0: Velocity mode 1: Position mode 2: Torque mode 3: Torque-mode-velocity-position hybrid mode	-	1	Stop	Real-time	U16
P02	01	Rotation Direction Setting	0: CCW 1: CW	-	0	Any	Restart	U16
P02	02	Frequency division output pulse phase	0: A ahead of B 1: B ahead of A	-	0	Any	Restart	U16
P02	03	Number of pulses outputted by encoder per revolution for motor	0~1073741824	-	2500	Any	Restart	U16
P02	05	Z Pulse Output Level Setting	0: Low level when Z pulse is effective 1: High level when Z pulse is effective	-	0	Any	Restart	U16
P02	06	Source Selection for Pulse Frequency Division Output	0: Communication encoder 1: Pulse encoder 3: Communication encoder error compensation mode 4: Pulse encoder error compensation mode 5: Output prohibited	-	0	Any	Restart	U16
P02	09	Ratio of Frequency Division Pulses to Encoder Pulses	0~65535	-	0	Any	Restart	U16
P02	0A	High precision AI enablement	0: Disable 1: Enable	-	0	Stop	Real-time	U16
P02	0E	Emergency Stop Mode Selection	0: Free stop 1: Slow down on slow down ramp 2: Slow down on quick stop ramp 3: Emergency torque	-	0	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
			stop 4 : Slow down on slow down ramp 5 : Slow down on quick stop ramp 6: Emergency torque stop					
P02	0F	Brake enablement	0: Disable 1:Enable	-	1	Stop	Real-time	U16
P02	10	Stop mode when server off	-3 : zero velocity stop and stay in DB state -2 : ramp stop and stay in DB state -1: DB stop and stay in DB state 0: free stop and stay in free stop 1 : ramp stop and stay in free state 2: zero velocity stop and stay in free state	-	1	Any	Real-time	I16
P02	11	Over travel stop mode	0: Free stop and stay in free state 1: Zero speed stop and stay in position-locked state 2: Speed ramp stop and stay in position-locked state	-	1	Any	Real-time	U16
P02	12	Stop Mode in Case of Uncontrollable Fault (Type 1)	0: Free stop 1: DB stop and stay in free state 2: DB stop and stay in DB state	-	2	Any	Real-time	U16
P02	13	Stop Mode in Case of Controllable Fault (Type 2)	-4 : Emergency torque stop and stay in DB state -3 : zero velocity stop and stay in DB		-3	Any	Real-time	I16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
			state -2: Ramp stop and stay in DB state -1: DB stop and stay in DB state 0: Free stop and stay in free state 1: Ramp stop and stay in free state 2: zero velocity stop and stay in free state 3 : Emergency torque stop and stay in free state					
P02	14	Stop Completion Threshold	10~1000	RPM	20	Any	Real-time	U16
P02	15	DB stop timeout	30~30000	ms	100	Any	Real-time	U16
P02	1A	Weak Magnetism Function Enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P02	1B	Weak Magnetism Depth	60~115	%	105	Any	Real-time	U16
P02	1C	Maximum Allowable Demagnetization Current	0~100	%	20	Any	Real-time	U16
P02	1D	Weak Magnetism Gain	0~4000	Hz	40	Any	Real-time	U16
P02	20	Regenerative Resistor Operation Mode Selection	: Enable internal regenerative resistor discharge 1: Enable external regenerative resistor discharge 2: No discharge	-	1	Any	Real-time	U16
P02	23	External Regenerative Resistor Power	1~65535	W	800	Any	Real-time	U16
P02	24	External Regenerative	1~1000	Ω	80	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Resistor Resistance						
P02	26	Resistance Heat Dissipation Coefficient	10~100	%	60	Any	Real-time	U16
P02	29	Absolute Encoder Usage Mode	0: Incremental mode 1: Absolute linear mode 2: Absolute rotary mode 3: linear mode	-	0	Any	Restart	U16
P02	2A	Mechanical Load Gear Ratio Numerator	1~65535	-	1	Stop	Real-time	U16
P02	2B	Mechanical Load Gear Ratio Denominator	1~65535	-	1	Stop	Real-time	U16
P02	30	Inertia Identification Operation Mode	0: Positive/negative operation mode 1: JOG mode	-	0	Stop	Real-time	U16
P02	31	Real-Time Inertia Identification Enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P02	32	Inertia Identification Velocity	10~1000	RPM	200	Any	Real-time	U16
P02	33	Inertia Identification Acceleration Time	20~800	ms	80	Any	Real-time	U16
P02	34	Inertia Identification Waiting Time	50~10000	ms	1500	Any	Real-time	U16
P02	35	Inertia Identification Distance Display	-	mm	-	Only display	Real-time	U16
P02	36	Inertia Identification Operation Mode Selection	0: Position mode 1: Velocity mode	-	1	Stop	Real-time	U16
P02	37	Micro-Motion Repeat Identification Error	0.0~180.0	°	30.0	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Allowance						
P02	38	Micro-Motion Method Repeat Identification Enablements	0: Disable 1: Enable	-	1	Any	Real-time	U16
P02	3A	UVW Phase Sequence Identification Enablement	0: Disable 1: Enable	-	1	Stop	Real-time	U16
P02	3B	Angle Identification Method Selection	0: Pre-positioning identification 1: Given electrical angle identification 2: Micro-motion method 1 3: Micro-motion method 2 4: Hall identification 5: Open-loop identification 6: Open-loop identification + single-turn reset 7: Pre-positioning identification + single-turn reset	-	0	Stop	Real-time	U16
P02	3C	Angle Identification Micro-Motion Method Electric Angle Action Threshold	1~900	Set by P02.4 A	2	Any	Real-time	U16
P02	3D	Angle Identification Micro-Motion Method Stop Threshold	1~300	Set by P02.4 A	1	Any	Real-time	U16
P02	3E	Direct Presetting Method Set Electric Angle	0~180	Degree	0	Any	Real-time	U16
P02	3F	HALL Identification	0: Disable 1: Enable	-	0	Stop	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Enablement						
P02	40	Closed-Loop Gain During Angle Identification	1~20000	-	30	Any	Real-time	U16
P02	41	HALL Monitoring Enablement	0: Disable 1: Monitor abnormal changes in Hall voltage levels 2: Use Hall voltage to detect abnormal electrical angles 3: Enable monitoring of AI10.C and AI10.E alarms	-	3	Any	Restart	U16
P02	42	Closed-Loop Velocity Setting During Angle Identification	0~500	RPM	30	Any	Real-time	U16
P02	43	Maximum Current Amplification Ratio During Angle Identification	10~200	%	100	Any	Real-time	U16
P02	44	Time to Accelerate to Maximum Current During Angle Identification	10~8000	ms	250	Any	Real-time	U16
P02	45	Electric Angle Adjustment Gain	0~1000	-	30	Any	Real-time	U16
P02	46	Current Amplification Factor During Electric Angle Compensation	0~300	%	150	Any	Real-time	U16
P02	47	Linear Vertical Axis Enablements	0: Disable 1: Enable	-	0	Stop	Real-time	U16
P02	48	Perform Angle Identification upon Power on	0: Disable 1: Enable	-	0	Stop	Real-time	U16
P02	49	Maximum Current	100~10000	ms	2000	Any	Real-	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Duration					time	
P02	4A	Open-Loop Identification Running Unit	◆ 0: 0.1 degree ◆ 1: Encoder feedback unit	-	0	Stop	Real-time	U16
P02	4C	Motor parameter identification current loop gain	0~65535	Hz	50	Any	Real-time	U16
P02	4F	Automatically adjust running distance	0~2147483648	Command unit	10000	Any	Real-time	U16
P02	51	Automatically adjust running velocity	0~3000	RPM	300	Any	Real-time	U16
P02	52	Automatically adjust acceleration and deceleration time	0~10000	ms	30	Any	Real-time	U16
P02	53	Automatically adjust waiting time	0~10000	ms	1000	Any	Real-time	U16
P02	54	Automatically adjust mode	0: Positioning mode 1: Trajectory mode	-	0	Any	Real-time	U16
P02	55	Automatically adjust positioning time requirement	1.0~6553.5	ms	30.0	Any	Real-time	U16
P02	56	Automatically adjust positioning error requirement	2~65535	Command unit	100	Any	Real-time	U16
P02	5A	Absolute Position Offset	-2147483648~2147483647	Encoder unit	0	Stop	Real-time	I32
P02	5C	High 32 bit of absolute position offset	-2147483648~2147483647	Encoder unit	0	Stop	Real-time	I32
P02	5E	Multi-turn data offset	0~65535	-	0	Any	Real-time	U16
P02	5F	Multi-turn data overflow	0~65535	-	0	Any	Real-time	U16

8.4 P03 Group Command Setting Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P03	00	Position Command Mode Setting	0: External pulse command 1: Internal position mode	-	0	Stop	Real-time	U16
P03	02	Pulse form	0: Direction + pulse, positive logic 1: Direction + pulse, negative logic 2: AB quadrature pulse 3: CW + CCW	-	0	Any	Restart	U16
P03	03	Pulse Effective Determination	0: Falling edge 1: Rising edge	-	0	Any	Restart	U16
P03	04	Pulse Filtering Time	0~255	25ns	2	Any	Restart	U16
P03	05	Source of Pulse	0: high speed pulse port 1: Low speed pulse port	-	0	Stop	Real-time	U16
P03	06	Position Command low-pass Filtering Time	0.0~500.0	ms	0	Any	Real-time	U16
P03	07	Moving average filtering time 1	0.0~256.0	ms	0	Any	Real-time	U16
P03	0A	Moving average filtering time 2	0.0~256.0	ms	0	Any	Real-time	U16
P03	10	Number of command pulse corresponding to one revolution (pole pitch) for motor	0~1073741824	Command unit	0 (linear motor) 10000 (Rotary motor)	Stop	Real-time	U32
P03	12	Numerator of Electronic Gear Ratio 1	0~ 1073741824	-	1	Stop	Real-time	U32
P03	14	Denominator of Electronic Gear Ratio 1	0~ 1073741824	-	1	Stop	Real-time	U32
P03	16	Numerator of Electronic Gear Ratio 2	0~ 1073741824	-	1	Stop	Real-time	U32

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Ratio 2						
P03	18	Denominator of Electronic Gear Ratio 2	0~ 1073741824	-	1	Stop	Real-time	U32
P03	20	Absolute Position Limit Setting	0: Disable 1: Immediately enable 2: Enable after homing		0	Any	Real-time	U16
P03	21	Software limit minimum	-2147483648 ~2147483648	Comm and unit	0	Any	Real-time	I32
P03	23	Software limit maximum	-2147483648 ~2147483648	Comm and unit	0	Any	Real-time	I32
P03	25	Unit of Excessive Position Deviation	0: Command unit 1: Encoder unit 2: Mechanical travel unit (mm)	-	2	Any	Real-time	U16
P03	26	Position Deviation Excessive Fault Setting Value	0~ 1073741824	Set by P03.25	100	Any	Real-time	U32
P03	28	Time window of excessive position deviation	0~65535	ms	0	Any	Real-time	U16
P03	2E	Homing completion delay	0~5000	ms	300	Any	Real-time	U16
P03	2F	Torque limit on hardware limit	20.0~150.0	%	100.0	Any	Real-time	U16
P03	30	Homing enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P03	31	Homing mode	-5~35	-	3	Any	Real-time	I16
P03	32	Search for home position in high speed	10~6000	RPM	100	Any	Real-time	U16
P03	33	Search for home position in low speed	0~6000	RPM	10	Any	Real-time	U16
P03	34	Homing acceleration	0~10000	ms	10	Any	Real-	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		or deceleration time					time	
P03	35	Maximum time for homing	0~65535	ms	50000	Any	Real-time	U16
P03	36	Home Mechanical Offset	-1073741824~1073741824	Comm and unit	0	Any	Real-time	I32
P03	40	Velocity command mode setting	0 : Internal digital input 1: Analog input 2 : Analog input controlled by DI 5: Internal velocity	-	0	Any	Real-time	U16
P03	41	Velocity command set by DI	-6000~6000	RPM	300	Any	Real-time	I16
P03	42	DI jog velocity setting	-6000~6000	RPM	100	Any	Real-time	I16
P03	43	Velocity Command Acceleration Ramp Time	0~65535	ms	20	Any	Real-time	U16
P03	44	Velocity Command Deceleration Ramp Time	0~65535	ms	20	Any	Real-time	U16
P03	45	Jog velocity initial value	1~9000	RPM	30	Any	Real-time	U16
P03	46	Jog velocity acceleration ramp time	0~65535	ms	20	Any	Real-time	U16
P03	47	Velocity corresponding to analog 10V	-10000~10000	RPM	3000	Any	Real-time	I16
P03	4A	Torque command selection	0 : Internal digital input 1: Analog input 3: Analog input 2	-	0	Any	Real-time	U16
P03	4B	Toque command setting	-300.0~300.0	%	0	Any	Real-time	I16
P03	4C	Torque corresponding to analog 10V	-800.0~800.0	%	100.0	Any	Real-time	I16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P03	4F	Emergency stop torque	0.0~300.0	%	100.0	Any	Real-time	U16
P03	50	Positive limit of velocity	0~8000	RPM	6000	Any	Real-time	U16
P03	51	Negative limit of velocity	0~8000	RPM	6000	Any	Real-time	U16
P03	52	Positive limit of torque	0.0~600.0	%	300.0	Any	Real-time	U16
P03	53	Negative limit of torque	0.0~600.0	%	300.0	Any	Real-time	U16
P03	54	Positive limit of internal velocity in torque mode	0~6000	RPM	3000	Any	Real-time	U16
P03	55	Negative limit of internal velocity in torque mode	0~6000	RPM	3000	Any	Real-time	U16
P03	5A	Source of limit of torque	0 : Internal digital input 1: Analog input 2 : Positive torque limited by AI, negative torque limited by DI 3 : Positive torque limited by DI, negative torque limited by AI	-	0	Any	Real-time	U16
P03	5B	Torque limit filtering time	0.0~6000.0	ms	0.0	Any	Real-time	U16
P03	5D	Holding time for running from hardware limit to home position	0~65535	ms	15	Any	Real-time	U16
P03	5E	Distance for no Z retraction after seeking hardware limit	500~1073741824	Encoder unit	4194304	Any	Real-time	U32
P03	60	Threshold for wire disconnection detection	0.0~90.0	%	15.0	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P03	61	Filtering time for wire disconnection detection	0~65535	ms	30	Any	Real-time	U16

8.5 P04 Group Input Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P04	04	DI1 function selection	0~63	-	1	Any	Real-time	U16
P04	05	DI1 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	06	DI2 function selection	0~63	-	2	Any	Real-time	U16
P04	07	DI2 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	08	DI3 function selection	0~63	-	3	Any	Real-time	U16
P04	09	DI3 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	0A	DI4 function selection	0~63	-	0	Any	Real-time	U16
P04	0B	DI4 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	0C	DI5 function selection	0~63	-	0	Any	Real-time	U16
P04	0D	DI5 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	0E	DI6 function selection	0~63	-	7	Any	Real-time	U16
P04	0F	DI6 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	10	DI7 function selection	0~63	-	4	Any	Real-time	U16
P04	11	DI7 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	12	DI8 function selection	0~63	-	5	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P04	13	DI8 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P04	30	AI1 offset(MSD-PULSE-01 -U3:AI2 offset)	-5000~5000	mV	0	Any	Real-time	I16
P04	31	AI1 filtering time(MSD-PULSE-01 -U3: AI2 filtering time)	0.00~655.35	ms	2.00	Any	Real-time	U16
P04	32	AI1 deadband(MSD-PULSE-01 -U3: AI2 deadband)	0.0~1000.0	mV	10.0	Any	Real-time	U16
P04	33	AI1 zero drift(MSD-PULSE-01 -U3: AI2 zero drift)	-500.0~500.0	mV	0.0	Any	Real-time	I16
P04	40	DI filtering time	0.00~655.35	μs	10.00	Any	Real-time	U16

8.6 P05 Group Output Class Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P05	00	DO1 function selection	0~32	-	5	Any	Real-time	U16
P05	01	DO1 effective level	0: Positive logic 1: Negative logic	-	1	Any	Real-time	U16
P05	02	DO2 function selection	0~32	-	6	Any	Real-time	U16
P05	03	DO2 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P05	04	DO3 function selection	0~32	-	2	Any	Real-time	U16
P05	05	DO3 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P05	06	DO4 function selection	0~32	-	3	Any	Real-time	U16
P05	07	DO4 effective level	0: Positive logic	-	0	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		level	1: Negative logic					
P05	08	DO5 function selection	0~32	-	7	Any	Real-time	U16
P05	09	DO5 effective level	0: Positive logic 1: Negative logic	-	0	Any	Real-time	U16
P05	20	DO0~15 function state	0~65535	-	0	Only display	Real-time	U16
P05	21	DO16~31 function state	0~65535	-	0	Only display	Real-time	U16
P05	26	DO forced output enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P05	27	DO forced output setting	0~0xFFFF	-	0	Any	Real-time	U16
P05	2C	Position deviation threshold to determine whether positioning is completed	1~65535	-	100	Any	Real-time	U16
P05	2D	Time window to determine whether positioning is completed	0~2000	ms	0	Any	Real-time	U16
P05	2E	Position reached window unit setting	0: Command unit 1: Encoder unit	-	0	Any	Real-time	U16
P05	30	Zero-velocity clamp velocity command threshold	0~6000	RPM	10	Any	Real-time	U16
P05	32	Width of velocity consistent signal	1~200	RPM	10	Any	Real-time	U16
P05	33	Velocity reached threshold	10~6000	RPM	1000	Any	Real-time	U16
P05	34	Zero-velocity output signal threshold	1~6000	RPM	10	Any	Real-time	U16
P05	35	Velocity DO filtering time	0~65535	ms	0	Any	Real-time	U16
P05	36	Velocity consistent time window	0~1000	ms	0	Any	Real-time	U16

Function code	Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P05 3A	Torque reached reference value	0.0~300.0	%	0.0	Any	Real-time	U16
P05 3B	Comparison value when torque reached is enabled	20.0~300.0	%	20.0	Any	Real-time	U16
P05 3C	Comparison value when torque reached is disabled	10.0~300.0	%	10.0	Any	Real-time	U16

8.7 P06 Group Full Closed Loop function and Error Compensation Parameters

Only R3 and U3 series servo driver support full closed loop function.

Function code	Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P06 00	Full-closed loop operation mode	0: Semi-Closed-Loop Operation 1: Full Closed-Loop Operation 2: Full Closed-Loop Semi-Closed-Loop Switching	-	0	Stop	Real-time	U16
P06 01	External Encoder Running Direction Selection	0: CW is positive running direction 1: CCW is positive running direction	-	0	Stop	Restart	U16
P06 02	External encoder resolution	1~2147483647	External encoder unit	10000	Stop	Restart	U32
P06 04	Full Closed-Loop Vibration Suppression Gain	0.0~300.0	%	0.0	Any	Real-time	I16
P06 05	Full Closed-Loop Vibration Suppression Cutoff Frequency	10~5000	Hz	500	Any	Real-time	U16
P06 06	Full Closed-Loop Speed Feedback Correction	0.0~100.0	%	0.0	Any	Real-time	U16

Function code	Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
	Coefficient						
P06 07	Internal and External Loop Position Deviation Filtering Time Constant	0.0~100.0	ms	0.0	Any	Real-time	U16
P06 08	Full Closed-Loop Frequency Division Pulse Setting	0: Set the pulse count according to P02.03 1: Set the division ratio according to P06.09 and P06.0A	-	0	Stop	Restart	U16
P06 09	Full Closed-Loop Frequency Division Pulse Numerator	1~65535	-	1	Stop	Restart	U16
P06 0A	Full Closed-Loop Frequency Division Pulse Denominator	1~65535	-	1	Stop	Restart	U16
P06 0B	Full Closed-Loop Homing Using External Z Signal	0: Use motor encoder Z signal 1: Use grating ruler Z signal	-	0	Stop	Real-time	U16
P06 0C	Maximum Allowable Deviation of Internal and External Loop Encoders	-2147483647 ~2147483647	Encoder unit	10000	Any	Real-time	I32
P06 0E	Deviation of Internal and External Loop Encoders	-2,147,483,648~2,147,483,647	External encoder unit	-	Only display	Real-time	I32
P06 10	Internal Encoder Count	-	Encoder unit	-	Display	Real-time	I32
P06 12	External Encoder Count	-2,147,483,648~2,147,483,647	External encoder unit	-	Only display	Real-time	I32
P06 20	Error Compensation Enablement	0: Disable 1: Enable	-	0	Stop	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P06	21	Compensation Position Unit Setting	0: Encoder unit 1: Command unit 2: μm 3: mm	-	3	Any	Real-time	U16
P06	22	Error Compensation Unit Setting	0: Encoder unit 1: Command unit 2: μm 3: mm	-	2	Any	Real-time	U16
P06	23	Encoder Pulses per 1mm Rotation for Rotary Motor	1~1073741824		100	Any	Real-time	U32
P06	25	Error Compensation home position Selection	0: Internal homing automatically selects the home position. 1: Use FunIN.21 or Fn.0C to select the error compensation home position.	-	0	Any	Real-time	U16
P06	27	Total Number of Error Compensation Points	0~1024	-	0	Any	Real-time	U16
P06	28	Starting Point Position	0~1073741824	Set by P06.21	0	Any	Real-time	U32
P06	2A	Compensation Point Interval Distance	0~1073741824	Set by P06.21	0	Any	Real-time	U32

8.8 P08 Group Communication Settings

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P08	00	RS485 communication station number	1~127	-	1	Any	Real-time	U16
P08	01	RS485 communication baud rate	0: 2400 1: 4800 2: 9600	-	6	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
			3: 19200 4: 38400 5: 57600 6: 115200					
P08	02	RS485 communication data format	0: No Parity, 2 Stop Bits 1: Even Parity, 1 Stop Bit 2: Odd Parity, 1 Stop Bit 3: No Parity, 1 Stop Bit	-	3	Any	Real-time	U16
P08	03	RS485 communication response delay	0~20	ms	0	Any	Real-time	U16
P08	0A	RS232 communication baud rate	0: 115200 1: 750000	-	1	Any	Real-time	U16
P08	0F	EEPROM Storage Prohibition	0 : Parameters are allowed to save to EEPROM during RS485 communication 1 : Parameters are prohibited to save to EEPROM during RS485 communication	-	1	Any	Real-time	U16

8.9 P0B Group Extended Function Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0B	00	Stall over heat protection enablement	0: Disable 1: Use torque feedback to determine 2 : Use torque command to determine	-	1	Stop	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0B	01	Disable overload warning	0: Enable motor and drive overload warning 1: Disable motor overload warning 2: Disable drive overload warning 3: Disable both motor and drive overload warning	-	0	Stop	Real-time	U16
P0B	02	Motor run-away protection enablement	0: Disable 1: Enable	-	1	Stop	Real-time	U16
P0B	03	Multi-turn encoder overflow alarm enablement	0: Enable 1: Disable	-	1	Stop	Real-time	U16
P0B	04	Encoder battery alarm enablement	0: Disable 1: Enable	-	0	Stop	Real-time	U16
P0B	05	Power supply phase loss protection selection	0: Detect AC input, disable phase loss alarm 1: Detect AC input, enable phase loss alarm 2: Do not detect AC input, disable phase loss alarm	-	0	Stop	Real-time	U16
P0B	06	Fault Record Storage Enablement	0: Enable 1: Disable	-	0	Stop	Real-time	U16
P0B	07	Special fault reset enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P0B	09	Panel status display setting	16#0~16#25	-	16#25	Any	Real-time	U16
P0B	0A	PTC alarm resistance	0: Low resistance 1: High resistance	-	0	Any	Real-time	U16
P0B	10	Stall over heat protection time window	10~65535	ms	20	Any	Real-time	U16
P0B	11	Motor Overload Protection Gain	50~300	%	100	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0B	12	PTC Monitoring Enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P0B	13	Torque threshold to determine whether the motor experience run-away	0~500	%	100	Any	Real-time	U16
P0B	14	Overspeed Determination Threshold	0~65535	RPM	0	Any	Real-time	U16
P0B	15	Filtering time of displayed velocity	0~5000	ms	50	Any	Real-time	U16
P0B	16	Phase current RMS filtering time	0~1000	ms	5	Any	Real-time	U16
P0B	18	Communication Encoder Continuous Error Count	0~31	-	5	Any	Real-time	U16
P0B	1A	Nikon encoder reset upon power on	0: Power on without reset 1: Power on and reset	-	-	Any	Real-time	U16
P0B	1B	Bus encoder read ROM upon power on	0: read encoder ROM upon power on 1: Do not read encoder ROM upon power on 2: Protocol configuration prohibited	-	0	Any	Real-time	U16
P0B	1C	Encoder counting error alarm enablement	0: Disable 1: Enable	-	1	Any	Real-time	U16
P0B	1D	Encoder ABZ signal disconnection detection enablement	0: Disable 1: Enable	-	0	Any	Real-time	U16
P0B	1E	Enable QEP phase error alarm	0: When QEP phase error occurs, alarm Er.0C.4 is triggered	-	0	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
			1: When QEP phase error occurs, alarm Er.10.A is triggered					
P0B	20	Ramp stop acceleration and deceleration time	0~10000	ms	50	Any	Real-time	U16
P0B	22	Emergency torque stop deceleration	0~3000	%	500	Stop	Real-time	U16
P0B	24	Brake protection determination threshold	0.0~300.0	%load ratio	0.0	Any	Real-time	U16
P0B	25	Current Protection Alarm Duration	0~65535	ms	200	Any	Real-time	U16
P0B	26	Current protection determination threshold	200~3000	%	1000	Any	Real-time	U16
P0B	27	Current protection alarm duration	0~65535	ms	0	Any	Real-time	U16
P0B	30	Hold time while the brake is open and the command is 0	0~500	ms	200	Any	Real-time	U16
P0B	31	Delay from brake actuated to servo off	50~1000	ms	150	Any	Real-time	U16
P0B	33	Delay from zero command to brake actuated	1~1000	ms	500	Any	Real-time	U16

8.10 P0F Group Internal Velocity Mode

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0F	00	Velocity Scheduled Operation Mode	0: Continuous operation by time 1: DI switch operation 2: Communication setting	-	0	Any	Real-time	U16
P0F	01	Maximum Number of Segments to Run	1~16	-	3	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0F	02	Communication set the starting segment	0~15	-	3	Any	Real-time	U16
P0F	04	Run Time Unit Selection	0: ms 1: 10ms 2: 100ms 3: s	-	0	Any	Real-time	U16
P0F	08	Segment Velocity Setting ¹	-6000~6000	RPM	300	Any	Real-time	I16
P0F	09	Segment Velocity Run Time ¹	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	0A	Segment Velocity Acceleration Ramp Time ¹	0~65535	ms	200	Any	Real-time	U16
P0F	0B	Segment Velocity Deceleration Ramp Time ¹	0~65535	ms	200	Any	Real-time	U16
P0F	0C	Segment Velocity Setting ²	-6000~6000	RPM	300	Any	Real-time	I16
P0F	0D	Segment Velocity Run Time ²	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	0E	Segment Velocity Acceleration Ramp Time ²	0~65535	ms	200	Any	Real-time	U16
P0F	0F	Segment Velocity Deceleration Ramp Time ²	0~65535	ms	200	Any	Real-time	U16
P0F	10	Segment Velocity Setting ³	-6000~6000	RPM	300	Any	Real-time	I16
P0F	11	Segment Velocity Run Time ³	0~65535	Set by P0F.04	10	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0F	12	Segment Velocity Acceleration Ramp Time 3	0~65535	ms	200	Any	Real-time	U16
P0F	13	Segment Velocity Deceleration Ramp Time 3	0~65535	ms	200	Any	Real-time	U16
P0F	14	Segment Velocity Setting 4	-6000~6000	RPM	300	Any	Real-time	I16
P0F	15	Segment Velocity Run Time 4	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	16	Segment Velocity Acceleration Ramp Time 4	0~65535	ms	200	Any	Real-time	U16
P0F	17	Segment Velocity Deceleration Ramp Time 4	0~65535	ms	200	Any	Real-time	U16
P0F	18	Segment Velocity Setting 5	-6000~6000	RPM	300	Any	Real-time	I16
P0F	19	Segment Velocity Run Time 5	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	1A	Segment Velocity Acceleration Ramp Time 5	0~65535	ms	200	Any	Real-time	U16
P0F	1B	Segment Velocity Deceleration Ramp Time 5	0~65535	ms	200	Any	Real-time	U16
P0F	1C	Segment Velocity Setting 6	-6000~6000	RPM	300	Any	Real-time	I16
P0F	1D	Segment Velocity Run Time 6	0~65535	Set by P0F.0 4	10	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P0F	1E	Segment Velocity Acceleration Ramp Time 6	0~65535	ms	200	Any	Real-time	U16
P0F	1F	Segment Velocity Deceleration Ramp Time 6	0~65535	ms	200	Any	Real-time	U16
P0F	20	Segment Velocity Setting 7	-6000~6000	RPM	300	Any	Real-time	I16
P0F	21	Segment Velocity Run Time 7	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	22	Segment Velocity Acceleration Ramp Time 7	0~65535	ms	200	Any	Real-time	U16
P0F	23	Segment Velocity Deceleration Ramp Time 7	0~65535	ms	200	Any	Real-time	U16
P0F	24	Segment Velocity Setting 8	-6000~6000	RPM	300	Any	Real-time	I16
P0F	25	Segment Velocity Run Time 8	0~65535	P0F.0 4	10	Any	Real-time	U16
P0F	26	Segment Velocity Acceleration Ramp Time 8	0~65535	ms	200	Any	Real-time	U16
P0F	27	Segment Velocity Deceleration Ramp Time 8	0~65535	ms	200	Any	Real-time	U16
P0F	28	Segment Velocity Setting 9	-6000~6000	RPM	300	Any	Real-time	I16
P0F	29	Segment Velocity Run Time 9	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	2A	Segment Velocity 9	0~65535	ms	200	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Acceleration Ramp Time						
P0F	2B	Segment 9 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	2C	Segment 10 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	2D	Segment 10 Velocity Run Time	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	2E	Segment 10 Velocity Acceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	2F	Segment 10 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	30	Segment 11 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	31	Segment 11 Velocity Run Time	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	32	Segment 11 Velocity Acceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	33	Segment 11 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	34	Segment 12 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	35	Segment 12 Velocity Run Time	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	36	Segment 12 Speed Acceleration	0~65535	ms	200	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Ramp Time						
P0F	37	Segment 12 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	38	Segment 13 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	39	Segment 13 Velocity Run Time	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	3A	Segment 13 Velocity Acceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	3B	Segment 13 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	3C	Segment 14 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	3D	Segment 14 Velocity Run Time	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	3E	Segment 14 Velocity Acceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	3F	Segment 14 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	40	Segment 15 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	41	Segment 15 Velocity Run Time	0~65535	Set by P0F.0 4	10	Any	Real-time	U16
P0F	42	Segment 15 Velocity	0~65535	ms	200	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
		Acceleration Ramp Time						
P0F	43	Segment 15 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	44	Segment 16 Velocity Setting	-6000~6000	RPM	300	Any	Real-time	I16
P0F	45	Segment 16 Velocity Run Time	0~65535	Set by P0F.04	10	Any	Real-time	U16
P0F	46	Segment 16 Velocity Acceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16
P0F	47	Segment 16 Velocity Deceleration Ramp Time	0~65535	ms	200	Any	Real-time	U16

8.11 P10 Group Task Position Mode

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	00	Starting segment selection	0: Start from the first segment 1: Set by DI 2: Set by P10.02	-	0	Any	Real-time	U16
P10	02	Set Starting Segment Value	0~19	-	0	Any	Real-time	U16
P10	04	Task Cancel Ramp Stop	0~65535	ms	10	Any	Real-time	U16
P10	05	Current Running Segment Number	-	-	-	Any	Real-time	U16
P10	08	Segment 1 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	0A	Segment 1 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	0B	Segment 1 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	0C	Segment 1 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	0D	Segment 1 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	0E	Segment 1 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	0F	Running times of Segment 1 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	10	Segment 2 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	12	Segment 2 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	13	Segment 2 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	14	Segment 2 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	15	Segment 2 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	16	Segment 2 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	17	Running times of Segment 2 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	18	Segment 3 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	1A	Segment 3 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	1B	Segment 3 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	1C	Segment 3 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	1D	Segment 3 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	1E	Segment 3 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	1F	Running times of Segment 3 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	20	Segment 4 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	22	Segment 4 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	23	Segment 4 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	24	Segment 4 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	25	Segment 4 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	26	Segment 4 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	27	Running times of Segment 4 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	28	Segment 5 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	2A	Segment 5 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	2B	Segment 5 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	2C	Segment 5 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	2D	Segment 5 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	2E	Segment 5 Attribute Configuration	0x~0xFFFF	-	0x0	Any	Real-time	U16
P10	2F	Running times of Segment 5 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	30	Segment 6 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	32	Segment 6 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	33	Segment 6 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	34	Segment 6 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	35	Segment 6 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	36	Segment 6 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	37	Running times of Segment 6 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	38	Segment 7 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	3A	Segment 7 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	3B	Segment 7 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	3C	Segment 7 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	3D	Segment 7 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	3E	Segment 7 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	3F	Running times of Segment 7 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	40	Segment 8 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	42	Segment 8 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	43	Segment 8 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	44	Segment 8 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	45	Segment 8 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	46	Segment 8 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	47	Running times of Segment 8 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	48	Segment 9 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	4A	Segment 9 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	4B	Segment 9 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	4C	Segment 9 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	4D	Segment 9 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	4E	Segment 9 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	4F	Running times of Segment 9 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	50	Segment 10 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	52	Segment 10 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	53	Segment 10 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	54	Segment 10 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	55	Segment 10 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	56	Segment 10 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	57	Running times of Segment 10 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	58	Segment 11 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	5A	Segment 11 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	5B	Segment 11 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	5C	Segment 11 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	5D	Segment 11 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	5E	Segment 11 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	5F	Running times of Segment 11 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	60	Segment 12 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	62	Segment 12 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	63	Segment 12 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	64	Segment 12 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	65	Segment 12 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	66	Segment 12 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	67	Running times of Segment 12 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	68	Segment 13 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	6A	Segment 13 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	6B	Segment 13 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	6C	Segment 13 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	6D	Segment 13 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	6E	Segment 13 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	6F	Running times of Segment 13 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	70	Segment 14 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	72	Segment 14 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	73	Segment 14 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	74	Segment 14 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	75	Segment 14 Wait Time	0~65535	ms	0	Any	Real-time	U16
P10	76	Segment 14 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	77	Running times of Segment 14 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	78	Segment 15 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	U16
P10	7A	Segment 15 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	7B	Segment 15 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	7C	Segment 15 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	7D	Segment 15 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	7E	Segment 15 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	7F	Running times of Segment 15 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	80	Segment 16 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	82	Segment 16 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	83	Segment 16 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	84	Segment 16 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	85	Segment 16 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	86	Segment 16 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	87	Running times of Segment 16 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	88	Segment 17 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	8A	Segment 17 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	8B	Segment 17 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	8C	Segment 17 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	8D	Segment 17 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	8E	Segment 17 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	8F	Running times of Segment 17 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	90	Segment 18 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	92	Segment 18 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	93	Segment 18 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	94	Segment 18 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	95	Segment 18 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	96	Segment 18 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	97	Running times of Segment 18 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	98	Segment 19 target position	-1073741824~1073741824	Command unit	10000	Any	Real-time	I32
P10	9A	Segment 19 Velocity	1~9000	RPM	300	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P10	9B	Segment 19 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	9C	Segment 19 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	9D	Segment 19 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	9E	Segment 19 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	9F	Running times of Segment 19 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16
P10	A0	Segment 20 target position	-1073741824 ~1073741824	Command unit	10000	Any	Real-time	I32
P10	A2	Segment 20 Velocity	1~9000	RPM	300	Any	Real-time	U16
P10	A3	Segment 20 Acceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	A4	Segment 20 Deceleration Time	0~65535	ms	10	Any	Real-time	U16
P10	A5	Segment 20 Wait Time	0~65535	ms	100	Any	Real-time	U16
P10	A6	Segment 20 Attribute Configuration	0x0~0xFFFF	-	0x0	Any	Real-time	U16
P10	A7	Running times of Segment 20 and the Next Running Segment	0x1~0xFFFF	-	0x1	Any	Real-time	U16

8.12 P17 Group Non-standard Function Parameters

Function Code		Name	Setting Range	Unit	Factory Setting	Setting Method	Effective Method	Data Type
P17	30	Encoder Single-Turn Absolute Position Corresponding to Station Origin	-	Encoder Units	-	Display	-	-
P17	32	Set Current Position as Station Origin	0: No Operation 1: Set Current Position as Station Origin	-	0	Any	Real-time	U16
P17	33	Operating Speed during Automatic Return to Station	1~500	rpm	30	Any	Real-time	U16
P17	34	Acceleration/Deceleration Time during Automatic Return to Station	0~65535	ms	100	Any	Real-time	U16
P17	35	Number of Stations	1~64	-	4	Any	Real-time	U16
P17	36	Return to Station Direction Selection	0: Positive 1: Negative 2: Nearest	-	0	Any	Real-time	U16
P17	37	Return to Station Trigger Method	0: Enable Automatic Return to Station 1: Use DI Function FunIn53 to Trigger Return to Station	-	1	Any	Real-time	U16
P17	38	Return to Station triggered by function code	0: No Operation 1: Trigger Return to Station	-	0	Any	Real-time	U16
P17	3E	Velocity for running to station	1~1000	rpm	30	Any	Real-time	U16
P17	3F	Acceleration/Deceleration Time for running to station	0~65535	ms	100	Any	Real-time	U16
P17	40	Current Station Number Display	-	-	-	Display	-	-

Function Code		Name	Setting Range	Unit	Factory Setting	Setting Method	Effective Method	Data Type
P17	44	Encoder Single-Turn Absolute Position Corresponding to Station 1	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32
P17	46	Encoder Single-Turn Absolute Position Corresponding to Station 2	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32
P17	48	Encoder Single-Turn Absolute Position Corresponding to Station 3	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32
P17	4A	Encoder Single-Turn Absolute Position Corresponding to Station 4	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32
P17	4C	Encoder Single-Turn Absolute Position Corresponding to Station 5	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32
P17	4E	Encoder Single-Turn Absolute Position Corresponding to Station 6	- 2147483648~2147483647	Encoder Units	0	Any	Real-time	I32

8.13 P18 Group Motor Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P18	00	Motor Encoder Model	16#0~16#FFFF	-	16#1012	Any	Restart	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P18	02	Motor code	0~65535	-	0	Any	Restart	U16
P18	03	Rotary motor Pulse encoder resolution	0~2147483647	p	2500	Stop	Restart	U32
P18	07	Zero electrical angle shift for bus encoder	0~65535	-	-	Stop	Restart	U16
P18	08	Electric angle corresponding to Z signal	0.0~360.0	degree	-	Stop	Restart	U16
P18	0F	Bus Encoder Data Transmission Compensation Time	-30.0~30.0	μs	0.0	Stop	Restart	U16
P18	10	Rotary motor bus encoder resolution selection	0: one-turn resolution of motor is same as protocol resolution 1: one-turn resolution of motor is set by P18.03(P18.03*4)	ns	0	Stop	Restart	U16
P18	11	Back Electromotive Force Compensation Coefficient	0.0~6553.5	%	50.0	Any	Real-time	U16
P18	12	D-axis Coupling Voltage Compensation Coefficient	0.0~6553.5	%	50.0	Any	Real-time	U16
P18	13	Q-axis Coupling Voltage Compensation Coefficient	0.0~6553.5	%	50.0	Any	Real-time	U16
P18	14	D-axis Proportional Gain	0~65535	Hz	1000	Any	Real-time	U16
P18	15	D-axis Integer Compensation Factor	0.00~655.35	-	1.00	Any	Real-time	U16
P18	16	Q-axis Proportional Gain	0~65535	Hz	1000	Any	Real-time	U16
P18	17	Q-axis Integral Compensation Factor	0.00~655.35	-	1.00	Any	Real-time	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P18	20	Rated Power	0.00~655.35	kW	-	Stop	Restart	U16
P18	22	Rated current	0.00~655.35	A	-	Stop	Restart	U16
P18	24	Maximum current	0.00~655.35	A	-	Stop	Restart	U16
P18	26	Rated torque	0.00~21474836.47	Nm	-	Stop	Restart	U32
P18	2A	Rated velocity	0~65535	RPM	-	Stop	Restart	U16
P18	2C	Maximum velocity	0~65535	RPM	-	Stop	Restart	U16
P18	2E	Rotational Inertia	0.00~21474836.47	kg*cm ²	-	Stop	Restart	U32
P18	30	Permanent Magnet Synchronous Motor Pole Pairs	0~65535	-	-	Stop	Restart	U16
P18	31	Stator Phase Resistance	0.000~65.535	Ω	-	Stop	Restart	U16
P18	32	Q-axis Inductance	0.00~655.35	mH	-	Stop	Restart	U16
P18	33	D-axis Inductance	0.00~655.35	mH	-	Stop	Restart	U16
P18	34	Back Electromotive Force Coefficient	0.00~21474836.47	mV/RPM	-	Stop	Restart	U32
P18	3C	Internal Encoder Check	16#0~16#FFFF	-	-	Any	Real-time	U16
P18	3D	Internal Encoder Configuration	16#0~16#FFFF	-	-	Any	Real-time	U16
P18	47	BISS C Protocol Encoder Configuration	16#0~16#FFFF	-	16#0	Any	Real-time	U16



For the rotary motor with a Tamagawa 23-bit encoder, set P18.00 to 0x1012; for the rotary motor with a Tamagawa 17-bit encoder, set P18.00 to 0x1010; for the rotary motor with a 2500-line encoder, set P18.00 to 0x2020.

8.14 P19 Group Drive Parameters

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P19	00	Drive series code	0~65535	-	-	Stop	Restart	U16
P19	02	Rated power	-	kW	-	Only display	Real-time	U16
P19	08	Maximum output current	-	A	-	Only display	Real-time	U16
P19	0A	Carrier wave frequency	4000~20000	Hz	-	Stop	Restart	U16
P19	0B	Dead band time	0.00~20.00	μs	-	Stop	Restart	U16
P19	0C	Bootstrap Time	0.0~20.0	μs	-	Stop	Restart	U16
P19	0E	Temperature Alarm Point	0.0~6553.5	℃	-	Stop	Restart	U16
P19	10	Current Sensor Range	0.00~655.35	A	-	Stop	Restart	U16
P19	12	Overcurrent Point Setting	0.0~6553.5	%	-	Stop	Restart	U16
P19	13	Drive Rated Voltage	-	V	-	Only display	Real-time	U16
P19	14	Drive Overvoltage Point	0~1000	V	-	Stop	Restart	U16
P19	15	Drive Discharge Point	0~1000	V	-	Stop	Restart	U16
P19	16	Drive Undervoltage Point	0~1000	V	-	Stop	Restart	U16
P19	17	Bus Voltage Correction Coefficient	0.0~200.0	%	-	Stop	Restart	U16
P19	18	Minimum Braking Resistance	1~150	Ω	-	Stop	Restart	U16
P19	1B	Command Dispatch Frequency	0: 4kHz 1: 2kHz 2: 1kHz	-	0	Stop	Restart	U16
P19	1C	Voltage Filtering Cutoff Frequency	3000~65535	Hz	20000	Stop	Real-time	U16
P19	20	Current Sampling Filtering Time	0~3	25ns	1	Stop	Restart	U16
P19	21	Current Sampling Extraction Rate	0~3	-	1	Stop	Restart	U16

Function code		Name	Setting range	Unit	Default	Setting mode	Activate mode	Data type
P19	22	Overcurrent Filtering Time	0~750	ns	375	Stop	Restart	U16
P19	24	Filtering time for ABZ encoder input	0~6000	ns	25	Stop	Restart	U16
P19	25	Filtering time for Hall signal input	0~6000	ns	6000	Stop	Restart	U16

8.14.1 U00 Group Status Display Parameters

Function Code		Name	Unit	Data Type
U00	00	Motor Velocity	mm/s(RPM)	I16
U00	01	Input Signal Level	-	U16
U00	03	Output Signal Level	-	U16
U00	05	Input Command Pulse Counter	Command unit	I32
U00	07	Absolute Position Counter	Command unit	I32
U00	09	Encoder Feedback Pulse Counter	Encoder unit	I32
U00	0B	Position Deviation	Encoder unit	I32
U00	0D	Discharge resistor load rate	%	U16
U00	0E	Average Load Rate	%	U16
U00	0F	Velocity Command	RPM	I16
U00	10	Internal Torque Command	%	I16
U00	11	Motor Mechanical Angle	°	U16
U00	12	Motor Electrical Angle	°	U16
U00	13	Input Command Pulse Velocity	-	I16
U00	14	Current Sampling Value(RMS)	A	I16
U00	15	Bus Voltage	V	U16
U00	17	AI1 voltage	V	U16
U00	18	AI2 voltage	V	U16
U00	1A	Drive Temperature	°C	I16

Function Code		Name	Unit	Data Type
U00	1D	Total Running Time	s	U32
U00	20	Total Input Pulse Count	-	I32
U00	23	Encoder Multi-turn Count	-	U16
U00	24	Encoder Single-turn Position	Encoder unit	U32
U00	26	Low 32-bit of Absolute Position in Encoder Unit	Encoder unit	U32
U00	28	High 32-bit of Absolute Position in Encoder Unit	Encoder unit	U32
U00	2A	Low 32-bit of Mechanical Absolute Position	Encoder unit	U32
U00	2C	High 32-bit of Mechanical Absolute Position	Encoder unit	U32
U00	32	Rotating Load Single-turn Position	Command unit	U16
U00	36	Incremental Encoder AB Counter	-	I32
U00	38	Incremental Encoder Z Counter	-	U16
U00	39	Hall Status	-	U16
U00	3E	Function Code Number for Abnormal Parameter	-	U16
U00	3F	Offset in the Function Code Group for Abnormal Parameter	-	U16
U00	40	FPGA Record Absolute Encoder Fault Information	-	U16
U00	41	FPGA System State Information		U16
U00	42	FPGA System Fault Information		U16
U00	43	Quadrature Encoder Error Information	-	U16
U00	44	Nikon Encoder State Information	-	U16

Function Code		Name	Unit	Data Type
U00	45	Tamagawa Encoder Error Information	-	U16
U00	47	Manufacturer Parameter	-	U16
U00	48	Manufacturer Parameter	-	U16
U00	49	Manufacturer Parameter	-	U16
U00	4A	Manufacturer Parameter	-	U16
U00	4B	Manufacturer Parameter	-	U16
U00	68	DI Function Status 1	-	U16
U00	69	DI Function Status 2	-	U16
U00	6A	DI Function Status 3	-	U16
U00	6B	DI Function Status 4	-	U16
U00	6C	DO Function Status 1	-	U16
U00	6D	DO Function Status 2	-	U16
U00	6E	DO Function Status 3	-	U16
U00	6F	DO Function Status 4	-	U16
U00	90	Current Fault Code	-	U16
U00	91	Servo Status	-	U16
U00	92	Current Alarm Code	-	U16
U00	93	Fault Record SN	-	U16
U00	94	Fault Record Fault Code	-	U16
U00	96	Fault Timestamp	s	U32
U00	98	Velocity when fault occurs	RPM	I16
U00	99	Phase U current when fault occurs	A	I16
U00	9A	Phase V current when fault occurs	A	I16
U00	9B	Bus voltage when fault occurs	V	U16
U00	9C	Input terminal state when fault occurs	-	U16
U00	9E	Output terminal state when fault occurs	-	U16

8.14.2 U01 Group Software Version Display Parameters

Function Code		Name	Display Range	Unit	Data Type
U01	00	MCU Software Version	-	-	U32
U01	02	FPGA Software Version	-	-	U32
U01	04	Temporary Version Number	-	-	U16
U01	05	Encoder Version Number	-	-	U16

8.14.3 F Group Auxiliary Function Class Parameters

Function Code		Name	Setting Range	Data Type
F02	(F.Stop)	Emergency stop	0: Disable 1: Enable	U16
F03	(F.Agl)	Absolute encoder initial angle identification	0: Disable 1: Enable 2: Fault	U16
F04	(F.Part)	Parameter reset	0: No operation 1: Reset function code 4: Restore to factory parameter 5: Reset function code(rotation motor) 6: Reset function code(linear motor)	U16
F05	(F.Errt)	Fault reset	0: Disable 1: Enable	U16
F06	(F.Sftr)	Software reset operation	0: Disable 1: Enable	U16
F07	(F.Abtr)	Absolute encoder reset	0: Disable 1: Reset fault 2: Reset fault and multi-turn value 3: Operation failed(When write it to 1 or 2, after successfully reset, value of this parameter is automatically set to 0, otherwise is set to 3)	U16
F08	(F.Enc)	Encoder ROM operation	0: Disable 1: Write ROM 2: Read ROM 3: Operation failed(when this parameter is set to 1 or 2, write ROM or read ROM fails, this parameter is automatically set to 3)	U16

Function Code	Name	Setting Range	Data Type
F09 (F.Aiau)	AI automatic zero drift adjustment	0: Disable 1: Ordinary AI adjustment	U16
F0B	Fault record reset	0: Disable 1: Enable	U16
F0C	Error compensation specified origin	0: No operation 1: Specify origin	U16
F0D	Motor parameter identification	0: Disable 1: Enable	U16
F0E	Read fault status of Nikon encoder	0: Disable 1: Enable	U16
F0F	Single-click adjustment operation	0: Disable 1: Enable	U16
F10	Reload FPGA FIASH	0: Disable 1: Enable	U16
F31	Operation control communication address 1	0~65535	U16
F32	Operation control communication address 2	0~65535	U16

8.15 DI and DO Function

8.15.1 DI Function Parameter Setting

DI function number	DI function description
1	Enablement
2	Positive Over Travel
3	Negative Over Travel
4	Home position signal
5	Enable homing
6	Execute internal position command
7	Fault reset
8	Switch command polarity
9	Emergency stop
10	Internal position halt
11	Operation mode switching selection 1(Mode_Sel1)

DI number	function DI function description
12	Operation mode switching selection 2(Mode_Sel2) When Mode_Sel1=0 and Mode_Sel2=0, it is in position mode When Mode_Sel1=1 and Mode_Sel2=0, it is in velocity mode. When Mode_Sel1=0 and Mode_Sel2=1, it is in torque mode. When Mode_Sel1=1 and Mode_Sel2=1, it is in position mode.
13	Positive velocity jog
14	Negative velocity jog
15	Zero-speed clamping enablement
16	Gain switching enablement
17	Electronic gear ratio switching
18	Pulse Prohibited
19	Clear Position5 Deviation
20	Position-comparison output origin setting
21	Error Compensation Origin Setting
22	Internal Task Canceled
25	Internal Task SN Selection 1
26	Internal Task SN Selection 2
27	Internal Task SN Selection 3
28	Internal Task SN Selection 4 When using internal position (velocity), the specified number of segments for operation is (FunIn.28*8+FunIn27*4+FunIn26*2+FunIn25)
31	Capture 1
32	Capture 2
48	DDR non-standard Next1
49	DDR non-standard Next2
50	DDR Non-standard Save Single Turn Position
51	DDR Non-standard Correction Position
52	DDR Non-standard Triggered to Auto Homing
53	DDR Non-standard Combination Functional Trigger
54	Torque Limit Switching
55	Adjustable Gain Parameter Switching
56	Analog forward jogging
57	Analog reverse jogging

8.15.2 Digital Output (DO) Function Parameter Setting

DO function number	DO function description
1	Servo is ready
2	Servo on
3	Position reached
4	Warning Output
5	Fault Output Signal
6	Brake Signal
7	Homing Completed
8	Angle Identification Completed
9	Torque limit status
10	Auxiliary Gain is effective
13	Zero Speed Signal
14	Velocity Consistency Signal
15	Velocity Reached Signal
16	Torque Command Reached Signal
19	DDR Auto Homing Completed
24	DDR Non-Standard Position 1 Output
25	DDR Non-Standard Position 2 Output
26	DDR Non-Standard Position 3 Output

9 Appendix - Terminology

Terminology	Description
AI	AI (Analog Input) refers to input signals that represent continuously changing physical quantities. The higher the sampling resolution, the finer the analog quantity is quantized, resulting in more accurate results. Physical quantities for analog inputs include temperature, pressure, flow rate, etc., which are sensed by corresponding sensors and often converted into electrical signals by transmitters before being input into the controller's analog input port.
AO	AO (Analog Output) refers to analog signals output by the drive. In a microcontroller-based control system, there are many analog signals in the output signal. They are digital signals output by the microcontroller and processed through the analog output channel. The task of the analog output channel is to convert the digitally processed signals from the drive into analog voltage signals through a D/A converter, amplify them, and drive the corresponding actuator to achieve control purposes.
DB	DB (Dynamic Brake) consists of a dynamic braking resistor. It is used to shorten the mechanical feed distance of the servo motor during faults, emergency stops, or power outages through energy-consuming braking.
DDR	DDR (Direct Drive Rotate motor), also known as torque motor, is a new type of motor that directly connects to the load mechanism and precisely controls the movement of the load component through the drive system. The basic principle and structure of the DDR motor adopt a permanent magnet method and design a dedicated disk motor. Utilizing the space at both ends of the outer rotor structure, the stators of the two disk motors are fixed together with the stator of the outer rotor structure. The rotors of the two disk motors and the rotor cylinder of the outer rotor structure form a three-dimensional closed outer rotor. In the same volume, this compound structure can generate greater electromagnetic torque than a single outer rotor structure and a single disk-shaped structure motor.
DI	DI (Digital Input) converts switch signals with only two states in the production process into signals recognizable by the drive and inputs them into the drive. For example, the status of field limit switches.
DO	DO (Digital Output) converts the binary-coded signals output by the drive into switch signals that can control the production process or display status. For example, status control and display of on/off indicators, motor start/stop, valve open/close, relay on/off, etc.
EEPROM	EEPROM (Electrically Erasable Programmable Read Only Memory) refers to electrically erasable programmable read-only memory. It is a type of non-volatile storage chip that retains data even when power is removed. EEPROM can erase existing information on a computer or dedicated device and reprogram it. It is commonly used in plug-and-play scenarios.
EtherCAT	EtherCAT (Ethernet for Control Automation Technology) is an open architecture fieldbus system based on Ethernet. The name "CAT" in EtherCAT stands for Control Automation Technology. EtherCAT is a deterministic industrial Ethernet originally developed by the German company Beckhoff. EtherCAT has a short cycle time because the microprocessors of the slaves do not need to process Ethernet packets. All program data is processed by the hardware of the slave controller. This feature, combined with the functional principle of EtherCAT, allows EtherCAT to become a

Terminology	Description
	high-performance distributed I/O system: the data exchange of a thousand distributed digital inputs/outputs only takes 30 μ s. Reading and writing to a system with a hundred servo axes can be updated at a rate of 10 kHz. The typical update rate is about 1~30 kHz, but lower update rates can also be used to avoid too frequent direct memory access affecting the operation of the master.
Modbus	Modbus is a serial communication protocol developed by Modicon (now Schneider Electric) in 1979 for communication with programmable logic controllers (PLCs). Modbus has become an industry-standard communication protocol in the industrial field and is now a common way of connecting industrial electronic devices. The main reasons why Modbus is more widely used than other communication protocols are: ◆ Publicly published and no copyright requirements. ◆ Easy to deploy and maintain. ◆ Few restrictions on modifying moving local bits or bytes for vendors. Modbus allows multiple (about 240) devices to be connected to the same network for communication. For example, a device measuring temperature and humidity and sending the results to a computer. In Supervisory Control and Data Acquisition (SCADA) systems, Modbus is typically used to connect monitoring computers and Remote Terminal Units (RTUs).
Modbus RTU	Modbus RTU protocol is an open, mainly serial-based communication protocol. In Modbus RTU protocol, the communication parties are called "master" and "slave". The master sends queries or write commands to the slave, and the slave passively receives commands and then feeds back the corresponding data results or executes write commands according to the function code and register number. In a RS485 network, theoretically, up to 254 slaves can be connected, but in practical applications, considering line loss and interference, it generally does not exceed 100, otherwise Ethernet communication is recommended.
PDFF	PDFF (Pseudo-Derivative Feedback and Feedforward) introduces a feedforward gain in the speed loop PI controller, superimposing the system setpoint onto the control quantity through a feedforward channel. This can increase the integral gain without causing excessive overshoot, and through the integral link, many low-frequency interference signals can be filtered out, thereby improving the system's response capability and disturbance resistance, and allowing the motor to quickly positioning and have good following ability during operation.
PI	PI control, short for Proportional-Integral control, is a closed-loop control system widely used in the industrial automation field. In this system, the controller adjusts the control amount based on the error between the actual output value and the desired output value through proportional and integral terms, so that the actual output value is as close as possible to the desired output value.
Brake	A mechanical brake mainly plays the role of deceleration and stopping, similar to stepping on the brake when driving.
Object Dictionary	CANopen Object Dictionary is the core concept of the CANopen protocol. The so-called Object Dictionary is an ordered set of objects that describes all parameters of the corresponding CANopen node, including the location of communication data, which is included in its index. This table becomes a transmittable form called EDS file (Electronic Data Sheet).