FV5 Series Rotary Pulse Servo Drive User Manual

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Revision History

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2024-07-18	01	Initial Publication

Contents

Preface

Overview

Thank you for choosing products from Flexem. The FV5 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 FV5 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 via 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 operation methods and functions of the FV5 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 FV5 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
Italic	Variables, must be replaced by actual values accordingly. For example, “Enter ‘ftp:*//the IP of HMI*’ 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 call our service hotline at 4008-033-022.

For more documents, please visit https://www.flexem.com/download.

Contact Information

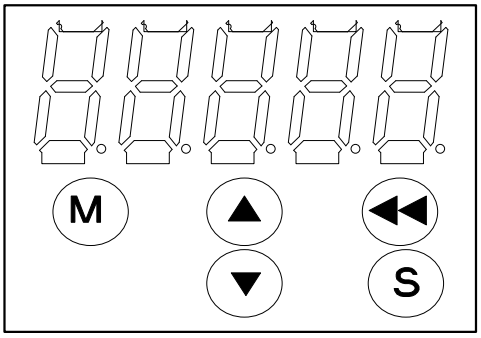
Address: 9th Floor, Building A, INNO Business Park, No. 386 Guo'an Road, Yangpu District, Shanghai

Zip Code: 200043

Website: https://www.flexem.com

1 Panel Display and Control Timing

1.1 Panel Button Introduction

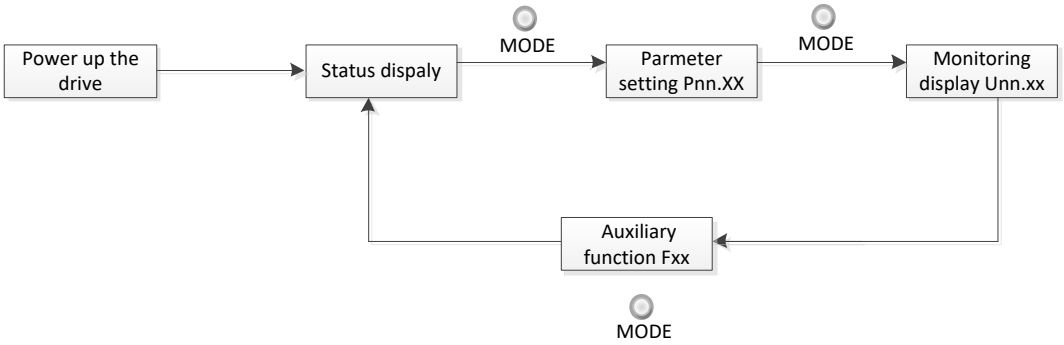


The panel of the servo drive consists of a display (LED digital tube) and buttons. It can be used for various displays of the servo drive. Taking the P group parameters as an example, the functions of the buttons are as follows:

Name		Regular Function
M	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	Shift the selected number (blinking number) to the left or page up
S	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.

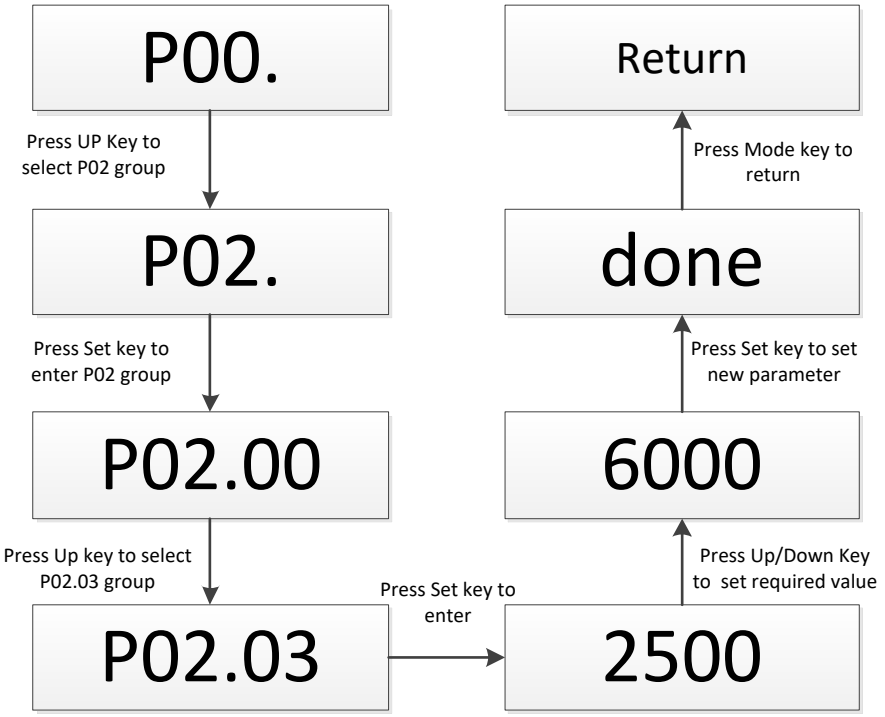
Status Display: Shows the current status of the servo. See the table below for details.

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	Er.053
Servo Alarm status	AL.OC0

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.

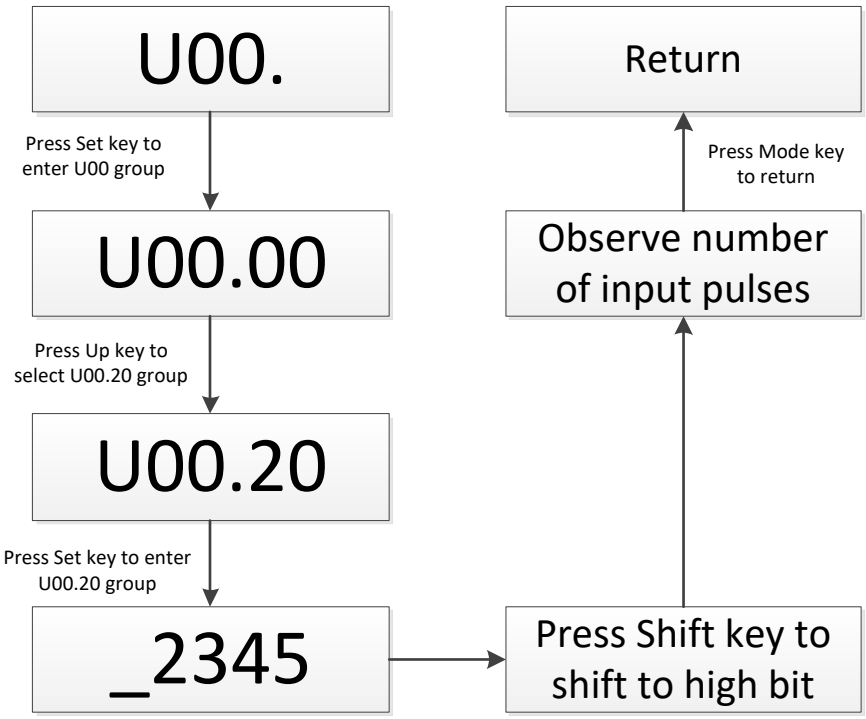
1.3 Group P Parameter Setting

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:

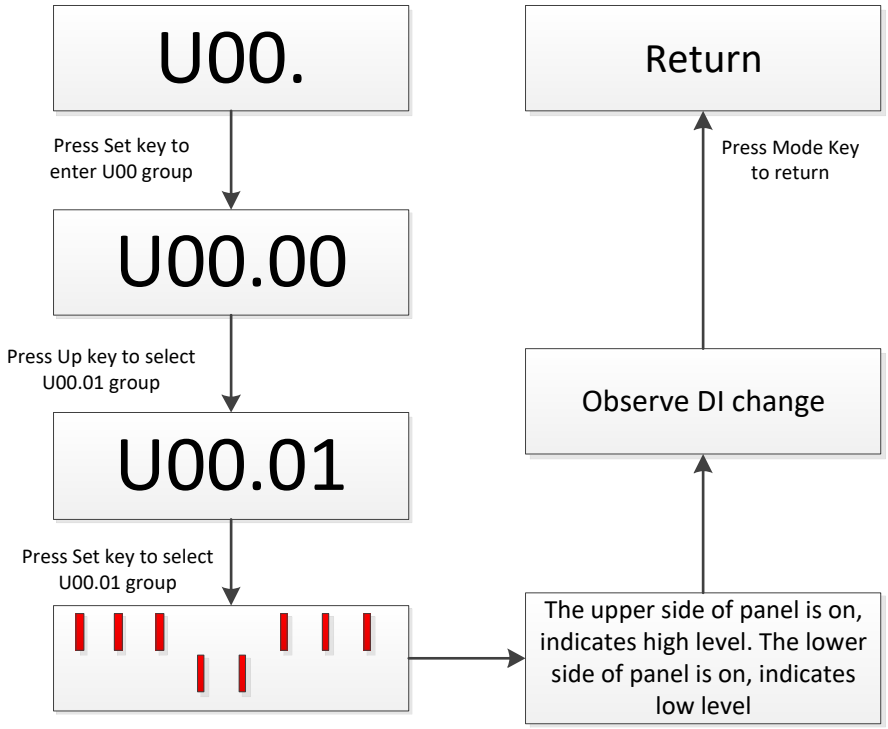


1.4 Group U Parameter Display

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



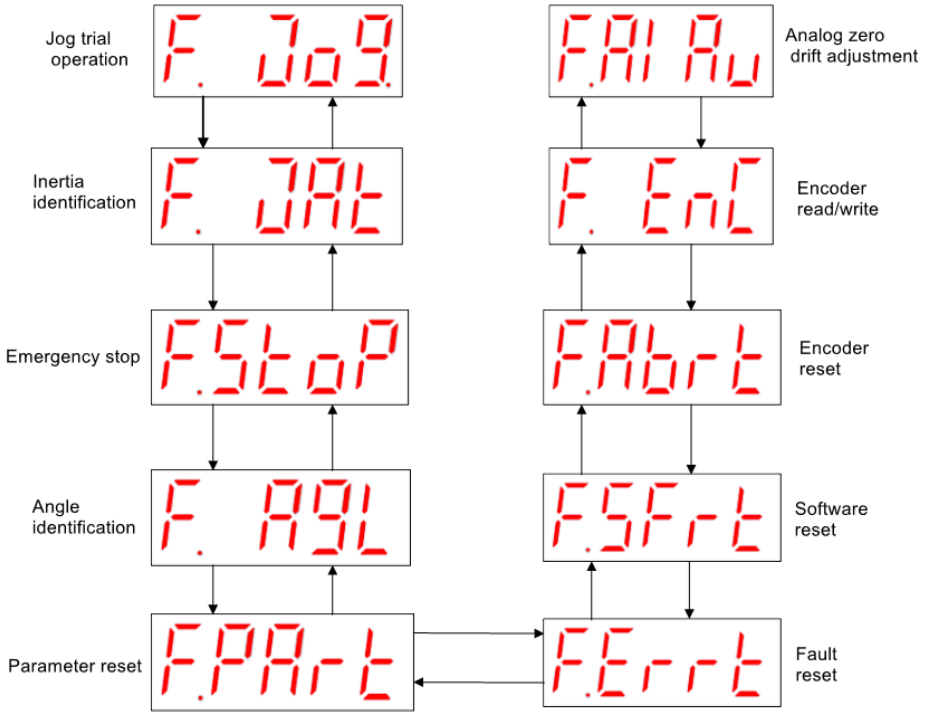
◆ For example: Selecting U00.01 displays the input DI status of the servo. The operation process is as shown in the figure below.



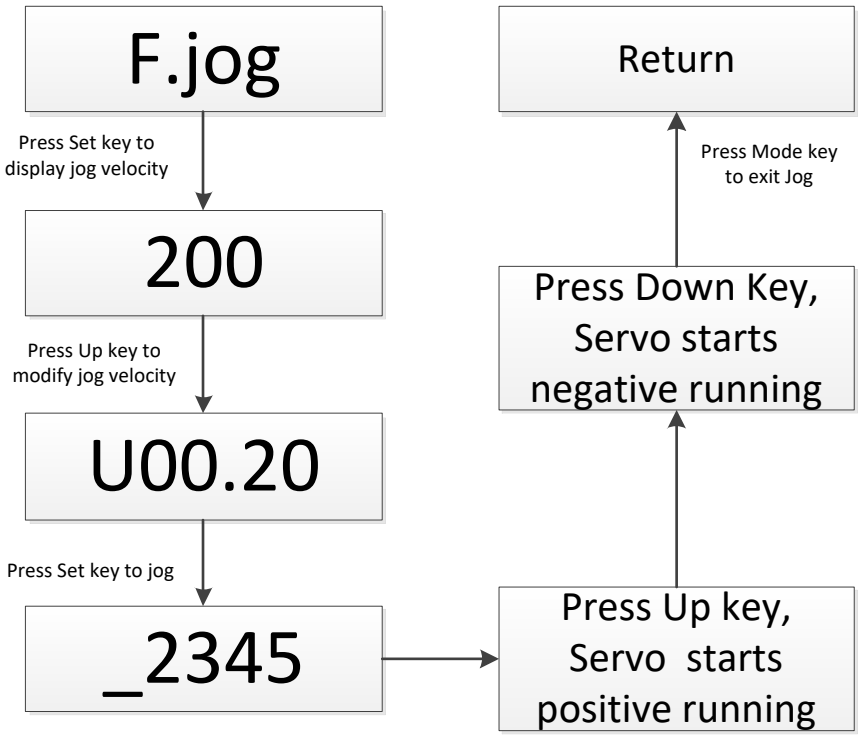
The DI status display indicates the status of the DI channels, with the rightmost indicating the status of DI1, the second from the right indicating the status of DI2, and so on, with DI1 to DI8 corresponding from right to left.

1.5 F Group Parameter Usage

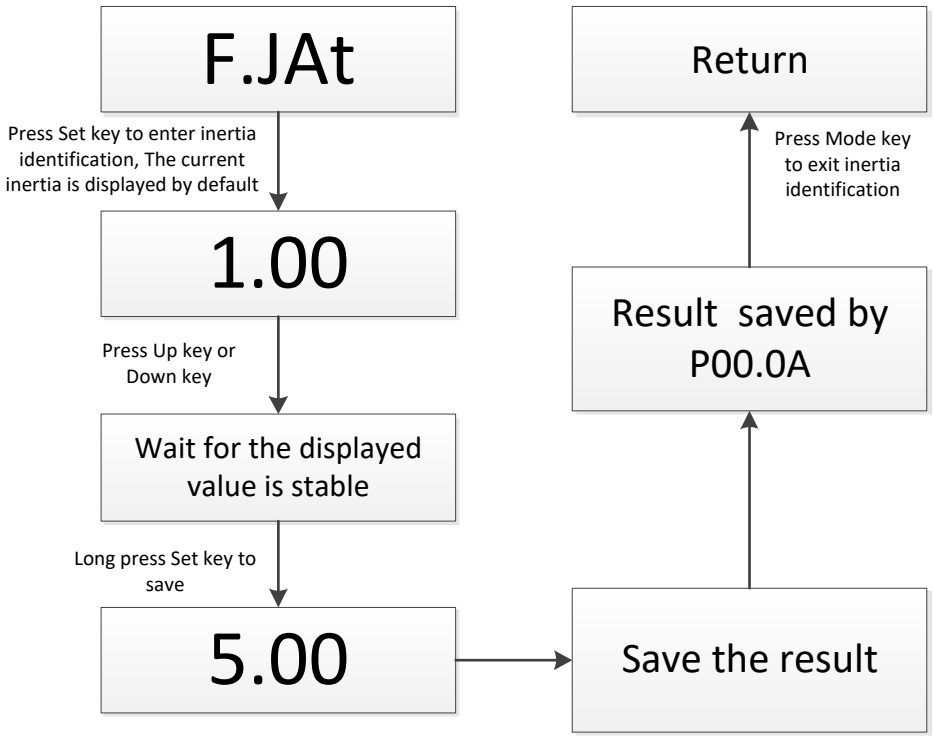
Group F parameters are used for monitoring display, serving as the auxiliary function group for the servo.



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

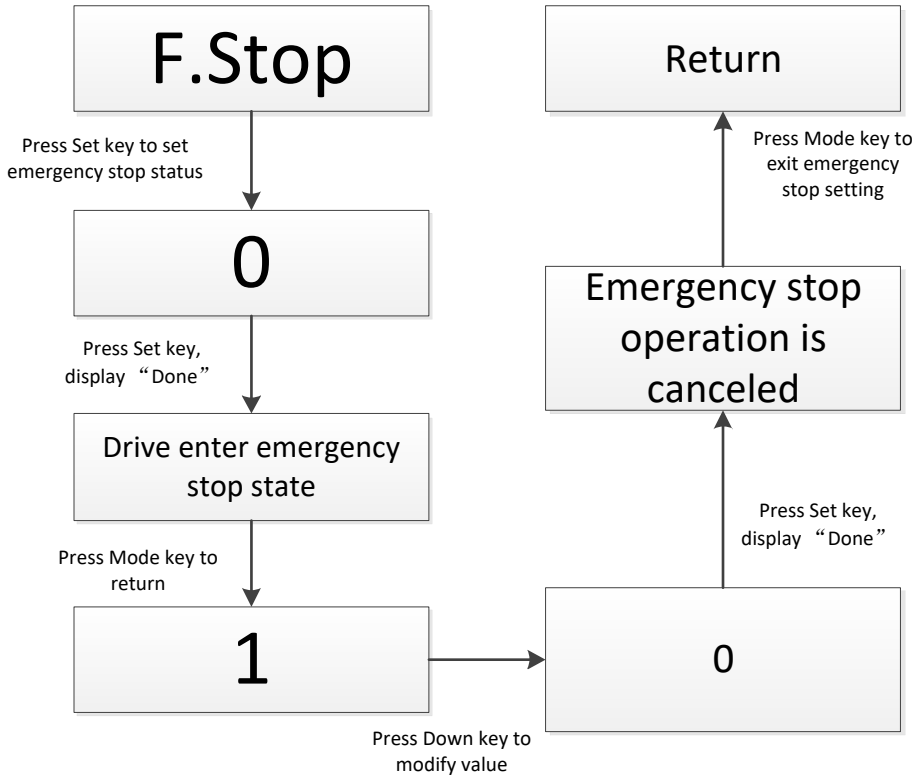


◆ For example: For the inertia identification function, please refer to the following diagram for the operating process.

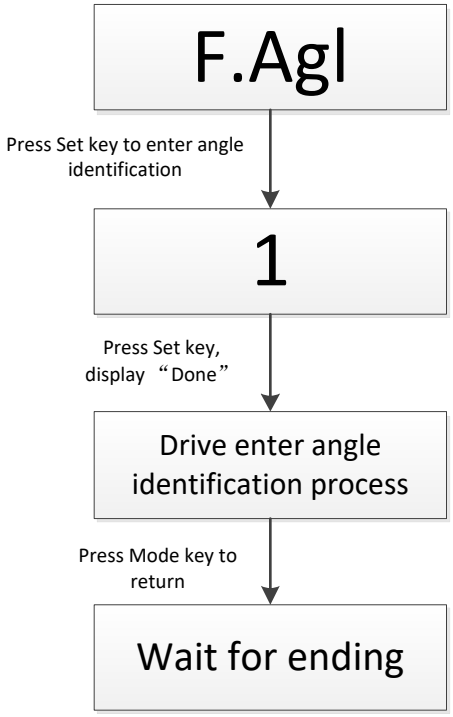


Explanation: A fluctuation of less than 15% is considered stable.

- 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

Fault display: Er.XX.Y, where XX represents the major fault category, and Y represents the sub-fault 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)

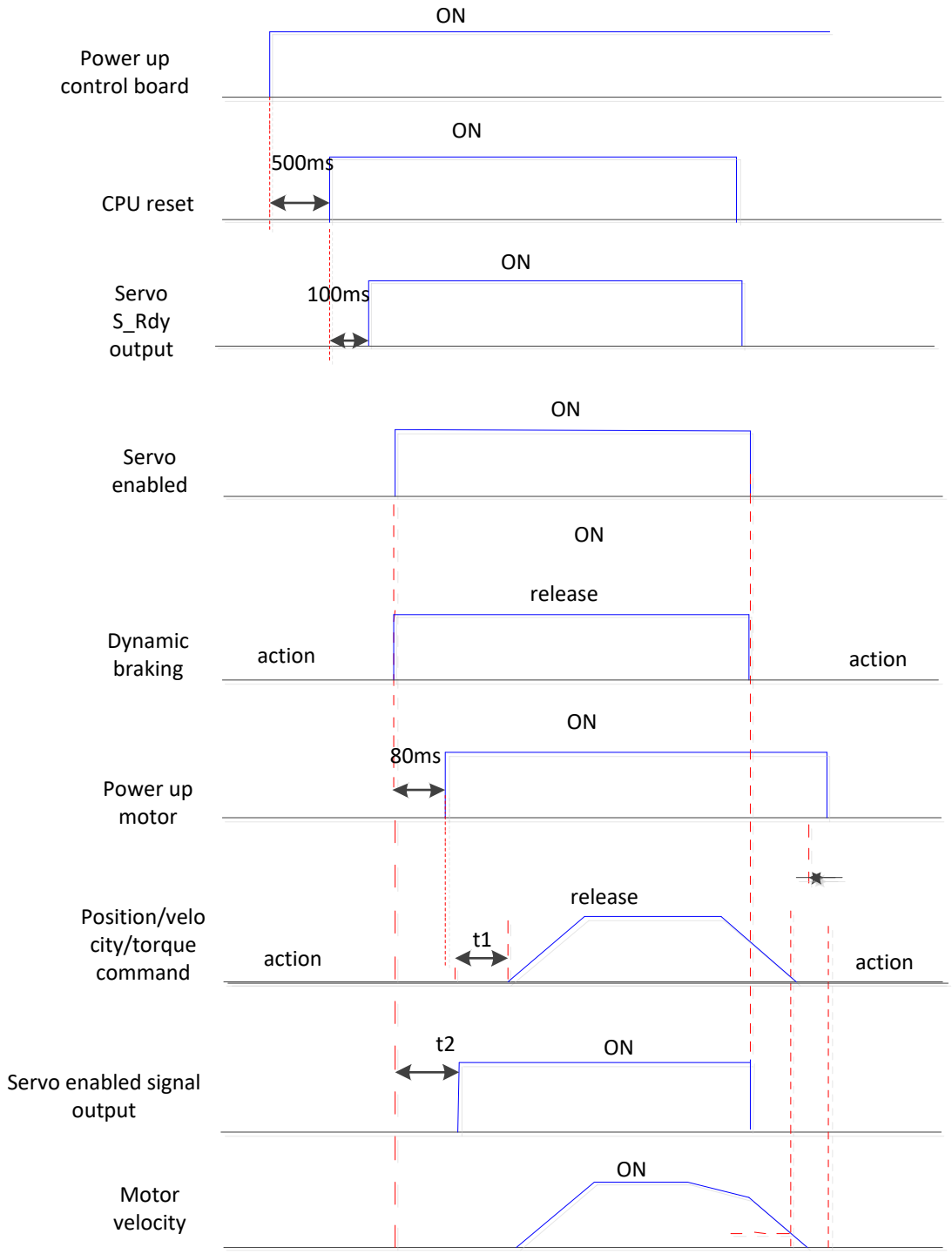
Warning display: Al.XX.Y, where XX represents the major fault category, and Y represents the sub-fault code.

Display	Name	Content
AL.0C.0	Current Alarm Code	AL.: The driver currently has warning 0C.0: Warning code, indicating to repower up

2 Control and Timing

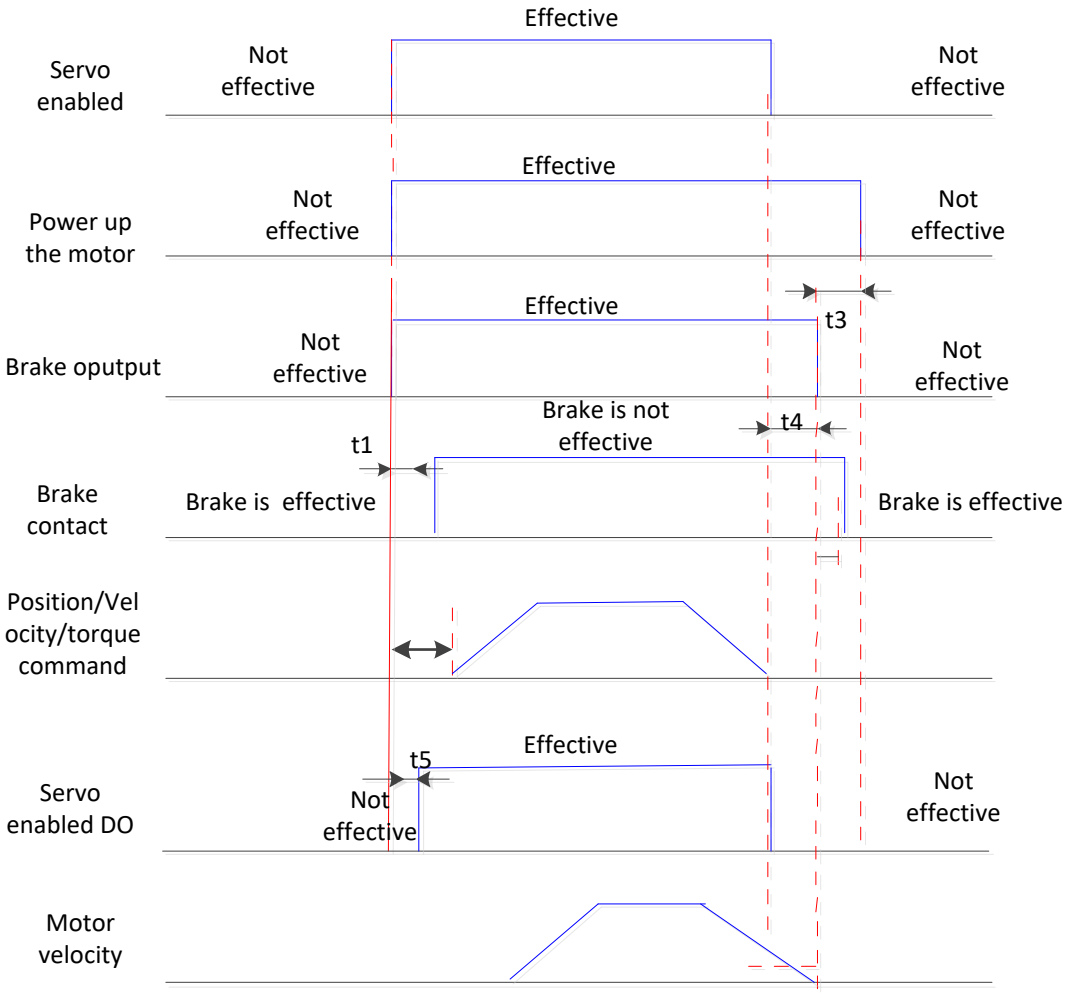
2.1 Power-On Timing Diagram

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



The t2 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 t1 is the brake action time.

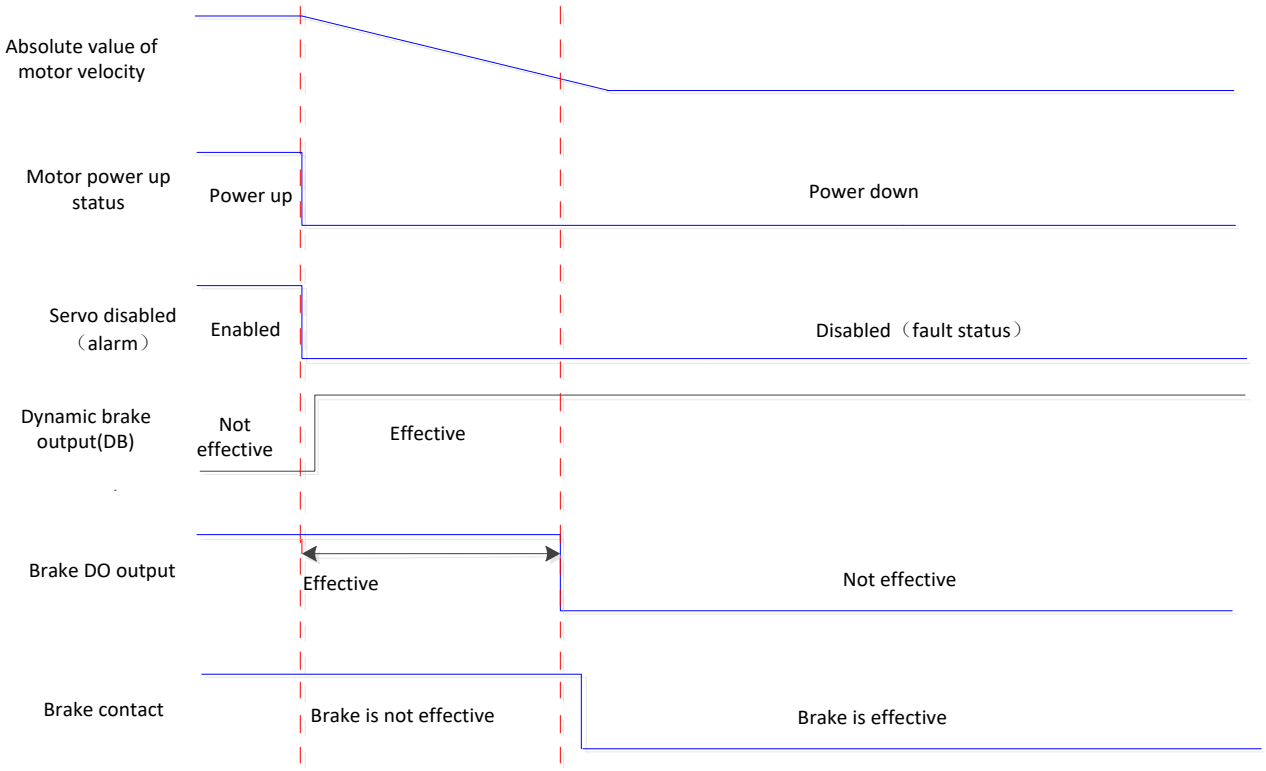
Time t2 is the time set by P0B.30. Before this time, no commands can be received from the upper computer.

Time t3 is the time set by P0B.31, during which the brake is effective until the motor is de-energized.

Disabling time, the brake is effective when the delay reaches the set time t4 (P0B.33) or when the velocity is less than the set value (PB2.32).

Time t5 is the internal servo bootstrap circuit charging time.

2.3 Shutdown Timing Diagram



Shutdown Related Function Codes

	Shutdown Methods when P02.10 Enablement is Ineffective	Setting Range	Unit	Factory Default	Related Modes		
		-3~2	-	-3	P	S	T

Explanation

The shutdown methods when the servo is disabled should be adjusted according to the actual situation.

- -3: Zero-speed shutdown and stay in DB state
- -2: Ramp shutdown, DB braking
- -1: DB shutdown and stay in DB state
- 0: Free shutdown and stay in free state
- 1: Ramp shutdown and stay in free state
- 2: Zero-speed shutdown and stay in free states

	P02.11 Overtravel Stop Method	Setting Range	Unit	Factory Default	Related Modes		
		0~1	-	1	P	S	T

It is generally not recommended to modify this setting.

	P02.12 Uncontrollable Fault (Type 1) Shutdown Method	Setting Range	Unit	Factory Default	Related Modes

		0~2	-	2	P	S	T
Explanation: This fault is non-resettable ◆ 0: Free shutdown ◆ 1: DB shutdown and stay in free state ◆ 2: DB shutdown and stay ins DB state							

	P02.13 Controllable Fault (Type 2) Shutdown Method	**Setting Range**	**Unit**	**Factory Default**	**Related Modes**		
		-4~3	-	-2	P	S	T
Explanation: This fault is resettable ◆ -4: Emergency torque shutdown and stay in DB state ◆ -3: Ramp shutdown and stay in DB state ◆ -2: Ramp shutdown and stay in DB state ◆ -1: DB shutdown and stay in DB state ◆ 0: Free shutdown and stay in free state ◆ 1: Ramp shutdown and stay in free state ◆ 2: Ramp shutdown and stay in free state ◆ 3: Emergency torque shutdown and stay in free state							

	P02.14 Shutdown Completion Threshold	**Setting Range**	**Unit**	**Factory Default**	**Related Modes**		
		10~1000	RPM	20	P	S	T
Explanation: When the actual running velocity of the motor is less than this threshold value, it is determined to be a shutdown state.							

	P0B.20 Ramp Shutdown Acceleration/Deceleration Time	**Setting Range**	**Unit**	**Factory Default**	**Related Modes**		
		0~10000	ms	50	P	S	T
Explanation:s The acceleration/deceleration time of ramp shutdown when there is a fault shutdown or servo OFF shutdown.							

	P0B.22 Emergency Torque Shutdown Deceleration	**Setting Range**	**Unit**	**Factory Default**	**Related Modes**		
		0.0~300.0	%	50.0	P	S	T

The change amount of torque during emergency torque shutdown.

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 resistor
- 1: External resistor
- 2: No discharge

	P02.21 Internal Regenerative Resistor Power	Setting Range	Unit	Factory Default	Related Modes		
		1~65535	W	800	P	S	T

Explanation:

A too small power rating can lead to overheating or overloading of the discharge resistor

	P02.22 Internal Regenerative Resistor Resistance	Setting Range	Unit	Factory Default	Related Modes		
		1~1000	Ω	50	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 overcurrent in the drive, while if it is too large, it may affect discharge effectiveness

	P02.23 External Regenerative Resistor Power	Setting Range	Unit	Factory Default	Related Modes		
		1~65535	W	800	P	S	T

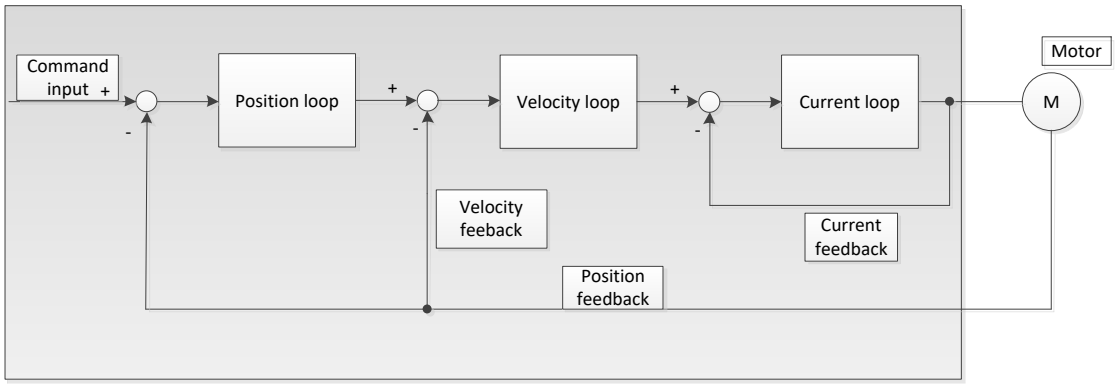
Explanation: If the power is too small, it may cause the discharge resistor to overheat or overload

	P02.24 External Regenerative Resistor Resistance	Setting Range	Unit	Factory Default	Related Modes		
		1~1000	Ω	50	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.							

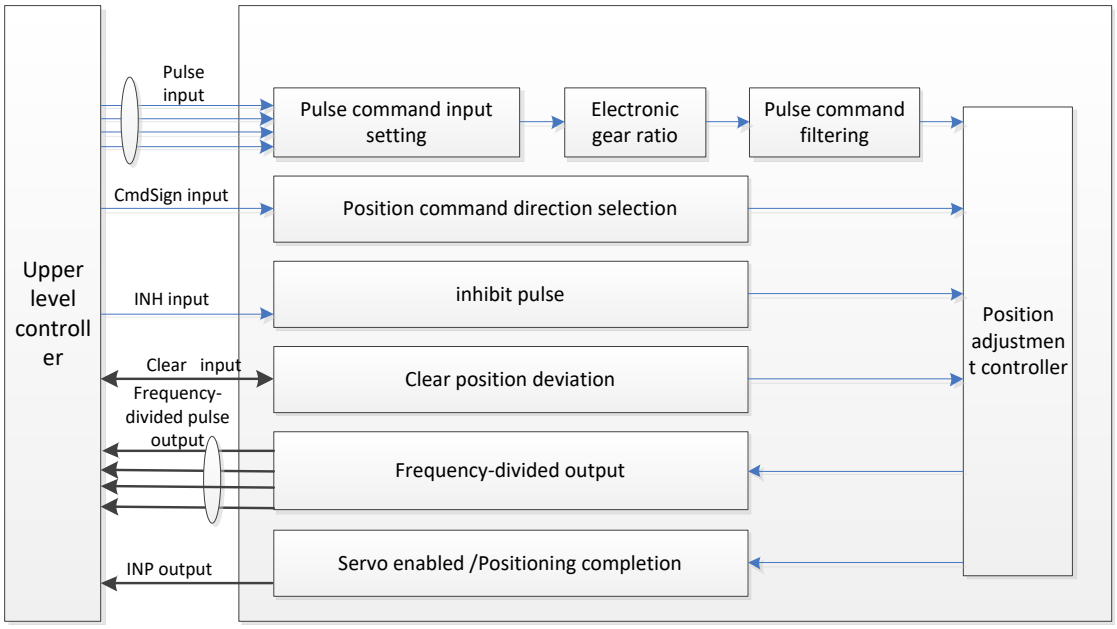
3 Control Mode

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

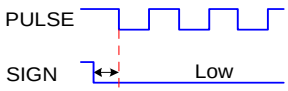
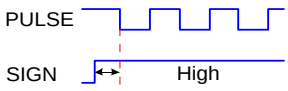
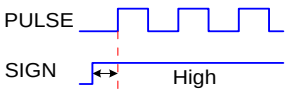
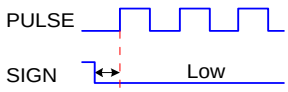
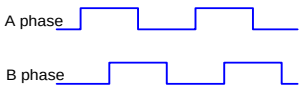
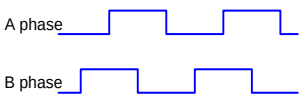
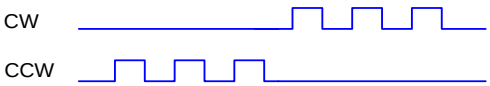
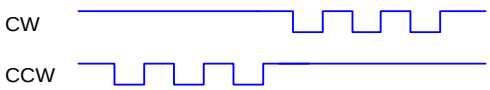
P03.00 Source of Position Command	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T

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	 A Phase Leading B Phase by 90°	 B Phase Leading A Phase by 90°
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 Output Pulse Port Selection	Setting Range	Unit	Factory Default	Related Modes		
		0~1	-	-	P	S	T

Explanation:

- 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:

Number of input command pulses $*\frac{Electronic\ gear\ ratio\ numerator}{Electronic\ gear\ ratio\ denominator}$=actual number of pulses the motor runs

	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 the numerator of the electronic gear ratio being the encoder's pulse count per revolution, with the denominator being P03.10.

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

	P03.12 Electronic Gear Ratio 1 (Numerator)	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	1	P	S	T

Explanation: Set the numerator of electronic gear ratio 1

	P03.14 Electronic Gear Ratio 1 (Denominator)	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	1	P	S	T
Explanation: Set the denominator of electronic gear ratio 1							

	P03.16 Electronic Gear Ratio 2 (Numerator)	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	10	P	S	T
Explanation: Set the numerator of electronic gear ratio 2							

	P03.18 Electronic Gear Ratio 2 (Denominator)	Setting Range	Unit	Factory Default	Related Modes		
		1~1072741824	-	1	P	S	T
Explanation: Set the number of electronic gear ratio 2							

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:

$$0.001<=\frac{Electronic\ gear\ ratio\ numerator}{Electronic\ gear\ ratio\ denominator}<=100000$$

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 Frequency Division Output Pulse Phase	Setting Range	Unit	Factory Default	Related Modes		
		0~1	-	0	P	S	T
Explanation: Set the phase relationship between the A-phase pulse and the B-phase pulse of the pulse output. ◆ 0: Positive frequency division ◆ 1: Negative frequency division							

	P02.03 Encoder Frequency Pulse Count	Setting Range	Unit	Factory Default	Related Modes		
		10~1048576	p/revolution	1024	P	S	T
Explanation: The number of A-phase and B-phase output by the motor per revolution is equal to 4 times the value set in parameter P02.03.							

P02.05 Z Pulse Output Polarity Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	1	P	S	T

Explanation:

Setting the output level when the Z-phase pulse is effective.

- 0: Positive polarity output (Z-phase is high-level)
- 1: Negative polarity output (Z pulse is low-level)

Position DO output related function codes

P05.2C Positioning Completion Amplitude	Setting Range	Unit	Factory Default	Related Modes		
	1~65535	-	100	P	S	T

Explanation:

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

The unit of this parameter is determined by P05.2E:

- P05.2E=0: in user units
- P05.2E=1: in encoder units

P05.2D Position Completion Holding Time	Setting Range	Unit	Factory Default	Related Modes		
	0~2000	ms	0	P	S	T

Explanation:

When the position command is sent, and the absolute value of the position deviation is less than or equal to P05.2C, and it maintains the time specified by P05.2D, the position completion signal FunOut.3 (INP) is output.

The unit of this parameter is determined by P05.2E:

- P05.2E=0: In user units
- P05.2E=1: In encoder units

P05.2E Position Arrival Window Unit Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T

Explanation:

Set the unit for the position arrival threshold.

- 0: User unit
- 1: Encoder unit

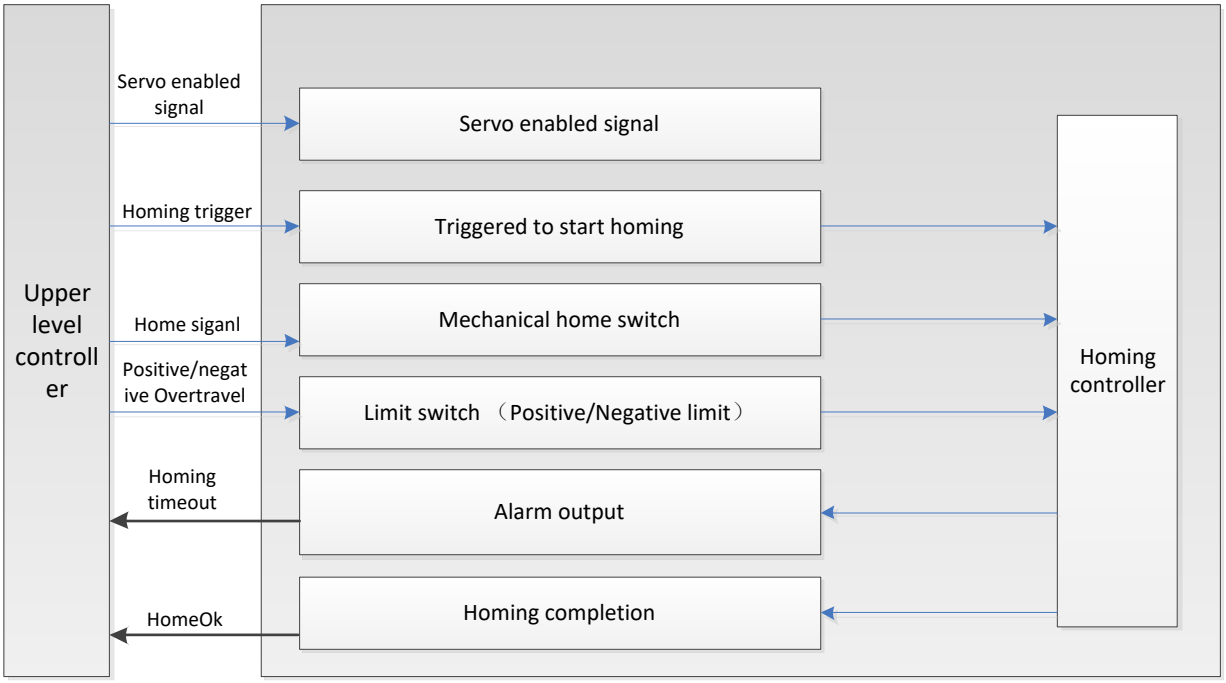
P03.25 Position Deviation Excessive Threshold Unit Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~2	-	2	P	v	

Explanation:

- 0: User unit
- 1: Encoder unit
- 2: mm (For linear motors only)

Rotary motors default to 1, linear motors default to 2

3.2 Position Control 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.

3.2.1 Introduction to the Homing Function

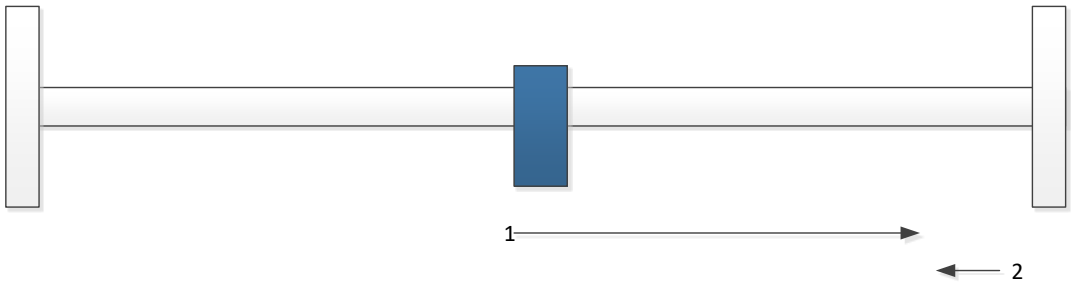
Related function codes:

P03.31 Homing Mode	Setting Range	Unit	Factory Default	Related Modes		
	-3~35	-	1	P	S	T

Explanation:

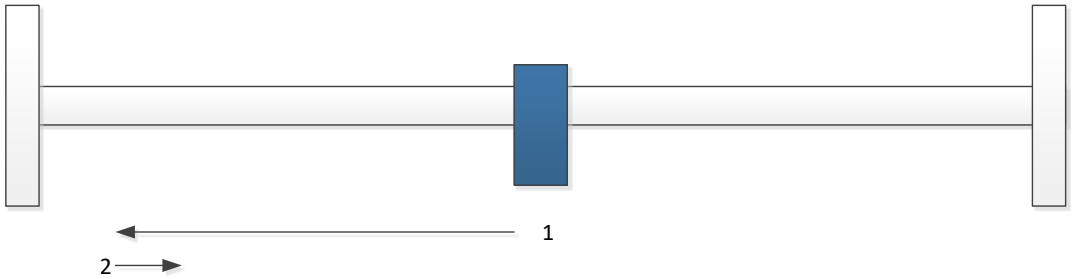
Fully compatible with the CanOpen402 (Cia402) protocol's Homing mode, as detailed in the following table

Homing method - 2



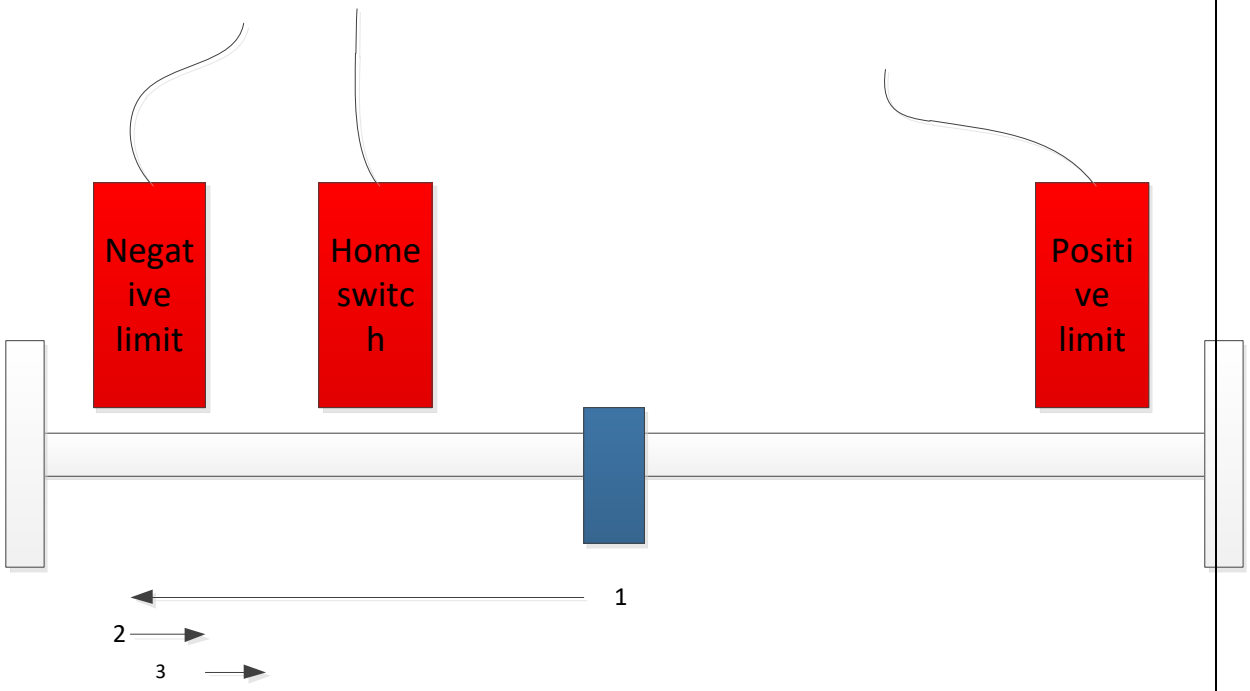
1. Positive motion, seeking the rising edge of the negative mechanical limit (high-speed to low-speed transition).
2. Seek the Z signal in negative direction.

Homing method - 1



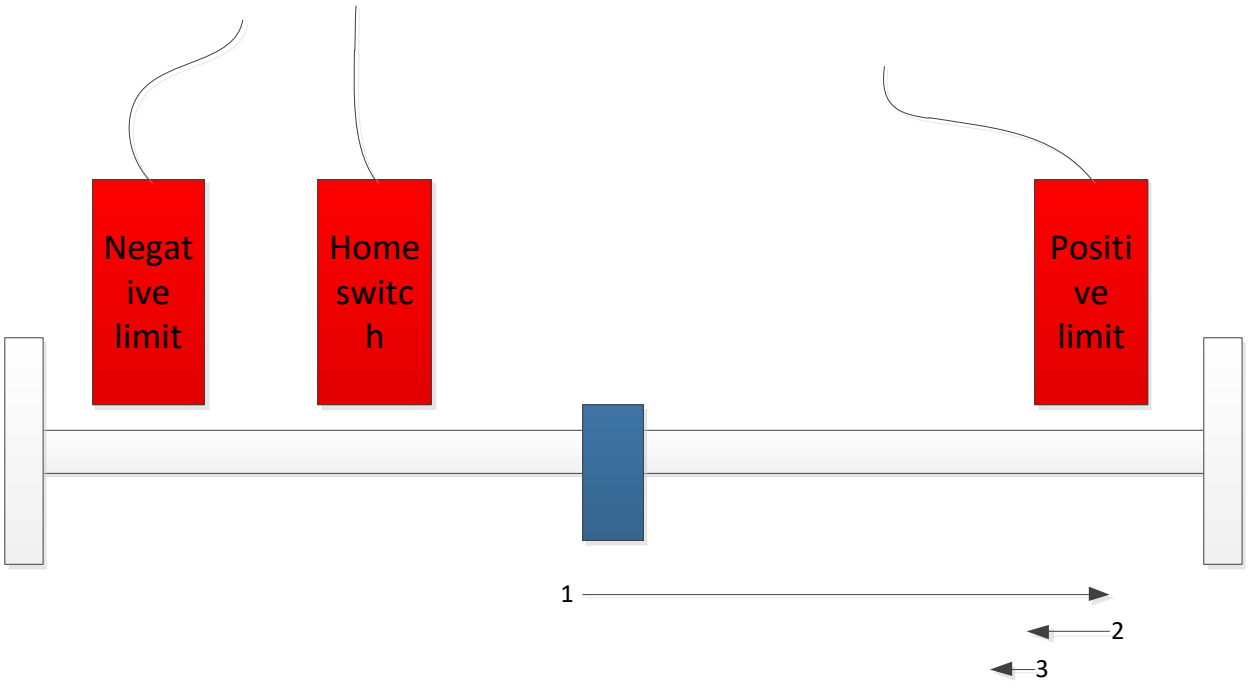
1. Negative motion, seeking the rising edge of the negative mechanical limit (high-speed to low-speed transition).
2. Seek the Z signal in positive direction.

Homing method 1 (Method 17)



1. Negative motion, seeking the rising edge of the negative limit switch (high-speed switching to low-speed).
2. Positive motion, seeking the falling edge of the negative limit switch.
3. Seek the Z signal in positive direction. (Method 17 does not seek the Z signal)

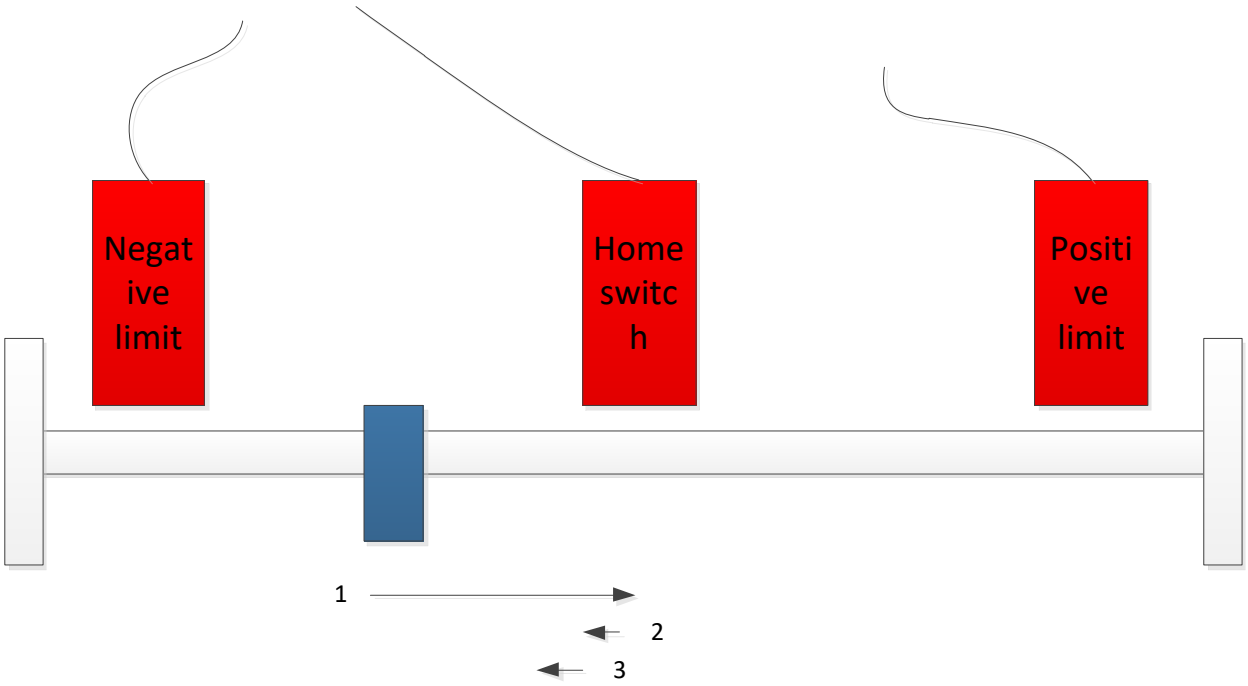
Homing method 2 (Method 18)



1. Positive motion, seeking the rising edge of the positive limit switch (high-speed switching to low-speed).

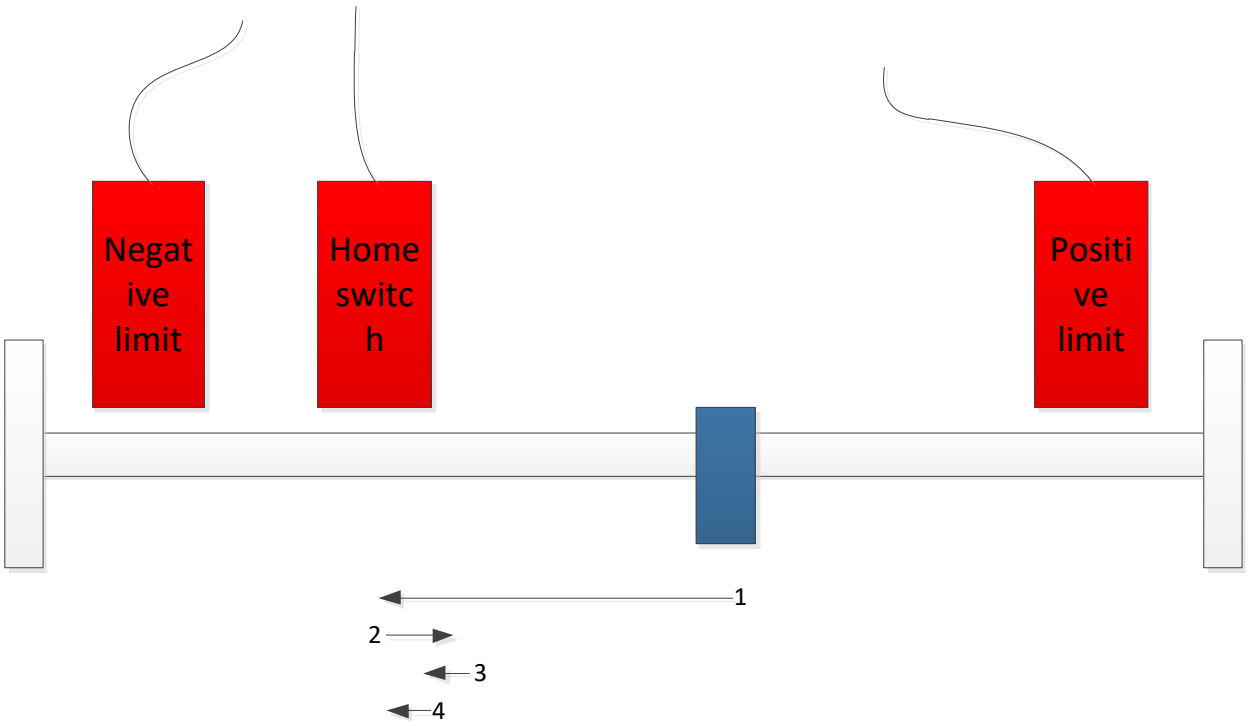
2. Negative motion, seeking the falling edge of the positive limit switch.
3. Seek the Z signal in negative direction. (Method 18 does not seek the Z signal)

Homing method 3 (Method 19)



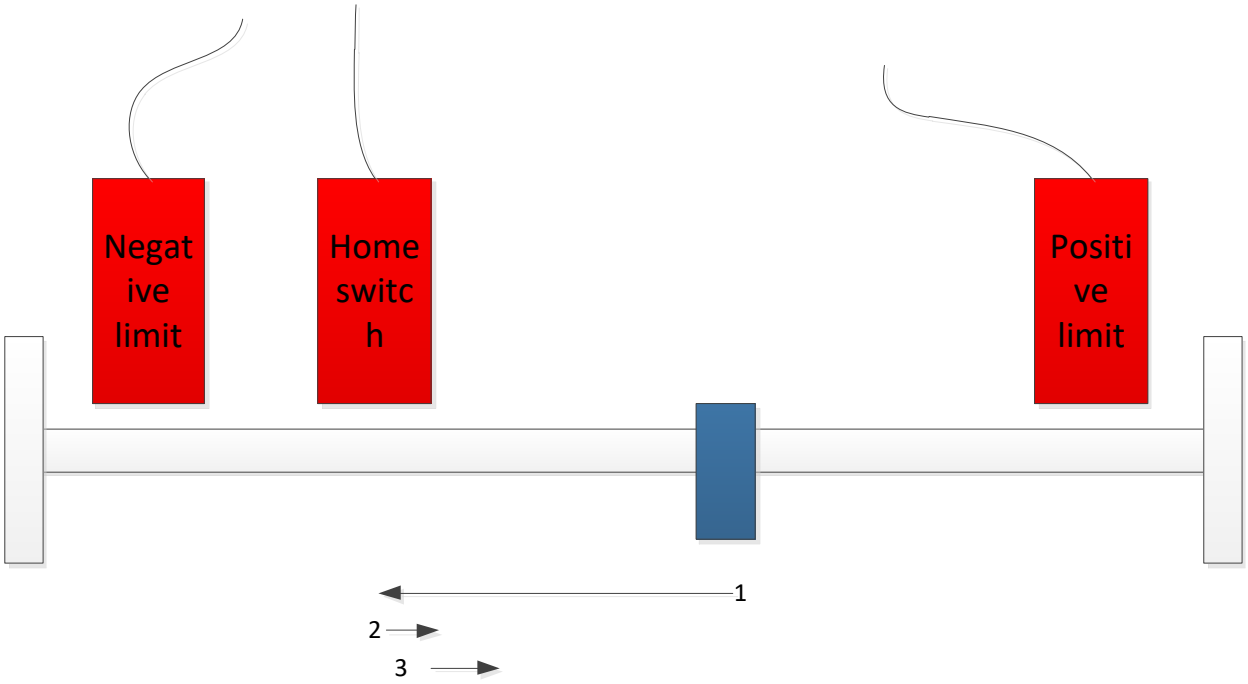
1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Negative motion, seeking the falling edge of the home switch (same side).
3. Seek the Z signal in negative direction. (Method 19 does not seek the Z signal)

Homing method 4 (Method 20)



1. Negative motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Positive motion, seeking the falling edge of the home switch (same side).
3. Negative motion, seeking the rising edge of the home switch.
4. Seek the Z signal in negative direction. (Method 20 does not seek the Z signal).

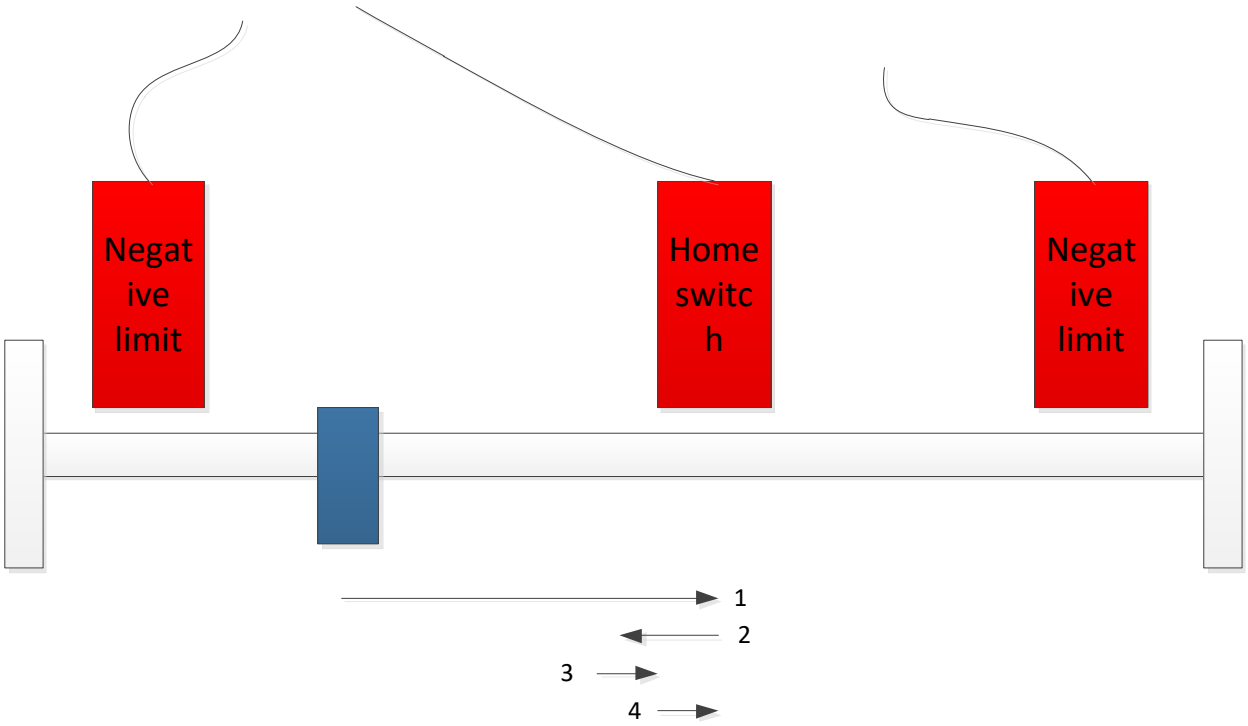
Homing method 5 (Method 21)



1. Negative motion, seeking the rising edge of the home switch (high-speed switching to low-speed).

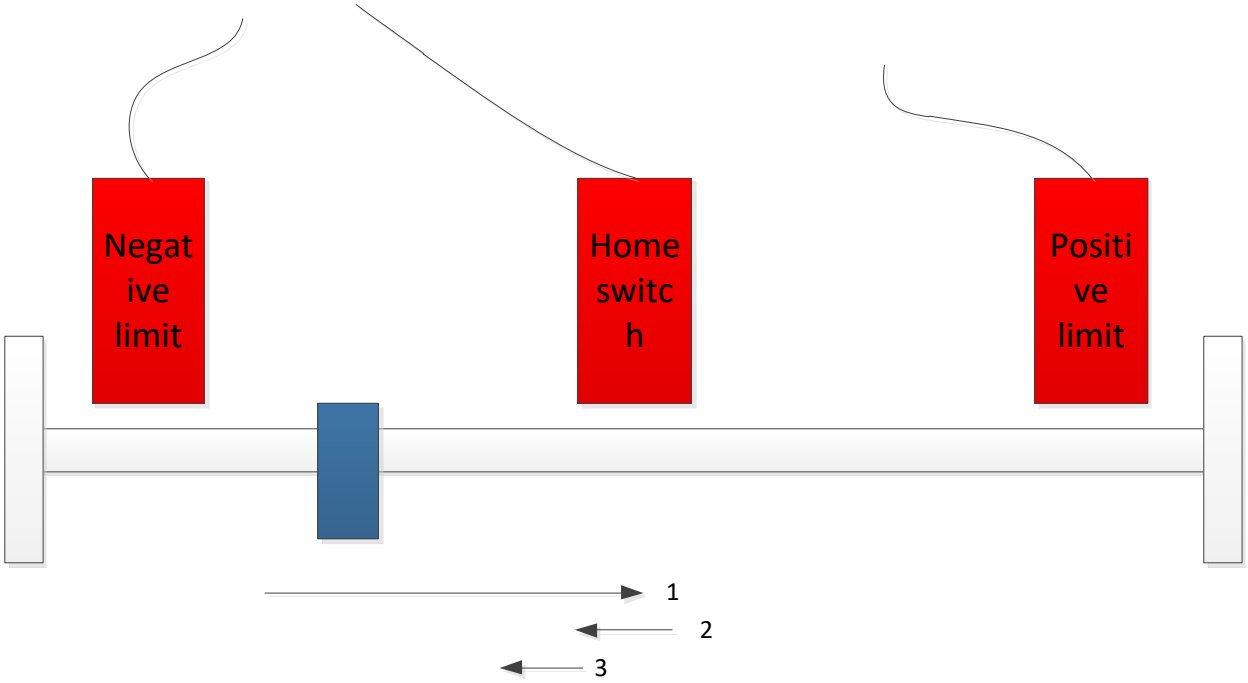
2. Negative motion, seeking the falling edge of the home switch (same side).
3. Seek the Z signal in positive direction. (Method 21 does not seek the Z signal).

Homing method 6 (Method 22)



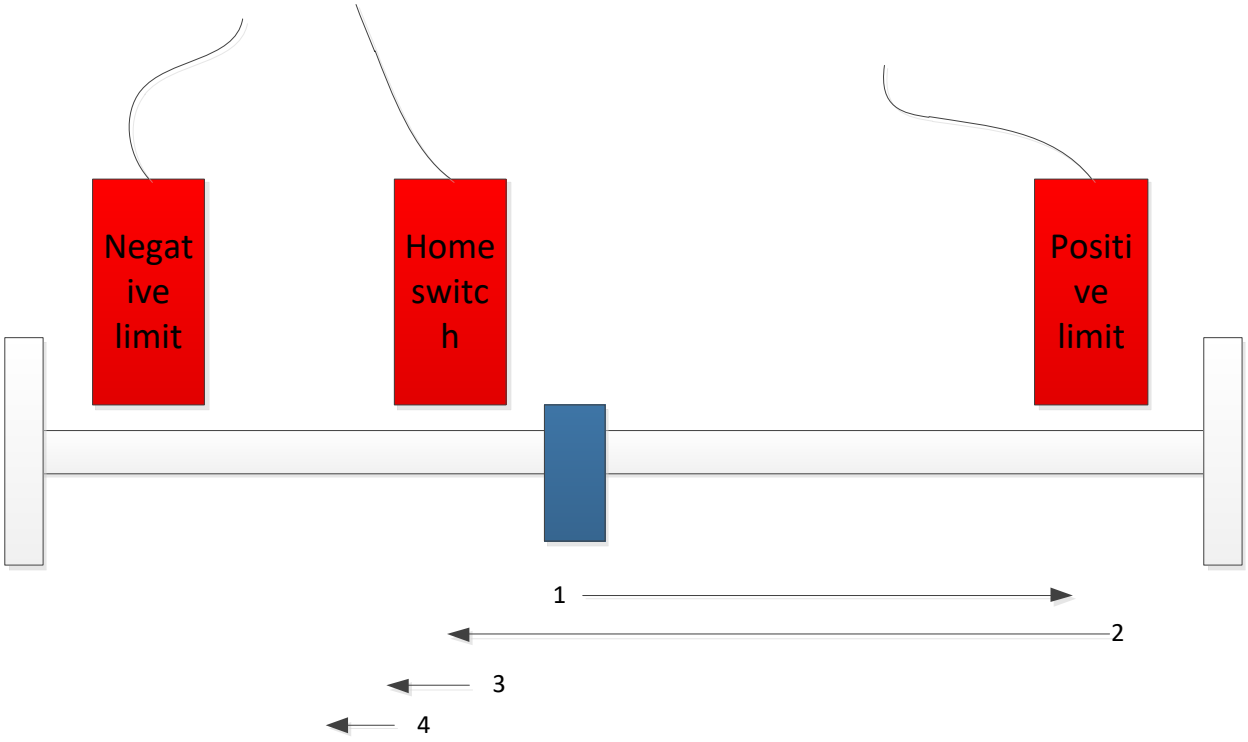
1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Negative motion, seeking the falling edge of the home switch (same side).
3. Positive motion, seeking the rising edge of the home switch.
4. Seek the Z signal in positive direction. (Method 22 does not Seek the Z signal).

Homing method 7 (Method 23)



1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Negative motion, seeking the falling edge of the home switch (same side).
3. Seek the Z signal in negative direction. (Method 23 does not seek the Z signal).

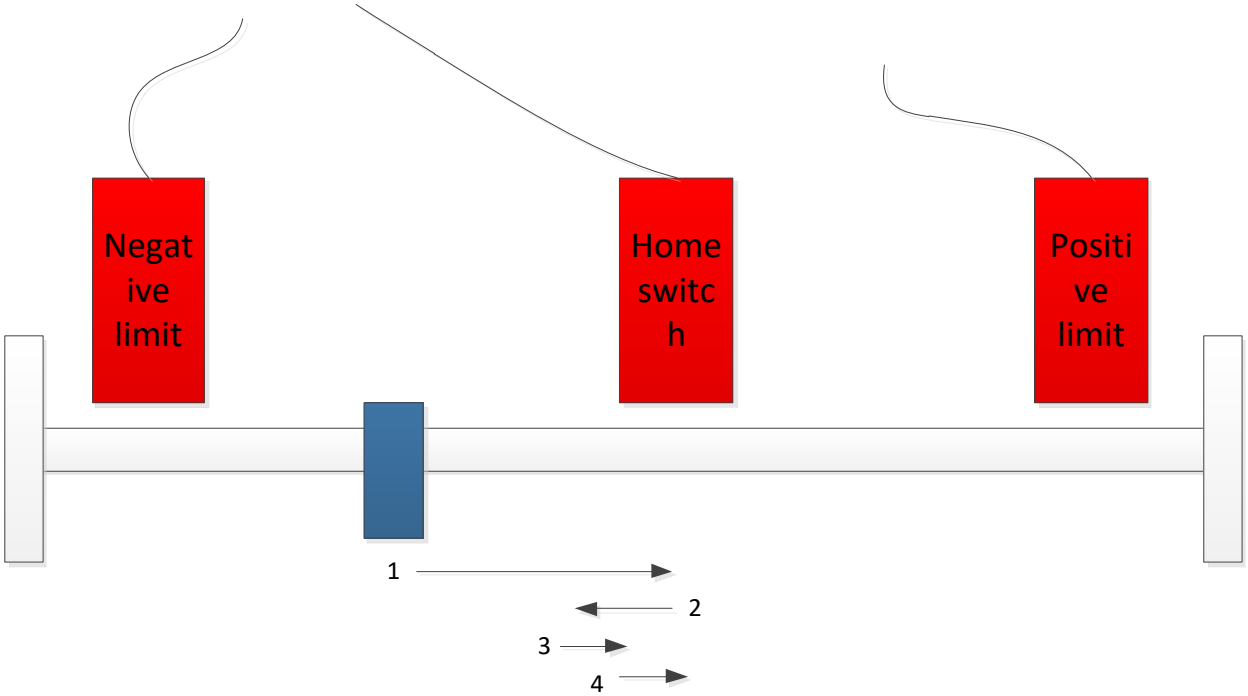
OR



1. Positive motion, seeking the rising edge of the positive limit switch.
2. Negative motion, seeking the rising and falling edges of the home switch (high-speed switching to low-speed).
3. Seek the falling edge of the home switch in negative direction.

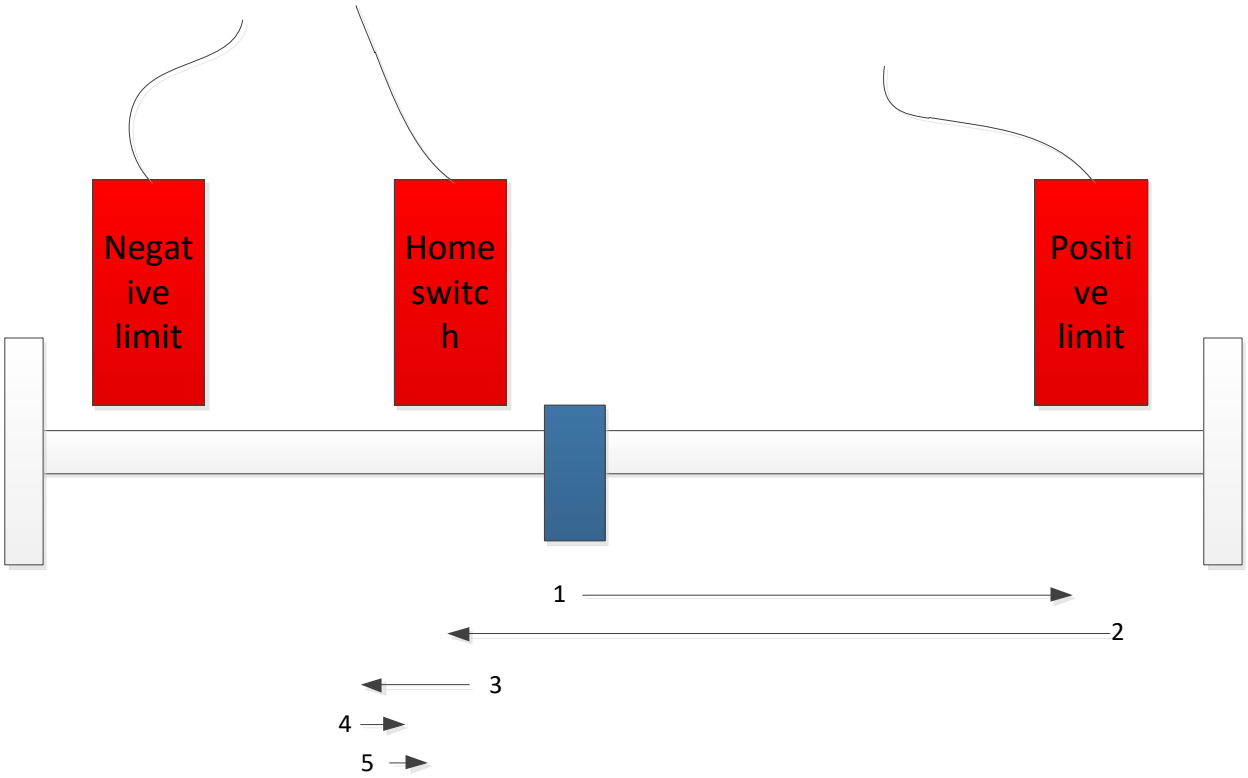
4. Seek the Z signal in negative direction. (Method 23 does not seek the Z signal).

Homing method 8 (Method 24)



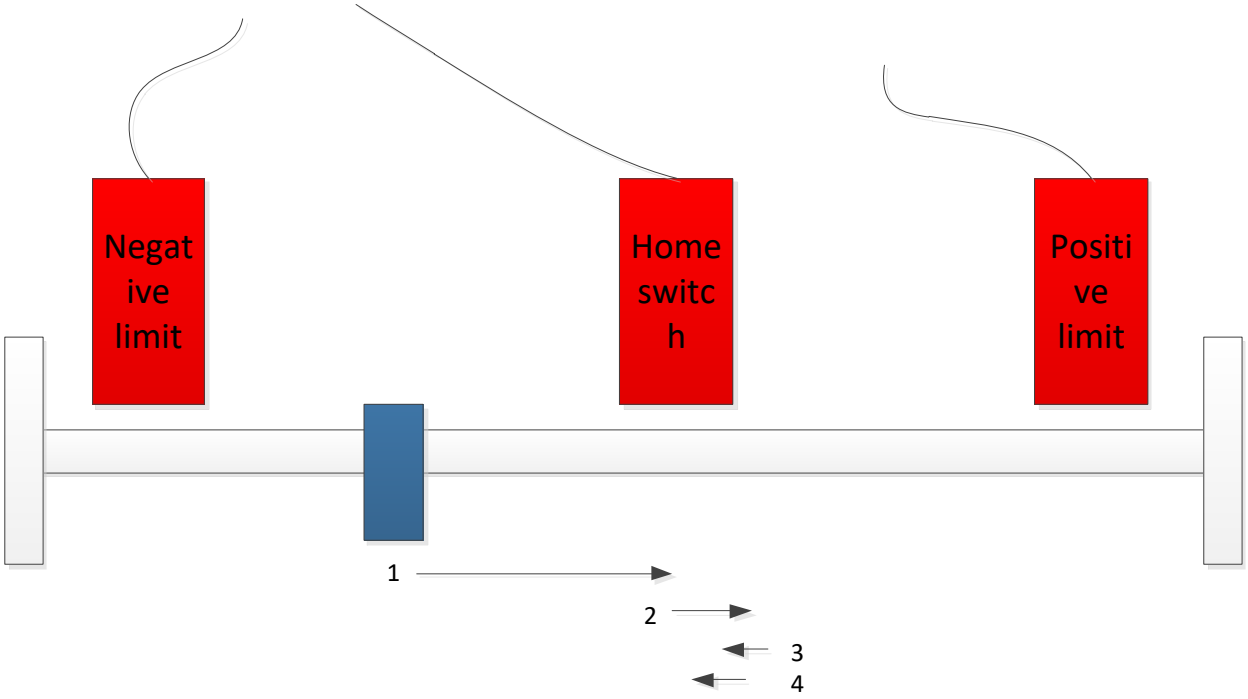
1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Negative motion, seeking the falling edge of the home switch (same side).
3. Positive motion, seeking the rising edge of the home switch.
4. Positive motion, seeking the Z signal. (Method 24 does not seek the Z signal).

OR



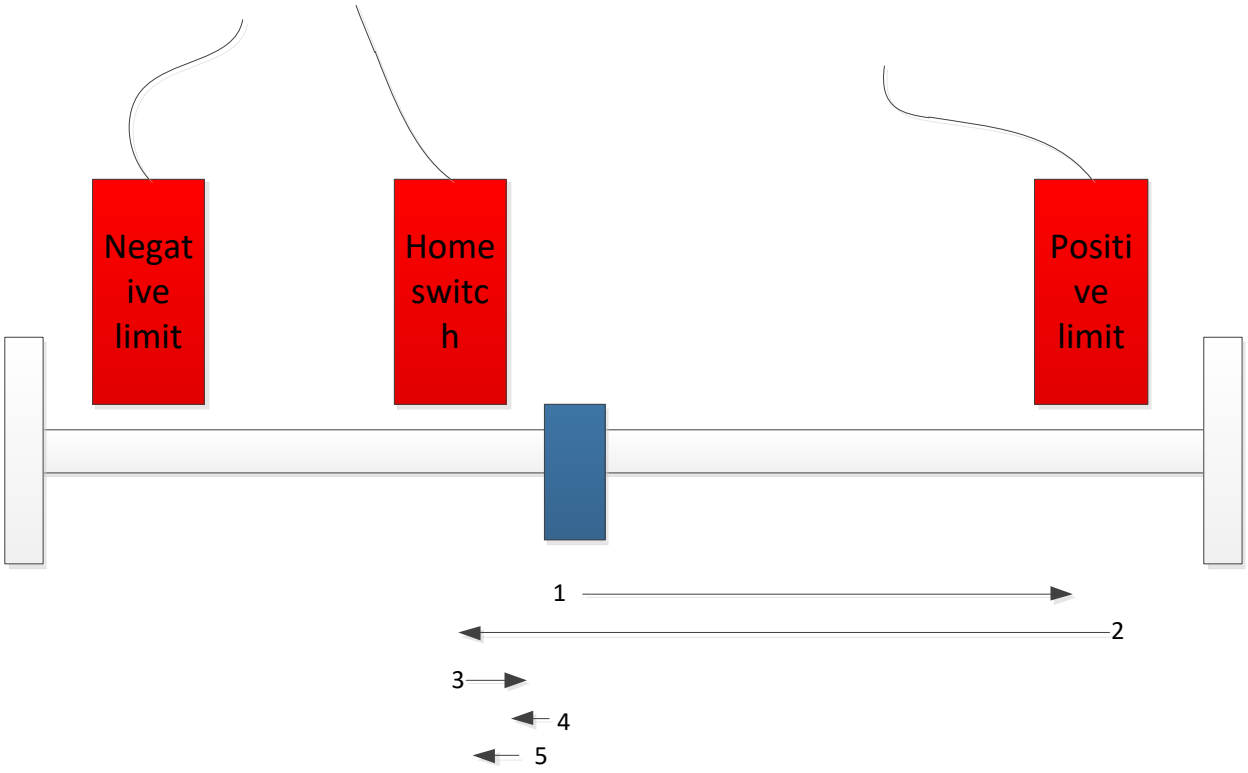
1. Positive motion, seeking the rising edge of the positive limit switch.
2. Negative motion, seeking the rising and falling edges of the home switch (high-speed switching to low-speed).
3. Negative motion, seeking the falling edge of the home switch.
4. Positive motion, seeking the rising edge of the home switch.
5. Negative motion, seeking the Z signal. (Method 24 does not seek the Z signal).

Homing method 9 (Method 25)



1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Positive motion, seeking the falling edge of the home switch on the other side.
3. Negative motion, seeking the rising edge of the home switch.
4. Negative motion, seeking the Z signal. (Method 25 does not seek the Z signal).

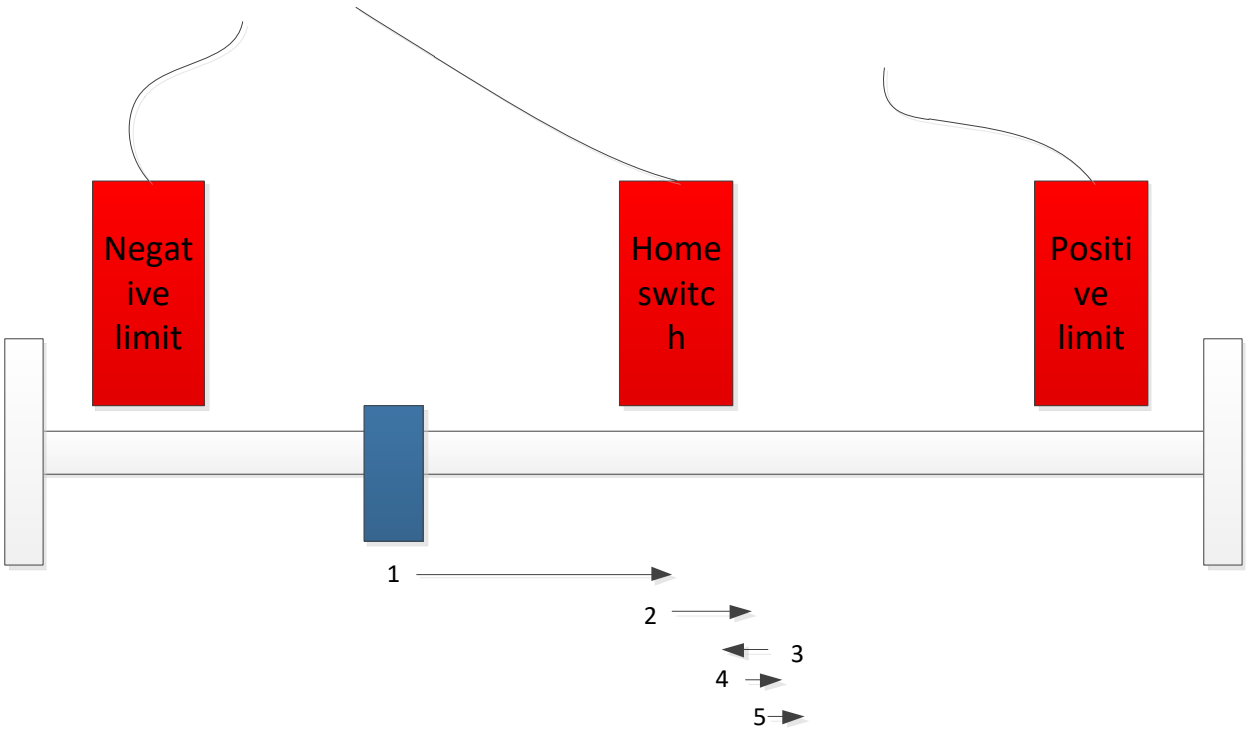
OR



1. Positive motion, seeking the rising edge of the positive limit switch.

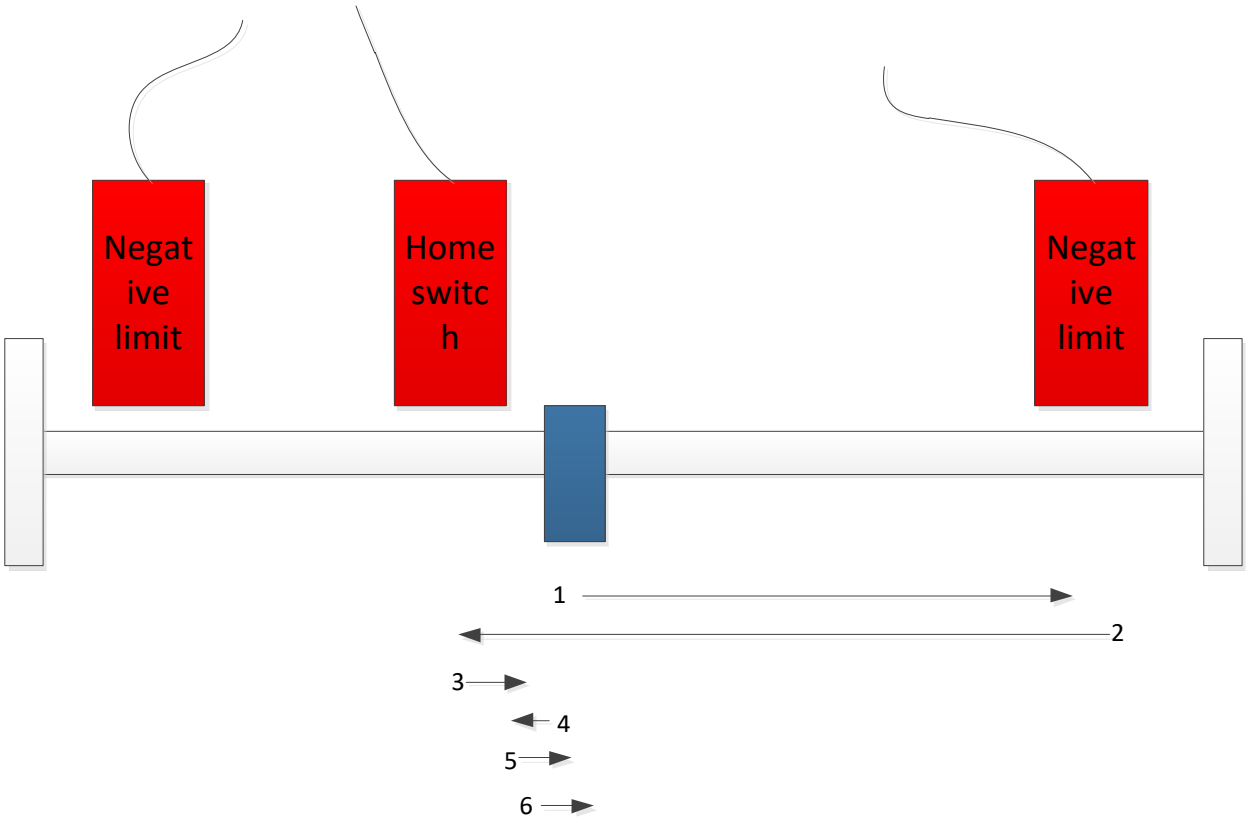
2. Negative motion, seeking the rising and falling edges of the home switch (high-speed switching to low-speed).
3. Positive motion, seeking the falling edge of the home switch.
4. Negative motion, seeking the rising edge of the home switch.
5. Negative motion, seeking the Z signal. (Method 25 does not seek the Z signal).

Homing method 10 (Method 26)



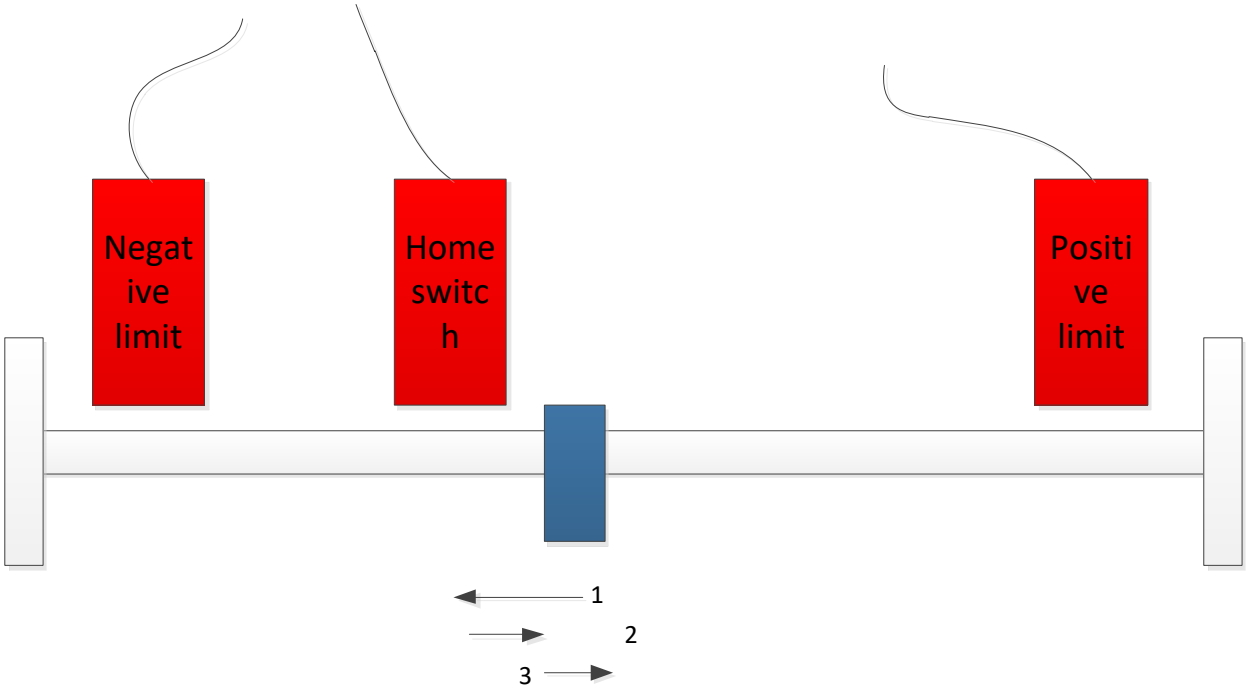
1. Positive motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Positive motion, seeking the falling edge of the home switch on the other side.
3. Negative motion, seeking the rising edge of the home switch.
4. Positive motion, seeking the falling edge of the home switch.
5. Positive motion, seeking the Z signal. (Method 26 does not seek the Z signal).

OR



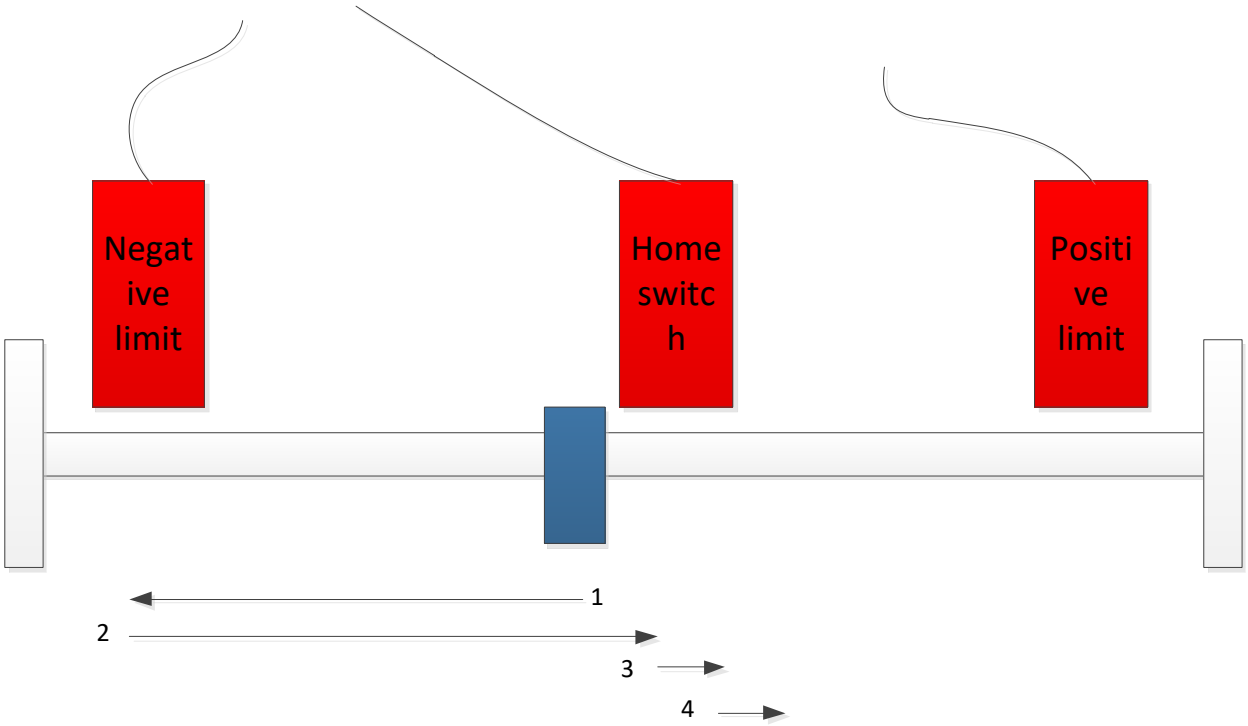
1. Positive motion, seeking the rising edge of the positive limit switch.
2. Negative motion, seeking the rising and falling edges of the home switch (high-speed switching to low-speed).
3. Positive motion, seeking the falling edge of the home switch.
4. Negative motion, seeking the rising edge of the home switch.
5. Positive motion, seeking the rising edge of the home switch.
6. Positive motion, seeking the Z signal. (Method 26 does not search for the Z signal).

Homing method 11 (Method 27)



Negative motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
Positive motion, seeking the falling edge of the home switch (same side).
Positive motion, seeking the Z signal. (Method 27 does not seek the Z signal).

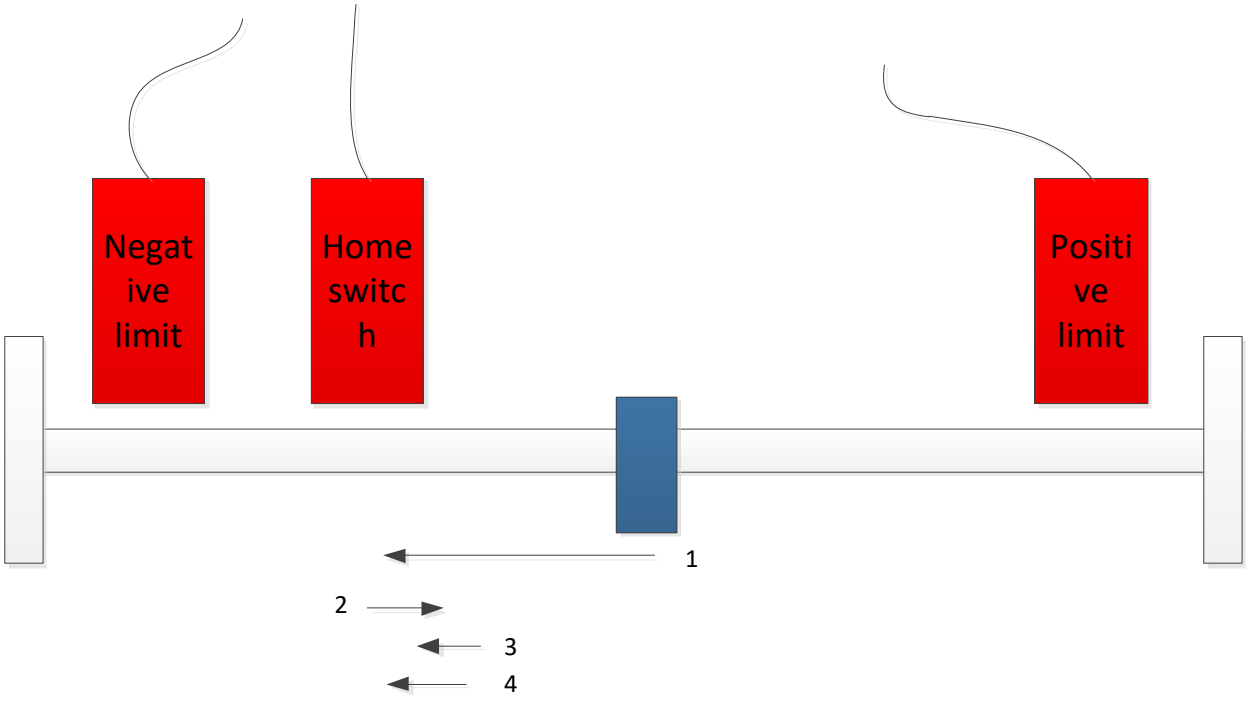
OR



1. Negative motion, seeking the rising edge of the negative limit switch.
2. Positive motion, seeking the rising or falling edge of the home switch (high-speed switching to low-speed).
3. Positive motion, seeking the falling edge of the home switch.

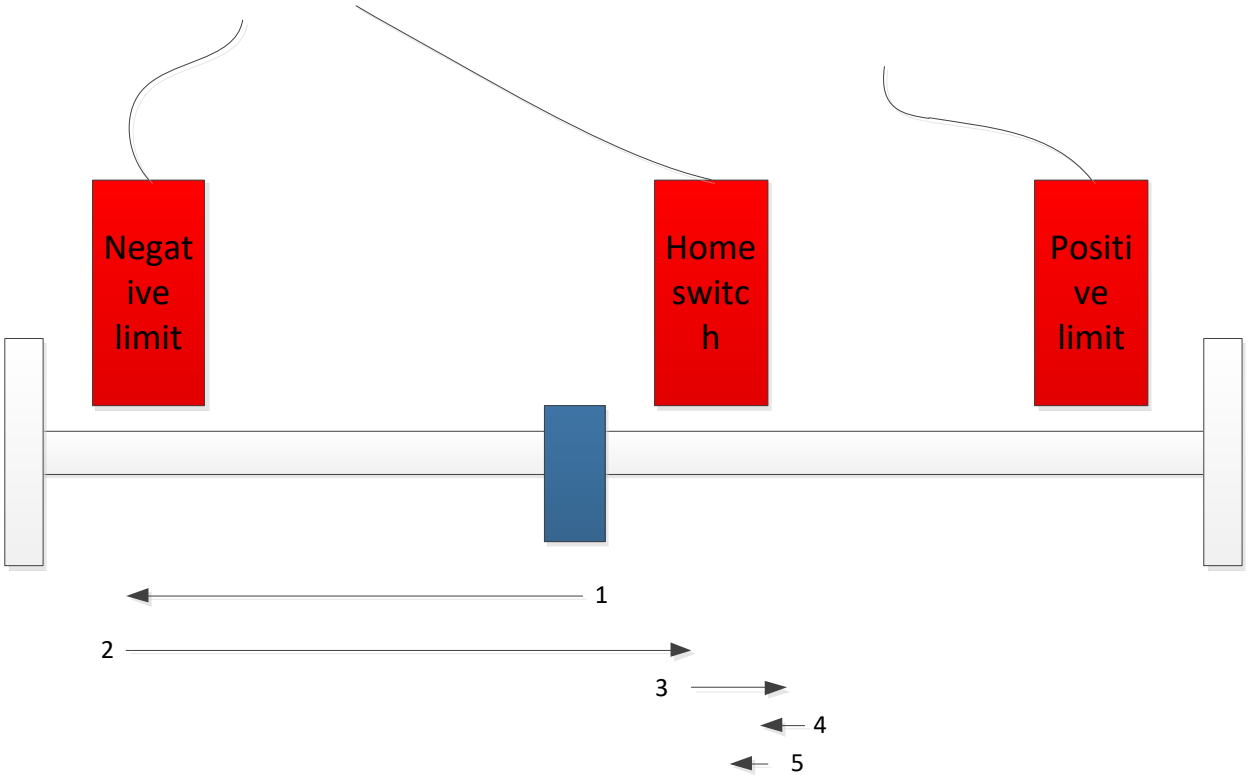
4. Positive motion, seeking the Z signal. (Method 27 does not seek the Z signal).

Homing method 12 (Method 28)



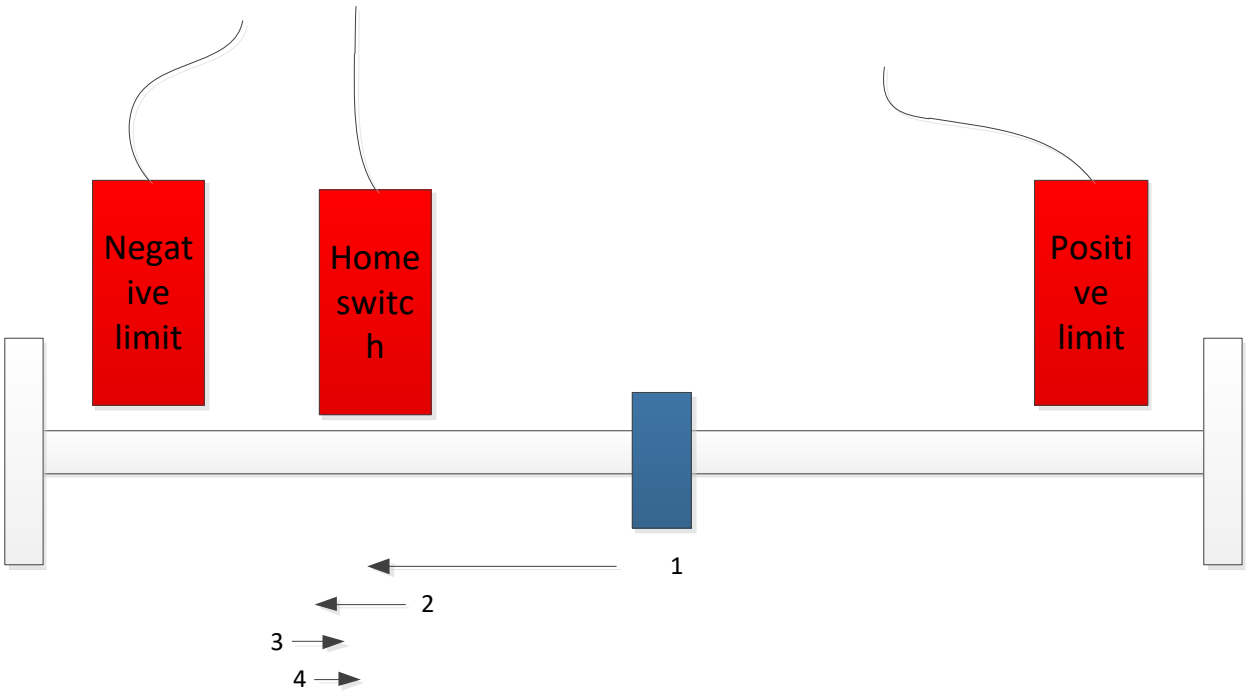
1. Negative motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Positive motion, seeking the falling edge of the home switch (same side).
3. Negative motion, seeking the rising edge of the home switch.
4. Negative motion, seeking the Z signal. (Method 28 does not seek the Z signal).

OR



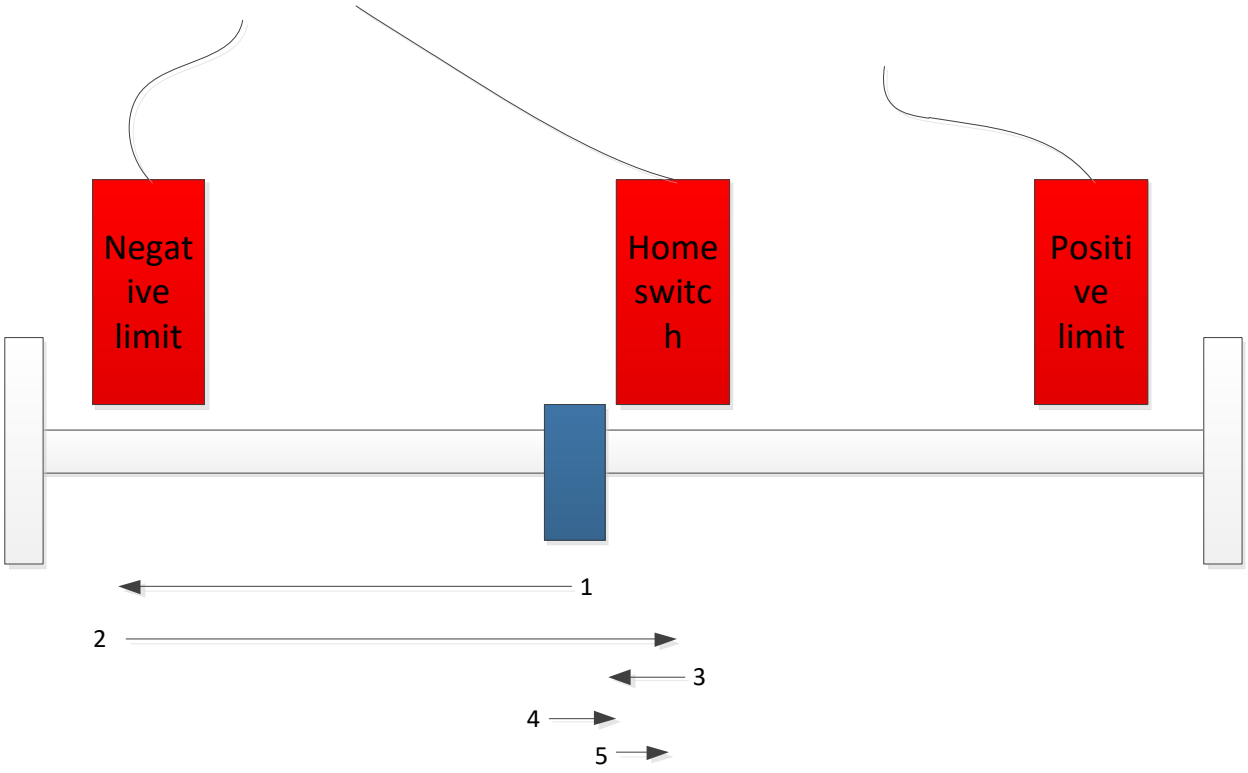
1. Negative motion, seeking the rising edge of the negative limit switch.
2. Positive motion, seeking the rising or falling edge of the home switch (high-speed switching to low-speed).
3. Positive motion, seeking the falling edge of the home switch.
4. Negative motion, seeking the rising edge of the home switch.
5. Negative motion, seeking the Z signal. (Method 28 does not seek the Z signal).

Homing method 13 (Method 29)



1. Negative motion, seeking the rising edge of the home switch.
2. Negative motion, seeking the falling edge of the home switch (on the other side).
3. Positive motion, seeking the rising edge of the home switch.
4. Positive motion, seeking the Z signal. (Method 29 does not seek the Z signal).

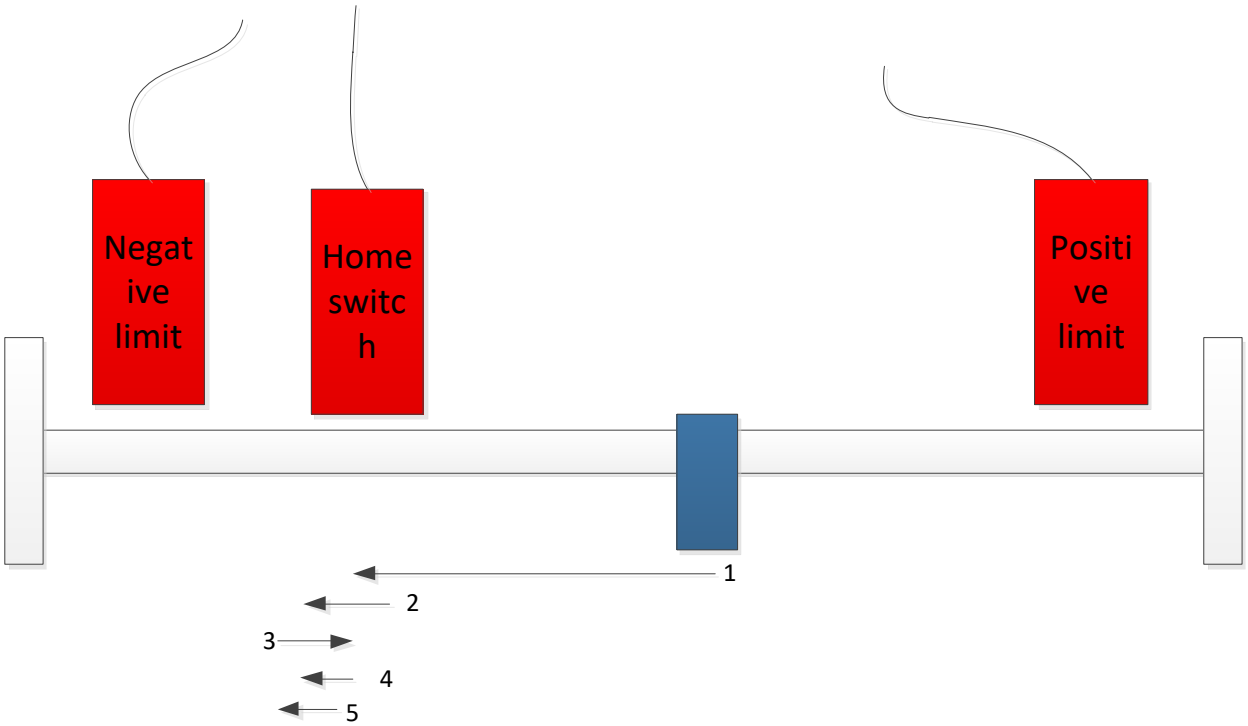
OR



1. Negative motion, seeking the rising edge of the negative limit switch.

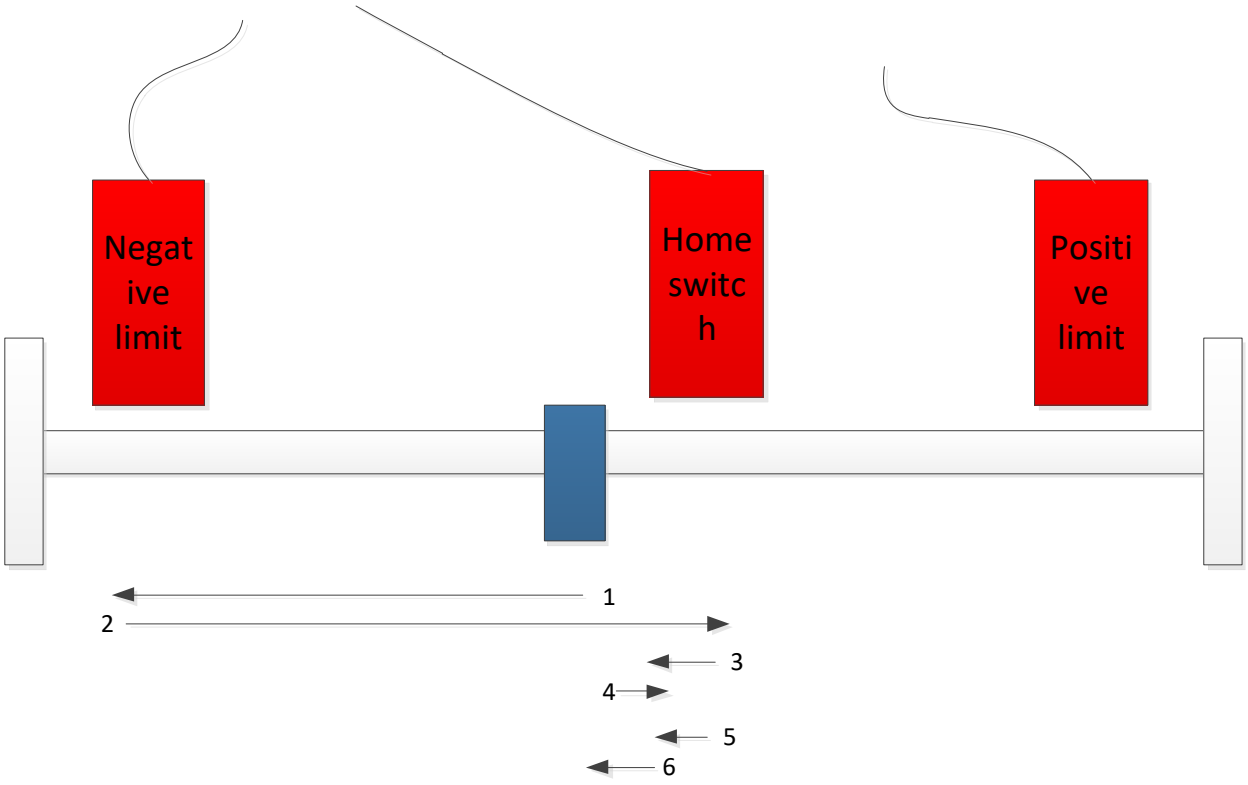
2. Positive motion, seeking the rising or falling edge of the home switch (high-speed switching to low-speed).
3. Negative motion, seeking the falling edge of the home switch.
4. Positive motion, seeking the rising edge of the home switch.
5. Positive motion, seeking the Z signal. (Method 29 does not seek the Z signal).

Homing method 14 (Method 30)



1. Negative motion, seeking the rising edge of the home switch (high-speed switching to low-speed).
2. Negative motion, seeking the falling edge of the home switch (on the other side).
3. Positive motion, seeking the rising edge of the home switch.
4. Negative motion, seeking the falling edge of the home switch.
5. Negative motion, seeking the Z signal. (Method 30 does not seek the Z signal).

OR



1. Negative motion, seeking the rising edge of the negative limit switch.
2. Positive motion, seeking the rising or falling edge of the home switch (high-speed switching to low-speed).
3. Negative motion, seeking the falling edge of the home switch.
4. Positive motion, seeking the rising edge of the home switch.
5. Negative motion, seeking the rising edge of the home switch.
6. Negative motion, seeking the Z signal. (Method 30 does not seek the Z signal).

Homing method 33

Homing in negative direction, with the home position being the motor Z signal

Homing method 34

Homing in positive direction, with the home position being the motor Z signal

Homing method 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 Homing High-speed Velocity	Setting Range	Unit	Factory Default	Related Modes		
		10~6000	RPM	100	P	S	T
Explanation: Velocity during the high-speed phase of homing.							

P03.33 Homing Low-speed Velocity	Setting Range	Unit	Factory Default	Related Modes		
	10~6000	RPM	10	P	S	T
Explanation: Velocity during the low-speed phase of homing						

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

P03.35 Homing Timeout Time	Setting Range	Unit	Factory Default	Related Modes		
	1~65535	ms	50000	P	S	T
Explanation: After timeout, an alarm Er.054 will be triggered, and homing procedure needs to be executed again after stopping.						

P03.36 Homing Offset	Setting Range	Unit	Factory Default	Related Modes		
	-1073807359~1073807359	p	0	P	S	T
Explanation: Offset distance after homing, unit is in encoder units.						

3.2.2 Introduction to Internal Position Function

In general, the internal position is used for internal testing purposes, including: 20 segments of internal positions, of these, the displacement, velocity, acceleration/deceleration time, wait time, and position attributes of each segment can be individually set.

Related function codes:

	P10.00 Internal Position Operation Mode	Setting Range	Unit	Factory Default	Related Modes		
		0~2	-	0	P	S	T

Explanation:

To execute internal command, you need to set P02.00=1 and P03.00=1 to enable the servo signal. After giving the servo enable signal and setting FunIN.6(Execute_PP), the run 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.288+FunIN.274+FunIN.26*2+FunIN.25).
- When P10.00 is set to 2, Number of segments to run is determined by P10.02.

	P10.02 Numerical Setting of Operation's Number of Segments	Setting Range	Unit	Factory Default	Related Modes		
		1~19	-	1	P	S	T

Explanation:

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

For example, setting 5 segments, with displacement in user units (i.e., units before the electronic gear ratio), velocity units set to RPM, and acceleration and deceleration time set to the time required for the velocity to reach 1000 RPM.

	P10.0E Configuration of Attribute for Segment 1	Setting Range	Unit	Factory Default	Related Modes		
		0~65535	-	0	P	S	T

Explanation:

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

Positioning Mode (Type):

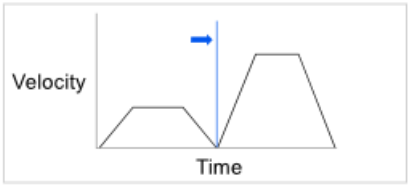
- 0: Absolute Positioning
- 1: Relative Positioning
- 2: Relative to the Last Target Position (used in cases where the target operation is unexpectedly interrupted)
- 3: Incremental Operation Relative to DI Captured Position
- 4: Positioning with modulus in Positive Direction
- 5: Positioning with modulus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

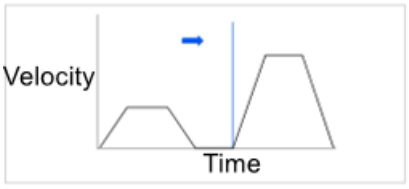
a. When using positioning with modulus, if it is DDR or the mechanical gear ratio is 1, there is no need to set P02.29=2. The program uses absolute positioning of the encoder single trun. Absolute value encoders need to set P02.29=2 and correctly set the mechanical gear ratio P02.2A and P02.2B.

b. Incremental encoders such as ABZ encoders do not support modulation positioning.

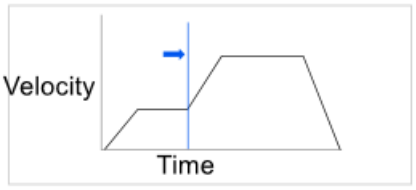
Next Segment Linking Method (Constraints):

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

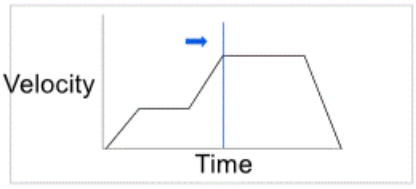




- 1: Command Merged into Acceleration Area End:



- 2: Command Merged into Velocity End:



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:

- For example, if the first segment is set as Type=0, TriggerType=1; position=100000.
- For example, if the first segment is set as Type=0, TriggerType=1; position=0.

- For example, if the tenth segment is set as Type=3, CapEn=1; position=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		
		0~65535	-	1	P	S	T

Explanation:

Bit Number	Description	Abbreviation
bit0~7	Operating times of this segment	Exe Num
Bit8~bit13	The next operating segment	Following Task

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

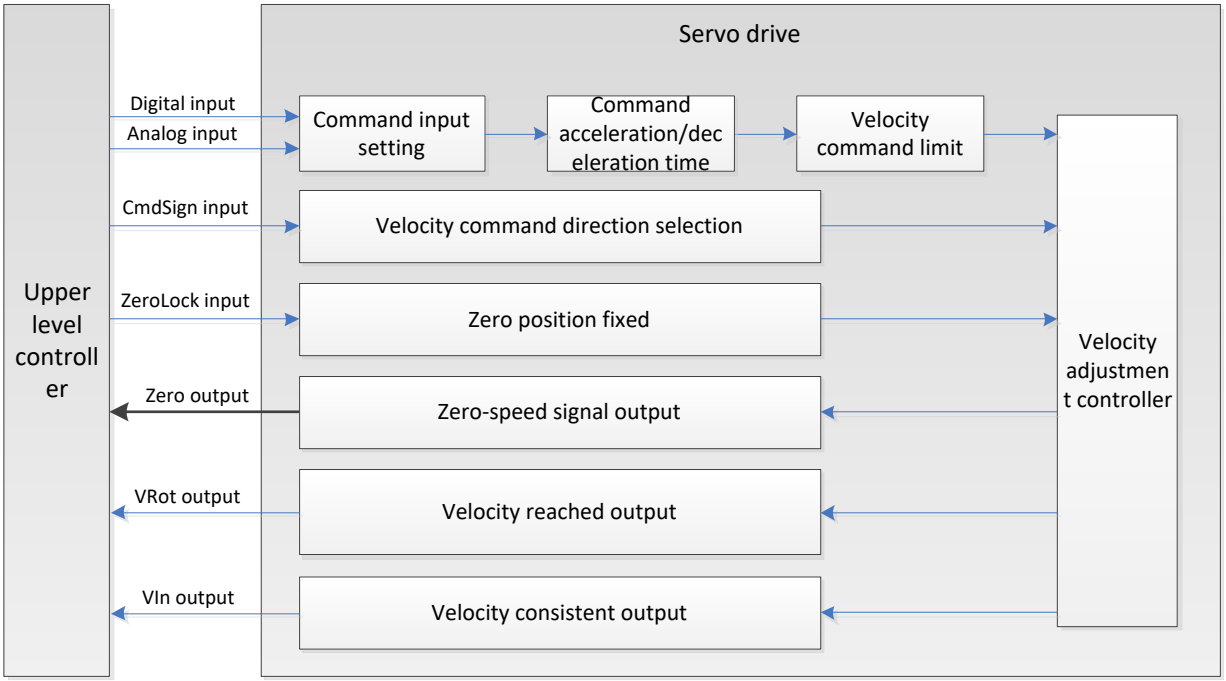
For manual setting: calculate as follows: Exe Num + Jumping Segment Number * 256.

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 Velocity Mode

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



3.3.1 Speed-related Function Codes

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

	P03.41 Velocity Command Digital Input	Setting Range	Unit	Factory Default	Related Modes		
		-6000~6000	RPM	300	-	S	-
Explanation: Setting the velocity command value by digital input.							

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

P03.43 Acceleration Ramp Time for Velocity Command	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	ms	20	-	S	T
Explanation: The time taken for the velocity command to accelerate from 0 RPM to 1000 RPM.						

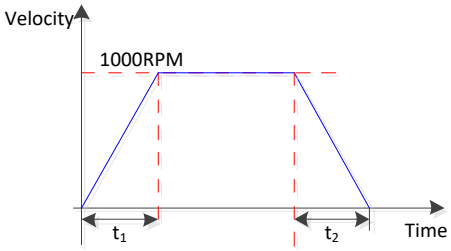
P03.44 Deceleration Ramp Time for Velocity Command	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	ms	20	-	S	-
Explanation: The time taken for the speed command to decelerate from 1000 RPM to 0 RPM.						

P03.46 Acceleration Ramp Time for Jogging Velocity	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	ms	20	-	S	-
Explanation: The time taken for the jogging velocity to accelerate from 0 RPM to 1000 RPM.						

P03.47 Velocity Corresponding to 10 Volts Analog Input	Setting Range	Unit	Factory Default	Related Modes		
	0~10000	RPM	3000	-	S	-
Explanation: The velocity value corresponding to a voltage input of 10 volts when using analog input.						

Velocity acceleration and deceleration time:

When the servo drive is in position mode or velocity mode, the velocity acceleration and deceleration are as shown in the diagram. The set acceleration time is t1 , deceleration time is t2, corresponding to the time to reach 1000 RPM. Therefore, the acceleration is 1000/t1 and the deceleration is 1000/t2.



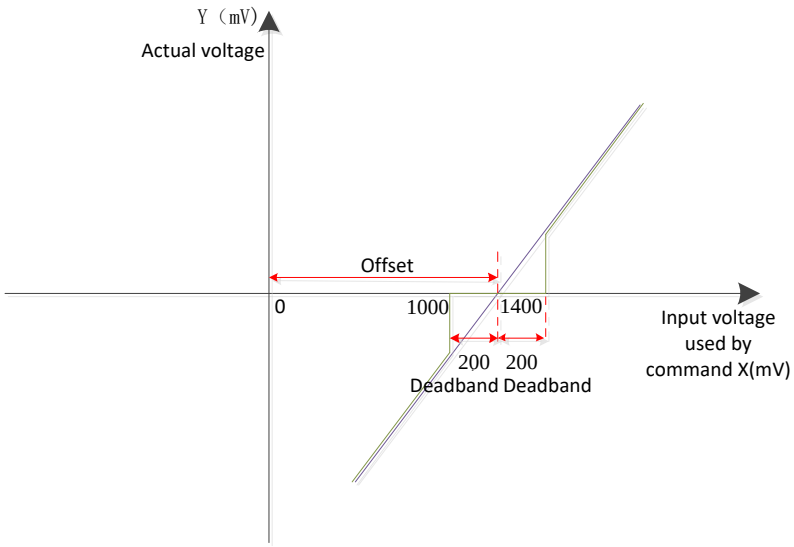
Analog input setting:

	P04.30 Analog Input Offset	Setting Range	Unit	Factory Default	Related Modes		
		-5000~5000	mV	0	-	S	T
Explanation: Analog input offset is applied to the actual analog input value before converting it into the corresponding velocity/torque.							

	P04.31 Analog Input Filtering	Setting Range	Unit	Factory Default	Related Modes		
		0.00~600.00	ms	2.00	-	S	T
Explanation: It can suppress the "spikes" in the analog input, improving the operation's "noise"							

	P04.32 Analog Input Deadband	Setting Range	Unit	Factory Default	Related Modes		
		0.00~100.00	mv	1.00	-	S	T
Explanation: When the input voltage is below this value, the command is set to 0.							

	P04.33 Analog Input Zero Drift	Setting Range	Unit	Factory Default	Related Modes		
		0.00~100.00	mv	0.00	-	S	T
Explanation: Setting F09 to 1 allows automatic adjustment of analog input zero drift.							



Velocity DO output related function codes

	P05.30 Zero Speed Fixed Velocity Command Threshold	Setting Range	Unit	Factory Default	Related Modes		
		0~6000	RPM	10	P	S	T
Explanation: The zero speed fixed velocity command threshold is set. When the signal FunIn.15 (z_Lock) is active and the command is less than P05.30, the velocity command is set to 0.							

	P05.31 Motor Rotation Status Threshold	Setting Range	Unit	Factory Default	Related Modes		
		0~1000	RPM	20	P	S	T
Explanation: FunOut.17 (VRot) is active when the actual motor velocity is greater than the set value, and inactive when the velocity is less than the set value.							

	P05.32 Velocity Reached Signal Width	Setting Range	Unit	Factory Default	Related Modes		
		1~200	RPM	10	P	S	T
Explanation: When | actual velocity command - actual velocity feedback | ≤ P05.32, and it is maintained for the duration specified by P06.36, the velocity consistency signal FunOut.14(VIn) output is effective.							

	P05.34 Zero-speed Output Signal Threshold	Setting Range	Unit	Factory Default	Related Modes		
		1~6000	RPM	10	P	S	T
Explanation: When |motor velocity| ≤ P05.34, and it remains for P05.37 time, the zero-speed signal FunOut.12(VZero) outputs is effective.							

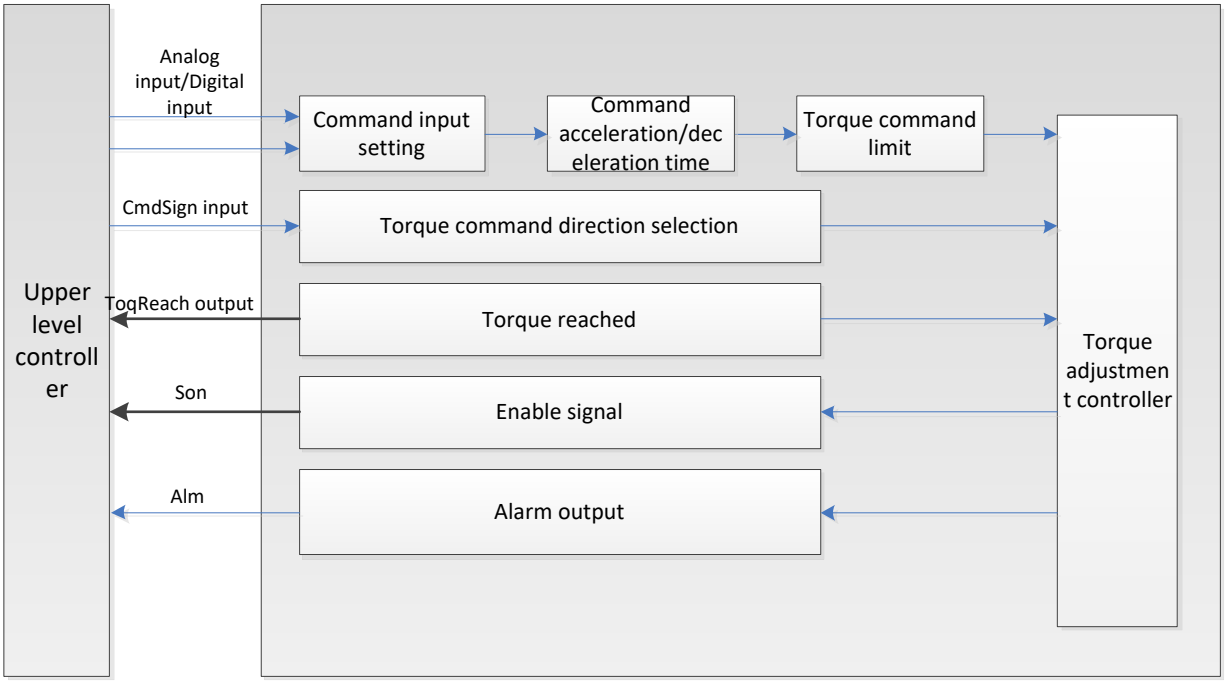
	P05.35 Velocity DO Filtering Time	Setting Range	Unit	Factory Default	Related Modes		
		0~6000	RPM	10	P	S	T
Explanation: The filtering time is set for the velocity feedback to determine the velocity reached signal using the filtered velocity feedback.							

	P05.36 Velocity Reached Signal Holding Time	Setting Range	Unit	Factory Default	Related Modes		
		0~1000	ms	0	P	S	T
Explanation: The holding time of the velocity reached signal is maintained when |the actual velocity command - actual velocity feedback| is less than or equal to P05.32, and it lasts for P05.36 time, during which the velocity consistent signal FunOut.14(VIn) output is effective.							

	P05.37 Zero Speed Signal Holding Time	Setting Range	Unit	Factory Default	Related Modes		
		0~1000	ms	0	P	S	T
Explanation: When | motor velocity | is ≤ P05.34, and it lasts for the duration specified by P05.37, the zero speed signal FunOut.13 (VZero) output is effective.							

3.4 Torque Mode

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



3.4.1 Torque Mode Related Function Codes

	P03.4A Torque Command Input Setting	Setting Range	Unit	Factory Default	Related Modes		
		0~1	-	0	-	-	T

Explanation:

Control motor rotation by providing a torque command.

- 0: Digital input
- 1: Analog input

	P03.4B Torque Command Digital Input	Setting Range	Unit	Factory Default	Related Modes		
		-300.0~300.0	%	0.0	-	-	T

Explanation:

Setting the torque (rated current percentage) via digital input.

	P03.4C Torque Command Corresponding to 10V Analog Input	Setting Range	Unit	Factory Default	Related Modes		
		0.0~300.0	%	0.0	-	-	T

Explanation:
The torque (rated current percentage) corresponding to a 10V analog input voltage.

P03.4F Emergency Stop Torque	Setting Range	Unit	Factory Default	Related Modes		
	0.0~300.0	%	100.0	P	S	T

The torque value used for emergency stop in emergency torque stop mode.

P03.50 Positive velocity Limit	Setting Range	Unit	Factory Default	Related Modes		
	1~6000	RPM	6000	P	S	

Explanation:
Positive velocity limit refers to the maximum allowable velocity in velocity/position mode. Upon reaching this limit, the system switches to velocity mode.

P03.51 Negative Velocity Limit	Setting Range	Unit	Factory Default	Related Modes		
	1~6000	RPM	6000	P	S	

Explanation:
Negative velocity limit in velocity/position mode. Upon reaching this limit, the system switches to velocity mode.

P03.52 Torque Command Positive Limit Value	Setting Range	Unit	Factory Default	Related Modes		
	1.0~400.0	%	3000	P	S	T

Explanation:
The maximum torque limit value in the positive direction in torque control mode (percentage of rated current).

P03.53 Torque Command Negative Limit Value	Setting Range	Unit	Factory Default	Related Modes		
	1.0~400.0	%	300.0	P	S	T

Explanation: The maximum torque limit value in the negative direction in torque control mode (percentage of rated current).

	P03.54 Positive Velocity Limit in Torque Mode	Setting Range	Unit	Factory Default	Related Modes		
		1~6000	RPM	3000	-	-	T
Explanation: Positive velocity limit in torque mode. When the limit value is reached, the system switches to velocity mode.							

	P03.55 Negative Velocity Limit in Torque Mode	Setting Range	Unit	Factory Default	Related Modes		
		1~6000	RPM	3000	-	-	T
Explanation: Negative velocity limit in torque mode. When the limit value is reached, the system switches to velocity mode.							

Torque DO output related function codes

	P05.3A Torque Reached Reference Value	Setting Range	Unit	Factory Default	Related Modes		
		0.0~300.0	%	0.0	P	S	T
Explanation: The reference value used to determine the validity of torque reached, which is compared with the actual torque.							

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

	P05.3C Torque Reached Signal Invalid 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, or when actual torque command - P05.3A ≤ - P05.3C, the torque reached signal is invalid.							

Torque reached signal FunOut.16

3.5 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

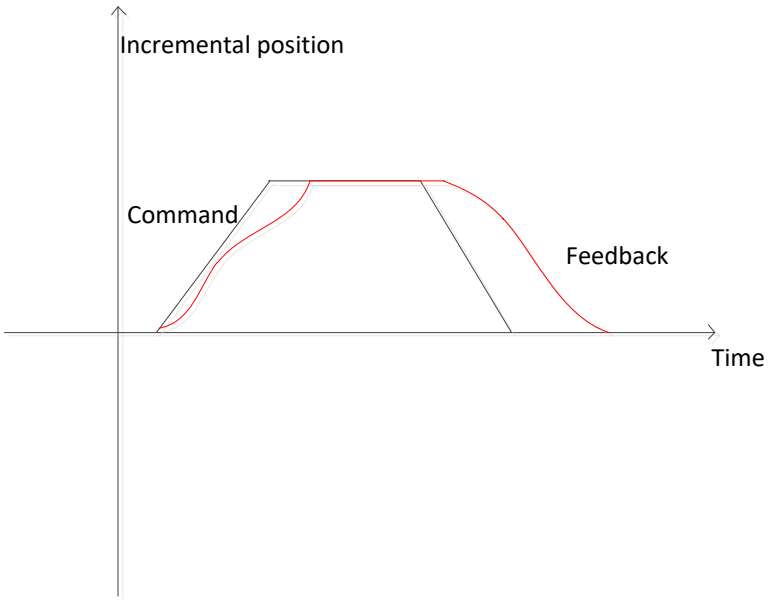
Using DI terminals for mode switching, if only two modes are needed, the upper computer can choose to control one DI function, and the other DI function can be set to default valid or invalid.

4 Gain Adjustment

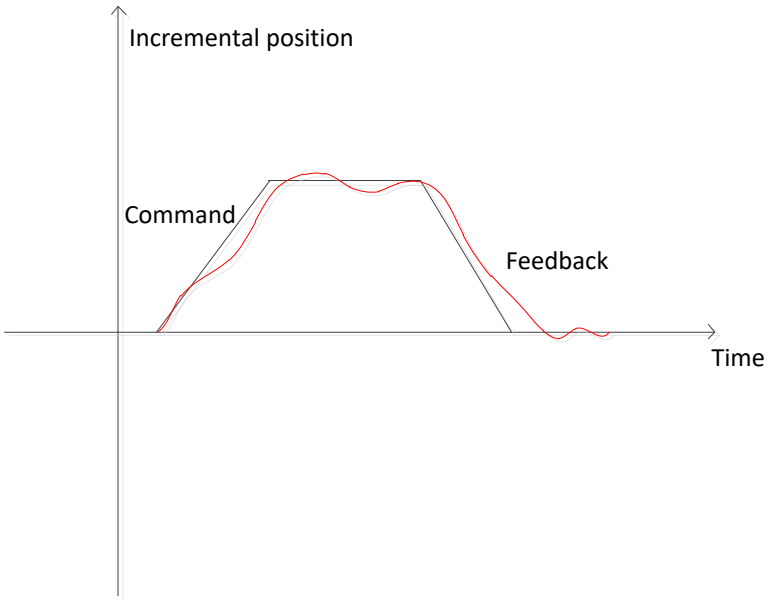
4.1 Objective of Gain Adjustment

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

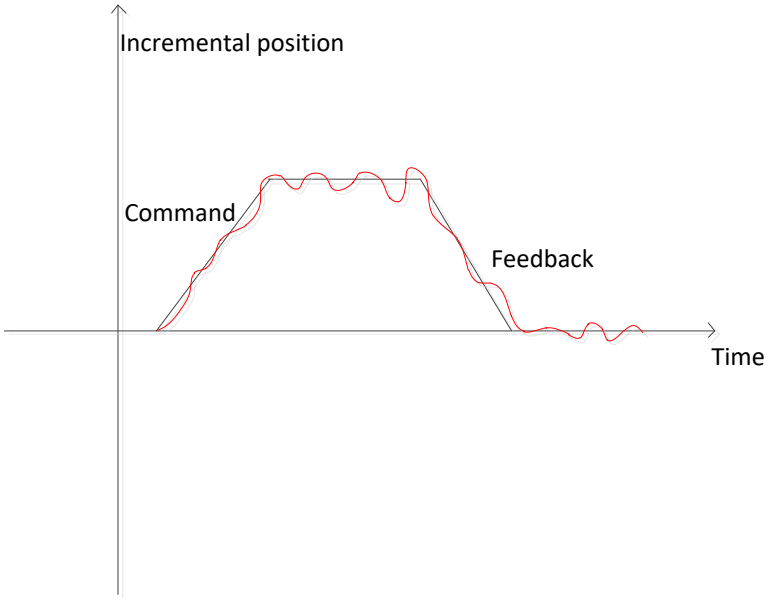
The figure below are several common types of debugging waveforms.



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

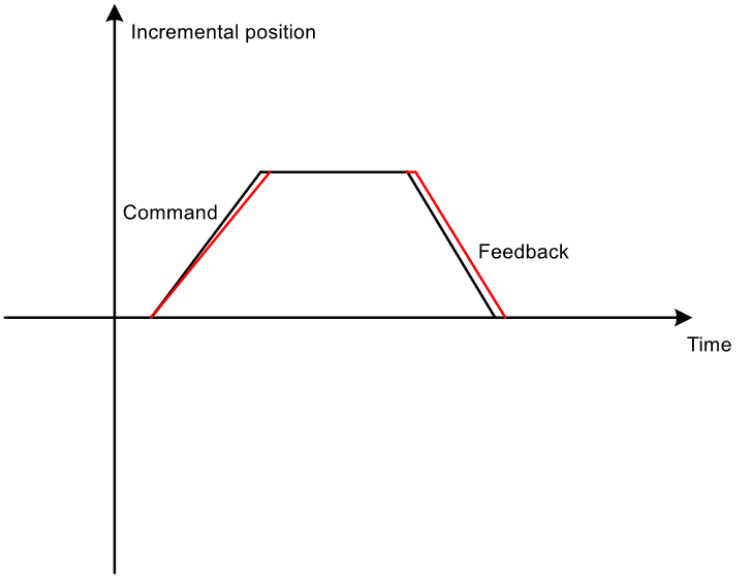


The servo's weak gain adjustment results in slow response and a delay. The mismatched gains between the position and speed control loops lead to overshoot.



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

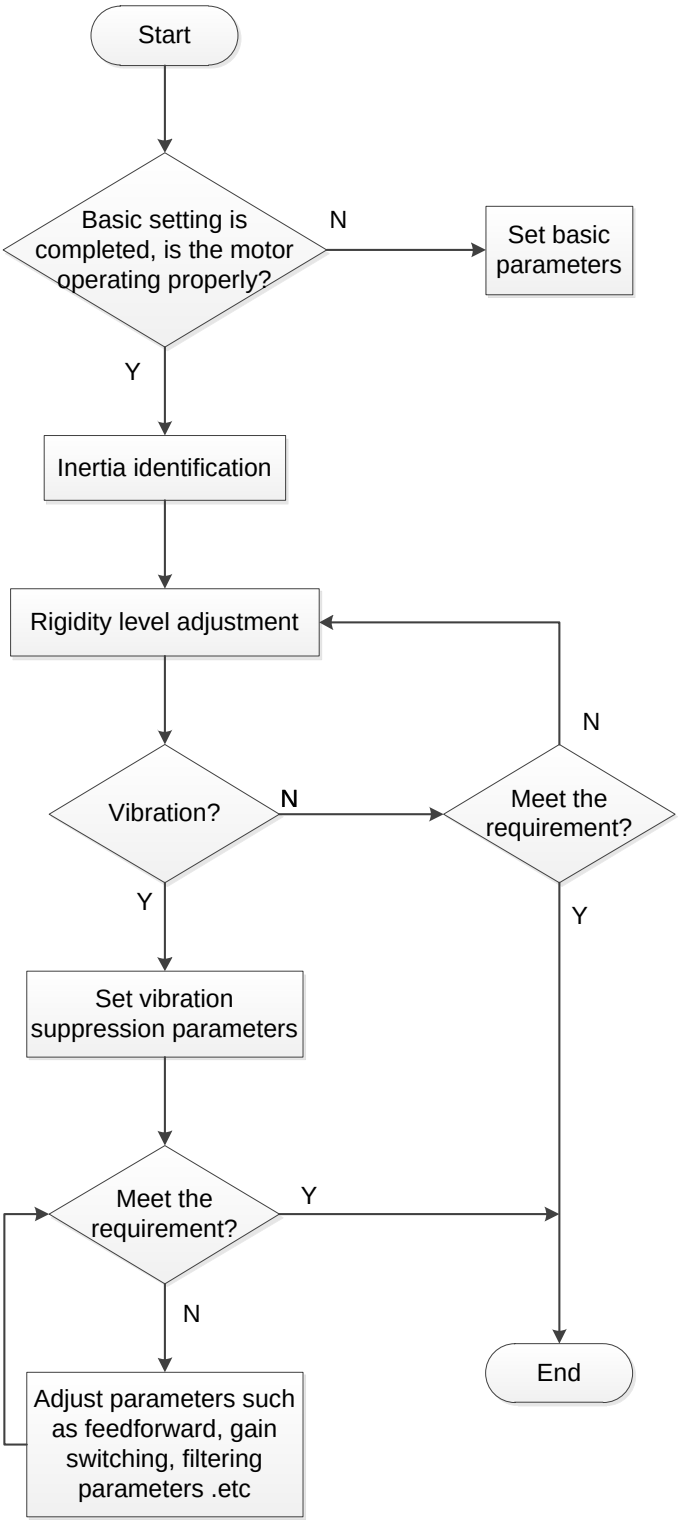
By increasing the gains in the position and speed control loops, as well as adjusting other parameters such as feedforward, the desired position response can be achieved.



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.

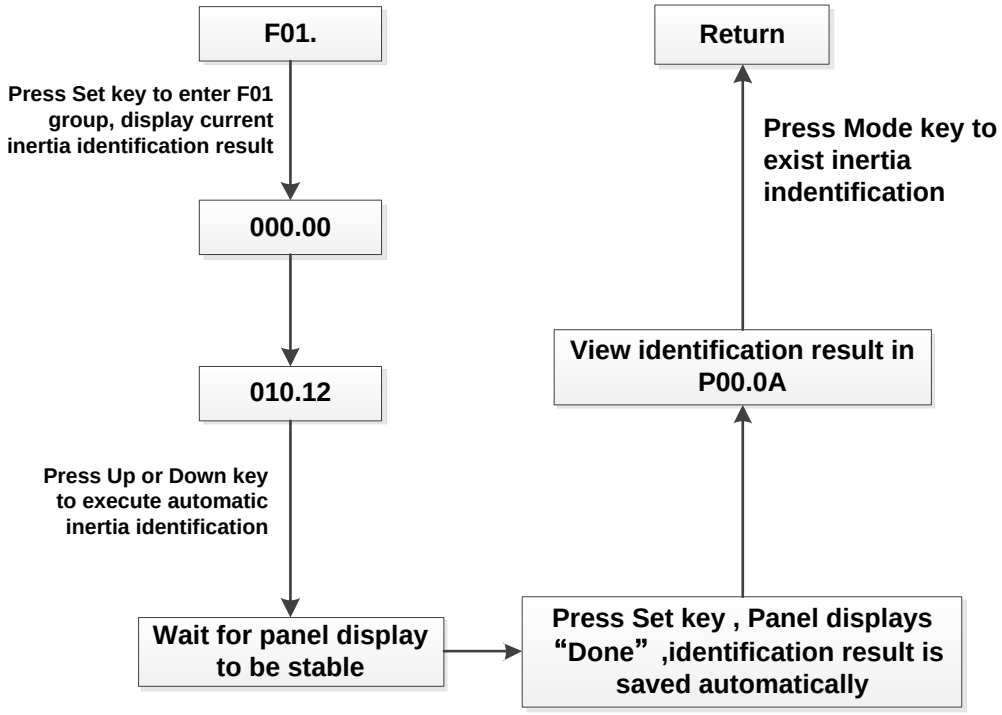
4.2 Manual Gain Adjustment

The gain adjustment should follow the following process.



4.2.1 Inertia Identification

Inertia identification is the first step in parameter adjustment, which can be performed via the panel or via Servo configuration software. If inertia identification is carried out using Servo configuration software, it can be completed via a guider. If done via the panel, the operation process is as follows:



Inertia identification related function codes

F01 Automatic Identification of Load Inertia Ratio	Setting Range	Unit	Factory Default	Related Modes		
	-	-	-	P	S	T
Explanation: Automatically identifies the load inertia ratio after servo enabled.						

P00.0A Load Inertia Ratio	Setting Range	Unit	Factory Default	Related Modes		
	0.00~120.00	-	1.00	P	S	T
Explanation: Load inertia ratio = external load inertia / motor load inertia						

P02.30 Inertia Identification Trajectory	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T

Explanation:

- 0: Positive and negative triangle command (limited mechanical travel, motor runs in both directions).
- 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 Table Mode	Positioning Mode	Single-click Adjustment Mode
P00.02	Velocity Loop Gain Group 1	○	○	○
P00.03	Velocity Loop Integral Time Constant Group 1	○	○	○
P00.04	Position Loop Gain Group 1	○	○	○
P00.05	Torque Filtering Constant Group 1	○	○	○
P00.06	Velocity Loop Gain Group 2	×	○	○
P00.07	Velocity Loop Integral Time Constant Group 2	×	○	○
P00.08	Position Loop Gain Group 2	×	○	○
P00.09	Torque Filtering Constant Group 2	×	○	○
P00.10	Velocity Feedforward Gain	×	○	○
P00.12	PDFF Control Coefficient	×	×	○
P00.14	Torque Feedforward Gain	×	×	○
P00.19	Gain Switching Mode	×	○	○
P00.31	Friction Compensation Percentage	×	×	○

Gain setting related function codes

P00.00 Self-tuning Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
	0~3	-	1	P	S	T

Explanation:

- 0: Manual Gain Setting
- 1: Rigidity Table Mode
- 2: Positioning Mode
- 3: Single-click Adjustment Mode

Choose different adjustment methods according to the load condition and operation mode to maximize the system's responsiveness and stability.

P00.01 Rigidity Level Selection	Setting Range	Unit	Factory Default	Related Modes		
	1~31	-	11	P	S	T

Explanation:

The higher the rigidity, the better the system's responsiveness. However, excessive rigidity can lead to system oscillations. Therefore, it should be set according to the actual situation.

P00.02 Velocity Loop Gain Group 1	Setting Range	Unit	Factory Default	Related Modes		
	1.0~2000.0	Hz	18.0	P	S	T

Explanation:

The larger the proportional gain setting of the velocity loop, the faster the response of the velocity loop. However, setting it too high can easily lead to system oscillation.

P00.03 Velocity Loop Integral Time Constant Group 1	Setting Range	Unit	Factory Default	Related Modes		
	0.15~512.00	ms	31.00	P	S	T

Explanation:

The larger the integral time constant of the velocity loop, the smaller the integral action of the velocity loop.

P00.04 Position Loop Gain Group 1	Setting Range	Unit	Factory Default	Related Modes		
	0.0~2000.0	Hz	32.0	P	S	T

Explanation: The larger the proportional gain of the position loop, the faster the position tracking.

	P00.05 Torque Filtering Constant Group 1	Setting Range	Unit	Factory Default	Related Modes		
		0.0~30.00	ms	1.26	P	S	T
Explanation: Torque command low-pass filtering time.							

	P00.06 Velocity Loop Gain Group 2	Setting Range	Unit	Factory Default	Related Modes		
		1.0~2000.0	Hz	40.0	P	S	T
Explanation: The proportional gain setting of the velocity loop determines how quickly the velocity loop responds. However, setting it too high can lead to system oscillations.							

	P00.07 Velocity Loop Integral Time Constant Group 2	Setting Range	Unit	Factory Default	Related Modes		
		0.15~512.00	ms	20.00	P	S	T
Explanation: The integral time constant setting of the velocity loop determines the impact of integral action on the velocity loop. A larger integral time constant leads to less integral action in the velocity loop.							

	P00.08 Position Loop Gain Group 2	Setting Range	Unit	Factory Default	Related Modes		
		0.0~2000.0	Hz	64.0	P	S	T
Explanation: The proportional gain setting of the position loop determines how quickly the system tracks the desired position. A larger proportional gain results in faster position tracking.							

	P00.09 Torque Filtering Constant Group 2	Setting Range	Unit	Factory Default	Related Modes		
		0.00~30.00	ms	1.26	P	S	T
Explanation: Torque command low-pass filtering time							

P00.10 Velocity Feedforward Gain	Setting Range	Unit	Factory Default	Related Modes		
	0.00~10.00	%	0.00	P	S	-
Explanation: Used to set the velocity feedforward compensation amount						

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

P00.19 Gain Switching Mode	Setting Range	Unit	Factory Default	Related Modes		
	0~4	-	0	P	S	T
Explanation: ◆ 0: No gain switching ◆ 1: DI switches P/PI mode ◆ 2: DI switches between the first and second groups ◆ 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	Gain Group 1				Gain Group 2			
	P00.02	P00.03	P00.04	P00.05	P00.06	P00.07	P00.08	P00.09
	Position Loop Gain 1 (0.1/s)	Velocity Loop Gain 1 (0.1Hz)	Velocity Loop Integral Time Constant 1 (0.01ms)	Torque Filtering Time Constant 1 (0.01ms)	Position Loop Gain 2 (0.1/s)	Velocity Loop Gain 2 (0.1Hz)	Velocity Loop Integral Time Constant 2 (0.01ms)	Torque Filtering Time Constant 2 (0.01ms)
0	20	15	37000	1500	30	15	51200	1500
1	25	20	28000	1100	40	20	51200	1100
2	30	25	22000	900	45	25	51200	900
3	40	30	19000	800	55	30	51200	800

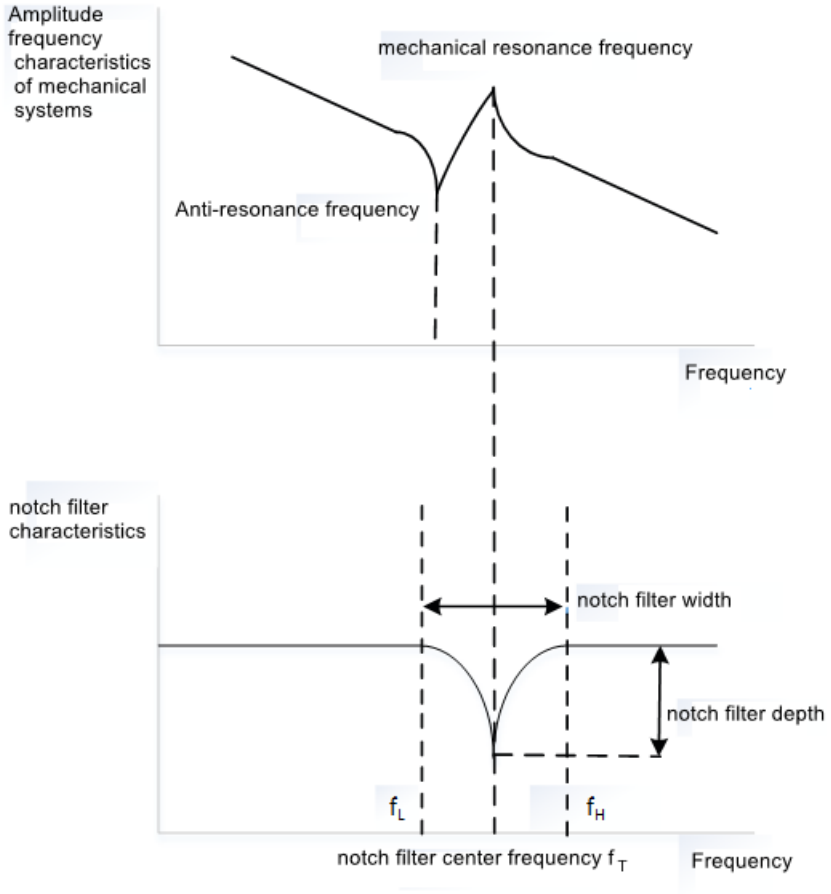
Rigidity Level	Gain Group 1				Gain Group 2			
	P00.02	P00.03	P00.04	P00.05	P00.06	P00.07	P00.08	P00.09
	Position Loop Gain 1 (0.1/s)	Velocity Loop Gain 1 (0.1Hz)	Velocity Loop Integral Time Constant 1 (0.01ms)	Torque Filtering Time Constant 1 (0.01ms)	Position Loop Gain 2 (0.1/s)	Velocity Loop Gain 2 (0.1Hz)	Velocity Loop Integral Time Constant 2 (0.01ms)	Torque Filtering Time Constant 2 (0.01ms)
4	45	35	16000	600	75	35	51200	600
5	55	45	12000	500	95	45	51200	500
6	75	60	9000	400	115	60	51200	400
7	95	75	7000	300	140	75	51200	300
8	115	90	6000	300	175	90	51200	300
9	140	110	5000	200	320	110	51200	200
10	175	140	4000	200	390	140	51200	200
11	320	180	3100	126	480	180	51200	126
12	390	220	2500	103	630	220	51200	103
13	480	270	2100	84	720	270	51200	84
14	630	350	1600	65	900	350	51200	65
15	720	400	1400	57	1080	400	51200	57
16	900	500	1200	45	1350	500	51200	45
17	1080	600	1100	38	1620	600	51200	38
18	1350	750	900	30	2060	750	51200	30
19	1620	900	800	25	2510	900	51200	25
20	2060	1150	700	20	3050	1150	51200	20
21	2510	1400	600	16	3770	1400	51200	16
22	3050	1700	500	13	4490	1700	51200	13
23	3770	2100	400	11	5000	2100	51200	11
24	4490	2500	400	9	5600	2500	51200	9
25	5000	2800	350	8	6100	2800	51200	8
26	5600	3100	300	7	6600	3100	51200	7
27	6100	3400	300	7	7200	3400	51200	7
28	6600	3700	250	6	8100	3700	51200	6
29	7200	4000	250	5	9000	4000	51200	5
30	8100	4500	200	5	9000	4500	51200	5
31	9000	5000	200	4	9000	5000	51200	4

By default, the rigidity level is generally 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 graph.



The servo drive provides 4 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 background and then calculating it using $f_0=1/T$. The other method involves using the background frequency sweep function 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 frequnecy							

	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**		
		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		
		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 prefer not to suppress resonance through manual setting of function codes, you can enable the adaptive filter to suppress resonance frequencies automatically. This feature can automatically set parameters related to the third and fourth sets of notch filters. If no resonance frequency is found after activation, the system will automatically exit after 30 minutes. If a resonance frequency is found and notch filters are set but the vibrations become more severe, the adaptive function will also automatically exit 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

Explanation:

- 0: Disable adaptive filter
- 1: Automatic update of parameters for the third set of notch filters
- 2: Automatic update of parameters for the third and fourth sets of notch filters
- 3: Only test resonance frequency, displayed in P01.02
- 4: Clear values for the third and fourth sets of notch filters

	P01.01 Vibration Detection Threshold	Setting Range	Unit	Factory Default	Related Modes		
		0.0~100.0	%	2.0	P	S	T

Explanation:

100% corresponds to the motor's rated torque

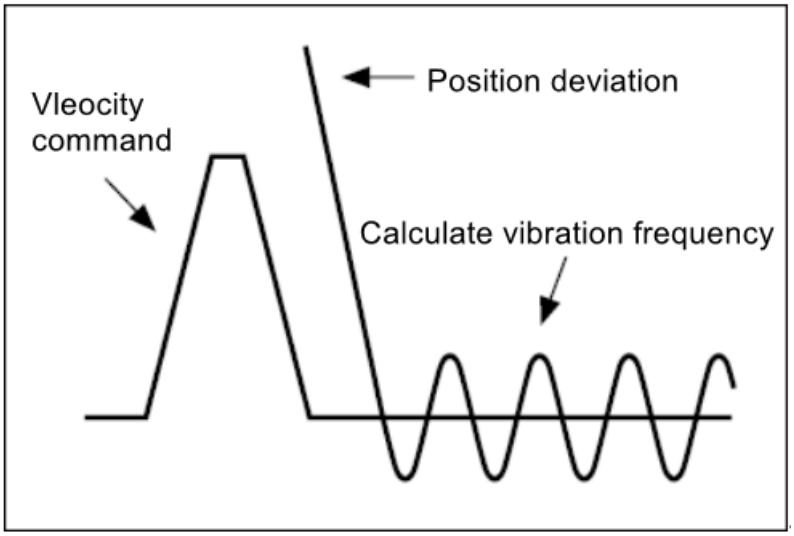
	P01.02 Resonance Frequency Identification Result	Setting Range	Unit	Factory Default	Related Modes		
		0~5000	Hz	-	P	S	T

Explanation:

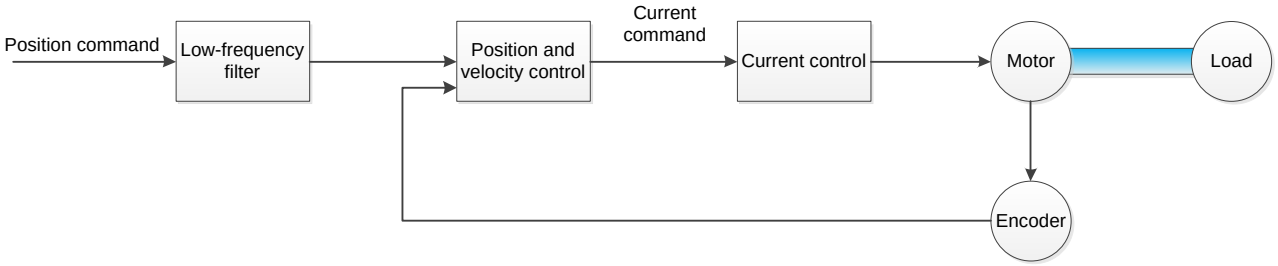
Display the detected resonance frequency value

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 diagram.



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	-	-
Explanation: ◆ 0: No suppression ◆ 1: Suppression of 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	-	-
Explanation: Measured low-frequency vibration frequency							

P01.22 Low-frequency Vibration Filtering Setting	Setting Range	Unit	Factory Default	Related Modes		
	0~10	-	2	P	-	-
Explanation: The larger the value, the wider the filtering width, but it also leads to greater delay.						

P01.23 Attenuation Ratio of Low-frequency Resonance Frequency	Setting Range	Unit	Factory Default	Related Modes		
	1.2~3.0	1	1.2	P	-	-
Explanation: The larger the value, the deeper the filtering, and the smaller the delay in the position command.						

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 Mixed 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 Mixed 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 Inner and Outer Loop Position Deviation Filtering Coefficient	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.

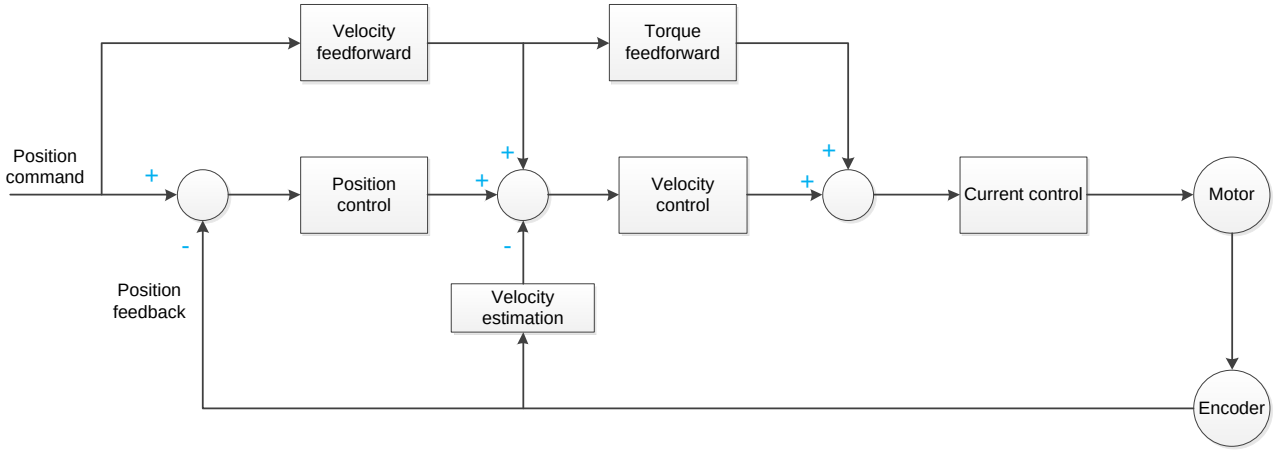
4.2.4 Practical Application of Gain Adjustment

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 Parameter	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.

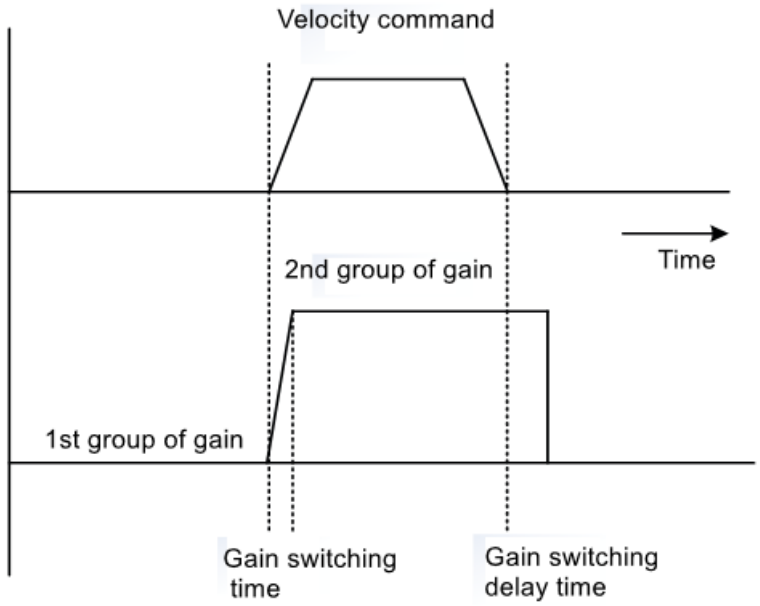
	P00.15 Torque Feedforward Filtering Time Parameter	Setting Range	Unit	Factory Default	Related Modes		
		0.00~64.00	ms	0.50	P	S	-
Explanation: Applies low-pass filtering to the torque feedforward to prevent abrupt changes in torque command.							

4.2.4.2 Gain Switching

During servo operation and stopping, it's often necessary for the servo to have different response characteristics:

- 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 diagram:



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 Mode Selection	Setting Range	Unit	Factory Default	Related Modes		
		0~4	-	0	P	-	-
Explanation: ◆ 0: Fixed to the first group gain ◆ 1: Maintain the first group of gain, DI switching integral time is set to 0 ◆ 2: Use DI to switch between the first and second group of gains ◆ 3: Use position command + velocity feedback switching ◆ 4: Use position command + velocity feedback switching with locked gain							

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

	P00.1B Gain Switching Level	Setting Range	Unit	Factory Default	Related Modes		
		0~20000	-	50	P	-	-
Explanation: If the switching condition is position, the unit is in p (position units); if the switching condition is velocity, the unit is in RPM; if the switching condition is torque, the unit is in 0.1%.							

	P00.1C Gain Switching Time-lag	Setting Range	Unit	Factory Default	Related Modes		
		0~20000	-	30	P	-	-
Explanation: If the switching condition is position, the unit is in p (position units); if the switching condition is velocity, the unit is in RPM; if the switching condition is torque, the unit is in 0.1%.							

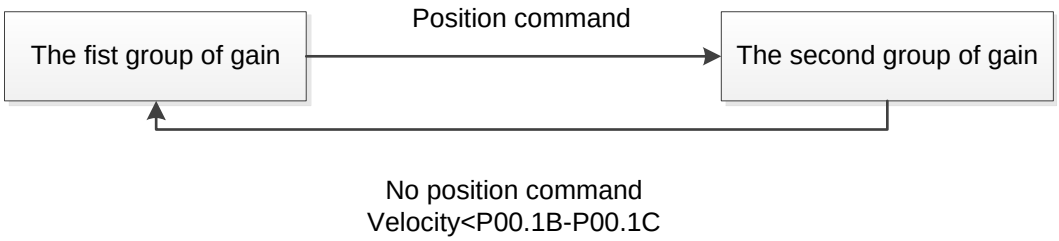
	P00.1D Gain Switching Time	Setting Range	Unit	Factory Default	Related Modes		
		0.0~1000.0	ms	3.0	P	-	-
Explanation: Used to set the time taken to switch from the first group of gain to the second group of gain.							

	P00.1E 3rd Group of Gain Coefficient	Setting Range	Unit	Factory Default	Related Modes		
		50~10000	%	100	P	-	-

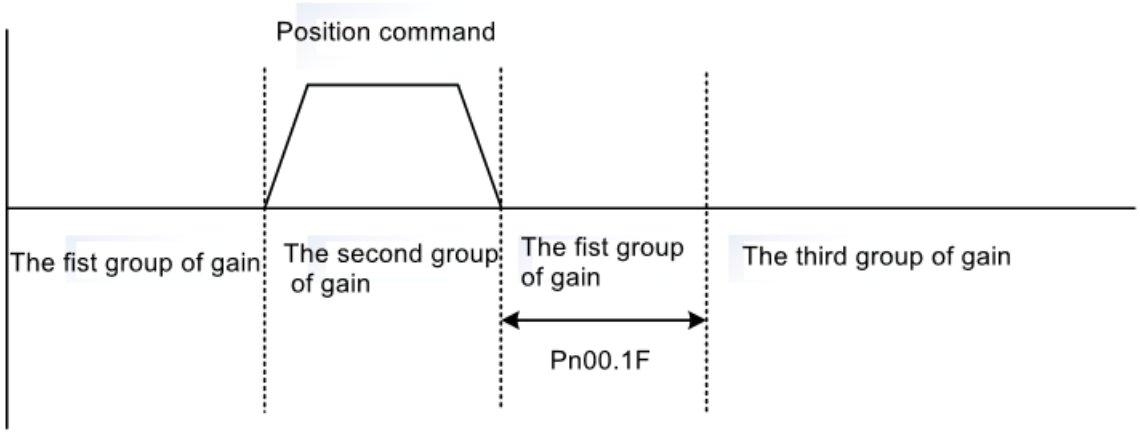
Explanation: Used to set the amplification factor of the third group of gain and the first group of gain when stopping. It only amplifies the position proportional gain and the velocity proportional gain.

	P00.1F Waiting Time of the 3rd Group of Gain Switching	Setting Range	Unit	Factory Default	Related Modes		
		0.0~1000.0	ms	0	P	-	-
Explanation: Used to set the waiting time of the third group of gain switching when stopping.							

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



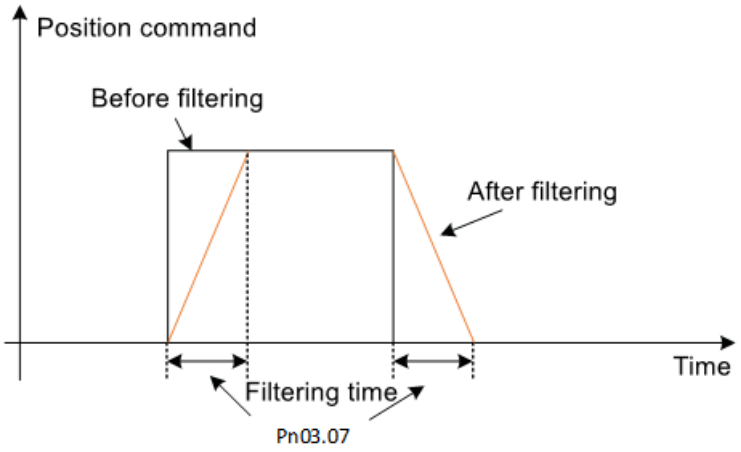
When the gain switching mode selection is set to 4, a new group of gains is introduced based on 3. The amplification factor P00.0E of the third group gain only applies to the position proportional gain and speed proportional gain of the first group gain. The velocity integral time and torque filtering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



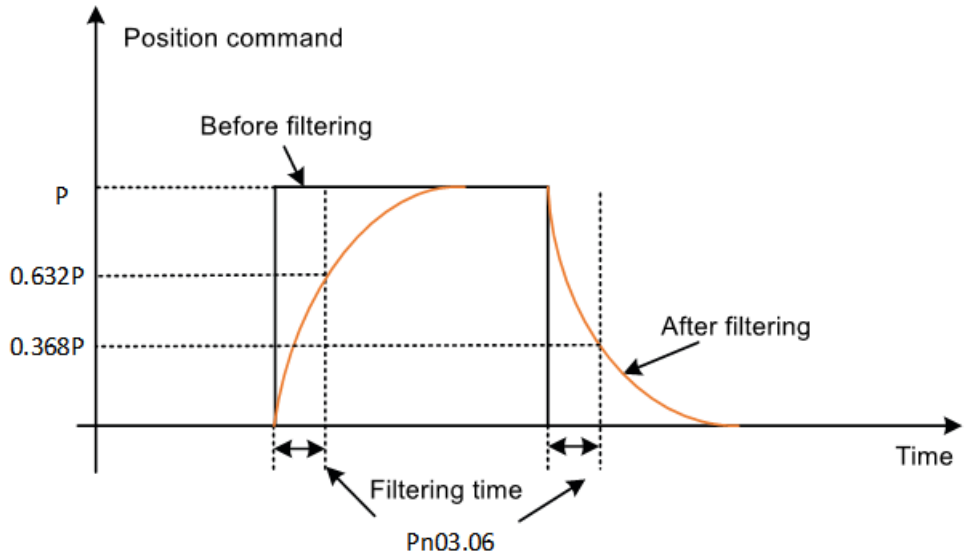
4.2.4.3 Command Filtering Function

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.



Position command low-pass filtering, when the filtering time is set, the command will show a significant reduction in variation when accelerating to maximum speed and decelerating to minimum speed, as shown in the following diagram.



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 Filter Enablement	Setting Range	Unit	Factory Default	Related Modes		
	0~1	-	0	P	S	T

Explanation:

When it is set to 1, the velocity feedback is calculated by robust algorithm(robust filter) and can effectively suppress noise from the encoder.

P00.22 Velocity Feedback Robust filter Gain	Setting Range	Unit	Factory Default	Related Modes		
	10~2000	Hz	60	P	S	T

Explanation:

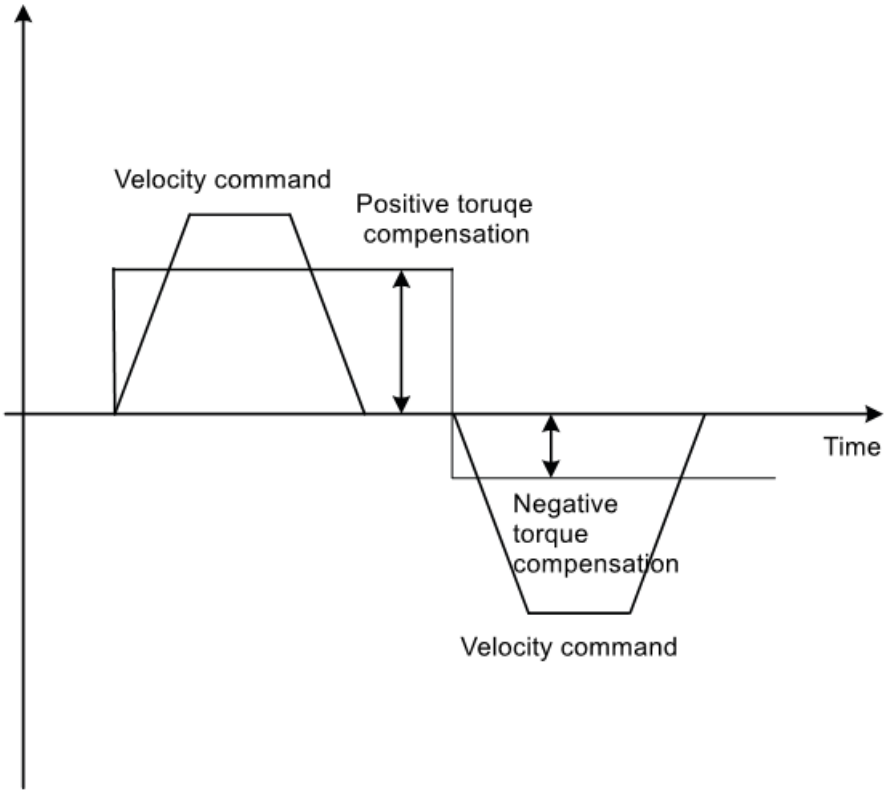
Used to adjust the bandwidth of the robust filter for velocity feedback, typically adjusted within the range of 50 to 200 Hz.

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

	P00.24 Velocity Feedback Robust Filter Filtering time	Setting Range	Unit	Factory Default	Related Modes		
		0.00~20.00	ms	0.40	P	S	T
Explanation: The filtering time of robust filter for velocity feedback. Increasing the parameter can reduce noise but may introduce vibration due to delay.							

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 Communication Protocol

The FV5 series rotary pulse servo drive supports RS-485 and RS-232 serial communication functions. Using the communication function, parameters within the servo system can be read and modified. Both RS-485 and RS-232 communication functions can be used simultaneously.

The RS-485 interface is located at CN8. Please refer to the *FV5 Series Rotary Pulse Servo Drive Installation Guide* for wiring methods.

The RS-232 interface is CN2. Please refer to the *FV5 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 Station Number Selection	Setting Range	Unit	Factory Default	Related Modes		
		0~127	1	0	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 Modbus Communication Baud Rate Setting	Setting Range	Unit	Factory Default	Related Modes		
		0~6	-	6	P	S	T
Explanation: ◆ 0:2400 bps ◆ 1: 4800 bps ◆ 2: 9600 bps ◆ 3: 19200 bps ◆ 4: 38400 bps ◆ 5: 57600 bps ◆ 6: 115200 bps							

	P08.02 Modbus Communication Data Format	Setting Range	Unit	Factory Default	Related Modes		
		0~3	-	0	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 Servo Configuration Software RS232 Baud Rate Communication Setting	Setting Range	Unit	Factory Default	Related Modes		
		0~6	-	6	P	S	T

Explanation:

- 0: 2400 bps
- 1: 4800 bps
- 2: 9600 bps
- 3: 19200 bps
- 4: 38400 bps
- 5: 57600 bps
- 6: 115200 bps

	P08.0F Disable EEROPM Storage During RS485 Communication	Setting Range	Unit	Factory Default	Related Modes		
		0~0xFFFF	-	0	P	S	T

Explanation:

- 0: Enable EEPROM storage
- 1: Disable EEPROM storage

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.

5.1 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

5.2 RTU Function Command

5.2.1 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

5.2.2 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

5.2.3 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
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

5.3 Modbus Function Code Communication Address

When setting the function code as Pxx.YY, the corresponding Modbus address is xx.YY. For example, for P05.10,

0x05 represents the group number, and 0x10 represents the offset, both in hexadecimal.

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

- U00.YY. Corresponding Modbus address: group number 0x1A, offset 0xYY. For example, reading the current temperature of the drive U00.1D, the address is 0x1A, offset 0x1D.
- U01.YY. Corresponding Modbus address: group number 0x1B, offset 0xYY. For example, reading the speed when the selected fault occurred U01.05, the address is 0x1B, offset 0x05.
- U02.YY. Corresponding Modbus address: group number 0x1C, offset 0xYY. For example, software version U02.00, the address is 0x1C, offset 0x00.

The auxiliary function code group corresponds to communication addresses as FYY, with the corresponding Modbus address being group number 0x1F and offset 0xYY.

6 Alarm Handling

Please refer to the table below for alarm information.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.01.0	Overvoltage	Resettable error (Fault 1 shutdown)	For 220V drive model，ensure that the 220V input is within the range from 200V to 240V，drive bus overvoltage point is 420V. For 380V drive model，ensure that the 380V input is within the range from 380V to 440V, drive bus overvoltage point is 760V. If overvoltage occurs during operation, set the discharge function, add an external discharge resistor to dissipate excess energy, or increase the acceleration and deceleration time.
Er.01.1	Undervoltage	Resettable error (Fault 2 shutdown)	Check if the external power supply input is too low. For 220V drive model, ensure that the 220V input is within the range from 200V to 240V. For 380V drive model, ensure that the 380V input is within the range from 380V to 440V.
Er.01.2	Power failure	Resettable error (Fault 2 shutdown)	Check if the external power supply input is disconnected while the servo is enabled. In the event of a power failure during operation followed by an immediate restoration.
Er.01.3	Power phase loss	Resettable error (Fault 2 shutdown)	Check if the external power supply input is disconnected while the servo is enabled, or set P0B.05=2 to mute this fault.
Er.01.5	Phase sequence error	Non-resettable error (Fault 1 shutdown)	U, V, W wiring error, swap any two phase connections.
Er.01.6	Control point undervoltage	Resettable error (Fault 2 shutdown)	Check if the external power supply input is disconnected while enabled.
Er.02.0	Bus phase p overcurrent	Non-resettable error (Fault 1 shutdown)	Check if U, V, W wiring is short-circuited, test if the resistance values between U, V, W phases are correct. Braking resistor resistance too small or short-circuited. shorted to ground, U, V, W short circuit to PE. Parameter setting error, excessive gain, appropriately reduce rigidity, decrease gain.
Er.02.1	Bus phase n overcurrent	Non-resettable error (Fault 1 shutdown)	
Er.02.2	U phase overcurrent fault	Non-resettable error (Fault 1 shutdown)	

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.02.3	V phase overcurrent fault	Non-resettable error (Fault shutdown) 1	
Er.02.4	Short circuit to ground	Non-resettable error (Fault shutdown) 1	Ensure insulation between U, V, W, and PE, resistance reaches MΩ level.
Er.02.5	Discharge overcurrent	Non-resettable error (Fault shutdown) 1	Braking resistor short circuit, check braking resistor resistance.
Er.02.7	Driver temperature too high	Non-resettable error (Fault shutdown) 2	Increase heat dissipation space, reduce average load rate.
Er.02.8	Driver overload	Non-resettable error(Fault shutdown) 1	Reduce average load rate, increase acceleration and deceleration time, check if the machinery is stuck.
Er.02.9	Motor overload	Non-resettable error (Fault shutdown) 1	Reduce average load rate, increase acceleration and deceleration time, check if the machinery is stuck, appropriately increase P0B.11 adjustment, or set P0B.01 to 1 to disable motor overload error.
Er.02.A	Motor stall	Non-resettable error (Fault shutdown) 1	Check if the machinery is stuck. Check if U, V, W wiring is incorrect. Angle error, re-identify the angle using Fn03.
Er.02.B	PTC motor temperature too high	Non-resettable error (Fault shutdown) 1	Reduce motor load rate.
Er.02.D	Discharge resistor overload	Warning	Unable to continue discharge after discharge resistor overload, need to increase discharge resistor power, set correct parameters P02.21~P02.24, or increase P02.26 heat transfer coefficient for discharge resistor.
Er.02.E	Driver zero drift too large	Warning	Need to contact the Flexem technical support engineer for handling.
Er.04.0	Pulse input abnormality	Resettable error (Fault shutdown) 2	Pulse input frequency exceeds 4M Hz. Reduce pulse frequency from the host. Check if pulse input wiring, shielded wire, and ground are correct.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.04.1	STO monitoring abnormality	Non-resettable error(Fault 1 shutdown)	Confirm if the external STO terminal is normal.
Er.04.2	STO monitoring chip abnormality	Non-resettable error(Fault 1 shutdown)	Confirm if the external STO terminal is normal.
Er.04.3	EERPOM read abnormality	Resettable error (Fault 2 shutdown)	Communication reading of function codes is too frequent. Can set P08.0f to 1.
Er.04.4	EERPOM write abnormality	Resettable error (Fault 2 shutdown)	Communication writing of function codes is too frequent. Can set P08.0f to 1.
Er.04.5	EERPOM abnormality	Resettable error (Fault 2 shutdown)	EEPROM operation is too frequent.
Er.04.6	AI1 voltage input too high	Resettable error (Fault 1 shutdown)	AI1 input too high
Er.04.7	Hall angle abnormality	Resettable error (Fault 1 shutdown)	During Hall identification, the width of the Hall device is less than 20°.
Er.04.8	CSP command abnormality 1	Resettable error (Fault 2 shutdown)	Mainly check if the PLC given 0x607A command is abnormal.
Er.04.9	CSP command abnormality 2	Resettable error (Fault 2 shutdown)	Mainly check if the PLC given 0x607A command is abnormal.
Er.04.E	EERPOM write abnormality	Resettable error(Fault 2 shutdown)	Communication writing of function codes is too frequent, damaging the EEPROM. Can set P08.0F to 1.
Er.04.F	EERPOM read abnormality	Resettable error(Fault 2 shutdown)	EEPROM data reading exception, device may be damaged, or set P08.0F to 1.
Al.05.0	Positive overtravel	Warning	External (or software limit) positive overtravel signal detected, servo no longer responds to positive commands.
Al.05.1	Negative overtravel	Warning	External (or software limit) negative overtravel signal detected, servo no longer responds to negative commands.
Al.05.2	Emergency stop	Warning	External stop signal detected.
Er.05.3	Position deviation too	Non-resettable error	Position deviation exceeds the set value of P03.26. Check if the machinery is stuck.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
	large	(Fault 1 shutdown)	Increase P03.26 setting value. Increase position gain, add position smoothing filtering processing.
Al.05.4	Homing timeout error	Warning	Homing timeout error, homing time exceeds the set value of P03.35.
Er.05.5	Motor is out of control	Non-resettable error (Fault 1 shutdown)	U, V, W wiring error. Angle error. Encoder cable abnormality, check feedback display. Check if P18.00 setting is correct.
Er.05.6	Overspeed	Non-resettable error (Fault 1 shutdown)	U, V, W wiring error. Angle error. Gain setting unreasonable. Encoder cable abnormality, check feedback display.
Er.05.7	Servo enablement fault	Resettable error (Fault 2 shutdown)	External servo enable DI is valid when using auxiliary function Fn.
Er.05.8	Position command dispatch anomaly	Resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.05.9	Full closed-loop's inner and outer deviation too large	Resettable error (Fault 1 shutdown)	Check if external encoder feedback is correct. Check if external encoder feedback direction is correct. Check if the machinery is slipping. Set correct deviation range.
Er.05.A	Brake overcurrent	Resettable error (Fault 1 shutdown)	When average load rate exceeds P0B.26 and lasts for P0B.27 set time, the brake may be damaged. When P0B.27 is set to 0, this alarm is disabled.
Er.05.B	Position deviation overflow	Non-resettable error (Fault 1 shutdown)	Position deviation exceeds the set value of P03.26. Check if the machinery is stuck. Increase P03.26 setting value. Increase position gain, add position smoothing filtering processing.
Er.05.C	Discharge resistor too small	Non-resettable error (Fault 1 shutdown)	Use specified regenerative braking resistor.
Er.06.0	No corresponding driver	Non-resettable error (Fault 1 shutdown)	P19.00 setting error, no corresponding driver model, need to contact Flexem technical support engineer for handling.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.06.1	No corresponding motor	Non-resettable error (Fault 1 shutdown)	P18.02 setting error, no corresponding motor code, modify P18.02 or contact Flexem technical support engineer for handling.
Er.06.2	No coresonding encoder	Non-resettable error (Fault 1 shutdown)	P18.00 seting error, no corresponding encoder, modify P18.00 or contact Flexem technical support engineer for handling.
Er.06.3	Drive model is not set	Resettable error (Fault 2 shutdown)	Drive factory parameters is abnormal，need to contact Flexem technical support engineer for handling.
Er.06.4	DI error	Resettable error (Fault 2 shutdown)	DI function assignment fault, assign the same DI function to different DIs, frequency division error, modify function code settings.
Er.06.5	Electronic gear ratio setting error	Resettable error (Fault 2 shutdown)	Modify electronic gear (P03.12~P03.18) ratio within the correct setting range.
Er.06.7	Frequency division output setting fault	Resettable error (Fault 2 shutdown)	Frequency division output pulse number exceeds encoder frequency division rate, need to reset P02.03.
Er.06.9	Software limit setting fault	Resettable error (Fault 2 shutdown)	Upper limit of software position limit (P03.23) is less than the lower limit (P03.21).
Er.06.A	Homing position setting error	Resettable error (Fault 2 shutdown)	Mechanical origin offset P03.36 setting is outside the software limit. Upper limit (P03.23), lower limit (P03.21) of software position limit. Need to reset P03.36
Er.06.C	Encoder similar setting fault	Resettable error（ Fault 2 shutdown）	P18.00 set as single-turn encoder, but absolute value function is enabled.
Er.07.0	Angle identification failure	Unresettable error(Fault 1 shutdown)	Ensure that U, V, W wiring is correct. Motor parameter setting is correct, linear motor needs to correctly set pole pair number, resolution, pole pitch. Contact Flexem technical support engineer for handling.
Er.07.1	Angle identification failure 1	Resettable error (Fault 1 shutdown)	Ensure that U, V, W wiring is correct. Encoder cable abnormality, check position feedback is correct. Ensure that motor parameter setting is correct, linear motor needs to correctly set pole pair number, resolution, pole pitch.

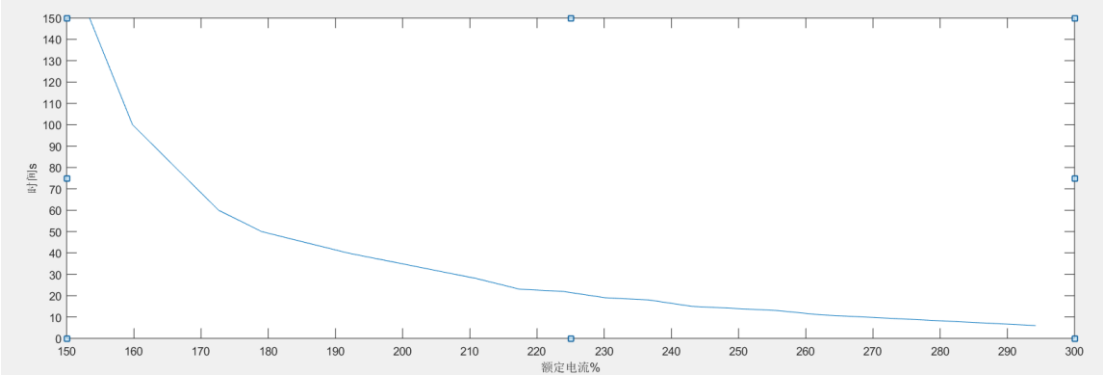
Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
			Contact Flexem technical support engineer for handling.
Er.07.2	Angle identification failure 2	Resettable error (Fault 1 shutdown)	Ensure that U, V, W wiring is correct. Encoder cable abnormality, check if position feedback is correct. Contact Flexem technical support engineer for handling.
Er.07.3	Offline inertia identification failure	Resettable error (Fault 2 shutdown)	Ensure that U, V, W wiring is correct. Ensure that machinery is not stuck. Ensure that motor can rotate normally.
Er.07.4	Angle identification stall	Resettable error (Fault 1 shutdown)	Motor is stuck during angle identification. Check if U, V, W wiring is correct. Ensure that machinery is not stuck, check if position feedback is correct.
Al.0C.0	Parameters Repower up	Warning	Parameters Repower up.
Al.0C.2	Power phase loss warning	Warning	Check if the external power supply input has phase loss, or set P0B.05=2 to disable this warning.
Al.0C.3	Homing parameter setting error0	Warning	Invalid homing method setting. Homing switch and limit switch are simultaneously valid.
Al.0C.4	Linear motor feedback interference warning	Warning	Check grating ruler feedback wiring, etc.
Al.0C.6	Encoder external battery undervoltage	Warning	Check encoder external battery circuit, confirm battery voltage is normal.
Er.10.0	Encoder disconnection	Non-resettable error (Fault 1 shutdown)	Check if P18.00 is set correctly. Check if encoder wiring is correct.
Er.10.1	Encoder parameter error	Non-resettable error (Fault 1 shutdown)	Motor EEPROM data verification error or parameter not saved.
Er.10.2	Encoder communication fault	Non-resettable error (Fault 1 shutdown)	Check if P18.00 is set correctly. Check if encoder wiring is correct.
Er.10.3	Encoder calculation error	Non-resettable error	Check if P18.00 is set correctly. Check if encoder wiring is correct.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
		(Fault 1 shutdown)	
Er.10.4	Encoder count increment anomaly	Non-resettable error (Fault 1 shutdown)	Check if P18.00 is set correctly. Check if encoder wiring is correct.
Er.10.5	Encoder parameter write fault	Non-resettable error (Fault 1 shutdown)	Check if P18.00 is set correctly. Check if encoder wiring is correct.
Er.10.6	Encoder battery failure	Non-resettable error (Fault 1 shutdown)	Check if the external battery is disconnected, or if the battery is low. Can use Fn07 to reset error.
Er.10.7	Encoder multi-turn count error	Non-resettable error (Fault 1 shutdown)	Check if the external battery is disconnected, or if the battery is low. Can use Fn07 to reset error.
Er.10.8	Encoder multi-turn counter overflow	Non-resettable error (Fault 1 shutdown)	Can use Fn07 to reset error.
Er.10.A	Incremental encoder AB interference	Non-resettable error	Check encoder wiring.
Er.10.B	Incremental encoder Z interference fault	Non-resettable error (Fault 1 shutdown)	Check encoder wiring.
Er.10.C	Incremental encoder power-on Hall error	Non-resettable error (Fault 1 shutdown)	Check encoder wiring, or encoder type P18.00 setting error, or motor encoder fault.
Er.10.D	Incremental encoder disconnection	Non-resettable error (Fault 1 shutdown)	Check encoder wiring.
Er.10.E	Linear encoder interference	Non-resettable error (Fault 1 shutdown)	Linear motor feedback count anomaly. Hall signal feedback anomaly.

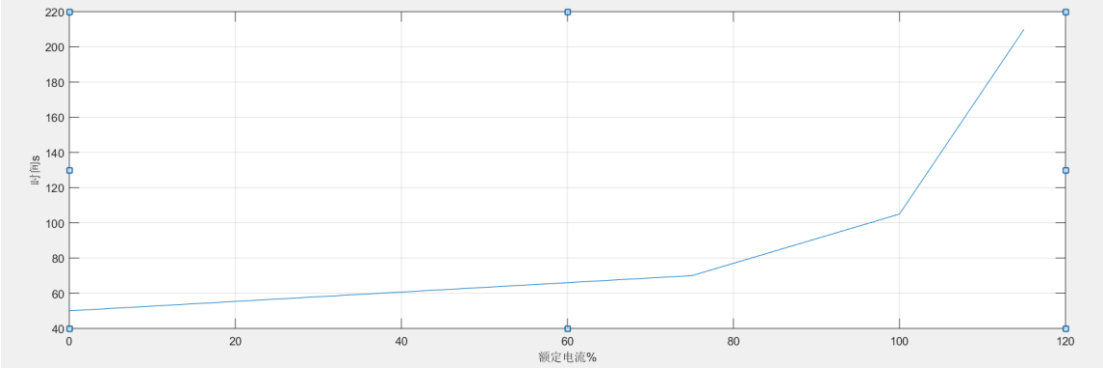
Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.12.0	FPGA is upgrading	Non-resettable error	Wait for the upgrade to complete.
Er12.2	Function code parameter is abnormal	Non-resettable error (Fault 1 shutdown)	Use F04 to reset function code.
Er.12.3	Manufacturer parameter is abnormal	Non-resettable error (Fault 1 shutdown)	View U00.3E and U00.3F to get the abnormal function code, then check if the abnormal function code setting value exceeds the allowed upper and lower limits, need to contact Flexem technical support engineer for handling.
Er.12.4	EEPROM storage range exceeded	Non-resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.12.5	Object dictionary storage range exceeded	Non-resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.12.6	Encryption chip anomaly	Non-resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.12.7	MCU and FPGA match error	Non-resettable error (Fault 1 shutdown)	The drive needs to reload the FPGA, set the parameter F10 to 1 and wait for the drive to restart automatically.
Er.12.8	MCU loss	Non-resettable error (Fault 1 shutdown)	Contact Flexem technical support engineer for handling if still invalid after a power cycle.
Er.12.9	System parameter anomaly/FPGA parallel port error	Non-resettable error(Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.12.A	Current sampling timeout	Non-resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.
Er.12.B	Encoder timeout	Non-resettable error (Fault 1 shutdown)	Encoder replacement needed, need to contact Flexem technical support engineer for handling.

Alarm Code	Alarm Name	Alarm Type	Mechanism and Handling Measures
Er.12.C	FPGA timeout	Non-resettable error (Fault 1 shutdown)	Need to contact the Flexem technical support engineer for handling.

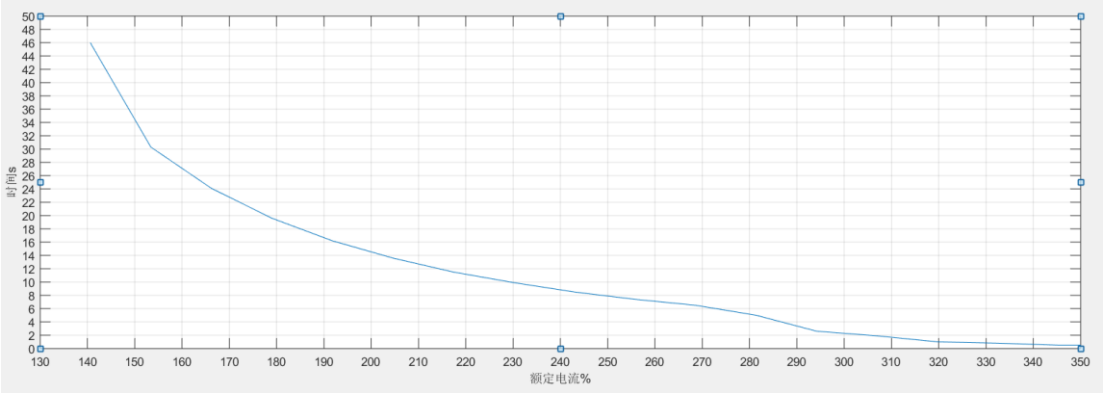
The motor overload protection time is as shown in the following figure. (When alarm ER.02.9 occurs, if the motor heating is not severe, P0B.11 can be adjusted appropriately).



The motor cooling time is as follows.



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



7 Function Code

7.1 Function Code Parameter Description

In the relevant modes, P represents position mode, S represents speed mode, and T represents torque mode.

7.1.1 P00 Gain Adjustment Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P00	00	Gain adjustment Mode Selection	0: Manual gain adjustment 1: Use of rigidity table 2: Positioning mode	-	1	Any setting	Take effect immediately	U16
P00	01	Automatically Adjust Mechanical Rigidity Settings	0~31	-	11	Any setting	Take effect immediately	U16
P00	02	1st Velocity Loop Gain	0.0~2000.0	Hz	18.0	Any setting	Take effect immediately	U16
P00	03	1st Velocity Loop Integral Time	0.15~512.00	ms	31.00	Any setting	Take effect immediately	U16
P00	04	1st Position Loop Gain	0.0~2000.0	Hz	32.0	Any setting	Take effect immediately	U16
P00	05	1st Torque Command Filtering Time Constant	0.00~30.00	ms	1.26	Any setting	Take effect immediately	U16
P00	06	2nd Velocity Loop Gain	0.0~2000.0	Hz	40.0	Any setting	Take effect immediately	U16
P00	07	2nd Velocity Loop Integral Time	0.15~512.00	ms	20.00	Any setting	Take effect immediately	U16
P00	08	2nd Position Loop Gain	0.0~2000.0	Hz	64.0	Any setting	Take effect immediately	U16
P00	09	2nd Torque Command Filtering Time Constant	0.00~30.00	ms	1.26	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P00	0A	Load Rotation of Inertia Ratio	0.00~120.00		1.00	Any setting	Take effect immediately	U16
P00	0B	Velocity Feedback Robust filter Enablement	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P00	0C	Torque Command Filtering Selection	0: First-order low-pass filter 1: Second-order low-pass filter	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P00	0F	Velocity Feedforward Control Selection	0: No velocity feedforward 1: Internal velocity feedforward 2: External velocity feedforward	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P00	10	Velocity Feedforward Gain	0.0~100.0	%	0.0	Any setting	Take effect immediately	U16
P00	11	Velocity Feedforward Filtering Time	0.00~64.00	ms	0.50	Any setting	Take effect immediately	U16
P00	12	PDFF Control Coefficient	0.0~100.0	%	100.0	Any setting	Take effect immediately	U16
P00	13	Torque Feedforward Control Selection	0: No torque feedforward 1: Internal torque feedforward 2: External torque feedforward	-	1	Any setting	Take effect immediately	U16
P00	14	Torque Feedforward Gain	0.0~500.0	%	0.0	Any setting	Take effect immediately	U16
P00	15	Torque Feedforward Filtering Time	0.00~64.00	ms	0.50	Any setting	Take effect immediately	U16
P00	16	Current Loop Gain Coefficient	0~500	%	100	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
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 setting	Take effect immediately	U16
P00	1A	Gain Switching Delay Time	0.0~1000.0	ms	5.0	Any setting	Take effect immediately	U16
P00	1B	Gain Switching Level	0~20000	-	50	Any setting	Take effect immediately	U16
P00	1C	Gain Switching Time-lag	0~20000	-	30	Any setting	Take effect immediately	U16
P00	1D	Position Gain Switching Time	0.0~1000.0	ms	3.0	Any setting	Take effect immediately	U16
P00	1E	Gain Coefficient of the 3rd Group	10~1000	%	100	Any setting	Take effect immediately	U16
P00	1F	Gain Switching Wait Time of the 3r Group	0.0~1000.0	ms	0.0	Any setting	Take effect immediately	U16
P00	20	Number of times the velocity feedback is filtered by moving average filter	0~5	-	0	Any setting	Take effect immediately	U16
P00	21	Low-Pass Filtering Cut-off Frequency for Velocity Feedback	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P00	22	Velocity Feedback Robust Fiter	10~2000	Hz	60	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Gain						
P00	23	Velocity Feedback Robust Filter Dynamic Coefficient	10~10000	%	100	Any setting	Take effect immediately	U16
P00	24	Velocity Feedback Robust Filter Filtering Time	0.00~20.00	ms	0.40	Any setting	Take effect immediately	U16
P00	2E	Torque Disturbance Observer Cut-off Frequency Adjustment Percentage	10~200	%	100	Any setting	Take effect immediately	U16
P00	2F	Torque Disturbance Observer Inertia Compensation Coefficient	0~1000	%	100	Any setting	Take effect immediately	U16
P00	30	Torque Disturbance Observer Filtering Frequency	0.0~1000.0	Hz	300.0	Any setting	Take effect immediately	U16
P00	31	Torque Disturbance Observer Compensation Percentage	0~200	%	0	Any setting	Take effect immediately	U16

7.1.2 P01 Vibration Suppression Function Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P01	00	Adaptive Filter Mode Selection	0: Disable adaptive filtering 1: 3rd notch filter adaptive 2: 3rd and 4th notch	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
			filter adaptive 3: Detection mode, resonance frequency displayed on Pn0102 4: Reset 3rd and 4th notch filter					
P01	01	Current Threshold for Determination of Resonance	0.0~100.0	%	2.0	Any setting	Take effect immediately	U16
P01	02	Vibration Frequency Display	-	Hz	-	Only display	Take effect immediately	U16
P01	04	Anti-resonance Frequency of the 1st Notch Filter	10~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	05	Frequency of the 1st Notch Filter	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	06	Bandwidth of the 1st Notch Filter	0~9	-	2	Any setting	Take effect immediately	U16
P01	07	Depth of the 1st Notch Filter	0~99	-	0	Any setting	Take effect immediately	U16
P01	08	Anti-resonance Frequency of the 2nd Notch Filter	10~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	09	Frequency of the 2nd Notch Filter	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	0A	Bandwidth of 2nd Notch Filter	0~9	-	2	Any setting	Take effect immediately	U16
P01	0B	Depth of the 2nd Notch Filter	0~99	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P01	0C	Anti-resonance Frequency of the 3rd Notch Filter	10~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	0D	Frequency of the 3rd Notch Filter	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	0E	Bandwidth of the 3rd Notch Filter	0~9	-	2	Any setting	Take effect immediately	U16
P01	0F	Depth of the 3rd Notch Filter	0~99	-	0	Any setting	Take effect immediately	U16
P01	10	Anti-resonance Frequency of the 4th Notch Filter	10~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	11	Frequency ot the 4th Notch Filter	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	12	Bandwidth of the 4th Notch Filter	0~9	-	2	Any setting	Take effect immediately	U16
P01	13	Depth of the 4th Notch Filter	0~99	-	0	Any setting	Take effect immediately	U16
P01	14	Anti-resonance Frequency of the 5th Notch Filter	10~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	15	Frequency of the 5th Notch Filter	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	16	Bandwidth of the 5th Notch Filter	0~9	-	0	Any setting	Take effect immediately	U16
P01	17	Depth of the 5th Notch Filter	0~99	-	50	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P01	18	Vibration time 1 per Revolution	0~65535		0	Any setting	Take effect immediately	U16
P01	19	Vibration time 2 per Revolution	0~65535		0	Any setting	Take effect immediately	U16
P01	1A	Vibration time 3 per Revolution	0~65535		0	Any setting	Take effect immediately	U16
P01	1B	Notch Filter Frequency 2 for Feedback	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	1C	Notch Filter Frequency 3 for Feedback	50~5000	Hz	5000	Any setting	Take effect immediately	U16
P01	1D	Positive Friction Compensation	-100.0~100.0	%	0.0	Any setting	Take effect immediately	I16
P01	1E	Negative Friction Compensation	-100.0~100.0	%	0.0	Any setting	Take effect immediately	I16
P01	1F	Low-frequency Vibration Suppression Mode Selection	0: No suppression 1: One Low-frequency vibration suppression	-	0	Any setting	Take effect immediately	U16
P01	21	Low-frequency Vibration Frequency	1.0~100.0	Hz	100.0	Any setting	Take effect immediately	U16
P01	22	Low-frequency Vibration Bandwidth	0~10	-	2	Any setting	Take effect immediately	U16
P01	23	Low-frequency Vibration Attenuation Coefficient	1.2~10.0		1.2	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P01	26	Vibration Time Unit Selection	0：0.01 1：0.1	-	0	Any setting	Take effect immediately	U16

7.1.3 P02 Group Basic Parameter Setting

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P02	00	Operation Mode Setting	0: Velocity mode 1: Position mode 2: Torque mode 3: Torque-mode-velocity-position hybrid mode	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	01	Rotation Direction Setting	0：CCW 1：CW	-	0	Any setting	Take effect immediately	U16
P02	02	Encoder Pulse Output Logic Flip	0：A ahead of B 1：B ahead of A	-	0	Any setting	Repower up	U16
P02	03	Number of Pulses Output by Motor per Rotation	0~1073741824	-	2500	Any setting	Repower up	U32
P02	05	Z Pulse Output Level Setting	0: Low level when Z pulse is effective 1: High level when Z pulse is effective	-	1	Any setting	Repower up	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 setting	Repower up	U16
P02	09	Ratio of	0~65535	-	0	Any	Repower up	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Frequency Divided Pulses to Encoder Pulses				setting		
P02	0E	Emergency Stop Mode Selection	0: Free stop 1: Slow ramp stop 2: Fast ramp stop 3: Emergency torque stop 4: Slow ramp stop 5: Fast ramp stop 6: Emergency torque stop	-	0	Any setting	Take effect immediately	U16
P02	0F	Brake Enable Switch	0: Disabled 1: Enabled	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	10	Stop Mode When Servo off	-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	-	0	Any setting	Take effect immediately	I16
P02	11	Overtravel 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	-	1	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
			state					
P02	12	Stop Mode in Case of Uncontrollable Fault (Type 1)	0: Free stop and stay in free state 1: DB stop and stay in free state 2: DB stop and stay in DB state	-	2	Any setting	Take effect immediately	U16
P02	13	Stop Mode in Case of Controllable Fault (Type 2)	-4: Emergency torque stop and stay in DB state -3: Zero speed stop and stay in DB state -2: Ramp stop and stay in DB state -1: DB stop, maintain 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 3: Emergency torque stop and stay in free state	-	-3	Any setting	Take effect immediately	I16
P02	14	Stop Completion Threshold	10~1000	RPM	100	Any setting	Take effect immediately	U16
P02	15	DB Stop Timeout	30~30000	ms	100	Any setting	Take effect immediately	U16
P02	1A	Weak Magnetism Function Enablement	0: Disable 1: Enable	-	0	Any setting	Take effect immediately	U16
P02	1B	Weak Magnetism Depth	60~115	-	105	Any setting	Take effect immediately	U16
P02	1C	Maximum Allowable	0~100	1%	20	Any	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Demagnetization Current				setting		
P02	1D	Weak Magnetism Gain	0~4000	Hz	40	Any setting	Take effect immediately	U16
P02	20	Regenerative Resistor Operation Mode Selection	0: Enable internal regenerative resistor discharge 1: Enable external regenerative resistor discharge 2: No discharge	-	1	Any setting	Take effect immediately	U16
P02	21	Internal Regenerative Resistor Power	1~65535	W	50	Any setting	Take effect immediately	U16
P02	22	Internal Regenerative Resistor Resistance	1~1000	Ω	50	Any setting	Take effect immediately	U16
P02	23	External Regenerative Resistor Power	1~65535	W	800	Any setting	Take effect immediately	U16
P02	24	External Regenerative Resistor Resistance	1~1000	Ω	50	Any setting	Take effect immediately	U16
P02	26	Resistance Heat Dissipation Coefficient	10~100	%	60	Any setting	Take effect immediately	U16
P02	29	Absolute Encoder Usage Mode	0: Incremental mode 1: Absolute linear mode 2: Absolute rotary mode	-	0	Any setting	Repower up	U16
P02	2A	Mechanical Load Gear Ratio Numerator	1~65535	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P02	2B	Mechanical Load Gear Ratio Denominator	1~65535	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	30	Inertia Identification Operation Mode	0: Positive/negative operation mode 1: JOG mode	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	31	Real-Time Inertia Identification Enable	0: Disable 1: Enable	-	0	Any setting	Take effect immediately	U16
P02	32	Inertia Identification Speed	100~1000	RPM	500	Any setting	Take effect immediately	U16
P02	33	Inertia Identification Acceleration Time	20~800	ms	120	Any setting	Take effect immediately	U16
P02	34	Inertia Identification Waiting Time	50~10000	ms	800	Any setting	Take effect immediately	U16
P02	35	Inertia Identification Distance Display	-	rev	-	Only display	Take effect immediately	-
P02	36	Inertia Identification Operation Mode Selection	0: Position mode 1: Velocity mode	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	37	Micro-Motion Repeat Identification Error Allowance	0.0~180.0	Degree	30.0	Any setting	Take effect immediately	U16
P02	38	Micro-Motion Method Repeat	0: Disable	-	1	Any	Take effect	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Identification Setting	1: Enable repetitive identification			setting	immediately	
P02	3A	UVW Phase Sequence Identification Enablement	0: Disable 1: Enable	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	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	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	3C	Angle Identification Micro-Motion Method Electric Angle Action Threshold	0.1~90.0	degree	0.2	Any setting	Take effect immediately	U16
P02	3D	Angle Identification Micro-Motion Method Stop Threshold	1~300	degree	1	Any setting	Take effect immediately	U16
P02	3E	Direct Presetting Method Set Electric Angle	0.0~18.0	degree	0.0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P02	3F	HALL Identification Enablement	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	40	Closed-Loop Gain During Angle Identification	1~20000	-	30	Any setting	Take effect immediately	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 Al10.C and Al.10.E alarms	-	3	Any setting	Repower up	U16
P02	42	Closed-Loop Speed Setting During Angle Identification	0~500	RPM	30	Any setting	Take effect immediately	U16
P02	43	Maximum Current Amplification Ratio During Angle Identification	10~200	%	100	Any setting	Take effect immediately	U16
P02	44	Time to Accelerate to Maximum Current During Angle Identification	10~8000	ms	250	Any setting	Take effect immediately	U16
P02	45	Electric Angle Adjustment Gain	0~1000	-	30	Any setting	Take effect immediately	U16
P02	46	Current Amplification	0~300	%	150	Any	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Factor During Electric Angle Compensation				setting		
P02	47	Linear Vertical Axis Enablement	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	48	Angle Identification on Power-up	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	49	Maximum Current Duration	100~10000	ms	2000	Any setting	Take effect immediately	U16
P02	4A	Open-Loop Identification Running Unit	◆ 0: 0.1 degree ◆ 1: Encoder feedback unit	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P02	5A	Absolute Position Offset	-2147483648 ~2147483647	Encoder unit	0	Set when the drive stops sending PWM pulses	Take effect immediately	I32
P02	5C	High 32-Bit Absolute Position Offset	-2147483648 ~2147483647	Encoder unit	0	Set when the drive stops sending PWM pulses	Take effect immediately	I32
P02	5E	Multi-Turn Data Offset	0~65535	-	0	Any setting	Take effect immediately	U16
P02	5F	Multi-Turn Data Overflow	0~65535	-	0	Any setting	Take effect immediately	U16

7.1.4 P03 Group Command Setting Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P03	00	Position Command Mode Setting	0: External pulse command 1: Position task mode	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P03	02	Pulse Mode	0: Direction + pulse, positive logic 1: Direction + pulse, negative logic 2: AB quadrature pulse 3: CW + CCW	-	0	Any setting	Take effect after power it on again	U16
P03	03	Pulse Effective Determination	0: Falling edge 1: Rising edge	-	0	Any setting	Repower up	U16
P03	04	Pulse Filtering Time	0~255	25ns	2	Any setting	Repower up	U16
P03	05	Pulse Source Selection	0: High-speed pulse port 1: Low-speed pulse port	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P03	06	Position Command FIR Filtering Time	0~5000	ms	0	Any setting	Take effect immediately	U16
P03	07	Moving average filtering time 1	0~2560	ms	0	Any setting	Take effect immediately	U16
P03	0A	Moving average filtering time 2	0~2560	ms	0	Any setting	Take effect immediately	U16
P03	10	Motor Revolution Command	0~1073741824	Command	0	Set when the drive stops	Take effect immediately	U32

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Pulses		unit		sending PWM pulses		
P03	12	1st Group of Electronic Gear Numerator	0~1073741824	-	10	Set when the drive stops sending PWM pulses	Take effect immediately	U32
P03	14	1st Group of Electronic Gear Denominator	0~1073741824	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U32
P03	16	2nd Group of Electronic Gear Numerator	0~1073741824	-	10	Set when the drive stops sending PWM pulses	Take effect immediately	U32
P03	18	2nd Group of Electronic Gear Denominator	0~1073741824	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U32
P03	20	Absolute Position Limit Setting	0: Disable 1: Immediately enable 2: Enable after homing	-	0	Any setting	Take effect immediately	U16
P03	21	Soft Limit Lower Limit Value	-2147483648 ~2147483648	Command unit	0	Any setting	Take effect immediately	I32
P03	23	Soft Limit Upper Limit Value	-2147483648 ~2147483648	Command unit	0	Any setting	Take effect immediately	I32
P03	25	Position Deviation	0: Command unit 1: Encoder unit		2	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Excessive Unit	2: Mechanical travel unit (mm)					
P03	26	Position Deviation Excessive Fault Setting Value	0~ 1073741824	Pn0325 设定	10	Any setting	Take effect immediately	U32
P03	28	Position Deviation Excessive Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P03	2E	Homing Completion Delay	0~5000	ms	300	Any setting	Take effect immediately	U16
P03	2F	Hard Limit Torque Limitation	20.0~150.0	%	1000	Any setting	Take effect immediately	U16
P03	30	Homing Enablement	0: Disable 1: Initiate homing	-		Any setting	Take effect immediately	U16
P03	31	Homing Mode	-2~35	-	3	Any setting	Take effect immediately	I16
P03	32	Home position High-Speed Search Speed	10~6000	mm/s	100	Any setting	Take effect immediately	U16
P03	33	Home position Low-Speed Search Speed	0~6000	mm/s	10	Any setting	Take effect immediately	U16
P03	34	Homing Acceleration-Deceleration Time	0~10000	ms	10	Any setting	Take effect immediately	U16
P03	35	Homing Time	0~65535	ms	50000	Any setting	Take effect immediately	U16
P03	36	Home Offset	-1073741824~1073741824	Encoder unit	0	Any setting	Take effect immediately	I32
P03	40	Velocity Command	0: Internal digital setting	-	0	Any	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Mode Setting	1: Analog setting 2: DI analog setting 5: Multistage velocity function			setting		
P03	41	Velocity Command by Digital Input	-6000~6000	RPM	300	Any setting	Take effect immediately	I16
P03	42	DI Jogging Speed Set Value	-6000~6000	RPM	20	Any setting	Take effect immediately	I16
P03	43	Velocity Command Acceleration Ramp Time	0~65535	ms	20	Any setting	Take effect immediately	U16
P03	44	Velocity Command Deceleration Ramp Time	0~65535	ms	20	Any setting	Take effect immediately	U16
P03	45	Panel Jogging Speed Initial Value	1~9000	RPM	300	Any setting	Take effect immediately	U16
P03	46	Jogging Speed Acceleration Ramp Time	0~65535	ms	20	Any setting	Take effect immediately	U16
P03	47	Analog 10V Corresponding Velocity	-10000~10000	RPM	3000	Any setting	Take effect immediately	I16
P03	4A	Torque Command Selection	0: Set by Internal digital input 1: Set by Analog input 2:Set by Analog input 2	-	0	Any setting	Take effect immediately	U16
P03	4B	Torque Command Keyboard Setting	-300.0~300.0	%	0	Any setting	Take effect immediately	I16
P03	4C	Analog 10V Corresponding Torque	-800.0~800.0	%	1000	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P03	4F	Emergency Stop Torque	0.0~300.0	%	1000	Any setting	Take effect immediately	U16
P03	50	Positive Velocity Limit	0~8000	RPM	6000	Any setting	Take effect immediately	U16
P03	51	Negative Velocity Limit	0~8000	RPM	6000	Any setting	Take effect immediately	U16
P03	52	Positive Torque Limit Value	0.0~600.0	%	3000	Any setting	Take effect immediately	U16
P03	53	Negative Torque Limit Value	0.0~600.0	%	3000	Any setting	Take effect immediately	U16
P03	54	Positive Torque Control Internal Velocity Limit Value	0~6000	RPM	3000	Any setting	Take effect immediately	U16
P03	55	Negative Torque Control Internal Velocity Limit Value	0~6000	RPM	3000	Any setting	Take effect immediately	U16
P03	5A	Torque Limit Source Selection	0: Limit set by internal digital input 1: Limit set by analog input 2: Positive limit set by analog input, negative limit set by digital input 3: Positive limit set by digital input, negative limit set by analog input		1	Any setting	Take effect immediately	U16

7.1.5 P04 Group Input Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P04	04	DI1 Terminal Function Selection	0~63	-	1	Any setting	Take effect immediately	U16
P04	05	DI1 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	06	DI2 Terminal Function Selection	0~63	-	2	Any setting	Take effect immediately	U16
P04	07	DI2 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	08	DI3 Terminal Function Selection	0~63	-	3	Any setting	Take effect immediately	U16
P04	09	DI3 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	0A	DI4 Terminal Function Selection	0~63	-	0	Any setting	Take effect immediately	U16
P04	0B	DI4 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	0C	DI5 Terminal Function Selection	0~63	-	0	Any setting	Take effect immediately	U16
P04	0D	DI5 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	0E	DI6 Terminal Function Selection	0~63	-	7	Any setting	Take effect immediately	U16
P04	0F	DI6 Terminal	0: Low-Level	-	0	Any setting	Take effect	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Logic Selection	Active 1: High-Level Active				immediately	
P04	10	DI7 Terminal Function Selection	0~63	-	4	Any setting	Take effect immediately	U16
P04	11	DI7 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	12	DI8 Terminal Function Selection	0~63	-	5	Any setting	Take effect immediately	U16
P04	13	DI8 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P04	30	AI1 Offset	-5000~5000	mV	0	Any setting	Take effect immediately	I16
P04	31	AI1 Input Filtering Time	0.00~655.35	ms	2.00	Any setting	Take effect immediately	U16
P04	32	AI1 Dead Zone	0.0~1000.0	mV	10.0	Any setting	Take effect immediately	U16
P04	33	AI1 Zero Drift	-500.0~500.0	mV	0.0	Any setting	Take effect immediately	I16
P04	40	DI Filtering Time	0.00~655.35	μs	10.00	Any setting	Take effect immediately	U16
P04	41	Probe 1 Filtering Time	0~6000	ns	300	Any setting	Take effect immediately	U16
P04	42	Probe 2 Filtering Time	0~6000	ns	300	Any setting	Take effect immediately	U16
P04	43	Probe Effective Level	0: Probe 1 Low-Level, Probe 2 Low-Level 1: Probe 1 High-Level, Probe 2 Low-Level 2: Probe 1 Low-Level, Probe 2 High-Level 3: Probe 1 High-	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
			Level, Probe 2 High-Level					

7.1.6 P05 Group Output Class Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P05	00	DO1 Terminal Function Selection	0~32	-	5	Any setting	Take effect immediately	U16
P05	01	DO1 Terminal Effective Level	0: Low-Level Active 1: High-Level Active	-	1	Any setting	Take effect immediately	U16
P05	02	DO2 Terminal Function Selection	0~32	-	6	Any setting	Take effect immediately	U16
P05	03	DO2 Terminal Effective Level	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P05	04	DO3 Terminal Function Selection	0~32	-	2	Any setting	Take effect immediately	U16
P05	05	DO3 Terminal Effective Level	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P05	06	DO4 Terminal Function Selection	0~32	-	3	Any setting	Take effect immediately	U16
P05	07	DO4 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16
P05	08	DO5 Terminal Effective Level	0~32	-	7	Any setting	Take effect immediately	U16
P05	09	DO5 Terminal Logic Selection	0: Low-Level Active 1: High-Level Active	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P05	20	DO0-15 Functional Status	-	-	0	Only display	Take effect immediately	U16
P05	21	DO16-31 Functional Status	-	-	-	Only display	Take effect immediately	U16
P05	26	Forced DO Enablement	0: Disable 1: Enable	-	-	Any setting	Take effect immediately	U16
P05	27	Forced DO Setting Value	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P05	2C	Position deviation threshold to determine whether positioning is completed	1~65535	-	100	Any setting	Take effect immediately	U16
P05	2D	Time window to determine whether positioning is completed	0~2000	ms	0	Any setting	Take effect immediately	U16
P05	2E	Position Reached Window Unit Setting	0: Command Unit 1: Encoder Unit	-	0	Any setting	Take effect immediately	U16
P05	30	Zero-Speed Clamp Speed Command Threshold	0~6000	RPM	10	Any setting	Take effect immediately	U16
P05	32	Velocity Consistency Signal Width	1~200	RPM	10	Any setting	Take effect immediately	U16
P05	33	Velocity Reached Signal Threshold	10~6000	RPM	1000	Any setting	Take effect immediately	U16
P05	34	Zero-Speed Output Signal Threshold	1~6000	RPM	10	Any setting	Take effect immediately	U16
P05	35	Velocity DO Filtering Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P05	36	Velocity Consistency Window Time	0~1000	ms	0	Any setting	Take effect immediately	U16
P05	3A	Torque Reached Reference Value	0.0~300.0	%	0.0	Any	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
						setting		
P05	3B	Comparison value when torque reached is enabled	20.0~300.0	%	20.0	Any setting	Take effect immediately	U16
P05	3C	Comparison value when torque reached is disabled	10.0~300.0	%	10.0	Any setting	Take effect immediately	U16

7.1.7 P06 Group Closed-Loop and Error Compensation Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P06	00	Full Closed-Loop Operating Mode	0: Semi-Closed-Loop Operation 1: Full Closed-Loop Operation 2: Full Closed-Loop Semi-Closed-Loop Switching	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P06	01	External Encoder Running Direction Selection	0: CW as the positive running direction 1: CCW as the positive running direction	-	0	Set when the drive stops sending PWM pulses	Repower up	U16
P06	02	External Encoder Resolution	1~2147483647	External encoder unit	10000	Set when the drive stops sending PWM pulses	Repower up	U32
P06	04	Full Closed-Loop Vibration Suppression Gain	0.0~300.0	%	0.0	Any setting	Take effect immediately	U16
P06	05	Full Closed-Loop Vibration Suppression Cutoff	10~5000	Hz	500	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Frequency						
P06	06	Full Closed-Loop Speed Feedback Correction Coefficient	0.0~100.0	%	0.0	Any setting	Take effect immediately	U16
P06	07	Internal and External Loop Position Deviation Filtering Time Constant	0.0~100.0	ms	0.0	Any setting	Take effect immediately	U16
P06	08	Full Closed-Loop Frequency Division Pulse Setting	0: Set the pulse count according to Pn0203 and Pn0204 1: Set the division ratio according to Pn0609 and Pn060a	-	0	Set when the drive stops sending PWM pulses	Repower up	U16
P06	09	Full Closed-Loop Frequency Division Pulse Numerator	1~65535	-	1	Set when the drive stops sending PWM pulses	Repower up	U16
P06	0A	Full Closed-Loop Frequency Division Pulse Denominator	1~65535	-	1	Set when the drive stops sending PWM pulses	Repower up	U16
P06	0B	Full Closed-Loop Homing Using External Z Signal	0: Use motor encoder Z signal 1: Use grating ruler Z signal	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P06	0C	Maximum Allowable Deviation of Internal and External Loop Encoders	-2147483647~2147483647	Encoder unit	10000	Any setting	Take effect immediately	I32

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P06	0E	Deviation of Internal and External Loop Encoders	-	Encoder unit	-	Display only	Take effect immediately	-
P06	10	Internal Encoder Count Value	-	Encoder unit	-	Only display	Take effect immediately	-
P06	12	External Encoder Count Value	-	External Encoder unit	-	Only display	Take effect immediately	-
P06	20	Error Compensation Enablement	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P06	21	Compensation Position Unit Setting	0: Encoder unit 1: Command unit 2：μm 3：mm	-	3	Any setting	Take effect immediately	U16
P06	22	Compensation Error Unit Setting	0: Encoder unit 1: Command unit 2：μm 3：mm	-	2	Any setting	Take effect immediately	U16
P06	23	Encoder Pulses per 1mm Rotation for Rotary Motor	1~1073741824		100	Any setting	Take effect immediately	U32
P06	25	Error Compensation Origin Selection Method	0: Internal homing automatically selects the origin point. 1: Use FunIN.21 or Fn.0C to select the error compensation origin.	-	0	Any setting	Take effect immediately	U16
P06	27	Total Number of Error Compensation Points	0~1024	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P06	28	Starting Point Position	0~1073741824	P06.21 setting unit	0	Any setting	Take effect immediately	U32
P06	2A	Compensation Point Interval Distance	0~1073741824	P06.21 setting unit	0	Any setting	Take effect immediately	U32

7.1.8 P08 Group Communication Settings

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P08	00	Node Address	1~127	-	1	Any setting	Take effect immediately	U16
P08	01	Modbus Baud Rate	0：2400bps 1：4800bps 2：9600bps 3：19200bps 4：38400bps 5：57600bps 6：115200bps	-	6	Any setting	Take effect immediately	U16
P08	02	Modbus 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	-	0	Any setting	Take effect immediately	U16
P08	03	Modbus Response Delay	0~20	ms	0	Any setting	Take effect immediately	U16
P08	0A	Console Baud Rate Selection	0：115200 1：750000	-	1	Any setting	Take effect immediately	U16
P08	0F	EEPROM Storage Enablement	0: Enable Parameters Saved by EEPROM 1: Disable Parameter Saved by EEPROM	-	1	Any setting	Take effect immediately	U16

7.1.9 P0B Group Extended Function Class Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0B	00	Motor Stall Overheat Protection Enablement	0: Disable 1: Utilize torque feedback judgment 2: Utilize torque command judgment	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
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	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P0B	02	Overtravel Protection Enablement	0: Disable 1: Enable	-	1	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P0B	03	Encoder Multiturn Overflow Fault Alarm Enablement	0: Enable 1: Disable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P0B	04	Encoder Battery Alarm Enablement	0: Disable 1: Enable	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	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	-	0	Set when the drive stops sending PWM	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
			2: Do not detect AC input, disable phase loss alarm			pulses		
P0B	06	Fault Record Storage Switch	0: Enable fault record storage 1: Disable fault record storage	-	0	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P0B	07	Special Fault Reset Enablement	0: Disable 1: Enable	-	0	Any setting	Take effect immediately	U16
P0B	09	Panel Status Display Setting	16#0~16#25	-	16#25	Any setting	Take effect immediately	U16
P0B	0A	PTC Alarm Level	0: Low-level 1: High-level	-	0	Any setting	Take effect immediately	U16
P0B	10	Motor Stall Overheat Protection Time Window	10~65535	ms	20	Any setting	Take effect immediately	U16
P0B	11	Motor Overload Protection Gain	50~300	-	100	Any setting	Take effect immediately	U16
P0B	12	PTC Monitoring Enablement	0: Disable PTC Monitoring 1: Enable PTC Monitoring	-	0	Any setting	Take effect immediately	U16
P0B	13	Torque value to determine whether the motor is out of control	0~500	%	100	Any setting	Take effect immediately	U16
P0B	14	Overspeed Determination Threshold	0~65535	RPM	0	Any setting	Take effect immediately	U16
P0B	15	Velocity Display Filtering Time	0~5000	ms	50	Any setting	Take effect immediately	U16
P0B	16	Panel Display Current	0~1000	ms	5	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Filtering Time						
P0B	18	Communication Encoder Continuous Error Count	0~31	-	5	Any setting	Take effect immediately	U16
P0B	1A	Nikon Encoder Power-on Reset Selection	0: No reset operation on power-up 1: Reset operation on power-up	-	1	Any setting	Take effect immediately	U16
P0B	1B	Bus Encoder Power-on ROM Read Selection	0: Read encoder ROM on power-up 1: Do not read encoder ROM on power-up 2: Prohibit protocol configuration	-	0	Any setting	Take effect immediately	U16
P0B	1C	Encoder Counting Error Alarm Enablement	0: Disable 1: Enable	-	1	Any setting	Take effect immediately	U16
P0B	1D	Enable Encoder ABZ Signal Disconnection Detection	0: Disable 1: Enable	-	1	Any setting	Take effect immediately	U16
P0B	1E	Enable QEP Phase Error Alarm	0: When QEP phase error occurs, alarm C.4 1: When QEP phase error occurs, error stop Al.10.A	-	0	Any setting	Take effect immediately	U16
P0B	20	Ramp Stop Acceleration/Deceleration Time	0~10000	ms	50	Any setting	Take effect immediately	U16
P0B	22	Emergency Torque Stop Deceleration	0~3000	%	500	Set when the drive stops sending PWM pulses	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0B	24	Brake Protection Determination Threshold	0~3000	%Load ratio	0	Any setting	Take effect immediately	U16
P0B	25	Brake Protection Alarm Duration	0~65535	ms	200	Any setting	Take effect immediately	U16
P0B	26	Current Protection Determination Threshold	200~3000	%Rated current	1000	Any setting	Take effect immediately	U16
P0B	27	Current Protection Alarm Duration	0~65535	ms	0	Any setting	Take effect immediately	U16
P0B	30	Brake Open to Zero Command Hold Time	0~500	ms	200	Any setting	Take effect immediately	U16
P0B	31	Delay Time from Brake Actuation to Servo OFF	50~1000	ms	150	Any setting	Take effect immediately	U16
P0B	32	Brake Actuation Velocity Threshold	20~300	ms	30	Any setting	Take effect immediately	U16
P0B	33	Delay Time from Zero command to Brake Actuation	1~1000	ms	500	Any setting	Take effect immediately	U16

7.1.10 P0F Group Internal Speed Mode

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	00	Velocity Scheduled Operation Mode	0: Continuous operation by time 1: DI switch operation 2: Communication	-	0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
			setting					
P0F	01	Maximum Number of Segments to Run	1~16	-	3	Any setting	Take effect immediately	U16
P0F	02	Communication Segment Selection	1~16	-	3	Any setting	Take effect immediately	U16
P0F	04	Run Time Unit Selection	0：ms 1：10ms 2：100ms 3：s	-	0	Any setting	Take effect immediately	U16
P0F	08	Segment 1 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	09	Segment 1 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	0A	Segment 1 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	0B	Segment 1 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	0C	Segment 2 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	0D	Segment 2 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	0E	Segment 2 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	0F	Segment 2 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	10	Segment 3 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	11	Segment 3 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	12	Segment 3 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	13	Segment 3 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	14	Segment 4 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	15	Segment 4 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	16	Segment 4 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	17	Segment 4 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	18	Segment 5 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	19	Segment 5 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	1A	Segment 5 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	1B	Segment 5 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	1C	Segment 6 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	1D	Segment 6 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	1E	Segment 6 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	1F	Segment 6 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	20	Segment 7 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	21	Segment 7 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	22	Segment 7 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	23	Segment 7 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	24	Segment 8 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	25	Segment 8 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	26	Segment 8 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	27	Segment 8 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	28	Segment 9 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	29	Segment 9 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	2A	Segment 9 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	2B	Segment 9 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	2C	Segment 10 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	2D	Segment 10 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	2E	Segment 10 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	2F	Segment 10 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	30	Segment 11 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	31	Segment 11 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	32	Segment 11 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	33	Segment 11 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	34	Segment 12 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	35	Segment 12 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	36	Segment 12 Speed Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	37	Segment 12 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	38	Segment 13 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	39	Segment 13 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	3A	Segment 13 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	3B	Segment 13 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	3C	Segment 14 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	3D	Segment 14 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	3E	Segment 14 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	3F	Segment 14 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	40	Segment 15 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16
P0F	41	Segment 15 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	42	Segment 15 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	43	Segment 15 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	44	Segment 16 Velocity Setting	-6000~6000	RPM	100	Any setting	Take effect immediately	I16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P0F	45	Segment 16 Velocity Run Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P0F	46	Segment 16 Velocity Acceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16
P0F	47	Segment 16 Velocity Deceleration Ramp Time	0~65535	ms	200	Any setting	Take effect immediately	U16

7.1.11 P10 Group Task Position Mode

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	00	Starting Segment Selection	0: Start from the first segment 1: Set by DI 2: Set by P10.02	-	0	Any setting	Take effect immediately	U16
P10	02	Set Starting Segment Value	0~19	-	0	Any setting	Take effect immediately	U16
P10	04	Task Cancel Ramp Stop	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	08	Segment 1 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	0A	Segment 1 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	0B	Segment 1 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	0C	Segment 1 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	0D	Segment 1 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	0E	Segment 1 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	0F	Segment 1 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	10	Segment 2 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	12	Segment 2 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	13	Segment 2 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	14	Segment 2 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	15	Segment 2 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	16	Segment 2 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	07	Segment 2 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	18	Segment 3 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	1A	Segment 3 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	1B	Segment 3 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	1C	Segment 3 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	1D	Segment 3 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	1E	Segment 3 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	1F	Segment 3 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	20	Segment 4 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	22	Segment 4 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	23	Segment 4 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	24	Segment 4 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	25	Segment 4 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	26	Segment 4 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	27	Segment 4 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	28	Segment 5 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	2A	Segment 5 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	2B	Segment 5 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	2C	Segment 5 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	2D	Segment 5 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	2E	Segment 5 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	2F	Segment 5 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	30	Segment 6 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	32	Segment 6 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	33	Segment 6 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	34	Segment 6 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	35	Segment 6 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	36	Segment 6 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	37	Segment 6 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	38	Segment 7 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	3A	Segment 7 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	3B	Segment 7 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	3C	Segment 7 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	3D	Segment 7 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	3E	Segment 7 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	3F	Segment 7 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	40	Segment 8 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	42	Segment 8 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	43	Segment 8 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	44	Segment 8 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	45	Segment 8 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	46	Segment 8 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	47	Segment 8 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	48	Segment 9 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	4A	Segment 9 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	4B	Segment 9 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	4C	Segment 9 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	4D	Segment 9 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	4E	Segment 9 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	4F	Segment 9 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	50	Segment 10 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	52	Segment 10 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	53	Segment 10 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	54	Segment 10 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	55	Segment 10 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	56	Segment 10 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	57	Segment 10 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	58	Segment 11 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	5A	Segment 11 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	5B	Segment 11 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	5C	Segment 11 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	5D	Segment 11 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	5E	Segment 11 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	5F	Segment 11 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	60	Segment 12 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	62	Segment 12 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	63	Segment 12 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	64	Segment 12 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	65	Segment 12 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	66	Segment 12 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	67	Segment 12 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	68	Segment 13 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	6A	Segment 13 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	6B	Segment 13 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	6C	Segment 13 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	6D	Segment 13 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	6E	Segment 13 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	6F	Segment 13 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	70	Segment 14 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	72	Segment 14 Speed	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	73	Segment 14 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	74	Segment 14 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	75	Segment 14 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	76	Segment 14 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	77	Segment 14 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	78	Segment 15 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	7A	Segment 15 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	7B	Segment 15 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	7C	Segment 15 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	7D	Segment 15 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	7E	Segment 15 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	7F	Segment 15 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	80	Segment 16 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	82	Segment 16 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	83	Segment 16 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	84	Segment 16 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	85	Segment 16 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	86	Segment 16 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	87	Segment 16 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	88	Segment 17 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	8A	Segment 17 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	8B	Segment 17 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	8C	Segment 17 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	8D	Segment 17 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	8E	Segment 17 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	8F	Segment 17 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	90	Segment 18 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	92	Segment 18 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	93	Segment 18 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	94	Segment 18 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	95	Segment 18 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	96	Segment 18 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	97	Segment 18 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	98	Segment 19 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	9A	Segment 19 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	9B	Segment 19 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P10	9C	Segment 19 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	9D	Segment 19 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	9E	Segment 19 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	9F	Segment 19 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	A0	Segment 20 Displacement	-1073741824 ~1073741824	Command unit	10000	Any setting	Take effect immediately	I32
P10	A2	Segment 20 Velocity	1~9000	RPM	300	Any setting	Take effect immediately	U16
P10	A3	Segment 20 Acceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	A4	Segment 20 Deceleration Time	0~65535	ms	10	Any setting	Take effect immediately	U16
P10	A5	Segment 20 Wait Time	0~65535	ms	0	Any setting	Take effect immediately	U16
P10	A6	Segment 20 Attribute Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P10	A7	Segment 20 running time and the next segment	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16

7.1.12 P17 Group Non-standard Function Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P17	30	The absolute position of the encoder single-	-	Encoder unit	-	Display-only	Take effect immediately	-

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		turn corresponding to the origin of the station						
P17	32	Set Current Position as Station Origin	0: No operation 1: Set current position as station origin	-	0	Any setting	Take effect immediately	U16
P17	33	Automatically return to station Running Velocity	1~500	RPM	30	Any setting	Take effect immediately	U16
P17	34	Automatically return to station Acceleration And Deceleration Time	0~65535	ms	100	Any setting	Take effect immediately	U16
P17	35	Number of Stations	1~64	-	4	Any setting	Take effect immediately	U16
P17	36	Returning to station Direction Selection	0: Positive 1: Negative 2: Nearest	-	0	Any setting	Take effect immediately	U16
P17	37	Trigger Method of Returning to station	0: Enable auto homing 1: Homing Triggered by DI function Funln22	-	1	Any setting	Take effect immediately	U16
P17	38	Function Code Trigger to returning to station	0: No Operation 1: Trigger returning to station	-	0	Any setting	Take effect immediately	U16
P17	3E	Return to station Operational Velocity	1~1000	RPM	30	Any setting	Take effect immediately	U16
P17	3F	Return to station Acceleration and Deceleration Time	0~65535	ms	100	Any setting	Take effect immediately	U16
P17	40	Display Current	-	-	-	Display-	Take effect	-

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
		Station Number				only	immediately	
P17	44	Encoder Single-turn Absolute Position Corresponding To Station 1	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	46	Encoder Single-turn Absolute Position Corresponding To Station 2	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	48	Encoder Single-turn Absolute Position Corresponding To Station 3	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	4A	Encoder Single-turn Absolute Position Corresponding To Station 4	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	4C	Encoder Single-turn Absolute Position Corresponding To Station 5	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	4E	Encoder Single-turn Absolute Position Corresponding To Station 6	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	50	Encoder Single-turn Absolute Position Corresponding To Station 7	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32
P17	52	Encoder Single-turn Absolute Position Corresponding To Station 8	-2147483647 ~2147483647	Encoder unit	0	Any setting	Take effect immediately	I32

7.1.13 P18 Group Motor Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P18	00	Motor Encoder Model	16#0~16#FFFF	-	16#1012	Any setting	Repower up	U16
P18	02	Motor Encoder Count	0~65535	-	20040	Any setting	Repower up	U16
P18	03	Rotary Motor Pulse Encoder Line Number	0~2147483647	p	2500	Set when the drive stops sending PWM pulses	Repower up	U32
P18	07	Bus Encoder Zero Electrical Angle Offset	0~65535	-	0	Set when the drive stops sending PWM pulses	Repower up	U16
P18	08	Z Signal Corresponding Electrical Angle	0.0~360.0	degree	180.0	Set when the drive stops sending PWM pulses	Repower up	U16
P18	0F	Bus Encoder Data Transmission Compensation Time	0~10000	ns	0	Set when the drive stops sending PWM pulses	Repower up	U16
P18	10	Rotary Motor Bus Encoder Resolution Selection	0: Motor single revolution resolution is the same as the protocol resolution. 1: Motor single revolution resolution is set by Pn1803 (One revolution resolution = Pn1803 * 4).	ns	0	Set when the drive stops sending PWM pulses	Repower up	U16
P18	11	Back Electromotive Force Compensation Coefficient	0.0~6553.5	%	50.0	Any setting	Take effect immediately	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P18	12	D-axis Coupling Voltage Compensation Coefficient	0.0~6553.5	%	50.0	Any setting	Take effect immediately	U16
P18	13	Q-axis Coupling Voltage Compensation Coefficient	0.0~6553.5	%	50.0	Any setting	Take effect immediately	U16
P18	14	D-axis Proportional Gain	0~65535	Hz	1000	Any setting	Take effect immediately	U16
P18	15	D-axis Integral Compensation Factor	0.00~655.35	-	1.00	Any setting	Take effect immediately	U16
P18	16	Q-axis Proportional Gain	0~65535	Hz	1000	Any setting	Take effect immediately	U16
P18	17	Q-axis Integral Compensation Factor	0.00~655.35	-	1.00	Any setting	Take effect immediately	U16
P18	20	Rated Power	0.00~655.35	kW	0.40	Set when the drive stops sending PWM pulses	Repower up	U16
P18	22	Rated Current	0.00~655.35	A	3.20	Set when the drive stops sending PWM pulses	Repower up	U16
P18	24	Maximum Current	0.00~655.35	A	11.20	Set when the drive stops sending PWM pulses	Repower up	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P18	26	Rated Torque	0.00~21474836.47	Nm	1.27	Set when the drive stops sending PWM pulses	Repower up	U32
P18	2A	Rated Velocity	0~65535	RPM	3000	Set when the drive stops sending PWM pulses	Repower up	U16
P18	2C	Maximum Velocity	0~65535	RPM	6500	Set when the drive stops sending PWM pulses	Repower up	U16
P18	2E	Rotational Inertia	0.00~21474836.47	kg*cm^2	0.56	Set when the drive stops sending PWM pulses	Repower up	U32
P18	30	Permanent Magnet Synchronous Motor Pole Pairs	0~65535	-	5	Set when the drive stops sending PWM pulses	Repower up	U16
P18	31	Stator Phase Resistance	0.000~65.535	Ω	2.620	Set when the drive stops sending PWM pulses	Repower up	U16
P18	32	Q-axis Inductance	0.00~655.35	mH	5.98	Set when the drive stops sending PWM pulses	Repower up	U16
P18	33	D-axis Inductance	0.00~655.35	mH	5.98	Set when the drive stops sending PWM	Repower up	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
						pulses		
P18	34	Back Electromotive Force Coefficient	0.00~21474836.47	mV/RPM	22.60	Set when the drive stops sending PWM pulses	Repower up	U32
P18	3C	Internal Encoder Calibration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P18	3D	Internal Encoder Configuration	16#0~16#FFFF	-	16#0	Any setting	Take effect immediately	U16
P18	47	BISS C Protocol Encoder Configuration	16#0~16#FFFF	-	16#0	Set when the drive stops sending PWM pulses	Repower up	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.

7.1.14 P19 Group Drive Parameters

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P19	00	Drive Serial Number	0~65535	-	28	Set when the drive stops sending PWM pulses	Repower up	U16
P19	02	Rated Power	-	kW	-	Only display	Take effect immediately	-
P19	04	Maximum Output Power	-	kW	-	Only display	Take effect immediately	-
P19	08	Maximum Output Current	-	A	-	Only display	Take effect immediately	-

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
P19	0A	Carrier Wave Frequency	4000~20000	Hz	8000	Set when the drive stops sending PWM pulses	Repower up	U16
P19	0B	Deadband Time	0.00~20.00	μs	2.00	Set when the drive stops sending PWM pulses	Repower up	U16
P19	0C	Bootstrap Time	0.0~20.0	μs	3.0	Set when the drive stops sending PWM pulses	Repower up	U16
P19	0E	Temperature Alarm Point	0.0~6553.5	degree	95.0	Set when the drive stops sending PWM pulses	Repower up	U16
P19	10	Current Sensor Range	0.00~655.35	A	21.33	Set when the drive stops sending PWM pulses	Repower up	U16
P19	12	Overcurrent Point Setting	0.0~6553.5	%	90.0	Set when the drive stops sending PWM pulses	Repower up	U16
P19	13	Drive Rated Voltage	-	V	-	Only display	Take effect immediately	-
P19	14	Drive Overvoltage Point	0~1000	V	420	Set when the drive stops sending PWM pulses	Repower up	U16
P19	15	Drive Discharge Point	0~1000	V	395	Set when the drive stops sending PWM pulses	Repower up	U16
P19	16	Drive Undervoltage Point	0~1000	V	200	Set when the drive stops sending	Repower up	U16

Function Code		Name	Setting Range	Unit	Default Setting	Setting Method	Effective Method	Data Type
						PWM pulses		
P19	17	Bus Voltage Correction Coefficient	0.0~200.0	%	100.0	Set when the drive stops sending PWM pulses	Repower up	U16
P19	18	Minimum Braking Resistance	1~150	Ω	50	Set when the drive stops sending PWM pulses	Repower up	U16
P19	1B	Command Dispatch Frequency	0：4kHz 1：2kHz 2：1kHz		0	Set when the drive stops sending PWM pulses	Repower up	U16
P19	1C	Voltage Filtering Cutoff Frequency	3000~65535	Hz	20000	Set when the drive stops sending PWM pulses	Take effect immediately	U16
P19	20	Current Sampling Filtering Time	0~3		1	Set when the drive stops sending PWM pulses	Repower up	U16
P19	21	Current Sampling Extraction Rate	0~3		1	Set when the drive stops sending PWM pulses	Repower up	U16
P19	22	Overcurrent Filtering Time	0~750	ns	375	Set when the drive stops sending PWM pulses	Repower up	U16
P19	24	ABZ Encoder Input Filtering Time	0~6000	ns	25	Set when the drive stops sending PWM pulses	Repower up	U16
P19	25	HALL Signal Input Filtering Time	0~6000	ns	6000	Set when the drive stops sending PWM pulses	Repower up	U16

7.1.15 U00 Group Status Display Parameters

Function Code		Name	Display Range	Unit	Data Type
U00	00	Motor Velocity	-32767~32767	RPM	I16
U00	01	Input Signal Level	0~65535	-	U16
U00	03	Output Signal Level	0~65535	-	U16
U00	05	Input Command Pulse Counter	-2147483648~2147483647	Command unit	I32
U00	07	Absolute Position Counter	-2147483648~2147483647	Command unit	I32
U00	09	Encoder Feedback Pulse Counter	-2147483648~2147483647	Encoder unit	I32
U00	0B	Position Deviation	-2147483648~2147483647	Encoder unit	I32
U00	0D	Discharge Resistor Load Rate	0~1000	0.1%	U16
U00	0E	Average Load Rate	0~3000	0.1%	U16
U00	0F	Velocity Command	-9000~9000	RPM	I16
U00	10	Internal Torque Command	-4000~4000	0.1%	I16
U00	11	Motor Mechanical Angle	0~3600	0.1°	U16
U00	12	Motor Electrical Angle	0~3600	0.1°	U16
U00	13	Input Command Pulse Speed	-32767~32767	RPM	I16
U00	14	U Current Sampling Value (RMS)	-30000~30000	0.01A	I16
U00	15	Bus Voltage	0~30000	0.1V	U16
U00	17	AI1 Voltage Value	0~20000	0.001V	U16
U00	18	AI2 Voltage Value	0~20000	0.001V	U16
U00	1A	Drive Temperature	-10~200	摄氏 degree	I16
U00	1D	Total Running Time	0~4294967295	0.1s	U32
U00	20	Total Input Pulse Count	-2147483648~2147483647	-	I32
U00	23	Encoder Multi-turn Count	0~65535	-	U16
U00	24	Encoder Single-turn Position	0~8388608	p	U32
U00	26	Encoder Unit Absolute Position Low 32-bit	0~4294967295	Encoder unit	U32
U00	28	Encoder Unit Absolute Position High 32-bit	0~4294967295	Encoder unit	U32
U00	2A	Mechanical Absolute Position Low 32-bit	0~4294967295	Encoder unit	U32
U00	2C	Mechanical Absolute Position High 32-bit	0~4294967295	Encoder unit	U32

Function Code		Name	Display Range	Unit	Data Type
U00	32	Rotating Load Single-turn Position	-	Command unit	U16
U00	36	Incremental Encoder AB Counter	-2147483648~2147483647	-	I32
U00	38	Incremental Encoder Z Signal Counter	0~65535	-	U16
U00	39	Hall Status	0~7	-	U16
U00	3E	Function Code Group Number for Parameter Abnormality	0~65535	-	U16
U00	3F	Offset in the Function Code Group for Parameter Abnormality	0~65535	-	U16
U00	40	FPGA Records Absolute Encoder Fault Information	0~65535	-	U16
U00	41	FPGA System Status Information	0~65535		U16
U00	42	FPGA System Fault Information	0~65535		U16
U00	43	Quadrature Encoder Error Information	0~65535	-	U16
U00	44	Nikon Encoder Status Information	0~65535	-	U16
U00	45	Tamagawa Encoder Error Information	0~65535	-	U16
U00	50	EtherCAT Slave Station Name	0~65535	-	U16
U00	52	Number of times synchronization signal has been lost	0~65535	-	U16
U00	53	Maximum Invalid Frames and Errors on Real-time EtherCAT Port 0	0~65535	-	U16
U00	54	Maximum Invalid Frames and Errors on Real-time EtherCAT Port 1	0~65535	-	U16
U00	55	Maximum Forwarding Errors on Real-time EtherCAT Port	0~65535	-	U16
U00	56	Maximum Error Count of Real-time EtherCAT Data Frame Processing Unit	0~65535	-	U16
U00	57	Maximum Disconnection Count of Real-time EtherCAT Port	0~65535	-	U16
U00	58	EtherCAT State Machine Status and Port Connection Status	0~65535	-	U16
U00	59	ECAT AL Status Code	0~65535	-	U16

Function Code		Name	Display Range	Unit	Data Type
U00	90	Current Fault Code	0~65535	-	U16
U00	91	Current Servo Status	0~65535	-	U16
U00	92	Current Warning Code	0~65535	-	U16
U00	93	Fault Record Number	0~10	-	U16
U00	94	Fault Record Fault Code	0~65535	-	U16
U00	96	Fault Timestamp	0~4294967296	0.1s	U32
U00	98	Fault Velocity	-37767~32767	RPM	I16
U00	99	Phase U Current When Fault Occurs	-37767~32767	0.01A	I16
U00	9A	Phase V Current When Fault Occurs	-37767~32767	0.01A	I16
U00	9B	Bus Voltage When Fault Occurs	0~3000	0.1V	U16
U00	9C	Input Terminal Status When Fault Occurs	0~65535	-	U16
U00	9E	Output Terminal Status When Fault Occurs	0~65535	-	U16

7.1.16 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

7.1.17 F Group Auxiliary Function Class Parameters

Function Code	Name	Setting Range	Data Type
F00.00 （F.Jog）	Jog operation	0~maximum motor velocity	U16
F00.01(F.JAt)	Inertia Identification	Depend on the load	U16
F00.02 （F.Stop）	Emergency Stop	0: Disable 1: Enable	U16
F00.03 （F.Agl）	Absolute Encoder Initial Angle Identification	0: Disable 1: Enable	U16

Function Code	Name	Setting Range	Data Type
		2: Fault	
F00.04 （F.PArt）	Parameters Reset	0: No operation 1: Reset function code 2: Reset object dictionary 3: Reset function code and object dictionary 4: Restore factory parameters	U16
F00.05 （F.Errt）	Fault Reset	0: Disable 1: Enable	U16
F00.06 （F.SFrt）	Software Reset Operation	0: Disable 1: Enable	U16
F00.07 （F.Abrt）	Absolute Encoder Reset	0: Disable 1: Reset fault 2: Reset fault and multi-turn fault	U16
F00.08 （F.Enc）	Encoder ROM Operation	0: Disable 1: Write ROM 2: Read ROM 3: Operation failed	U16
F00.09(F.AIAu)	AI Automatic Zero Offset Adjustment	0: Disable 1: AI1 adjustment 2: AI2 adjustment	U16
F00.0B	Fault Record Reset	0: Disable 1: Enable	U16
F00.0C	Error Compensation Specified Origin	1: No operation 2: Specify origin	U16
F00.0D	Motor Parameter Identification	0: Disable 1: Enable	U16
F00.0E	Read Nikon Encoder Fault Status	0: Disable 1: Enable	U16
F00.0F	Single-click Adjustment Operation	0: Disable 1: Enable	U16
F00.10	Reload FPGA FLASH	0: Disable 1: Enable	U16

7.2 Input Output (DI/DO) Function

7.2.1 DI Function Parameter Setting

DI Function Number	DI Function Explanation
1	Servo Enablement: SRV_ON
2	Positive Limit: POT
3	Negative Limit: NOT
4	Origin Switch: ORGP
5	Execute Homing Enablement: Execute_Homing
6	Execute Internal Position Mode: Execute_PP
7	Fault Reset: A_Clr
8	Operation Mode Switching: CmdSign
9	Emergency Stop Signal: E_Stop
10	Internal Task Pause
11	Operation Mode Switching 1: Mode_Sel1
12	Operation Mode Switching 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 Jogging: JogCmdP
14	Negative Jogging: JogCmdN
15	Zero Position Lock: ZeroLock
16	Gain Switching (P-PI): Gain(P-PI)
17	Electronic Gear Ratio Switching: GearSw
18	Pulse Inhibit: INH
19	Pulse Deviation Clear: CL
20	Origin Selection for Comparison Output
21	Error Compensation Origin Selection
22	Task Cancel
25	Internal Segment Selection 1
26	Internal Segment Selection 2
27	Internal Segment Selection 3
28	Internal Segment Selection 4 When using internal position (velocity), the specified number of segments for operation is (FunIn.288+FunIn274+FunIn26*2+FunIn25)
31	Probe 1
32	Probe 2

DI Function Number	DI Function Explanation
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 Trigger Auto Homing
53	DDR Non-standard Functional Combination
54	Torque Limit Switching
55	Adjustable Gain Parameter Switching

7.2.2 Digital Output (DO) Function Parameter Setting

DO Function Number	DO Function Explanation
1	Servo Ready State Output: SRdy
2	Servo Enabled State Output: Son
3	Positioning Completion Output: INP
4	Warning Output Signal: Warn
5	Fault Output Signal: Alm
6	Brake Signal: Blk
7	Homing Completion Output: HomeOK
8	Angle Identification Completion: LnrAngOK
10	Auxiliary Gain is Valid
13	Zero Speed Signal Output: SZero
14	Velocity Consistency Signal: VIn
15	Velocity Reached Output: VRot
16	Torque Command Reached Signal: ToqReach
19	DDR Auto Homing Completion
24	DDR Non-Standard Position 1 Output
25	DDR Non-Standard Position 2 Output
28	Comparison Output is Valid
29	60FE Control Output 1
30	60FE Control Output 2
31	60FE Control Output 3
32	60FE Control Output 4

8 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 μs. 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).