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R6L Pulse Series AC Servo Driver User Manual

Shenzhen Rtelligent Technology Co.,Ltd

ADDRESS: 2-6F, A Building, Ruitech Industrial Park, Xingyu Road No.23, Xixiang Street, Bao an District, Shenzhen,Guang Dong Province, China

PHONE/WHATSAPP: +86 138 2653 6186
OFFICE DIRECT LINE: +86 755 27440012
EMAIL: info@rtelligent.cn
WEBSITE: www.rtelligentglobal.com

Preface

Thank you for purchasing the R6L pulse series V6.2 servo driver!

R6L pulse series V6.2 servo driver is the 6th generation of general-purpose AC servo driver developed by Rtelligent. The power range of this series products is 0.1~3KW, and it supports RS485-based MODBUS communication protocol. It can be used for network operation of multiple drivers. The driver also contains an internal PLC mode to facilitate customer customization

The R6L pulse series servo system is equipped with a standard 17~23-bit single-turn/multi-turn absolute encoder motor, and the frame below 80 adopts a full series of ultra-short high-density servo motors. It can achieve ultra-small installation dimension and high speed precise positioning.

The R6L pulse series servo system has the characteristics of fast positioning and good adaptability. The driver has three basic control modes (position control, speed control, torque control). In addition, more flexible application functions can be realized by using the drive "internal PLC programming" or "485 communication".

This manual is a comprehensive user manual for the R6L pulse series V6.2 servo driver. Please read this manual carefully to confirm the relevant information before the formal power-on connection. If you have any doubts about the functions and performance of the product, please consult our technical support.

As we are committed to the continuous improvement of servo drivers, the information provided by the company is subject to change without prior notice.

Revision History

Date	Version	Description
2025.01.10	V6.0	Sixth Edition Product Update
2025.05.07	V6.1	Modify naming rules, drive specifications, CN1port definitions, default functions, incorrect wiring diagrams,add alarm codes, and correct some parameter descriptions
2025.06.18	V6.2	Chapter 4:Modification of positive and negative definitions for CN1 analog port

Contents

1. Safety Instructions

1.1. Safety Precautions

- Please disconnect the power supply for more than 5 minutes before removing or disassembling the driver, otherwise it may cause electric shock due to residual voltage.
- Please never touch the inside of the servo driver, otherwise it may cause electric shock.
- Please insulate the connection part of the power supply terminal, otherwise it may cause electric shock.
- The ground terminal of the servo driver must be grounded, otherwise it may cause electric shock.
- Please do not damage or pull on the cable, subject the cable to excessive force, put it under heavy objects or clamp it. Doing so may result in electric shock, which may cause the product to stop or burn out.
- Unless designated personnel, please do not set up, disassemble or repair, otherwise it may cause electric shock or injury.
- Please do not remove the cover, cables, connectors and optional accessories while the power is on, otherwise it may cause electric shock and damage the driver.
- Please follow the steps required by this manual for trial operation.
- If an operation error occurs while the servo motor is connected to the machine, it will not only cause damage to the machine, but also sometimes cause personal accidents.
- Please do not change the maximum speed value, except for special purposes. Inadvertent change may damage the machine or cause injury.
- When the power is turned on and for a period of time after the power is cut off, the heat sink of the servo driver, the external braking resistor, and the servo motor may become hot. Please do not touch it, otherwise it may cause burns. To prevent accidental contact with hands or parts (cables, etc.), please take safety precautions such as installing an enclosure.
- Please do not touch the rotating part of the servo motor while it is running, as this may result in injury.
- If the servo motor is installed on the supporting machine and starts to run, make sure that the servo motor can be stopped at any time, otherwise you may get injured.
- Please install a stop device on the machine side to ensure safety.
- The brake of the servo motor with brake is not a stopping device to ensure safety. If a stop device is not provided, it may cause injury.
- If power is restored after a momentary power failure occurs during operation, the machine may restart suddenly, so please do not approach the machine.

- Please take measures to ensure that personal safety will not be endangered when restarting, otherwise it may cause injury.
- Please do not modify the product in any way, otherwise it may cause injury or mechanical damage.
- Please install the servo driver, servo motor, and external braking resistor on non-combustible materials, otherwise it may cause a fire.
- Between the power supply and the main circuit power supply of the servo driver (single-phase L1, L2), be sure to connect an electromagnetic contactor and a non-fuse circuit breaker. Otherwise, when the servo driver fails, the large current cannot be cut off, which may cause a fire.
- In the servo driver and servo motor, please do not mix oil, grease and other flammable foreign objects and screws, metal pieces and other conductive foreign objects, otherwise it may cause fire and other accidents.

1.2. Unpacking Inspection

Items	Description
Check whether the delivered products comply with you ordered.	The packaging box contains the products you ordered. Please confirm it by the nameplate model of the servo motor and servo drive.
Check whether the products are intact.	Please check the product surface to see if the product is damaged during transportation. If any omission or damage is found, please contact our company or your supplier as soon as possible.
Check whether the motor is rotating smoothly	It is normal to be able to turn gently by hand. Except for servo motors with brakes.

1.3. Packing List

No.	Products
1	R6L pluse servo driver (including one DB44 PIN terminal + one main circuit terminal)* 1
2	Servo motor* 1 set
3	Motor power extension cable* 1
4	Motor encoder extension cable* 1
5	Brake extension cable for brake motor*1 (for brake motor)(optional)

2. Product Information

2.1. Driver Introduction

2.1.1. Driver Naming

R	6	L	028	E	-	Z
①	②	③	④	⑤		⑥

① Product Series	③ Voltage level	⑤ Product type
R: R series servo S: S series servo (cost-effective) D: D series low-voltage DC servo	D: 110V AC L: 220V AC H: 380V AC	Null: Pulse E: EtherCAT P: Profinet C: CANopen M: RS485 Modbus + Pulse
② Product version	**④ Rated current**	**⑥ Relay version**
5: 5th generation servo 6. 6th generation servo	028: 2.8A 042: 4.2A 076: 7.6A 120: 12.0A	Null: No brake relay Z: With brake relay

◆ Note: Model naming rules are only used to resolve model meanings.

2.1.2. Driver Specification

(1) Basic specification

Driver model	R6L028	R6L028M	R6L042	R6L042M	R6L076	R6L076M	R6L120	R6L120M
Communication	-	RS485	-	RS485	-	RS485	-	RS485
Overload capacity	Supports 3x overload				Supports 3x overload		Supports 3x overload	
Adaptive power	50W~400W		750W		1KW~2KW		2KW~3KW	
Continuous current	2.8A		4.2A		7.6A		12A	
Maximum current	8.4A		12.6A		22.8A		36A	
Power supply	Single-phase 220VAC ± 10%, 50/60Hz						Single-phase/Three-phases 220VAC ± 10%, 50/60Hz	
Size code	Type A		Type B				Type C	
Size	175*156*40		175*156*51				196*176*72	
Braking resistor function	No braking resistor		With braking resistor (75W，50Ω)				With braking resistor (100W，50Ω)	

(2) Electrical specification

Item		Description
Control mode		IPM PWM control, SVPWM drive mode
Encoder feedback		Absolute encoder
Isolation function		Power/communication isolation; encoder input isolation; digital input/output isolation
Protection function		Overvoltage, undervoltage, overcurrent, overload, overheat, overspeed, communication abnormal, register abnormal, encoder errors, etc
Display and operation		5-bit LED display, 5-bit key operation
		DC bus indicator
Parameter setting		Key or RTServoStudio software
Power-off hold		Keep all optional parameters
Speed variation rate (at rated speed)	Load variation rate	0~100%: less than 0.1%
	Voltage variation rate	Rated voltage ±10%: 0%
	Temperature variation rate	25±25℃: less than ±0.1%
Digital input (9-way DI)		Positive travel limit, negative travel limit, latch signal, origin signal, etc. ◆ Note: The pin function can be assigned through the software configuration parameters, and the valid logic level can be entered
Digital output (6-way DO)		Servo ready, alarm output, brake release, command complete output, positioning complete output, speed reached, torque limit reached, etc. ◆ Note: Pin functions can be assigned by software configuration parameters to output valid logic levels
Modbus communication	Communication interface	2 RS485 communication port
	Communication standard	Standard ModBus RTU communication protocol, supporting the master station to read and write single or multiple parameters
	Communication Baud rate	4.8kbps、9.6kbps、19.2kbps、38.4kbps、57.6kbps、115.2kbps
	Maximum number of sites	32
Soft start/stop		Can be set 0~10s/1000rpm acceleration and deceleration
Homing function		Speed, acceleration and origin reset method can be specified, and 16 homing modes are supported.
Braking resistor protection function		The resistance and power of the internal and external braking resistors can be set to automatically calculate the output duty cycle that limits the discharge of the braking tube, preventing damage to the driver and braking resistor due to overheating.

STO function		Support
Absolute value multi-turn data clearing		The multi-turn data of the encoder can be cleared through the upper computer communication or the key panel.
Optional Whether to store the parameter in EEPROM		Communication change parameters can be set to save directly to EEPROM
Monitoring function		Internal oscilloscope, on Windows application software, can monitor operating parameters, such as speed, position, voltage, current, etc
Input pulse signal form		Pulse + direction, A phase + B phase, CW + CCW
Command control method		External pulse command /16 segment communication register command
		Speed control mode: 8 internal speed commands / 32 communication register commands Torque control mode: 32 segments communication register command
Command smoothing mode		Speed control mode: low-pass filtering, smoothing time constant 0~2500 (x10us)
Torque limit (speed control mode)		Internal parameters
Speed limit (torque control mode)		
Feedforward compensation		0~1000‰ (set resolution 1‰)
In-place error setting		0~32767 command unit (set resolution to 1 command unit)
Electronic gear ratio	N	1/200<N/M<200
	M	

2.2. Motor Introduction

2.2.1. Motor Naming

RSNA ① M ② 06 ③ J ④ 13 ⑤ 30 ⑥ A ⑦ – Z ⑧

① Product series	④ Encoder resolution J: 17 bits magnetic programmed single figure absolute value G:17 bits magnetic programmed multi-turn absolute value L: 23-bit optical multi-turn absolute value	⑥ Motor rated speed 30: 3000rpm
② Motor inertia code S:small inertia M:medium inertia H:large inertia		⑦ Output mode A: Wire type C: Connector type
③ Motor flange size 06: 60mm 13: 130mm	⑤ Motor rated torque 13: 1.3N·m 150: 15N·m	⑧ Brake code Z: With brake

◆ Note: Model naming rules are only used for model meaning analysis. For specific optional models, please refer to the details page.

2.2.2. Motor Specification

(1) Basic specification

Frame (mm)	Model	Power	Motor length (mm)	Motor length with brake (mm)
40	RSNA-M04J0130A	50W	61.5	93.5
	RSNA-M04J0330A	100W	81.5	110
60	RSNA-M06J0630A	200W	80	109
	RSNA-M06J1330A	400W	98	127
80	RSNA-M08J2430A	750W	107	144
	RSNA-M08J3230A	1000W	127	163
110	RS□-M11J4030A	1.2KW	189	294
	RS□-M11J5030A	1.5KW	204	264
	RS□-M11J6030A	1.8KW	219	294
130	RS□-M13J4025A	1.0KW	166	223
	RS□-M13J6025A	1.5KW	179	236
	RS□-M13J7725A	2.0KW	192	249
	RS□-M13J10025A	2.5KW	209	290
	RS□-M13J15015A	2.3KW	241	322

	RS□-M13J15025A	3.8KW	231	303

◆ Note: The encoder comes standard with 17-bit magnetic encoding, 23-bit optical encoding is optional, and multi-turn absolute value specifications are optional.

(2) Electrical specification

Item	Description
Rated voltage	220VAC
Encoder type	17bit magnetic encoder / 23bit optical encoder optional

2.2.3. Encoder Type

(1) Encoder specification

Encoder code	Description
J	17-bit single-turn magnetic absolute encoder
G	17-bit multi-turn magnetic absolute encoder
L	23-bit multi-turn optical absolute encoder

(2) Encoder performance instruction

- The encoder is the position counting device of the servo motor, and the feedback of the motor position and speed information provides the most important basis for the control of the driver. It is obvious that a high-resolution encoder can "cut" the movement of the motor in one revolution into smaller units, so a high-resolution encoder can provide higher precision information.
- The absolute encoder can feedback the absolute number of turns of the encoder, and can be connected to an external battery to keep the position information of the motor even after the driver is powered off. It is generally used in some occasions with high precision and precise positioning.
- Restricted by the encoder manufacturing process and servo drive acquisition capabilities, our company provides up to 23-bit photoelectric encoders with the highest resolution of 8388608. In actual use, because of the working conditions, we can choose a slightly lower resolution encoder to reduce the cost of the motor while ensuring a certain accuracy. Therefore, please choose the encoder specification of the servo motor reasonably according to your actual situation.

2.4. Braking Resistor Introduction

When the output torque of the motor and the rotation speed are in the opposite direction, it represents the energy transferred from the load end to the driver. This energy is fed back to the capacitor in the DC bus so that its voltage value rises. When it rises to a certain value, the capacitor cannot fully absorb the feedback energy, and a braking resistor is needed to dissipate it.

The braking resistor is connected to the P+ and Br ports. The driver has a braking resistor with a certain power. When the built-in resistor of the driver is not enough to absorb the braking energy consumption, the user can also connect an external braking resistor with a larger power. In this case, it is only necessary to replace the braking resistor built in the driver with a high-power braking resistor.

(1) Braking resistor specification

Drive model	R6L028	R6L028M	R6L042	R6L042M	R6L076	R6L076M	R6L120	R6L120M
Adaptive motor power	50W~400W		750W		1KW~2KW		2KW~3KW	
Continuous current	2.8A		4.2A		7.6A		12A	
Maximum current	8.4A		12.6A		22.8A		36A	
Built-in braking resistor resistance and power	-		50Ω				50Ω	
	-		75W				100W	
Allowable braking power	-		38W				50W	
Minimum resistance of external braking resistor	-		30Ω				20Ω	

(2) Configuration reference of braking resistor

As mentioned in the above table, the braking energy of the driver returns to the DC bus first. When the feedback superimposed voltage exceeds the reference value set by the driver (that is, the maximum absorption capacity of the DC bus capacitor), the braking energy enters the braking resistor.

When the built-in braking resistor of the driver cannot meet the discharge requirements, it is necessary to replace the braking resistor with a larger specification. The power of the braking resistor needs to be greater than the power of the built-in braking resistor of the driver. The resistance of the braking resistor needs to meet certain requirements, and the minimum resistance should not be lower than the lower limit listed in the above table.

Generally speaking, the greater the load inertia and the shorter the acceleration and deceleration time, the greater the braking energy and the greater the braking resistor power required.

2.5. Accessories

2.5.1. Motor & Encoder Cables

(1) Wiring matching table

1) AMP plug type motor (Frame 40/60/80mm)

Cable type	Cable length		
	3 meters	5 meters	8 meters
Motor cable	SMS4-030A	SMS4-050A	SMS4-080A
Single-turn absolute encoder cable	SES4-030	SES4-050	SES4-080
Multi-turn absolute encoder cable	SES6-030	SES6-050	SES6-080
Brake cable	SBS2-030	SBS2-050	SBS2-080

2) Aviation plug type motor (Frame 110/130mm)

Cable type	Cable length		
	3 meters	5 meters	8 meters
Motor cable	SMH4-030	SMH4-050	SMH4-080
Single-turn absolute encoder cable	SEH4-030	SEH4-050	SEH4-080
Multi-turn absolute encoder cable	SEH6-030	SEH6-050	SEH6-080
Brake cable (optional)	SZH2-030	SZH2-050	SZH2-080

◆ Note: The standard length of the extension cable is 3 meters, if you need other sizes, please specify when ordering.

(2) Motor wiring requirements

◆ The motor power cable needs to meet certain current carrying requirements, The motor with frame 40/60/80mm shall use the wire diameter specification of 0.5mm^2 or above, and the motor with frame 110/130mm shall use the wire diameter specification of 0.75mm^2 or above.

◆ The encoder cable of motor needs to meet the requirements of shielding isolation, standard configuration 0.14mm^2 wire diameter, twisted pair, shielded cable.

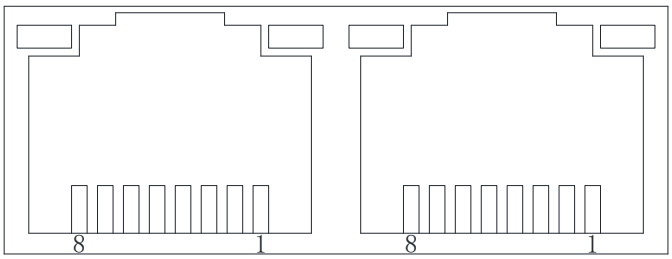
◆ For drag chains or similar use environments, please be sure to use flexible cables that meet the requirements to ensure the normal operation of the servo system.

◆ The cable installed in the drag chain needs to maintain a certain amount of space, and do not artificially increase the bending angle of the cable.

2.5.2. Type-C Debugging Cable

Please prepare the Type-C debugging cable yourself. Contact the after-sales service or download the driver from the official website.

2.5.3. RS485 Communication Cable



Signal		Pin	Function
Communication signal	RS485+	1	RS485 communication port
	RS485-	2	
	---	3	---
	---	4	---
	---	5	
	---	6	---
	DGND	7	GND signal
	---	8	---

◆ Note: Only R6L***M series products support RS485 communication function, R6L*** series does not support, the naming rules can be found in section 2.1.1 Driver naming.

3. Installation

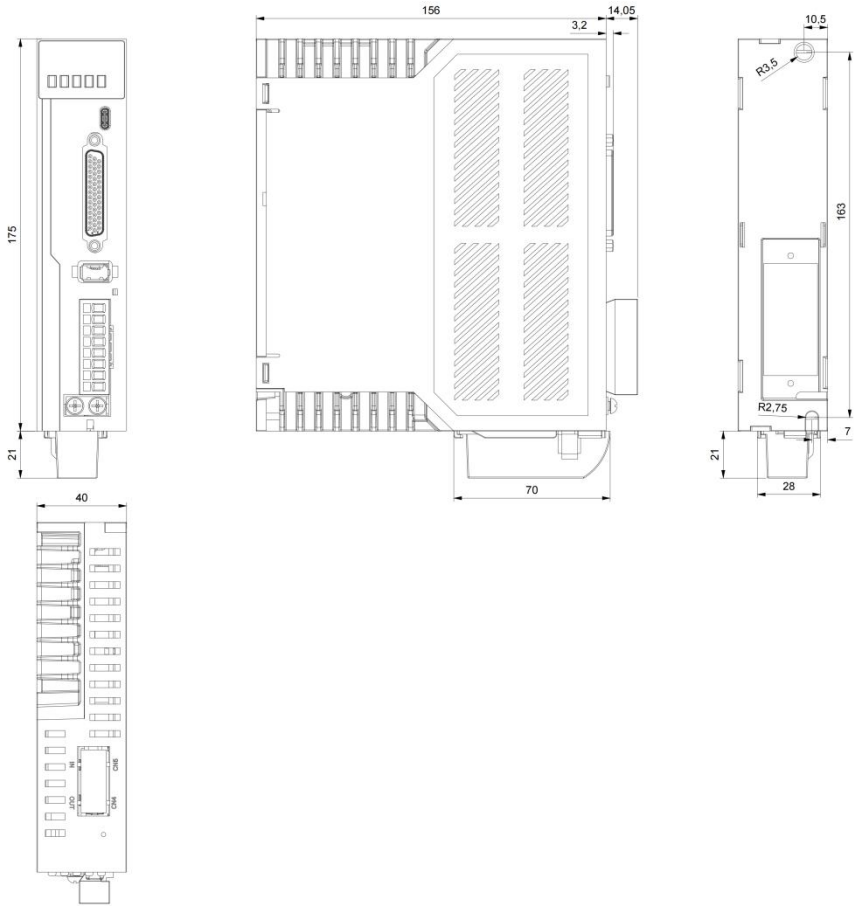
3.1. Servo Driver Installation

3.1.1. Driver Environment

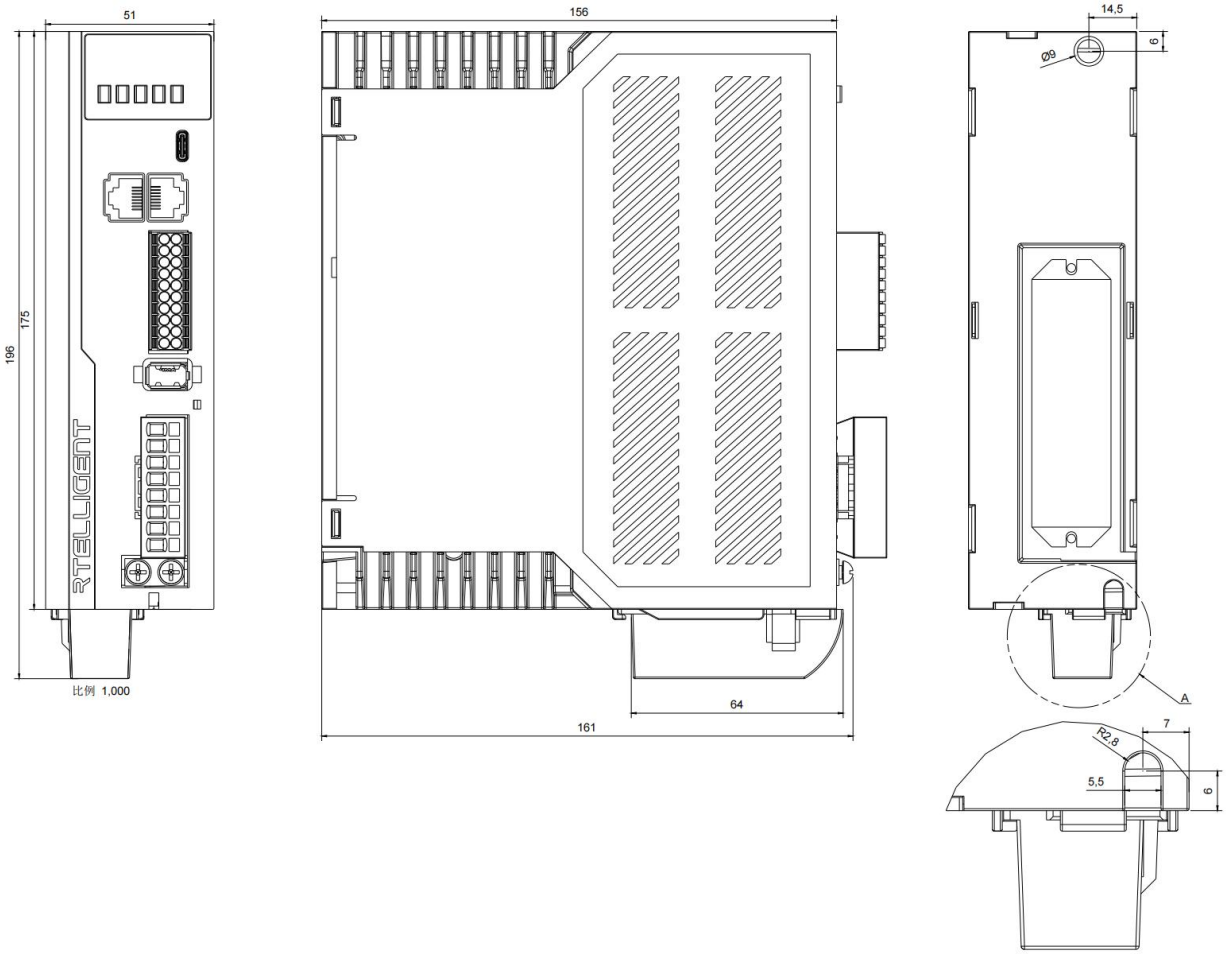
Item	Requirement
Working temperature	0℃ ~ +45℃
Storage temperature	-20℃ ~ +70℃
Ambient humidity	Work/Store ≤90% RH no condensation
Anti-Vibration	10~57Hz 3.5mm，57~150Hz 1g
Atmospheric environment	No corrosive gas, flammable gas, oil mist or dust, etc, 86-106kpa
Altitude	Less than 1000m

3.1.2. Dimension

(1) Type A: Below 400W (unit: mm)



(2) Type B: 750W~2300W (unit: mm)



3.1.3. Installation Precaution

- Please install the driver in an electrical cabinet free from sunlight and rain.
- Do not place the driver in a corrosive or other harmful environment.
- Please ensure that the installation direction is perpendicular to the wall, and use natural air convection or a fan to cool the servo driver. Fix the servo driver firmly on the mounting surface through 2~4 mounting holes (the number of mounting holes varies according to the capacity). When installing, please face the front of the drive to the operator and make it perpendicular to the wall. Please pay attention to avoid drilling chips and other foreign matter from falling into the driver during installation, otherwise it may cause driver failure.
- When multiple drivers are installed in the control cabinet, please note that sufficient space must be reserved for the placement position to achieve sufficient heat dissipation.
- Be sure to connect the ground terminal to the ground, otherwise there may be a risk of electric shock or interference resulting in malfunction.

- When there is a vibration source (punch) near the driver installation, if it is unavoidable, please use a vibration absorber or install an anti-vibration rubber gasket.
- When there are noise interference sources such as large magnetic switches and fusion splicers near the driver, it is easy to cause the driver to be interfered by the outside and cause malfunction. At this time, a noise filter needs to be installed, but the noise filter will increase the leakage current, therefore, it is necessary to install an insulating transformer on the input end of the driver.

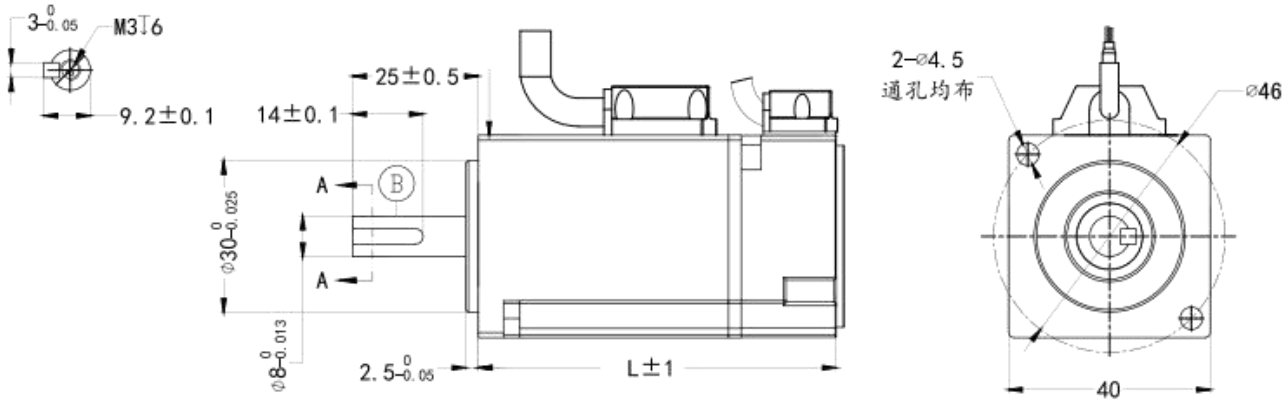
3.2. Servo Motor Installation

3.2.1. Motor Environment

Item	Requirement
Ambient temperature	0～40°C
Storage temperature	-20～60°C
Ambient/storage humidity	Below 90%RH (free from condensation)
Vibration/impact	49m/s2 /196m/s2
Protection class	IP65
Altitude	Below 1000m

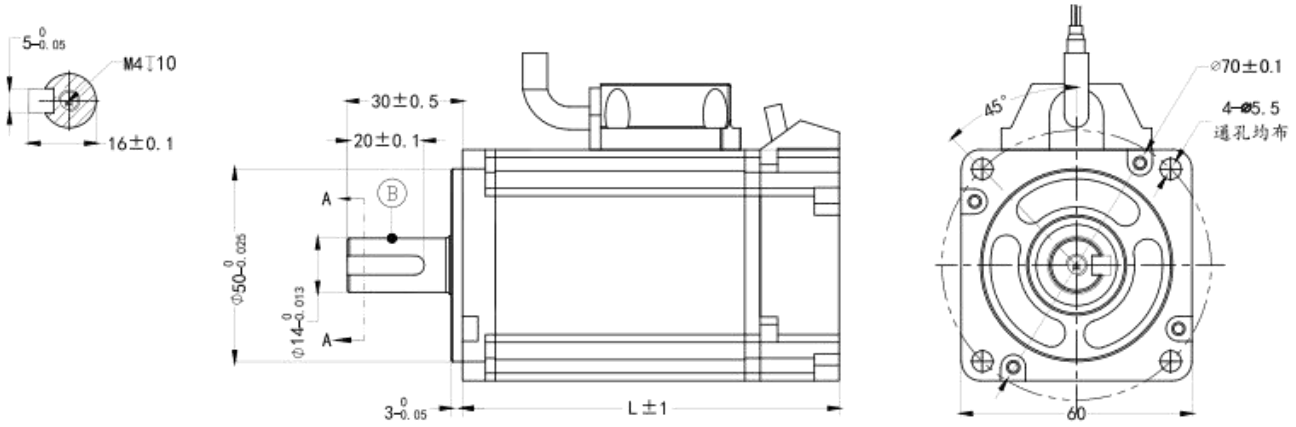
3.2.2. Dimension

(1) Frame 40mm (AMP plug outlet*)



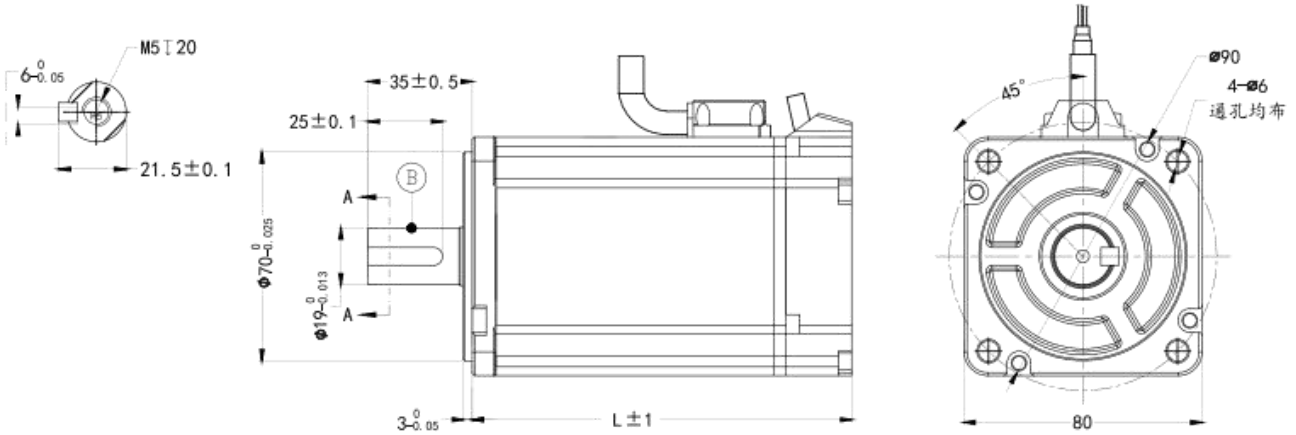
Description	Model	Length (mm)	Weight (Kg)
50W	RSNA-M04J0130A	61.5	0.35
100W	RSNA-M04J0330A	81.5	0.46
50W with brake	RSM-M04L0130A-Z-ST	93.5	0.52
100W with brake	RSNA-M04J0330A-Z	110	0.66

(2) Frame 60mm (AMP plug outlet*)



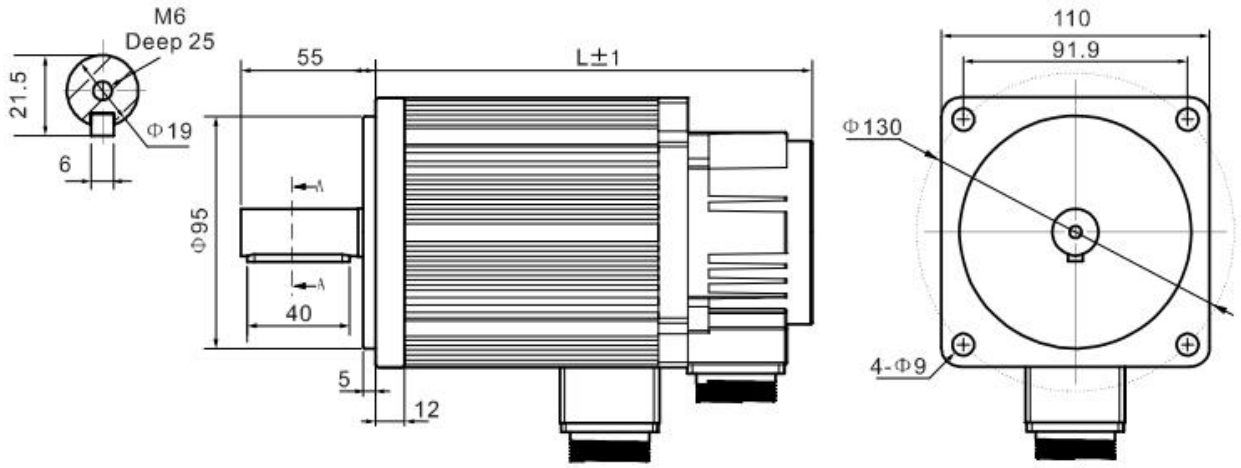
Description	Model	Length (mm)	Weight (Kg)
200W	RSNA-M06J0630A	80	0.84
400W	RSNA-M06J1330A	98	1.19
200W with brake	RSNA-M06J0630A-Z	109	1.21
400W with brake	RSNA-M06J1330A-Z	127	1.56

(3) Frame 80mm (AMP plug outlet*)



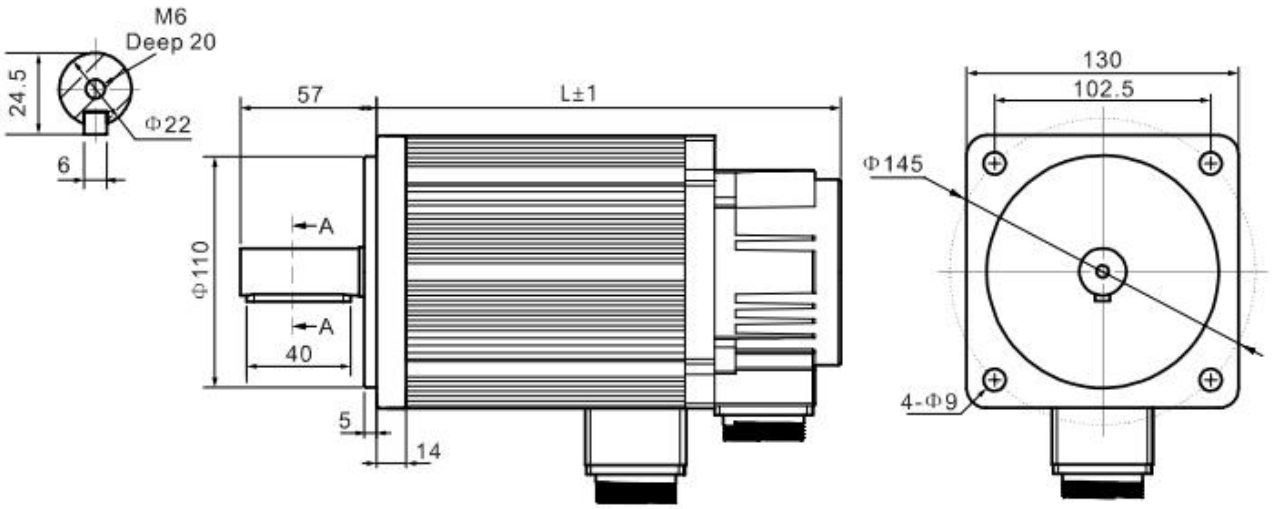
Description	Model	Length (mm)	Weight (Kg)
750W	RSNA-M08J2430A	107	2.27
1000W	RSNA-M08J3230A	127	2.95
750W with brake	RSNA-M08J2330A-Z	144	3.05
1000W with brake	RSNA-M08J3230A-Z	163	3.73

(4) Frame 110mm (Aviation plug outlet*)



Description	Model	Length (mm)	Weight (Kg)
1.2KW	RS□-M11J4030A	189	6.0
1.5KW	RS□-M11J5030A	204	6.8
1.2KW	RS□-M11J6020A	219	7.9
1.8KW	RS□-M11J6030A	219	7.9
1.2KW with brake	RS□-M11J4030A-Z	294	6.5
1.5KW with brake	RS□-M11J5030A-Z	264	7.3
1.2KW with brake	RS□-M11J6020A-Z	279	8.4
1.8KW with brake	RS□-M11J6030A-Z	294	8.4

(5) Frame 130mm (Aviation plug outlet*)



Description	Model	Length (mm)	Weight (Kg)
1.0KW	RS□-M13J4025A	166	6.2
1.5KW	RS□-M13J6025A	179	7.4
2.0KW	RS□-M13J7725A	192	8.3
2.6KW	RS□-M13J10025A	209	9.8
2.3KW	RS□-M13J15015A	241	12.6
3.8KW	RS□-M13J15025A	231	11.7
1.0KW with brake	RS□-M13J4025A-Z	223	7.8
1.5KW with brake	RS□-M13J6025A-Z	236	9.0
2.0KW with brake	RS□-M13J7725A-Z	249	9.9
2.6KW with brake	RS□-M13J10025A-Z	290	11.4
2.3KW with brake	RS□-M13J15015A-Z	332	14.2
3.8KW with brake	RS□-M13J15025A-Z	303	13.3

Remark:

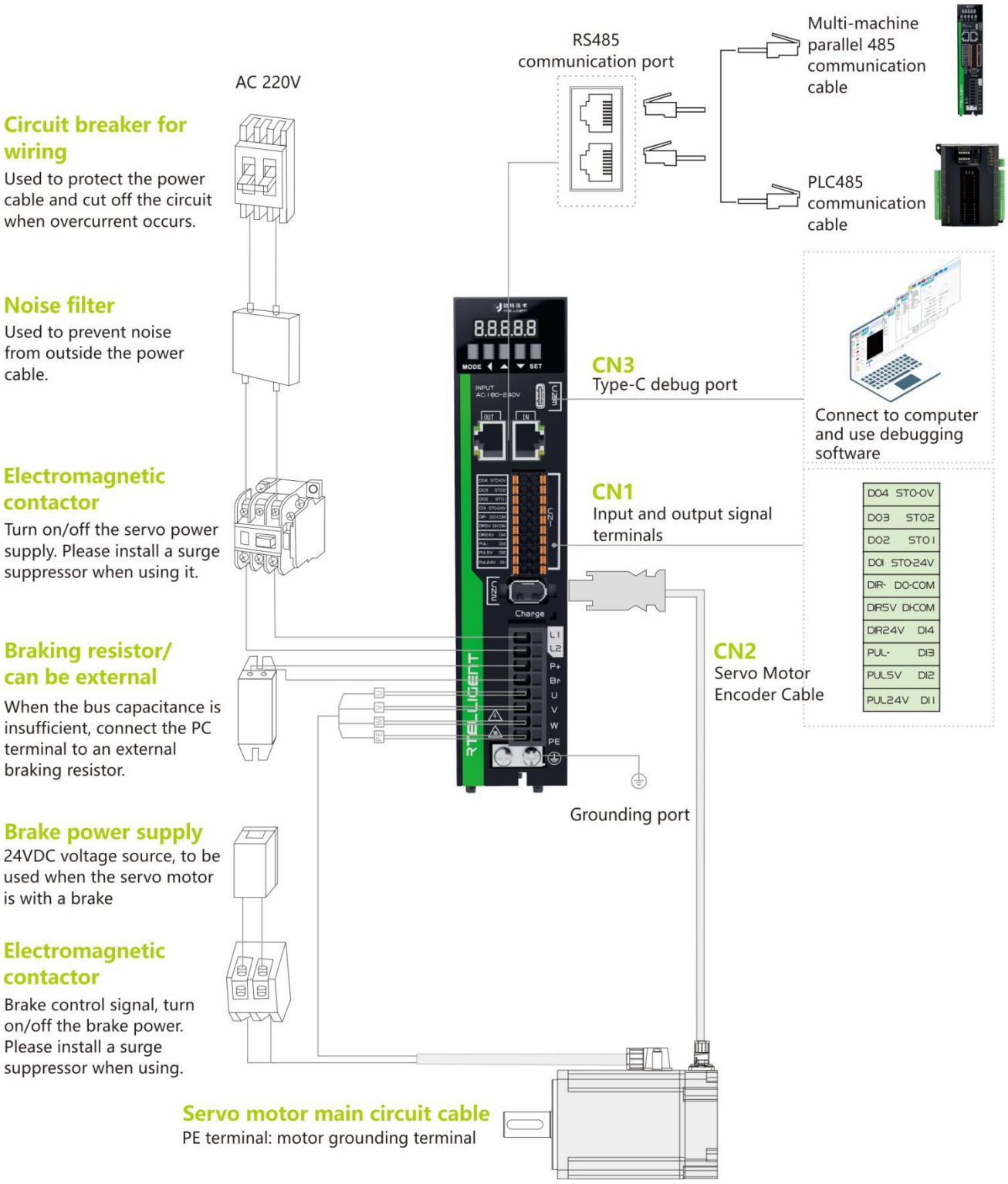
- The AMP plug outlet specification is "4 holes motor cable + 9 holes encoder cable + 2 holes brake cable".
- The aviation plug outlet specification is "4 holes motor cable + 7 holes encoder cable + 2 holes brake cable".

3.2.3. Installation Precaution

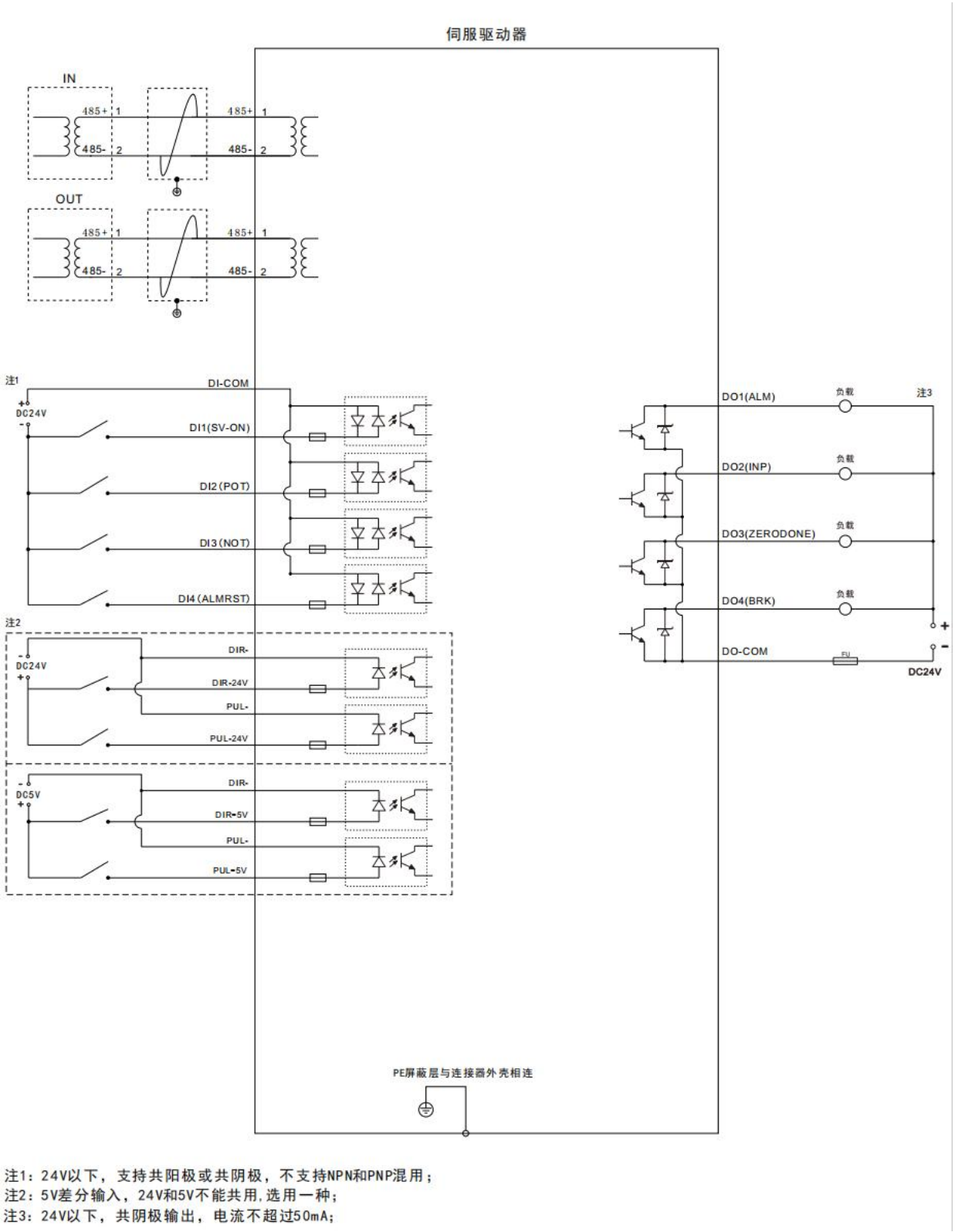
- Please ensure that the installation direction is perpendicular to the wall, and use natural air convection or a fan to cool the servo driver. By 2 ~ 4 mounting holes (the number of mounting holes varies according to the capacity), and the servo drive is firmly fixed on the mounting surface. When installing, please face the front of the driver to the operator and make it perpendicular to the wall. Please pay attention to avoid drilling chips and other foreign matter from falling into the driver during installation, otherwise it may cause driver failure.
- When multiple drivers are installed in the control cabinet, please note that sufficient space must be reserved for the placement position to achieve sufficient heat dissipation.
- Be sure to connect the ground terminal to the ground, otherwise there may be a risk of electric shock or interference resulting in malfunction.
- When there is a vibration source (punch) near the driver installation, if it is unavoidable, please use a vibration absorber or install an anti-vibration rubber gasket.
- When there are noise interference sources such as large magnetic switches and fusion splicers near the driver, it is easy to cause the driver to be interfered by the outside and cause malfunction. At this time, a noise filter needs to be installed, but the noise filter will increase the leakage current, therefore, it is necessary to install an insulating transformer on the input end of the driver.

4. Wiring

4.1. Driver Interface & Connection



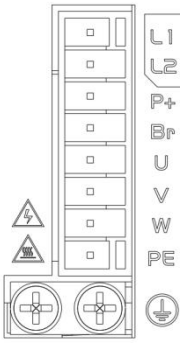
4.2. Control Mode Wiring Diagram



注1：24V以下，支持共阳极或共阴极，不支持NPN和PNP混用；
注2：5V差分输入，24V和5V不能共用，选用一种；
注3：24V以下，共阴极输出，电流不超过50mA；

4.3. Main Circuit Input Interface

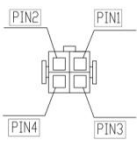
(1) Type A/B servo driver main loop input interface definition

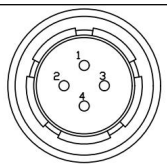
Terminal mark	Pin	Name	Description
	L1	Power supply input terminal	Servo driver power supply input terminal, single-phase 220VAC
	L2		
	P+	Braking resistor terminal	Connect to energy consumption braking resistor
	Br		
	U	Servo Motor connection terminal	Servo motor connection terminals, must be connected to the U, V, W, and PE terminals of the motor
	V		
	W		
	PE		

Circuit wiring precautions:

- Do not connect the input power cable to the output terminals U, V, W, otherwise the servo driver will be damaged.
- Do not pass the power cable and signal cable through the same pipe or bundle them together. To avoid interference, the distance between them should be more than 30cm.
- Do not turn on/off the power frequently. When you need to repeatedly turn on/off the power continuously, please control it to less than once a minute. Since the power supply part of the servo driver has a capacitor, when the power is turned on, a relatively large charging current will flow (charging time 0.2s). Frequent ON/OFF of the power supply will cause the performance of the main circuit components inside the servo driver to degrade.
- Please connect the servo driver to the ground reliably, and the PE wire should be as thick as possible to ensure that the grounding resistance is less than 100Ω.
- It is recommended that the power supply be supplied through a noise filter to improve the anti-interference ability.
- Please install a non-fuse type (NFB) circuit breaker so that the external power supply can be cut off in time when the driver error occurs.
- Do not power on and use the servo driver when the terminal screws or cables are loose, otherwise it may cause a fire.

(2) Face the servo motor power extension cable motor side terminals, their terminal definition serial number as shown in the following schematic diagram

Connector	Pin	Definition
 Motor side (AMP connector)	1	U
	2	V
	3	W
	4	PE

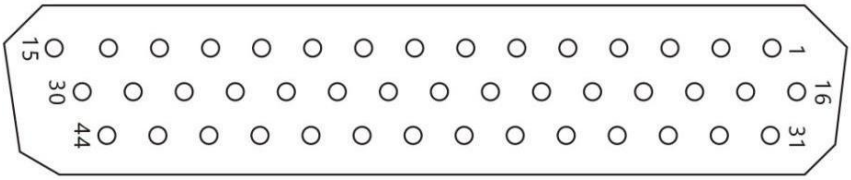
 Motor side (Aviation connector)	1	PE
	2	U
	3	V
	4	W

4.4. Control Signal Interface - CN1

4.4.1. CN1 Pin Definition

CN1 is a 44-pin three-row DB terminal that comes with the driver at the time of shipment.

Please carefully confirm the pin definition and electrical specifications. The pin diagram for the driver control signal terminal CN1 is shown below



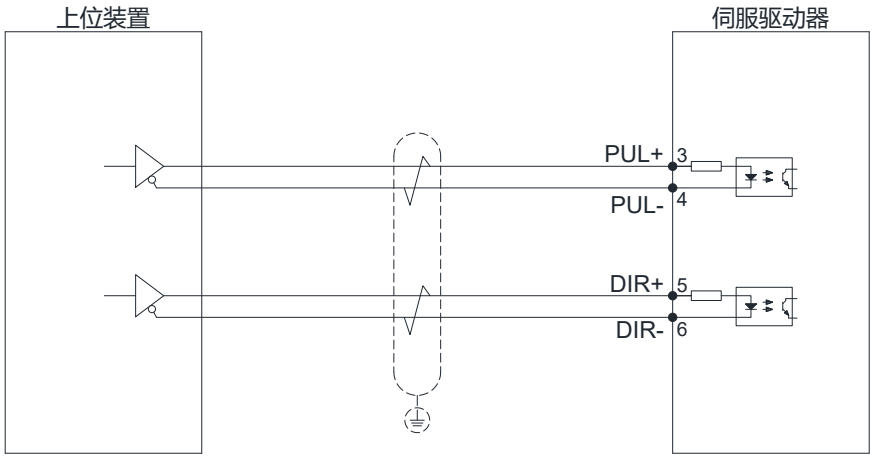
Functional classification	Signal name	PIN number	Signal definition	Default function	Description
External pulse interface	PUL+	3	Differential pulse, positive	---	Differential input, 5V
	PUL-	4	Differential pulse, negative		
	DIR+	5	Differential direction, positive		
	DIR-	6	Differential direction, negative		
	24VPUL+	16	24V pulse, positive		24V+
	24VDIR+	17	24V direction, positive		
Universal input interface	DI1(SV-ON)	2	Input 1	Servo enable	Below 24V, support common anode or common cathode. Does not support the mixed use of NPN and PNP.
	DI2(POT)	7	Input 2	Position limit	
	DI3(NOT)	8	Input 3	Negative limit	
	DI4(ALMRST)	9	Input 4	forward direction	
	DI5(PULStop)	10	Input 5	negative	
	DI6(Home)	11	Input 6	origin switch	
	DI7(ZEROStart)	12	Input 7	probe1	
	DI8(EMEStop)	13	Input 8	probe2	
	DI9(GAIN)	14	Input 9	non-function	
	DI-COM	1	Input common	---	

Universal common cathode output interface	DO1(SV-RDY)	32	Output 1	Servo ready	Common cathode output below 24V, Current does not exceed 50mA
	DO2(INP)	33	Output 2	Positioning completion	
	DO3(ALM)	34	Output 3	Alarm	
	DO4(ZERODONE)	35	Output 4	Homing completed	
	DO-COM-	31	Output common	---	
Universal Differential Output Interface	DFDO5+(BRK+)	18	Output5 positive	Brake	Differential output below 24V; Current does not exceed 200mA
	DFDO5-(BRK-)	19	Output5 negative		
	DFDO6+(PULO+)	20	Output6 positive	Internal command complete	
	DFDO6-(PULO-)	21	Output6 negative		
Encoder output interface	DFEA+	23	Encoder A+	---	5V differential output
	DFEA-	24	Encoder A-		
	DFEB+	25	Encoder B+		
	DFEB-	26	Encoder B-		
	DFEZ+	27	Encoder Z+		
	DFEZ-	28	Encoder Z-		
	EA	36	Single-ended EA	---	Collector output
	EB	37	Single-ended EB		
	EZ	29	Single-ended EZ		
	GND	30	Single-ended GND	---	
Analog input interface	AI1+	40	Analog channel 1+	---	reserved
	AI1-	39	Analog channel 1-		
	AI2+	44	Analog channel 2+		
	AI2-	43	Analog channel 2-		
	AIGND	41	Analog channel GND	---	
STO interface	STO1	15	STO1control input	---	Disable STO function: STO connected to STO-24V; Enable STO function: STO is connected to STO-0 V.
	STO2	22	STO2control input		
	STO-24V	38	STO-0V		
	STO-0V	42	Internal24V power supply		

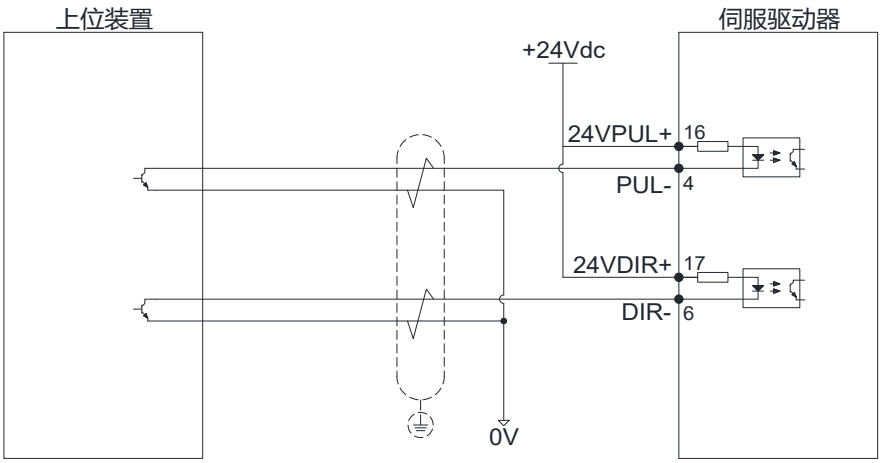
4.4.2. Position Command Input Signal

Signal name	Pin No.	Signal definition	Description
PUL+	3	Differential pulse, positive	Differential input, 5V
PUL-	4	Differential pulse, negative	
DIR+	5	Differential direction, positive	
DIR-	6	Differential direction, negative	
24VPUL+	16	24V pulse, positive	Single- ended input: 24V+
24VDIR+	17	24V direction, positive	

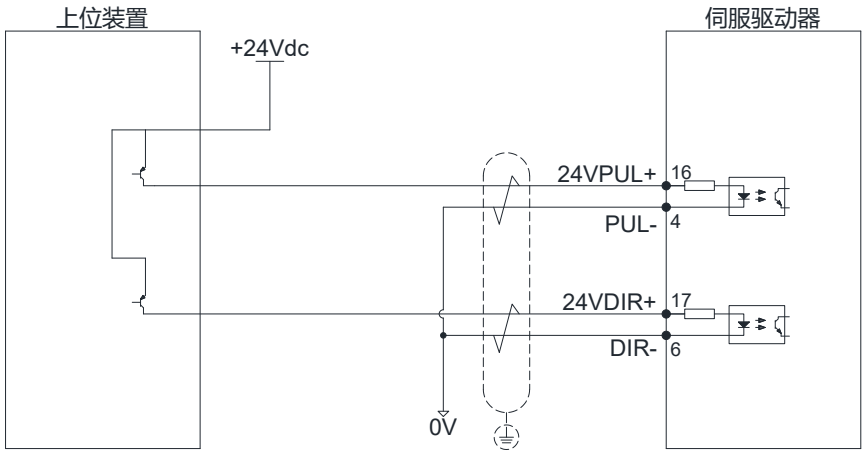
(1) 5V differential pulse signal



(2) Single- ended common anode signal



(3) Single- ended common cathode signal

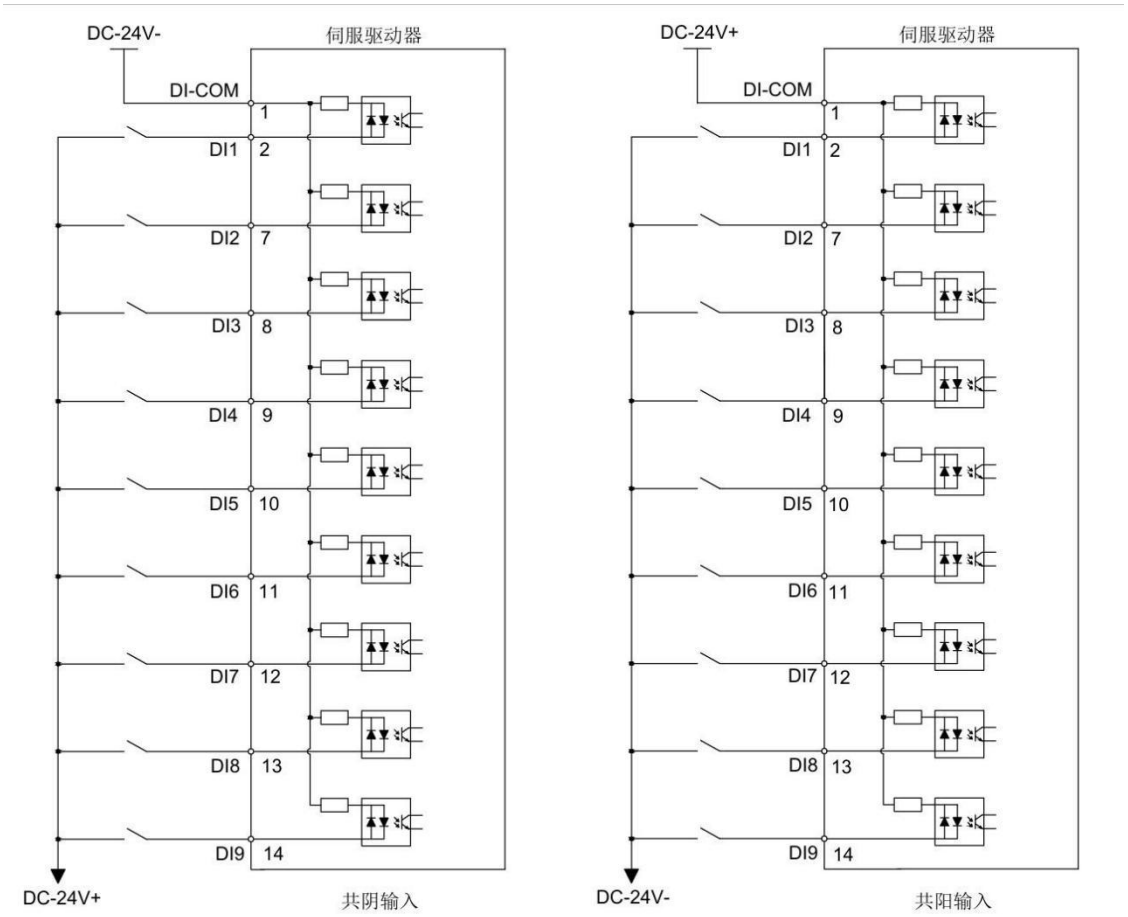


4.4.3. Digital input signal

Signal name	Pin No.	Signal definition	Default	Description
DI1(SV-ON)	2	Input 1	Servo Enable	Below 24V, support common anode or common cathode. Note: Does not support the mixed use of NPN and PNP.
DI2(POT)	7	Input 2	Positive limit	
DI3(NOT)	8	Input 3	Negative limit	
DI4(ALMRST)	9	Input 4	Fault reset	
DI5(PUL Stop)	10	Input 5	Pulse command disable	
DI6(Home)	11	Input 6	Home switch	
DI7(ZERO Start)	12	Input 7	Homing enable	
DI8(EME Stop)	13	Input 8	Emergency stop	
DI9(GAIN)	14	Input 9	Electronic gear ratio switching	
DI-COM	1	Input common terminal	---	

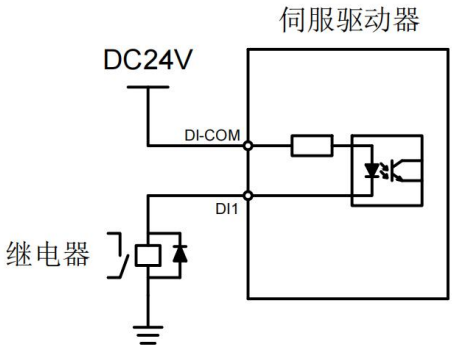
◆ The driver has a total of 9 input ports, and the function can be selected and set according to P02.00～P02.17.

The interface circuits of DI1 to DI6 are the same. The wiring is as shown in the figure below.

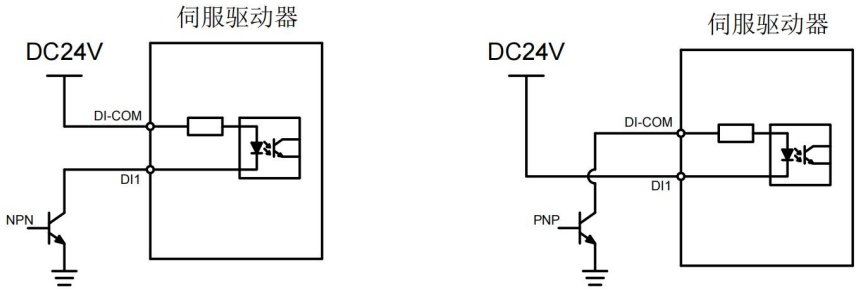


Taking DI1 as an example, an example of wiring is shown below:

(1) When the upper computer device is a relay output



(2) When the upper computer device is open-collector output:



◆ Note: Mixing of NPN and PNP is not supported

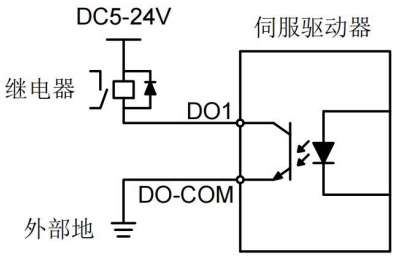
4.4.4. Digital output signal

Signal name	Pin No.	Signal definition	Default	Description
DO1 (SV-RDY)	32	Output 1	Servo ready	Below 24V, common cathode output, current does not exceed 50mA.
DO2 (INP)	33	Output 2	Positioning completed	
DO3 (ALM)	34	Output 3	Alarm output	
DO4 (ZERO DONE)	35	Output 4	Homing completed	
DO-COM-	31	Output common	---	
DO5+ (BRK+)	18	Output 5+	Brake	Below 24V differential output current not exceedi 200mA
DO5- (BRK-)	19	Output 5-		
DO6+ (PULO+)	20	Output 6+	Internal instruction stop	
DO6- (PULO-)	21	Output 6-		

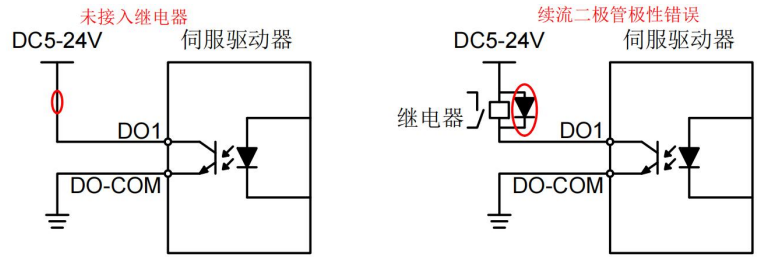
◆ The driver has a total of 6 output ports, the common cathode output terminal drive current is 50mA, which can be used for small current output; the maximum drive current of the differential output terminal is 200mA, which can be used to drive the relay type output.

The DO1~DO4 interface circuits are the same. Take DO1 as an example.

(1) When the upper computer device is a relay output

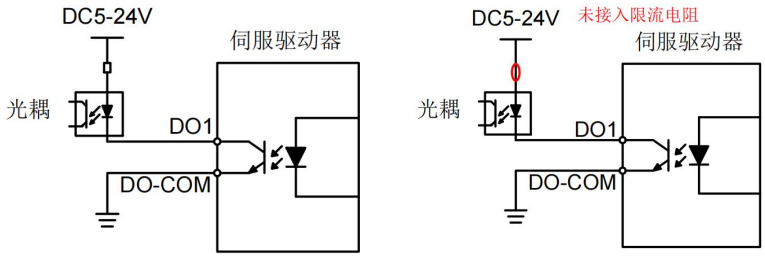


The following is the wrong wiring method:



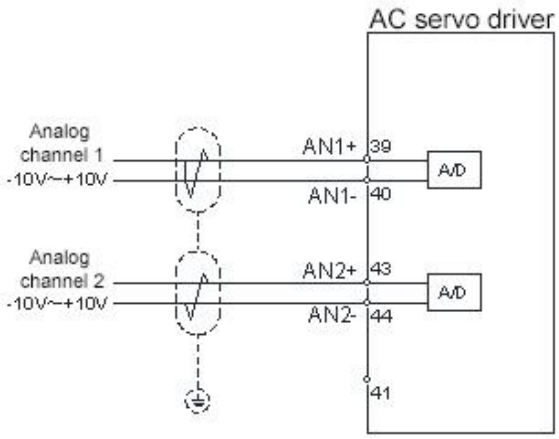
(2) When the upper device is optocoupler input

As shown in the following picture, the left picture is the correct connection, and the right picture is the wrong connection:



4.4.5. Analog input signal

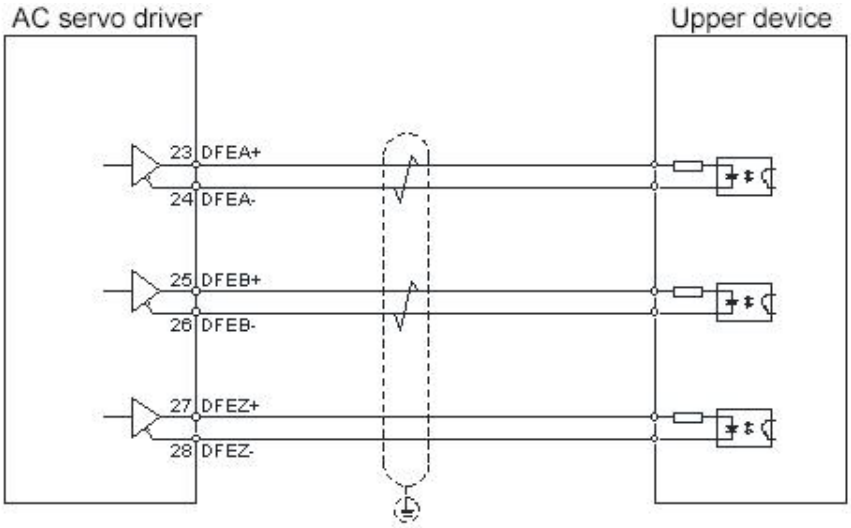
Signal name	Pin No.	Signal definition	Default	Description
AI1+	40	Analog channel 1+	---	-10V ～ +10V Analog input
AI1-	39	Analog channel 1-		
AI2+	44	Analog channel 2+		
AI2-	43	Analog channel 2-		
AIGND	41	Analog GND	---	



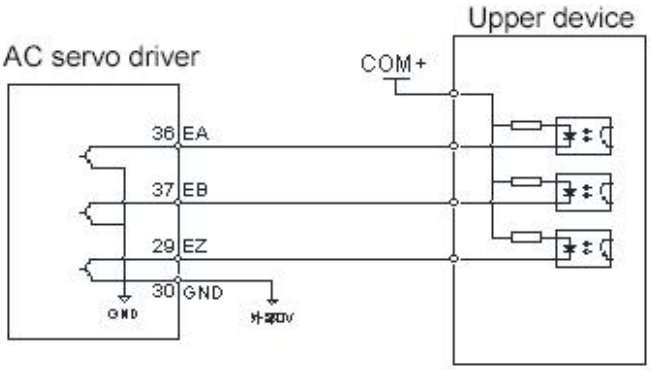
4.4.6. Encoder output signal

Signal name	Pin No.	Signal definition	Default	Description
DFEA+	23	Encoder A+	---	5V differential output
DFEA-	24	Encoder A-		
DFEB+	25	Encoder B+		
DFEB-	26	Encoder B-		
DFEZ+	27	Encoder Z+		
DFEZ-	28	Encoder Z-		
EA	36	Single-ended EA	---	Collector output
EB	37	Single-ended EB		
EZ	29	Single-ended EZ		
GND	30	Single-ended GND	---	

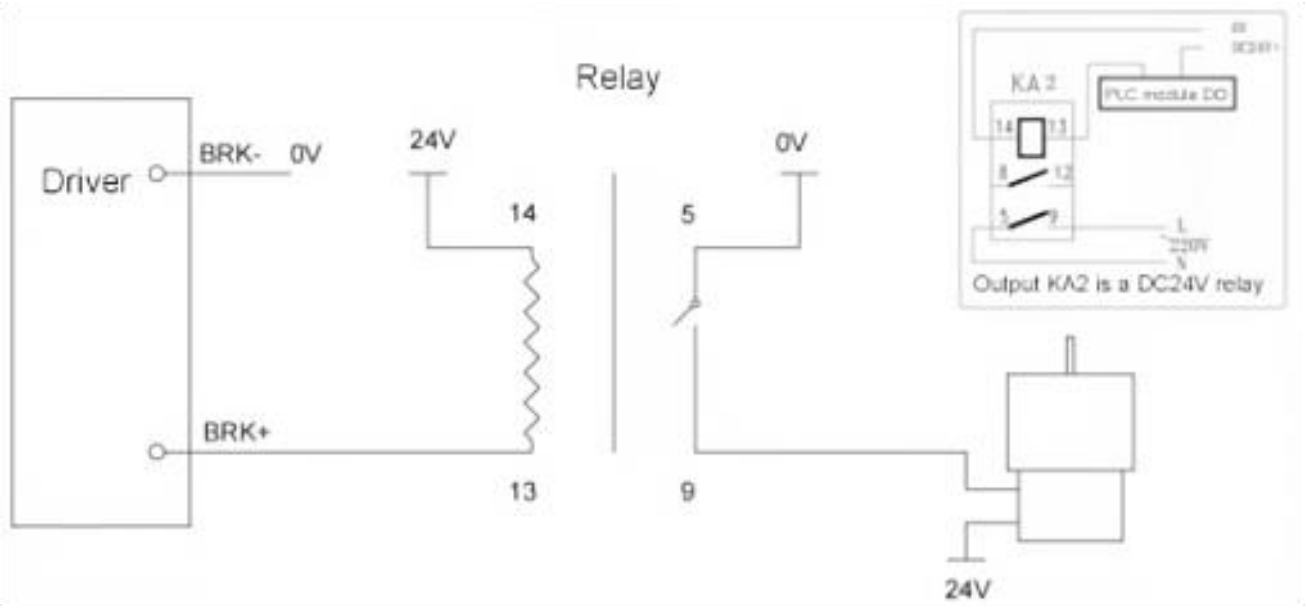
(1) Encoder differential output



(2) Encoder open-collector output



4.4.7. Motor Brake Wiring



4.4.8. Safe Torque Off Function (STO)

(1) Overview

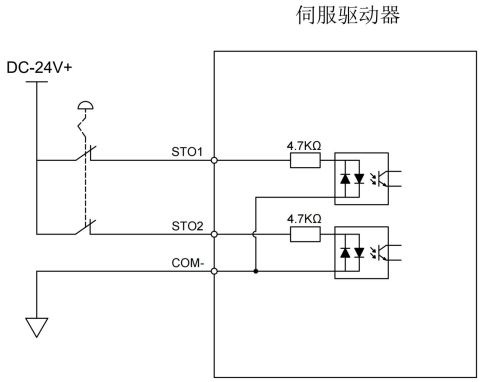
Safe Torque Off (STO) is a safety function that uses the input signal from the safety controller to cut off the input current of the motor and stop the motor from running. When the STO function is triggered, the servo driver will shut down the servo ready completed output signal (S-RDY) and enter the safe state.

(2) STO wiring instruction

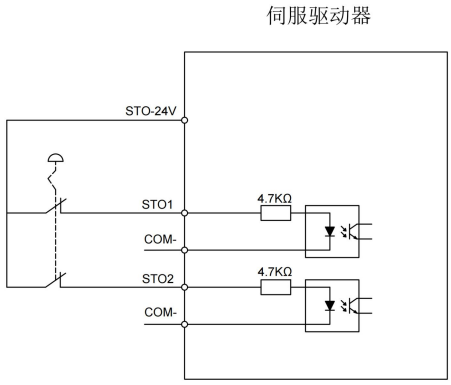
Signal name	Signal definition	Default	Description
STO-24V	Internal 24V power supply	---	Disable STO function: STO connects to STO-24V; Enable STO function: STO connects to STO-0V.
STO1	Control input for STO1		
STO2	Control input for STO2		
STO-0V	STO reference ground		

◆ Note: The servo driver will work properly only if the STO1 and STO2 input status are both high ("1" or "H"). One of STO1 and STO2 is high and the other is low ("0" or "L"), or both are low and neither driver is working.

1) External 24V connection example

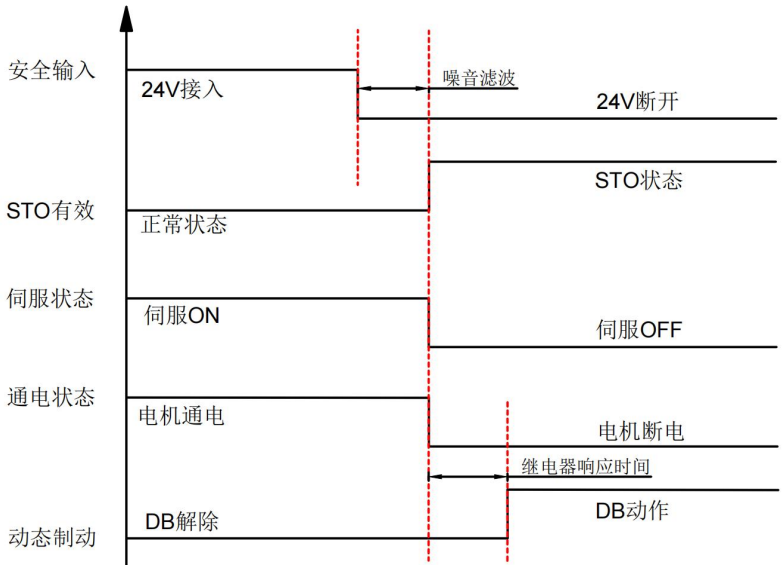


2) Internal 24V connection example

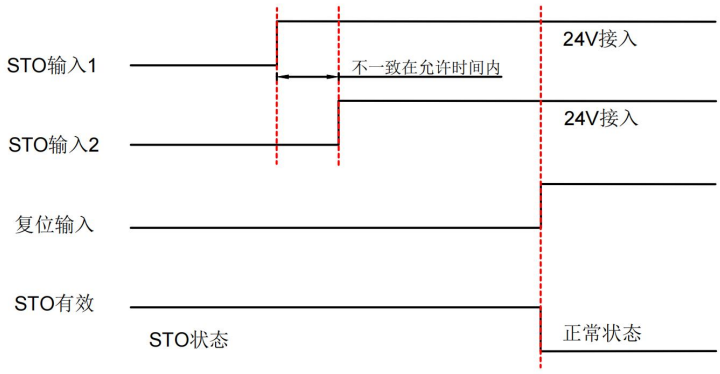


(3) Sequence diagram

1) Action sequence for entering the STO security state



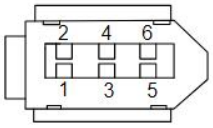
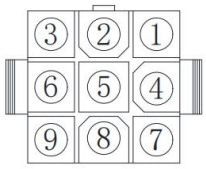
2) Reset sequence for exiting the STO security state



◆ Note: The servo can be enabled or disabled only after the STO status exits normally.

4.5. Encoder Signal - CN2

Face the servo side and motor side terminals of the servo encoder extension cable, and their terminal definition serial numbers are shown in the following schematic diagram:

Terminal mark	Connector	Driver side	Motor side		Definition
			AMP connector	Aviation connector	
CN2	 Driver side	1	2	7	Power output positive: +5V
		2	3	5	Power output negative: 0V
		-	6	3	Encoder battery: BAT+
		-	7	2	Encoder battery: BAT-
	 Motor side (AMP connector)	5	4	6	Encoder bus signal: SD+
		6	5	4	Encoder bus signal: SD-
	 Motor side (Aviation connector)	Shell	1	1	PE grounding (shielding layer)
⚠ Attention	◆ Do not short-circuit the encoder PE ground line with the encoder signal line, otherwise the servo driver will not work properly				

Remark:

- Please purchase Rtelligent the SE series cables or cables with the same specifications and above.
- The encoder cable should be as far away as possible from other high-current loops of the equipment to prevent interference.
- Do not place the encoder connector in the drag chain to prevent poor connection at the connector. The multi-turn absolute encoder wiring comes with two battery connectors. Please pay attention to the battery protection when purchasing.
- When cables are placed in the drag chain, attention should be paid to the distribution space to avoid excessive bending angles and the resulting reduction in cable life.

4.6. Anti-interference Countermeasures for Electrical Wiring

To suppress interference, please take the following measures

- The length of the command input cable should be less than 3m, and the encoder cable should be less than 20m.
- Use thick wires as much as possible for the grounding wiring. (Above $2.0\mathrm{mm}^2$)
- Please use a noise filter to prevent radio frequency interference. When using in a civil environment where the power supply interference noise is strong, please install a noise filter on the input side of the power cord.

In order to prevent the malfunction caused by electromagnetic interference, the following treatment methods can be used

- Install the host computer device and noise filter near the servo driver as much as possible.
- Install surge suppressors on the coils of relays, screw tubes, and electromagnetic contactors.
- When wiring, please lay the strong current cables separately from the weak current cables, and keep an interval of more than 30cm. Do not put them in the same pipe or bundle them together.
- Do not share power supply with electric welders, electrical discharge processing equipment, etc. When there is a high-frequency generator nearby, install a noise filter on the input side of the power cord.

5. Control Panel

5.1. Panel Overview

5.1.1. Panel Composition Introduction

The display panel of the servo driver is composed of 5 keys and a 5-digit LED digital tube display, which is used to realize various status information display, trial operation, parameter management and other functions. The 5 keys are identified as follows:

Function	Symbol	Description	Icon
Mode/return	MODE	Mode switch	
Shift key	◄	Shift left	
Increase	▲	Switch up selection/increase value	
Decrease	▼	Switch down selection/decrease value	
Confirm	SET	Confirm operation	

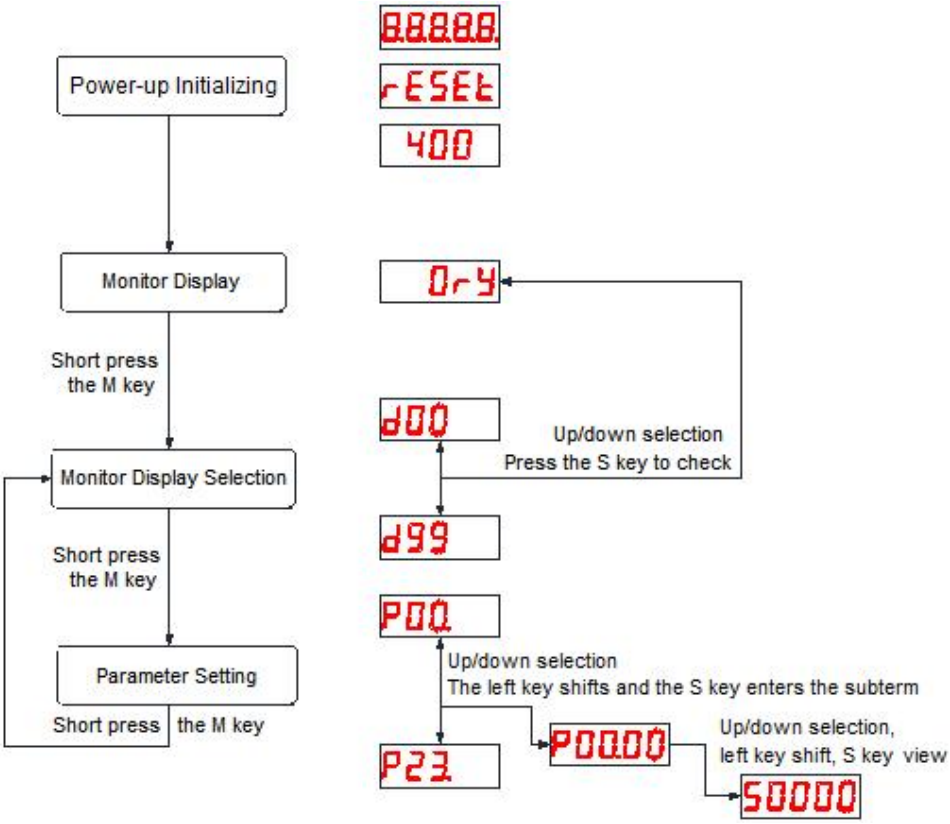
5.1.2. Panel Display Content

When the servo driver is running, the LED display can be used for servo monitoring display, parameter display, function display, parameter management, encoder adjustment, and open loop operation

- ◆ Monitoring display: display the current running status of the servo
- ◆ Parameter display: display the set value of servo control parameters
- ◆ Function display: internal test run operation
- ◆ Parameter management: used to manage servo control parameters
- ◆ Encoder adjustment, open loop operation: the manufacturer reserves this function

5.1.3. Panel Operation

The operation of the control panel of the servo driver is shown in the figure below:



- After the power is turned on and the initialization of the servo driver is completed, the panel display immediately enters the monitor display mode. The target parameter of pre-monitoring can be selected through parameter P01.35.
- Short press the "MODE" key to switch between different display modes.
- Once a fault occurs, the servo driver automatically displays the fault monitoring code.

5.1.4. Data Display

Different data length and negative number display description:

(1) 4 or less digits signed number or 5 or less digits unsigned number

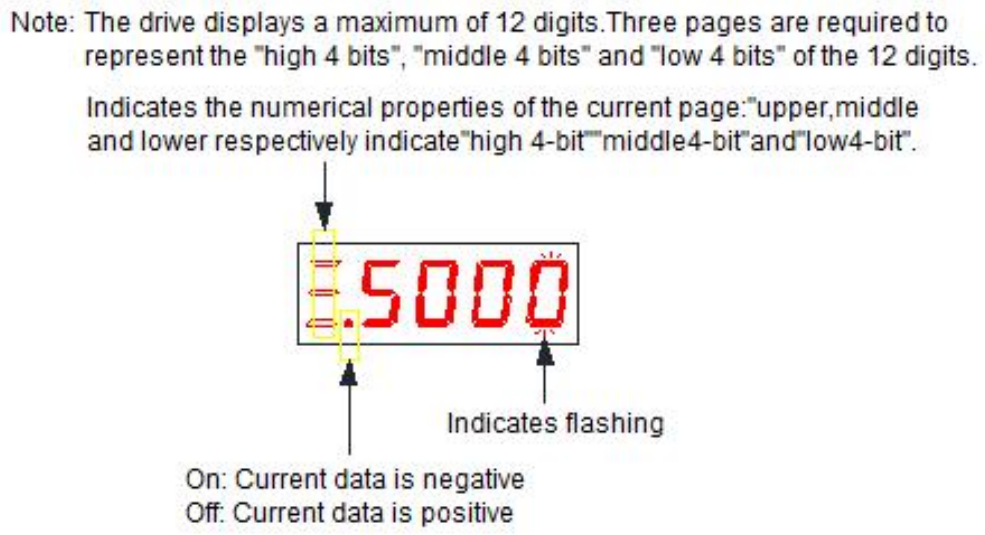
A single-page digital tube (5 digits) is used for display. For signed numbers, the highest digit of the data "-" indicates a negative sign.

1) Display example: -6666 is displayed as follows:

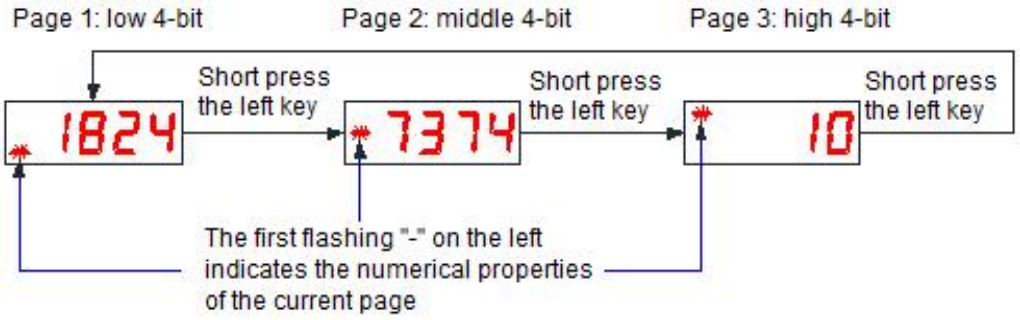
2) Display example: 65535 is displayed as follows:

(2) 4 or more digits signed number or 5 or more digits unsigned number

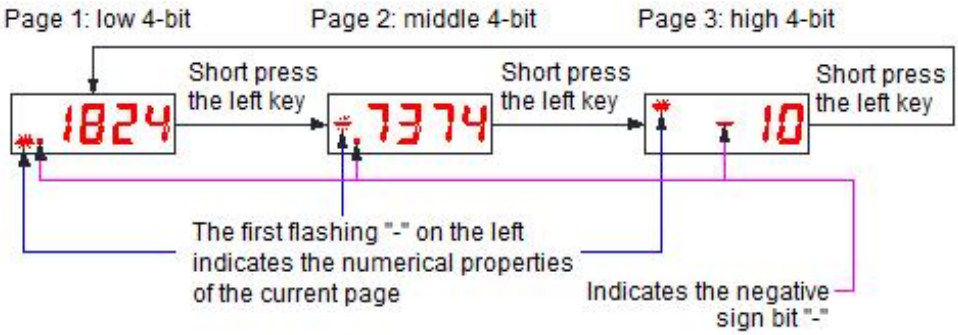
Display in pages from low to high by digits, each 4 digits is a page, display method: current page + current page value, switch the current page by long pressing the M key.



1) Display example: 1073741824 is displayed as follows:

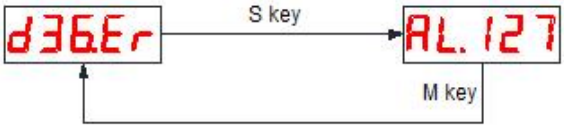


2) Display example: -1073741824 is displayed as follows:



5.1.5. Fault Display

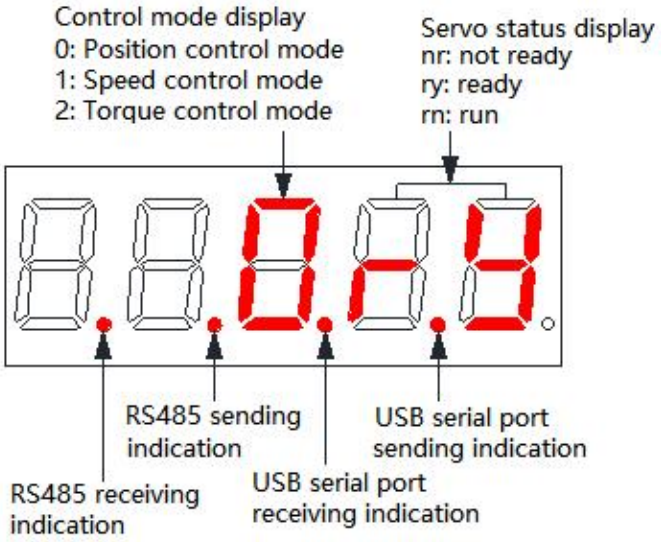
When the driver is in an error state, the LED panel can display related failure information. If the driver generates multiple fault alarms at the same time, the driver panel will jump to display each alarm in turn.



◆ For specific troubleshooting, please refer to the relevant content in chapter 9.

5.1.6. Monitor Display

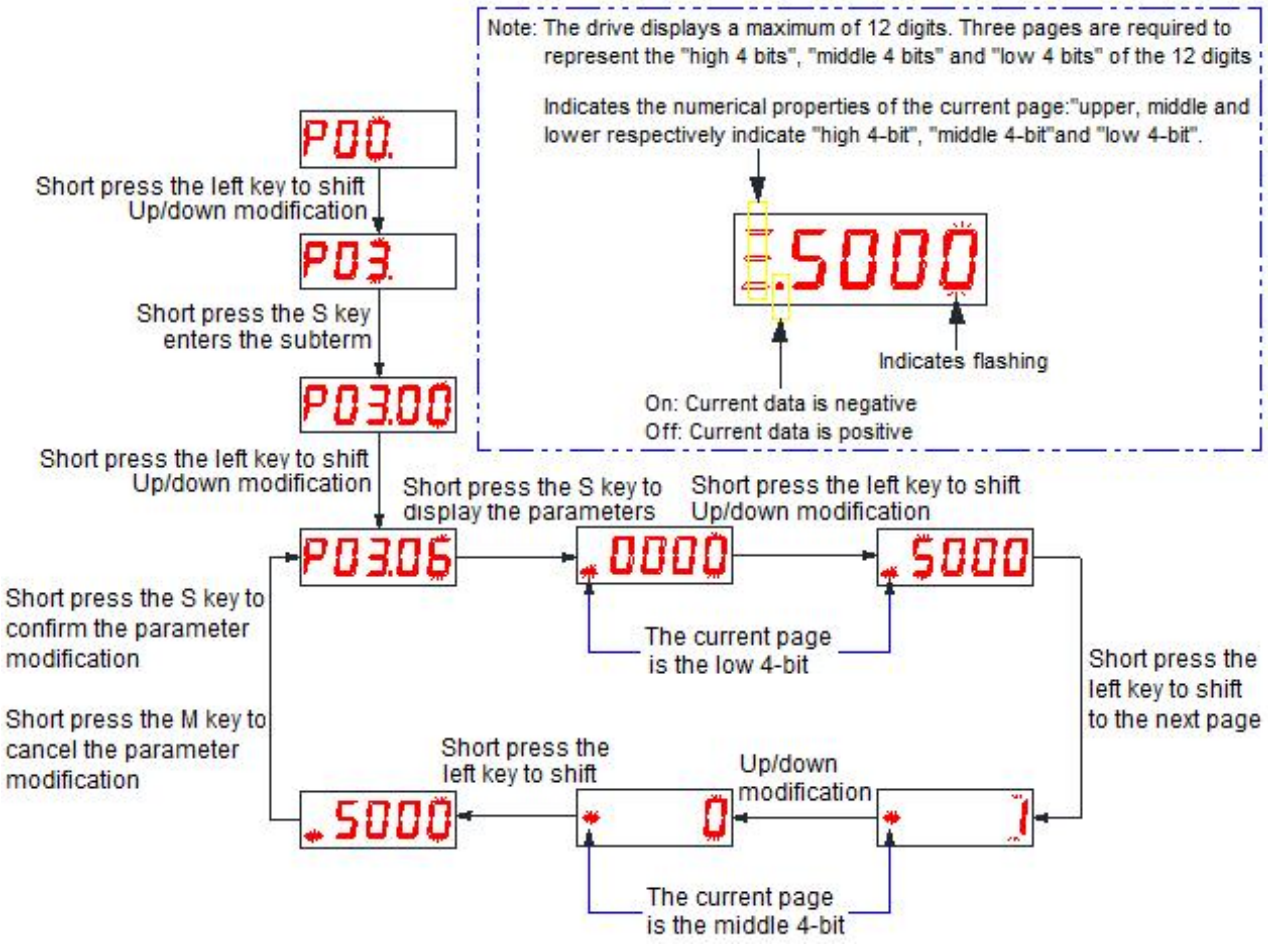
The monitor display is used to monitor the operation status of the servo driver. By setting the parameter code P01.35 (the panel default monitoring object), when the servo driver is powered on and initialized, the display will show the monitoring value of the object. The details about the monitoring display are as follows: For details about the monitoring display object, check the parameters in group P13. (Note: xx in the monitoring object dxx indicates two decimal values, ranging from 00 to 99. The value corresponds to the offset in the parameter group of group P13, that is, d00 corresponds to P13.00 and d36 corresponds to P13.36.) Only d00 objects are listed here:



5.2. Parameter Setting

Use the panel of the servo driver to set the parameters. For parameter details, please read “Chapter 7 Parameter Description”.

Take the LED display panel display parameter menu as an example, change the servo driver P03.06 (Number of position commands for one motor rotation) from the default value of 10000 to 5000 as an example, and proceed with the operation instructions:



Remark:

After confirming and modifying the parameters, they will be immediately written to the EEPROM chip of the driver, and no additional parameter saving operations are required.

5.3. Auxiliary Function

5.3.1. Parameter Management

- Factory reset: set parameter P12.00 to 1
- Clear fault records: set parameter P12.00 to 2

5.3.2. Fault Reset

- Fault reset: set parameter P12.08 to 1.

5.3.3. Absolute Value Operation

- Clear encoder faults: set parameter P12.05 to 1.
- Clear encoder faults and multi-turn values: set parameter P12.05 to 2.

  Note: Clear encoder fault and multi-turn value function is not open, please look forward to it.

5.3.4. Jog Test Machine

Through this operation, the servo driver can be tested.

Press the key to select parameter P12.10, and press the S key to enter the next page. If the driver has no alarm or is not enabled, the LED panel will display the default JOG running speed of 100. You can modify the value by pressing the key, and then press the S key to confirm. The driver LED panel will display “ready”. At this time, you can control the operation of the motor by pressing the up and down keys of the key.

- Note: When using this operation, please disable the servo enable signal.

6. Control Mode

6.1. Position Control Mode

Position control mode is mainly used in occasions that require positioning control, such as manipulators, placement machines, engraving (Pulse train command), CNC machine, etc. Set the value of parameter P01.00 to 0 to enable the driver to work in position control mode.

6.1.1. Position Command Input Setting

In position control mode, the position command source should be set through P03.00 first.

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P03.00	Position command source	0: Pulse command 1: Step amount command 2: Multi-segment position command 3: Communication position command 1 4: Reserve (Don't set) 5: Reserve (Don't set)	Set the source of the position command. The pulse command is an external position command, and the others are internal position commands.	Set after stopping	Effective immediately	0

(1) The source of position command is pulse command (P03.00=0)

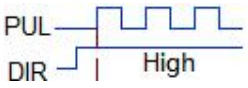
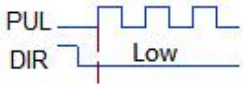
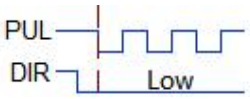
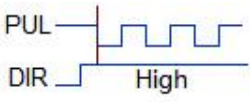
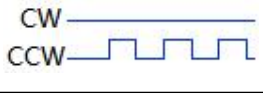
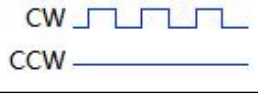
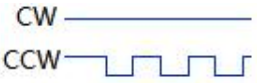
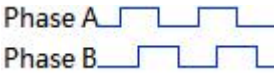
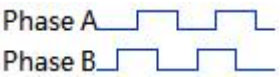
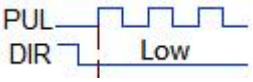
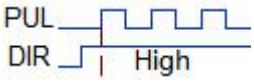
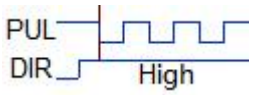
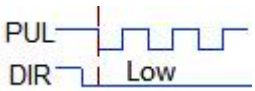
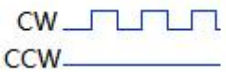
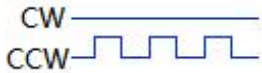
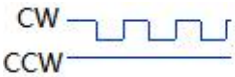
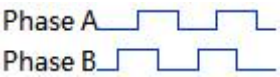
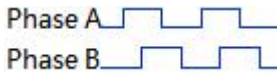
When setting the position command source as pulse command, it is necessary to correctly set the command type of external pulse according to the host computer or other pulse output device:

- ◆ Direction + pulse (positive logic or negative logic)
- ◆ A phase + B phase quadrature pulse, 4 times frequency
- ◆ Positive pulse / Negative pulse（CW + CCW）

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P03.02	Pulse command type	0: Direction + pulse (positive logic) 1: Direction + pulse (negative logic) 2: CW + CCW double-pulse 3: A phase + B phase quadrature pulse 4: Reserve (Don't set) 5: Reserve (Don't set)	Select the type of external pulse command	Set after stopping	Effective immediately	0

★ Description of pulse command types

P01.01 Rotation direction selection	P03.02 Command type setting	Command type	Signal	Schematic diagram of positive pulse	Schematic diagram of reverse pulse
0	0	Pulse + direction positive logic	PUL DIR		
	1	Pulse + direction negative logic	PUL DIR		
	2	CW+CCW double-pulse	PUL(CW) DIR(CCW)		
					
	3	A phase + B phase quadrature pulse 4 times frequency	PUL(A phase) DIR(B phase)	 ● Phase A ahead of phase B by 90°.	 ● Phase B ahead of phase A by 90°.
1	0	Pulse + direction positive logic	PUL DIR		
	1	Pulse + direction negative logic	PUL DIR		
	2	CW+CCW double-pulse	PUL(CW) DIR(CCW)		
					
	3	A phase + B phase quadrature pulse 4 times frequency	PUL(A phase) DIR(B phase)	 ● Phase B ahead of phase A by 90°.	 ● Phase A ahead of phase B by 90°.

(2) The position command source is the step amount command (P03.00=1)

Under this position command source, there is a function that controls the fixed-length forward/reverse rotation of the motor through the external input terminal, the direction of operation is determined by the positive and negative signs of the pulse command stroke.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P03.28	Step size	-32768～32767	Command Unit	Set the stroke of the motor for fixed-length operation: Positive number means forward rotation Negative number means reverse rotation	Set when running	Effective immediately	10000

The startup mode is as follows:

Set the corresponding IN terminal Function to 13 (FunIN13: step position trigger), and confirm the valid logic of the IN terminal Group P02: Terminal Input/Output Parameters.

★ Associated parameter description

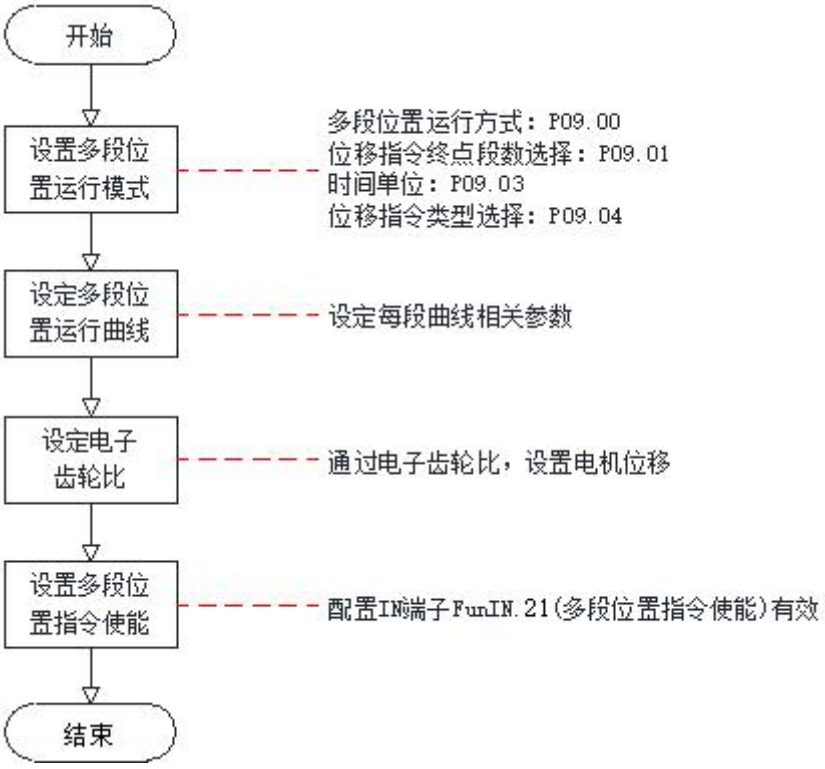
Coding	Function name	Function
FunIN.13	Step amount enable	The servo running status is as follows: Valid: the motor runs the position command stroke set by parameter P03.28. Invalid: the servo motor is in a locked state
FunIN.20	Position command direction selection	0: The running direction is normal 1: The running direction is reversed

FunIN.13 (step amount enable) is valid for edge trigger, the step position command is completed, and the servo motor enters the locked state;if FunIN.13 is triggered again, it is valid, and the servo motor will repeatedly execute the position command stroke set by P03.28.

◆ Note: If the current position command of the motor does not stop running, it will not respond to the re-triggering signal. The user can receive the output signal (FunOUT. 5: internal command completed) through the upper computer, which is used to determine whether the internal pulse of the servo driver has been sent, so as to determine the effectiveness of the second trigger.

(3) The source of position command is multi-segment position command (P03.00=2)

The servo driver has multi-segment position operation function. It means that there are 16 position commands stored in the servo driver, and the displacement, maximum operating speed, acceleration and deceleration time of each segment can be set separately. The waiting time and connection mode between the segments can also be selected according to actual needs. The setting process is as follows:

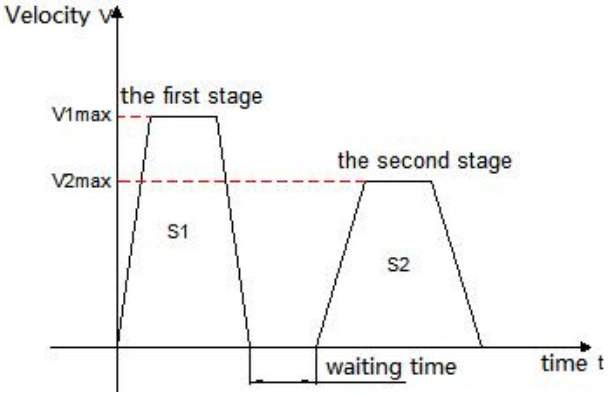


1) Set multi-segment position running mode

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P09.00	Multi-segment running mode	0: Single run 1: Cycle run 2: IN input control	Set the connection mode between operation sections in multi-segment position	Set after stopping	Effective immediately	0
P09.01	Number of displacements	1～16	Set the total segments of the multi-segment position command	Set after stopping	Effective immediately	1
P09.03	Waiting time unit	0：ms 1：s	Set the waiting time unit. Note: the waiting time is only valid when P09.00=0 or 1	Set after stopping	Effective immediately	0
P09.04	Position command type	0: Relative 1: Absolute	Set the type of multi-segment displacement command	Set after stopping	Effective immediately	0

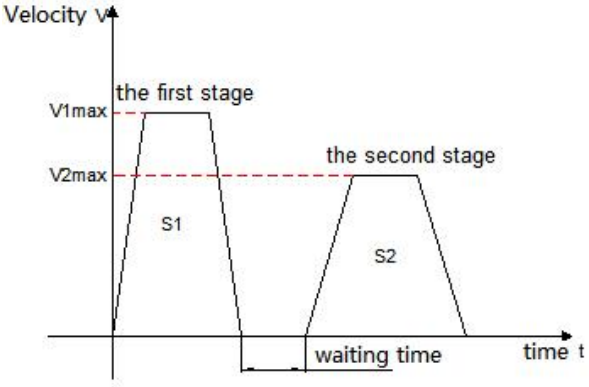
◆ Stop at the end of a single operation (P09.00=0)

Mode description	Running curve
● Run 1 round ● The segment number is automatically incremented and switched ● The waiting time can be set between each segment ● FunIN.21 (Position/Speed table running enable) signal is level effective	 V1max、V2max: Maximum operating speed of the first and second segment S1、S2: Segment 1 and segment 2 displacement ● After each segment of operation is completed, the motor's internal command stop signal output is valid. ● When the multi-segment position command is enabled OFF during operation, the driver gives up the uncompleted displacement of this segment and stops, and the positioning completion signal is valid after the stop is completed. ● Re-enable the multi-segment position command, and the driver will start to run sequentially from the first segment again.

★ Term explanation

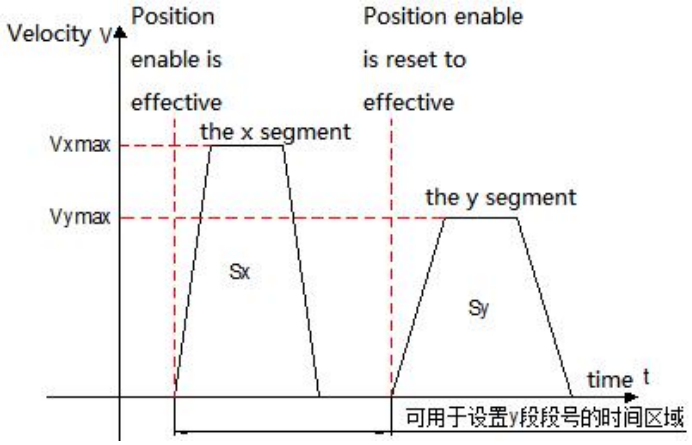
The total number of multi-segment position commands set by P09.01 when the driver completes one run is called the completion of one round of operation.

◆ Cycle operation (P09.00=1)

Mode description	Running curve
● Cyclic running, the starting section number of each round is 1 ● The section number is automatically incremented switched ● Waiting time can be set between each segment ● FunIN. 21 (Position/Speed table running enable) Signal is the level valid, and its signal is valid, and the drive will maintain the cyclic running state	 V1max、V2max: Maximum operating speed of the first and second segment S1、S2: The first segment and the second segment displacement ● After each segment of operation is completed, the motor's internal command stop signal output is valid. ● When the multi-segment position command is enabled OFF during

	operation, the driver gives up the uncompleted displacement of this segment and stops, and the positioning completion signal is valid after the stop is completed. ● Re-enable the multi-segment position command, and the driver will start to run sequentially from the first segment again.

◆ IN port control operation (P09.00=2)

Mode description	Running curve
● When running the current segment number, the next running segment number can be set, and the motor will stop after completing the position command set by the current segment number. After the multi-segment position command enable is set to ON again, run this time period number command ● The segment number is determined by the IN terminal logic ● There is no waiting time between each segment, the interval time is determined by the command delay of the host computer ● FunIN.21 (Position/Speed table running enable) signal is valid for edge change	 Vxmax、Vymax: Maximum operating speed of the x-th and y-th segment Sx、Sy: The x-th segment and the y-th segment displacement ● After each stage of operation is completed, the internal command stop signal output of the motor is valid; ● During operation, the multi-segment position command enable is OFF, the driver continues to execute the unfinished displacement of this segment, and outputs the positioning completion signal ● The switching segment numbers must be in the following order: ①The segment number switch is invalid before the positioning of the x-th segment is completed ②During the x-th segment displacement operation or after the positioning is completed, turn off the multi-segment position command first, and then switch the segment number from x to y (if x=y, the driver will execute the x-segment displacement again) ③After the x-th segment displacement positioning is completed, the multi-segment position command enable is set to ON, and the driver executes the y-th segment displacement

When the multi-segment position operation mode is set to IN switching operation, please configure the 4 IN terminals of the drive (the number of IN terminals required can be set according to the actual number of running stages) as functions 14~17 (FunIN.14~FunIN.17: position/speed table switch), and confirm the valid logic of IN terminal.

★ Description of related coding function

<table>
<tr><th>Coding</th><th>Name</th><th>Function name</th><th>Function</th></tr>
<tr><td>FunIN.14</td><td>CMD1</td><td>Position/speed table 1</td><td rowspan="4">The multi-segment number is a 4-digit binary number, and the corresponding relationship between CMD1～CMD4 and the segment number is as follows:
<table>
<tr><th>CMD4</th><th>CMD3</th><th>CMD2</th><th>CMD1</th><th>Segment</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td colspan="5">……</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>15</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16</td></tr>
</table>
The logic of the IN terminal is level valid, the CMD value is 1 when the input level is valid, otherwise it is 0</td></tr>
<tr><td>FunIN.15</td><td>CMD2</td><td>Position/speed table 2</td></tr>
<tr><td>FunIN.16</td><td>CMD3</td><td>Position/speed table 3</td></tr>
<tr><td>FunIN.17</td><td>CMD4</td><td>Position/speed table 4</td></tr>
</table>

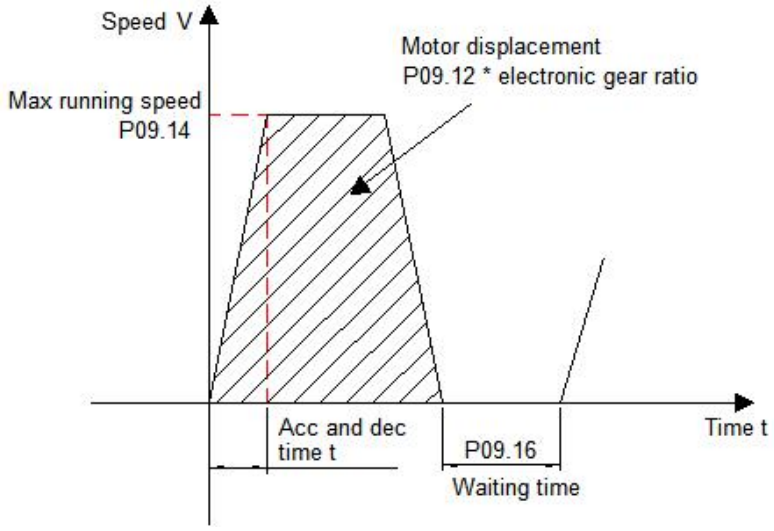
2) Set multi-segment position running curve

The multi-segment position running function can set 16 different position commands, and the displacement, maximum running speed, acceleration and deceleration speed of each segment and the waiting time between segments can be set separately. Take the 1st segment as an example:

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P09.12	Segment 1 moving displacement	-1073741824 ～ 1073741824	Pulse command	Set the sum of position commands in the segment 1	Set when running	Effective immediately	10000
P09.14	Maximum running speed of segment 1 displacement	1~6000	rpm	Set the maximum running speed of segment 1	Set when running	Effective immediately	100
P09.15	Acceleration and deceleration time constant of segment 1 displacement	0~65535	ms	Set the time of constant speed change from 0rpm to 1000rpm for the segment 1 of motor in multi-segment position	Set when running	Effective immediately	100
P09.16	Waiting time after the completion of segment 1 displacement	0~65535	ms(s)	Set the waiting time after the segment 1 positioning is completed	Set when running	Effective immediately	100

According to the above settings, the actual running curve of the motor is shown in the figure below:



Therefore, the actual acceleration time t to P09.14 (Maximum running speed of segment 1 displacement):

$$t = \frac{P09.14}{1000} \times P09.15$$

For the setting of the remaining 15 parameters, please refer to the parameter descriptions in Chapter 7.

3) Multi-segment position command enable

When selecting multi-segment position command as the source of position command, please configure 1 IN terminal of the servo driver as function 21 (FunIN.21: Position/Speed table running enable), and confirm the valid logic of IN terminal.

★ Associated parameter description

Coding	Function name	Function
FunIN.21	Position/speed table running enable	Valid: motor runs multi-segment position command Invalid: the motor is in a locked state Note: When P09.00=0/1, the IN terminal logic corresponding to the FunIN.21 signal is level valid When P09.00=2, the IN terminal logic corresponding to the FunIN.21 signal is valid for edge changes

(4) The source of position command is communication control 1 (P03.00=3)

Under the position command source, the start and stop of the motor can be controlled through communication, and the corresponding parameters can be set to make the motor work continuously in a single direction.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P03.53	Communication control position mode	0～1	-	Set the position mode of drive running 0: Incremental position mode 1: Absolute position mode	Set after stopping	Effective immediately	0
P03.54	Communication control acceleration time	1～65535	ms	Set the time to accelerate uniformly from 0rpm to 1000rpm	Set when running	Effective immediately	100
P03.55	Communication control deceleration time	1～65535	ms	Set the time to decelerate uniformly from 1000rpm to 0rpm	Set when running	Effective immediately	100
P03.56	Communication control speed	0～6000	rpm	Set the speed of communication control running	Set when running	Effective immediately	500
P03.57	Communication control stroke	-1073741824～1073741824	Command pulse	Set the stroke/position of communication control running, Pn229 is the high 16 bits, and Pn228 is the low 16 bits. Communication writing to Pn229 will immediately trigger a run (when the motor is stopped) or dynamically modify the running position (when the motor is running)	Set when running	Effective immediately	10000

The startup method is as follows:

By writing the start and stop command for running through P03.59, the motor will run according to the running curve determined by the command stroke, speed, acceleration and deceleration time constant set by P03.53 ~ P03.57.

Write value in P03.59	Description
0	Write: Null/No function.
1	Write: Trigger the motor to run forward of the command set by P03.57 and stop
2	Write: Trigger the motor to run reverse of the command set by P03.57 and stop
3	Write: Trigger the motor to jog forward
4	Write: Trigger the motor to jog reverse
5	Write: Trigger the motor slow down stop
6	Write: Trigger the motor slow down stop
7	Write: Trigger motor jog start (speed symbol indicates the running direction)

6.1.2. Electronic Gear Ratio

(1) Electronic gear ratio concept

In the position control mode, the input position command (command unit) is to set the load displacement, and the motor position command (encoder unit) is to set the motor displacement, in order to establish the proportional relationship between the motor position command and the input position command, the electronic gear ratio function is introduced.

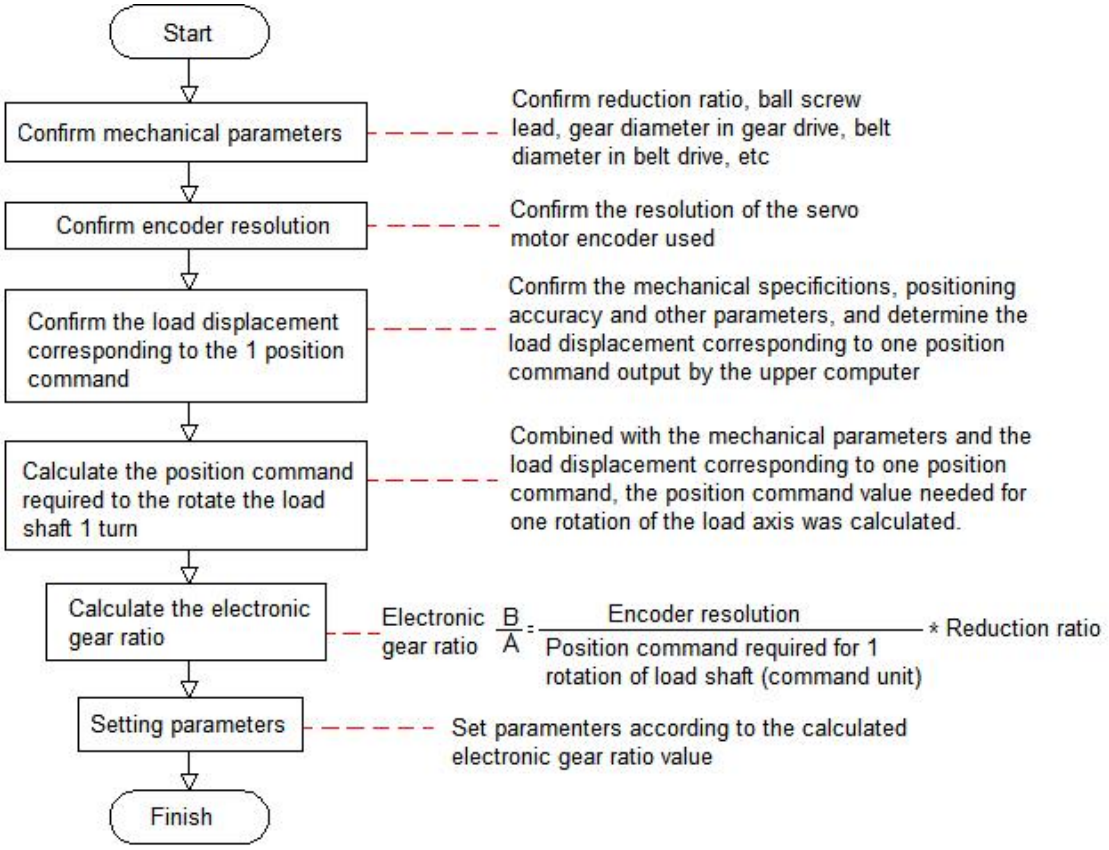
Through the frequency division (electronic gear ratio<1) or frequency multiplication (electronic gear ratio>1) function of the electronic gear ratio, the actual displacement of the motor rotation or movement can be set when the input position command is 1 command unit.

★ Term explanation

Command unit: Refers to the minimum recognizable value input from the upper device to the driver.

Encoder unit: Refers to the value of the input command after processing the electronic gear ratio.

(2) Setting steps of electronic gear ratio



★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P03.06	Pulse per revolution	0～8388608	p/r	Set the number of position commands required for one rotation of motor	Set after stopping	Effective immediately	10000
P03.08	Electronic gear ratio 1 numerator	1～1073741824	-	Set the numerator of electronic gear ratio 1 ● Effective when P03.06 is set to 0	Set after stopping	Effective immediately	1
P03.10	Electronic gear ratio 1 denominator	1～1073741824	-	Set the denominator of electronic gear ratio 1 ● Effective when P03.06 is set to 0	Set after stopping	Effective immediately	1

P03.12	Electronic gear ratio 2 numerator	1～1073741824	-	Set the numerator of electronic gear ratio 2 ● Effective when P03.06 is set to 0	Set after stopping	Effective immediately	1
P03.14	Electronic gear ratio 2 denominator	1～1073741824	-	Set the denominator of electronic gear ratio 2 ● Effective when P03.06 is set to 0	Set after stopping	Effective immediately	1

◆ When P03.06 (number of position commands for one motor rotation) is set to other than 0, the electronic gear ratio $\frac{A}{B}=\frac{Encoder\ resolution}{P03.06}$, at this time, electronic gear ratio 1 (P03.08/P03.10) and electronic gear ratio 2 (P03.12/P03.14) are invalid.

6.1.3. Position Command Filtering

Position command filtering is to filter the position command (encoder unit) after the electronic gear ratio frequency division or frequency multiplication. The methods are average filtering and first-order low-pass filtering.

In the following applications, you should consider adding position command filtering:

◆ The position command output by the host computer has not been processed for acceleration and deceleration

◆ Low pulse command frequency

◆ When the electronic gear ratio is more than 10 times

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P03.04	Position command average filter time	1~1280	0.1ms	Set the time constant for the average value filter of the position command (encoder unit)	Set after stopping	Effective immediately	0
P03.05	Position command low-pass filter time	0~65535	0.1ms	Set the first-order low-pass filter time constant of position command	Set after stopping	Effective immediately	0

◆ This function has no effect on the displacement (total number of position commands)

◆ If the set value is too large, the response delay will increase. The filter time constant should be set according to the actual situation

6.1.4. Positioning Completed Signal

The positioning completion function means that when the drive detects that the position error is less than P03.21 (P03.21: Positioning completed threshold), and it outputs the in-position completion signal when it is maintained for a certain period of time (P03.18: Positioning completed detect time).

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P03.18	Positioning completed detect time	0~65535	ms	Set the detection time when the positioning is completed and the positioning approach signal is valid	Set when running	Effective immediately	0
P03.20	Positioning completed output setting	0~2	-	Set the conditions for positioning completed signal output	Set when running	Effective immediately	0
P03.21	Positioning completed threshold	0~65535	-	Set the positioning accuracy when the motor positioning signal is output	Set when running	Effective immediately	91
P03.22	Positioning proximity threshold	0~65535	-	Set the positioning accuracy when the motor positioning proximity signal is output	Set when running	Effective immediately	91

The output settings for positioning completed are as follows:

◆ When P03.20=0 (Positioning completed output setting)

When the absolute value of the position error is less than P03.21 (positioning completed threshold), the positioning completed signal is output.

When the absolute value of the position error is less than P03.22 (positioning proximity threshold), the positioning proximity signal is output.

◆ When P03.20=1 (Positioning completed output setting)

When the absolute value of the position error is less than P03.21 (positioning completed threshold), and the position command increment after gear ratio transformation and smoothing is 0, and this state continues to exceed the time set in P03.18 (positioning detection time), the positioning completed signal is output.

When the absolute value of the position error is less than P03.22 (positioning proximity threshold), and the position command increment after gear ratio transformation and smoothing is 0, and this state continues to exceed the time set in P03.18 (positioning detection time), the positioning proximity signal is output.

◆ When P03.20=2 (Positioning completed output setting)

When the absolute value of the position error is less than P03.21 (positioning completed threshold), and the position command increment after gear ratio transformation is 0, and this state continues to exceed the time set in P03.18 (positioning detection time), the positioning completed signal is output.

When the absolute value of the position error is less than P03.22 (positioning proximity threshold), and the position command increment after gear ratio transformation is 0, and this state continues to exceed the time set in P03.18 (positioning detection time), the positioning proximity completed signal is output.

6.1.5. Homing Function

(1) Function introduction

- **Origin/Mechanical origin:** The origin is also called mechanical origin, which can be expressed as the origin switch signal or limit switch signal, and is set by parameter P03.41 (Homing mode selection).
- **Zero point:** The positioning target point, which can be expressed as origin + offset (P03.46/P03.47: mechanical origin offset). When the offset is set to 0, the zero point coincides with the origin.
- **Homing function:** The homing function is a function that the motor will actively find the zero point and complete the positioning after triggering the homing function when the drive is enabled. During the operation of homing, other position commands (including the re-triggered homing enable signal) are shielded; After the homing operation is completed, the drive can respond to other position commands. The homing function includes two modes: origin homing and electrical homing.
- **Origin homing:** After the drive receives the homing trigger signal , the drive will actively positioning the relative position between the motor shaft and the mechanical origin according to the preset mechanical origin. First find the origin, and then move the offset to the zero point position based on the origin. The origin homing is usually used to find the zero point for the first time.
- **Electrical homing:** After the zero point position is determined by the origin homing operation, take the current position as the starting point and move a relative displacement.

After the homing is completed (including the origin homing and electrical homing), the current position of the motor (P13.07/P13.08: position command counter) is consistent with the mechanical origin offset (P03.46/P03.47: mechanical origin offset). After the homing is completed, the drive outputs the origin homing completion signal, and the upper computer can confirm that the homing is completed after receiving the signal.

(2) Origin homing

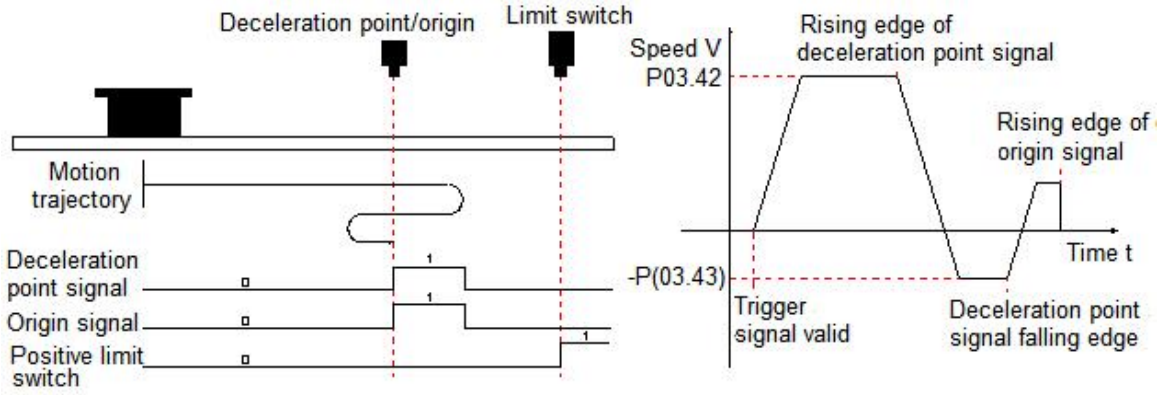
The following cases are used as examples to illustrate the operation mode of origin homing.

- Forward return to origin: deceleration point, origin as origin switch (P03.41 = 0)
- Forward return to origin: deceleration point, origin as forward limit switch (P03.41=2)
- Forward return to origin: deceleration point, origin as mechanical limit position (P03.41=4)

1) Forward return to origin: deceleration point, origin as origin switch (P03.41 = 0)

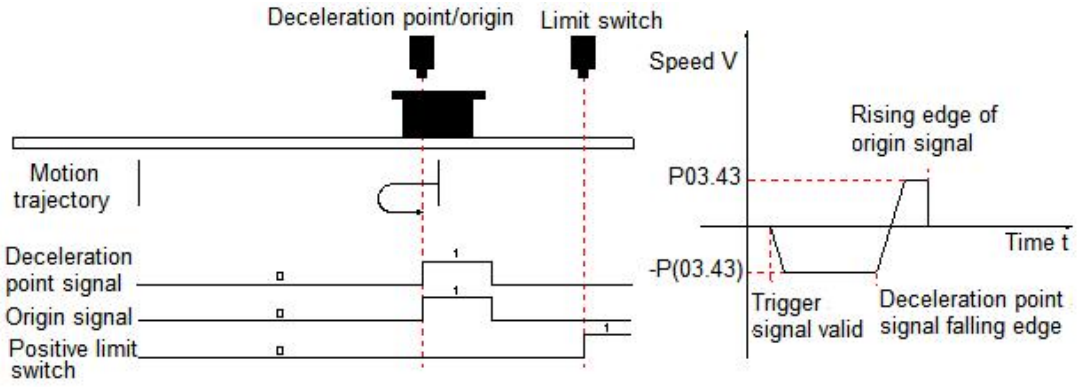
① The origin switch (decelerate point) signal is invalid (0 - invalid, 1 - valid) before the motor returns to origin, and the positive limit switch is not triggered in the whole process.

The motor first searches for the deceleration point signal in the forward direction at the set value of P03.42 (Speed in high-speed homing) until it encounters the rising edge of the deceleration point. After decelerating to 0 according to the deceleration time constant set in P03.44 (Homing acceleration and deceleration time), it reverses the acceleration to the set value of P03.43 (Low speed search origin switch signal) and searches for the deceleration point signal falling edge at low speed. When it encounters the falling edge of the deceleration point signal, it will decelerate and stop, and then continue to search for the rising edge of the deceleration point in the low speed forward direction with the set value of P03.43. During forward acceleration or forward uniform speed operation, the machine will stop immediately when it encounters the rising edge signal of the origin signal.



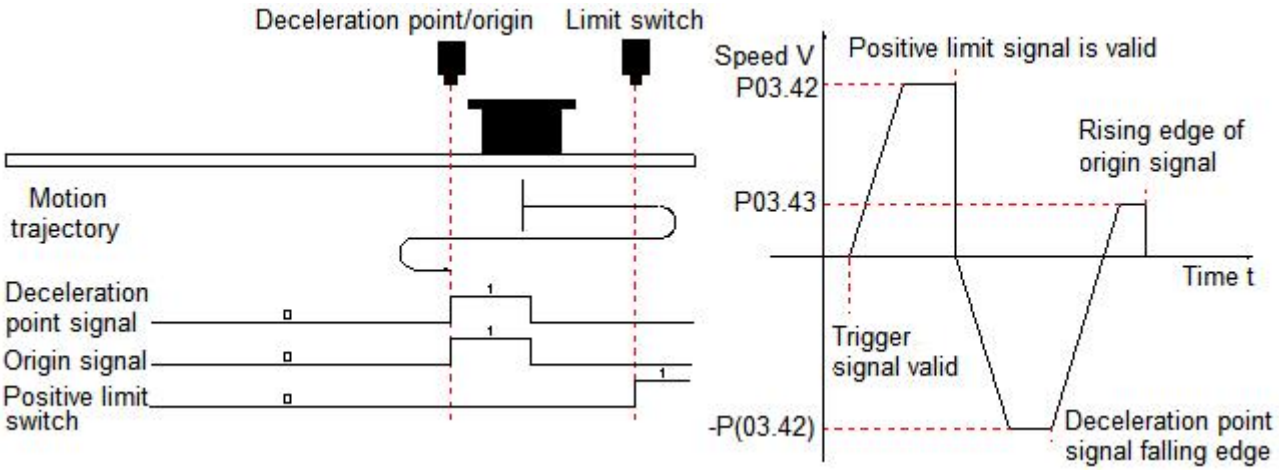
② The origin switch (decelerate point) signal is valid (0 - invalid, 1 - valid) before the motor returns to origin, and the positive limit switch is not triggered in the whole process.

The motor directly searches for the falling edge of the deceleration point signal in the reverse direction at the set value of P03.43 (Low speed search origin switch signal speed), and decelerates to stop when it encounters the falling edge of the deceleration point signal, and then continues to search for the rising edge of the deceleration point signal in the forward direction with the set value of P03.43, and stops immediately when it encounters the rising edge of the origin signal in the forward direction of acceleration or uniform speed operation.



③ **The origin switch (decelerate point) signal is invalid (0 - invalid, 1 - valid) before the motor returns to origin, and the positive limit switch is triggered during the process of returning to origin.**

The motor first searches for the deceleration point signal in the forward direction with the set value of P03.42 (High speed search origin switch signal speed), and stops after encountering the positive limit switch and decelerating to 0 according to the deceleration time constant set in P01.33 (Emergency stop deceleration time constant). And in accordance with P03.49 (Mechanical origin offset and limit processing method), immediately return to the origin in reverse direction (P03.49=2/3), or stop and wait for the upper device to give the trigger signal to return to origin again (P03.49=0/1). After the conditions are met, the motor searches for the falling edge of the deceleration point signal in the reverse direction with the set value of -P03.42. After encountering the deceleration point signal falling edge, decelerate the speed to 0 in accordance with the deceleration time set by P03.44 (Search for the acceleration and deceleration time constant of the zero switch signal), and then forward accelerate to the set value of P03.43 (Low speed search origin switch signal speed), and forward accelerate or forward uniformly in operation, and stop immediately when encountering the signal of the rising edge of the origin signal.

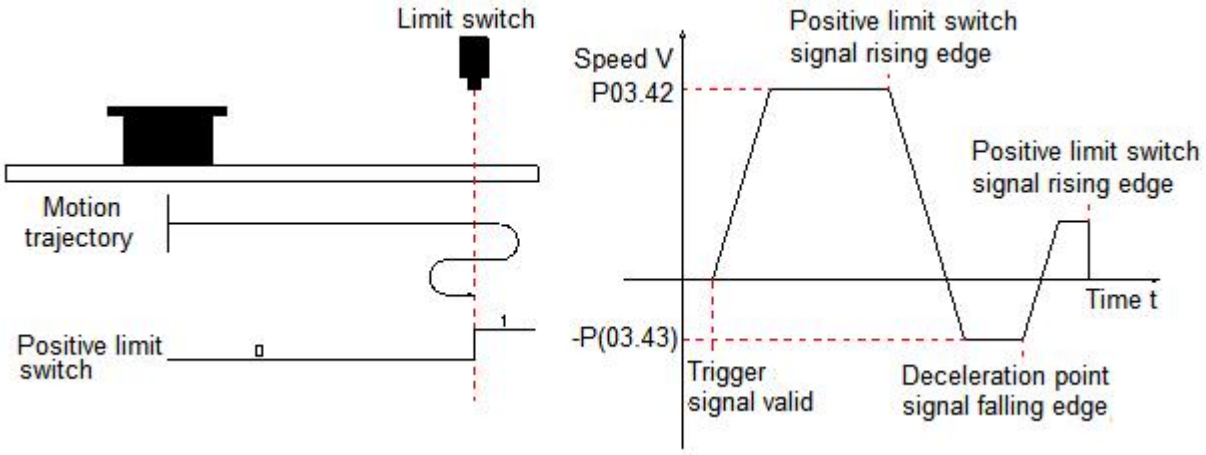


2) Forward return to origin: deceleration point, origin as forward limit switch (P03.41=2)

① **Positive limit switch (deceleration point) signal is invalid (0 - invalid, 1 - valid) before the motor returns to origin.**

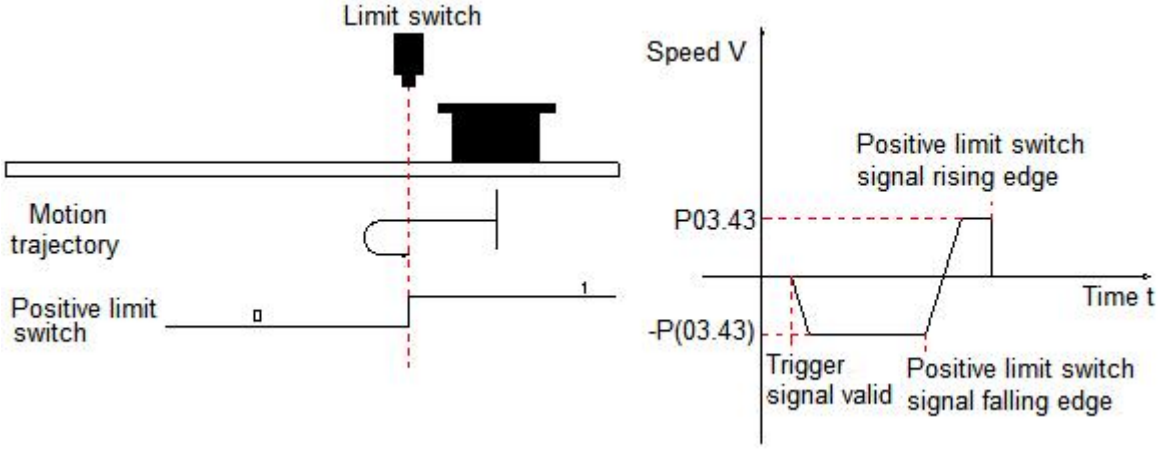
The motor first searches for the deceleration point signal in the forward direction at the value set in P03.42 (High speed search origin switch signal speed) until it encounters the rising edge of the deceleration point. After decelerating to 0 according to the deceleration time set in P03.44 (Search for the acceleration and deceleration time constant of the zero switch signal), the motor accelerates in the reverse direction to the value set in -P03.43 (Low speed search origin switch signal speed) and searches for the deceleration point signal falling edge at low speed. When it encounters the falling edge of the

deceleration point signal, it will decelerate to stop, and then continue to search for the rising edge of the deceleration point in the low speed forward direction with the set value of P03.43. During forward acceleration or forward uniform speed operation, will stop immediately when it encounters the rising edge signal of the positive limit switch signal.



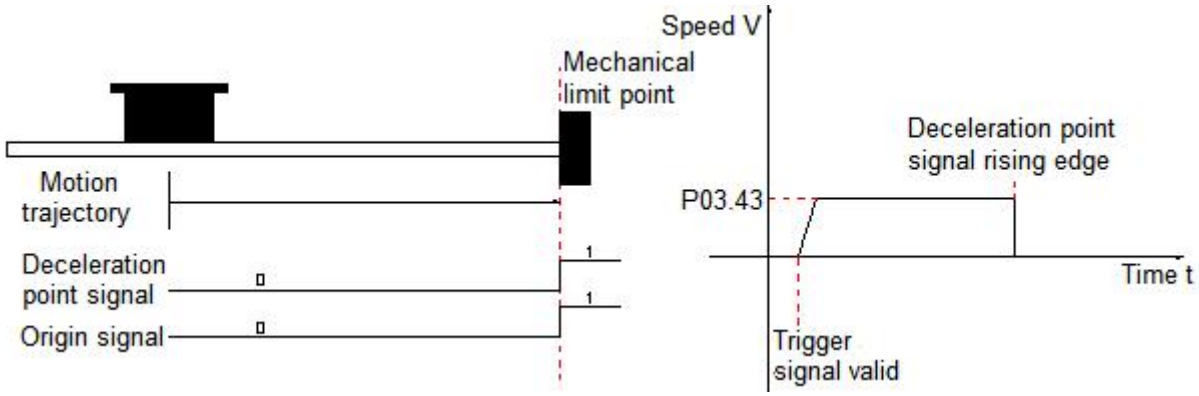
② **Positive limit switch (deceleration point) signal is valid (0 - invalid, 1 - valid) before the motor returns to origin.**

The motor directly searches for the falling edge of the deceleration point signal in the reverse direction at the set value of -P03.43 (Low speed search origin switch signal speed), and immediately decelerates to stop when it encounters the falling edge of the deceleration point signal, and then continues to search for the rising edge of the deceleration point signal in the forward direction with the set value of P03.43, and stops immediately when it encounters the rising edge of the forward limit switch signal during positive acceleration or uniform speed operation.



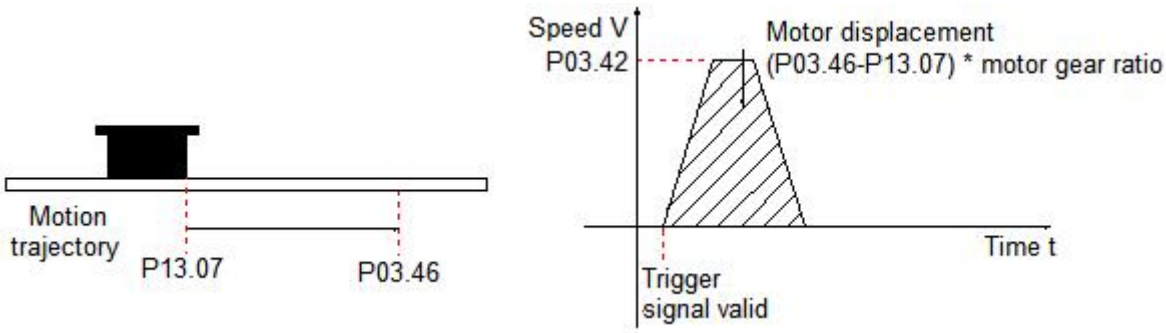
3) Forward return to origin: deceleration point, origin as mechanical limit position (P03.41=4)

The motor first runs at low speed in the positive direction with the set value of P03.43 (Low speed search origin switch signal speed), and after collision to the mechanical limit position, if the motor torque reaches P03.52 (Touch stop homing torque limit) and the actual motor speed is lower than P03.51 (Touch stop homing speed judgment threshold), and this state is maintained for a certain time P03.50 (Touch stop homing time judgment threshold), it is judged that the motor runs to the mechanical limit position and stops immediately.



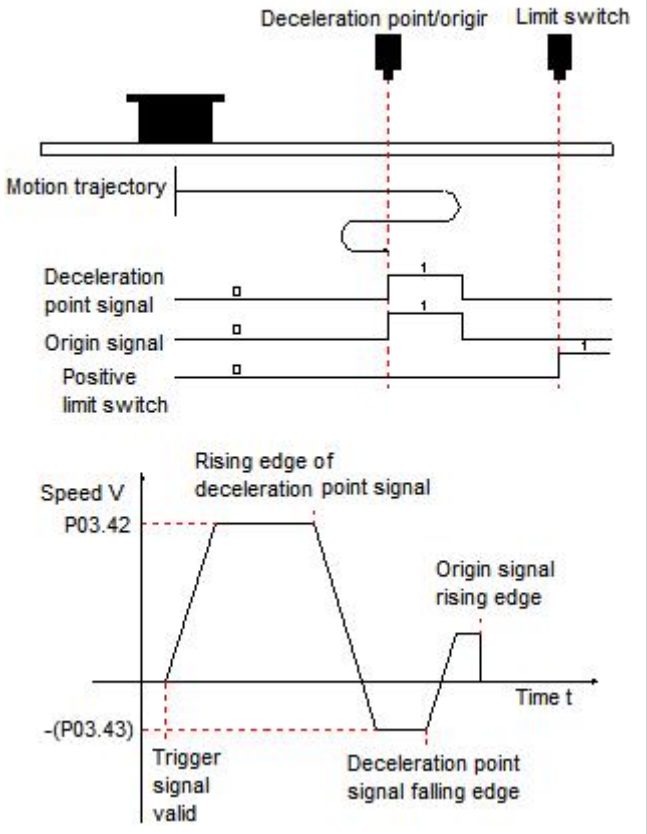
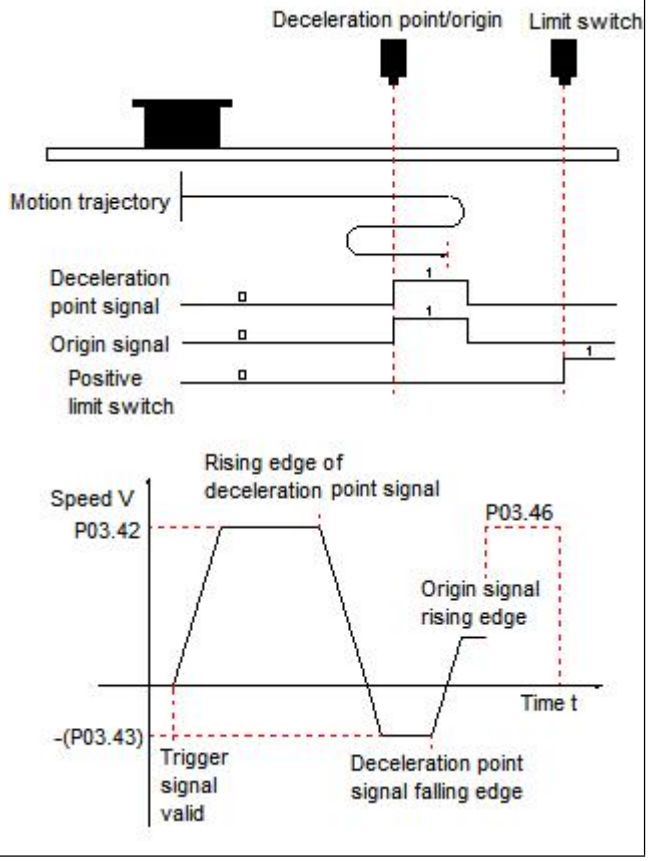
① **Electrical homing**

The mechanical zero point of the system is known after the motor has undergone a mechanical homing operation. At this time, after setting P03.46/P03.47, the motor can be moved from the current position (P13.07/P13.08) to the specified position (P03.46/P03.47). In the electrical homing mode, the motor runs at high speed at the set value of P03.42 (High speed search origin switch signal speed) throughout the entire process, and the total motor displacement is determined by the difference between P13.07/P13.08 and P03.46/P03.47, and the running direction is determined by the positive or negative of the total motor displacement. After the displacement command is completed, the motor will stop.



② Mechanical origin and mechanical zero point

Take P03.41=0 as an example to illustrate the difference between mechanical origin and mechanical zero point:

The mechanical origin does not coincide with the mechanical zero point	The mechanical origin coincides with the mechanical zero point
If the origin offset (P03.46/P03.47) is set and the mechanical origin does not coincide with the mechanical zero point (P03.49=0/2), during forward acceleration or forward uniform operation, the motor stops immediately after encountering the rising edge of the origin signal. And the current position of the motor P13.07/P13.08 is forced to the set value of P03.46/P03.47 after stopping.	If the origin offset (P03.46/P03.47) is set and the mechanical origin coincides with the mechanical zero point (P03.49=1/3), the motor stops immediately after encountering the rising edge of the origin signal during forward acceleration or forward uniform speed operation. After that, the motor stops after running the stroke of the set value P03.46/P03.47. At this time, the current position of the motor P13.07/P13.08 and the set value of P03.46/P03.47 are the same.
	

6.2. Speed Control Mode

Set the value of parameter P01.00 to 1, to enable the driver to work in speed control mode.

6.2.1. Speed Command Input Setting

In speed control mode, the source of speed command should be set by parameter P04.00 first.

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P04.00	Speed command source A	0: Digital given speed 1: AI1 2: AI2 3: Reserved (Don't set) 4: Reserved (Don't set) 5: Multi-segment speed command	Set the speed command source for speed command source A	Set after stopping	Effective immediately	0
P04.01	Speed command source B	0: Digital given speed 1: AI1 2: AI2 3: Reserved (Don't set) 4: Reserved (Don't set) 5: Multi-segment speed command	Set the speed command source for speed command source B	Set after stopping	Effective immediately	0
P04.02	Speed command selection	0: Speed command source A 1: Speed command source B 2: Speed command source A+B 3: Speed command source A/B switching 4: Communication given (P04.30)	Set the source of speed command in speed control mode	Set after stopping	Effective immediately	0

(1) The source of speed command is digital given speed (P04.00=0 / P04.01=0)

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.03	Digital given speed	-6000 ~ 6000	rpm	Set the maximum speed of motor running **Speed is a signed value, a positive number means positive rotation, a negative number means reverse rotation**	Set when running	Effective immediately	100
P04.05	Acceleration time constant	0~65535	ms	Set the time for the motor speed to uniformly accelerate from 0rpm to 1000rpm	Set when running	Effective immediately	100
P04.06	Deceleration time constant	0~65535	ms	Set the time for the motor speed to decelerate uniformly from 1000rpm to 0rpm	Set when running	Effective immediately	100

The startup method is as follows:

The motor starts to run when the servo is enabled, that is, the driver start and stop are controlled by the driver enable signal.

◆ The motor can select the running direction by setting the input terminal function to "FunIN.19 (speed command direction selection)". The actual running direction of the motor is as follows:

P01.01 (Rotation direction selection)	P04.03 (Digital given speed)	Speed command direction setting	Motor actual running speed
0	+	Invalid	CCW
	+	Valid	CW
	-	Invalid	CW
	-	Valid	CCW
1	+	Invalid	CW
	+	Valid	CCW
	-	Invalid	CCW
	-	Valid	CW

(2) The source of speed command is analog speed regulation (P04.00/P04.01=1/2)

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P02.64	AI1 offset	-10000~10000	mV	Set the offset of analog input channel AI1	Set when running	Effective immediately	0
P02.65	AI1 filter time	0~65535	0.01ms	Set the low-pass filter time of analog input channel AI1	Set when running	Effective immediately	200
P02.66	AI1 dead zone	0~10000	0.1mV	Set the dead zone of analog input channel AI1	Set when running	Effective immediately	100
P02.67	AI1 zero drift	-5000~5000	0.1mV	Set the zero drift of analog input channel AI1	Set when running	Effective immediately	0
P02.68	AI2 offset	-10000~10000	mv	Set the offset of analog input channel AI2	Set when running	Effective immediately	0
P02.69	AI2 filter time	0~65535	0.01ms	Set the low-pass filter cutoff frequency of analog input channel AI2	Set when running	Effective immediately	200
P02.70	Ali2 dead zone	0~10000	0.1mV	Set the dead zone of analog input channel AI2	Set when running	Effective immediately	100
P02.71	AI2 zero drift	-5000~5000	0.1mV	Set the zero drift of analog input channel AI2	Set when running	Effective immediately	0
P02.78	Speed value corresponding to 10V	0~6000	rpm	Set the corresponding motor speed when the analog input voltage is 10V	Set when running	Effective immediately	3000
P02.79	Torque value corresponding to 10V	0~5000	0.1%	Set the corresponding motor torque when the analog input voltage is 10V	Set when running	Effective immediately	1000

P12.14	AI zero drift calibration	0~2	-	Calibrate analog channel zero drift 1: Calibrate analog channel AI1 2: Calibrate analog channel AI2 After the zero drift calibration of the analog channel is completed, this parameter automatically changes to 0	Set when running	Effective immediately	0
P13.29	AI1 voltage	-	0.01V	Monitor the current AI1 input voltage (input voltage after zero drift and filtering)	Display	-	-
P13.34	AI2 voltage	-	0.01V	Monitor the current AI2 input voltage (input voltage after zero drift and filtering)	Display	-	-

The startup method is as follows:

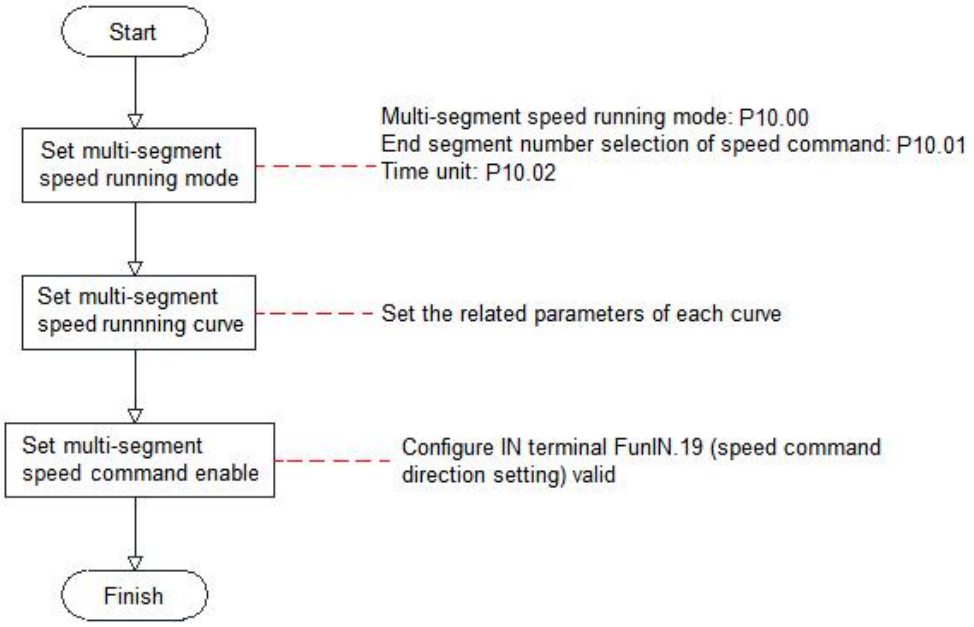
The motor starts running when the servo is enabled, that is, the start and stop of the drive are controlled by the drive enable signal.

- The motor can choose its running direction by setting the input terminal function to "FunIN.19 (speed command direction selection)". The actual running direction of the motor is as follows:

P01.01 (Rotation direction selection)	P04.01 (Speed command digital given value)	Speed command direction setting	Actual running speed of motor
0	+	Invalid	CCW
	+	Valid	CW
	-	Invalid	CW
	-	Valid	CCW
1	+	Invalid	CW
	+	Valid	CCW
	-	Invalid	CCW
	-	Valid	CW

(3) The source of speed command is multi-segment speed command (P04.00=5 / P04.01=5)

The servo driver has the function of multi-segment speed running. It means that there are 16 speed commands stored inside the servo driver, and the maximum running speed and running time of each segment can be set separately. And equipped with 7 groups of acceleration and deceleration time for selection. The setting process is as follows:



1) Set multi-segment speed running mode

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P10.00	Multi-segment speed command running mode	0: Single run 1: Cycle run 2: IN input	Set multi-segment speed command running mode	Set when running	Effective immediately	0
P10.01	Number of speed command end segments	1~16	Set the number of segments required for a multi-step speed command	Set when running	Next run	16
P10.02	Running time unit	0: 0.1s 1: 1min	Select the unit of multi-segment speed command running time	Set when running	Next run	0

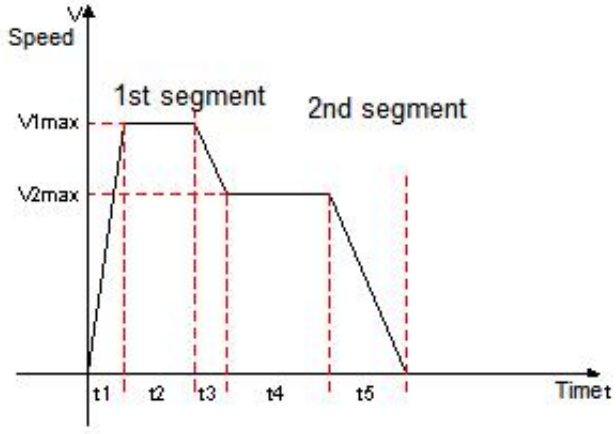
The external IN terminal can be configured with the function FunIN.19 (speed command direction setting) for multi-segment operation command direction selection

Coding	Function name	Function
FunIN.19	Speed command direction selection	Invalid: default command direction Valid: the opposite direction of the command

Take P10.01=2 as an example to illustrate each mode:

◆ **Single run（P10.00=0）**

P10.00 is set to 0 and the single run end stop mode is selected. After setting parameters P10.01 and P10.02 respectively according to the total number of executed segments and execution time units, and setting parameters such as command value, running time and acceleration/deceleration time of the corresponding segment according to the demand, the drive will run from segment 1 to segment N according to the segment code until it stops after running the last segment.

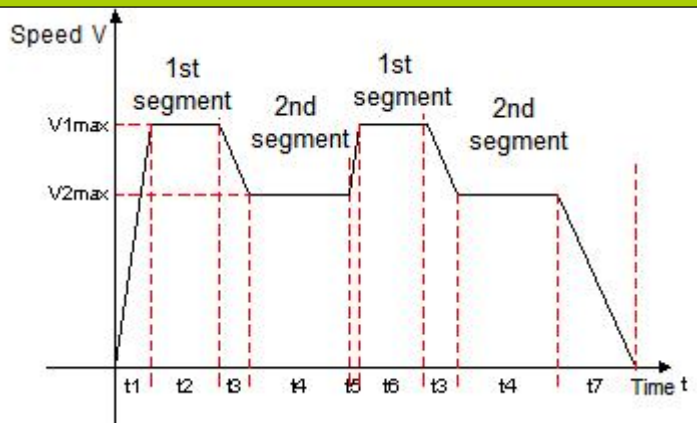
Mode description	Running curve
● Run 1 round ● The segment number is automatically incremented and switched	 V1max、V2max：Command speed of the 1st and 2nd segment. t1：The actual acceleration and deceleration time of the first segment. t3、t5：The actual acceleration and deceleration time of the second segment. ● A certain period of running time: the shifting time of the previous speed command switching to this speed command + the constant speed running time of this segment(for example: the running time of the first segment in the figure is t1+t2, and the running time of the second segment is t3+t4. And so on) ● When a certain period of running time is set to 0, the driver will skip this segment speed command and execute the next segment.

★ Term explanation

The total number of multi-segment speed commands set by P10.01 when the driver completes one run is called the completion of one round of operation.

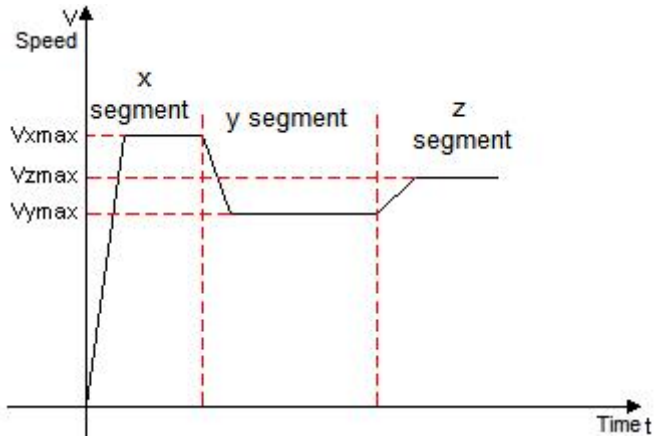
◆ Cycle run (P10.00=1)

P10.00 is set to 1, and the cycle operation mode is selected. After setting the Parameters P10.01 and P10.02 respectively according to the total number of execution segments and execution time unit, and setting the command value, running time, acceleration/deceleration time and other parameters of the corresponding segment according to the demand, the module will run according to the setting of the command running time and acceleration/deceleration time of each segment, and the driver will run in the mode of speed segment from the first segment to the Nth segment, and automatically jump to the first segment for cycle operation after the last segment.

Mode description	Running curve
● Cycle operation, the starting segment number of each round is 1 ● The segment number is automatically incremented and switched ● If the servo enable is valid, the cycle running state will always be maintained	 V1max、V2max：Command speed of the 1st and 2nd segment ● A certain period of running time: the shifting time of the previous speed command switching to this speed command + the constant speed running time of this segment(for example: the running time of the first segment in the figure is t1+t2, and the running time of the second segment is t3+t4. And so on) ● When a certain period of running time is set to 0, the drive will skip this segment speed command and execute the next segment.

◆ IN input control (P10.00=2)

P10.00 is set to 2 to select the external IN port switching mode. After setting the parameter P10.01 according to the total number of execution segments, and set the corresponding segment command value, running time, acceleration/deceleration time and other parameters according to the requirements, the driver will select the speed command value of the corresponding segment number according to the ON/OFF combination of external IN (multi-segment operation command switch x)

Mode description	Running curve
● If the segment number is updated, it can run continuously ● The segment number is determined by the IN terminal logic ● The interval time between segments is determined by the command delay of the host computer ● If the servo enable is valid, the cycle running state will always be maintained.	 x, y: segment number, the logical relationship between segment number and IN terminal is as follows: ● The running time of a certain segment is not affected by the parameter setting value. During the speed command operation of a certain segment, if the segment number changes, it will immediately switch to the new segment number to run.

When the multi-segment position operation mode is set to IN switching operation, please configure the 4 IN terminals of the driver as functions 14～17 (FunIN.14～FunIN.17: multi-segment running command switching), and confirm the valid logic of IN terminal. At the same time, one IN terminal of the servo driver can be configured as function 19 (FunIN.19: speed command direction setting) to switch the speed command direction.

<table>
<tr><th>Coding</th><th>Function name</th><th>Function</th></tr>
<tr><td>FunIN.14</td><td>Position/speed table 1</td><td rowspan="4">The multi-segment segment number is a 4-digit binary number, and the corresponding relationship between CMD1~CMD4 and the segment number is as follows:
<table>
<tr><th>CMD4</th><th>CMD3</th><th>CMD2</th><th>CMD1</th><th>Segment number</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td colspan="5">……</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>15</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16</td></tr>
</table></td></tr>
<tr><td>FunIN.15</td><td>Position/speed table 2</td></tr>
<tr><td>FunIN.16</td><td>Position/speed table 3</td></tr>
<tr><td>FunIN.17</td><td>Position/speed table 4</td></tr>
<tr><td>FunIN.19</td><td>Speed command direction selection</td><td>In multi-segment IN switching operation mode, used to set the speed command direction
Invalid: keep the original command direction
Valid: the direction of the speed command is reversed</td></tr>
</table>

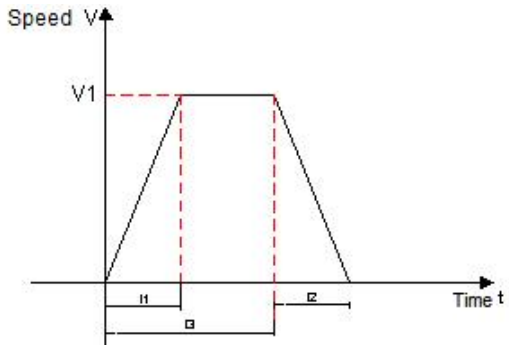
2) Multi-segment speed running curve setting

Take the segment 1 speed command as an example, the relevant parameters are as follows:

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P10.03	Acceleration time constant 1	0~65535	ms	Set the first group acceleration and deceleration time constant	Set when running	Effective immediately	100
P10.04	Deceleration time constant 1	0~65535	ms		Set when running	Effective immediately	100
P10.15	Acceleration time constant 7	0~65535	ms	Set the 7th group acceleration and deceleration time constant	Set when running	Effective immediately	100
P10.16	Deceleration time constant 7	0~65535	ms		Set when running	Effective immediately	100
P10.20	Segment 1 speed command	-6000~6000	rpm	Set the first segment speed command value	Set when running	Effective immediately	100
P10.21	Segment 1 speed command running time	0~65535	0.1s/ 1min	Set the first segment command running time	Set when running	Effective immediately	10
P10.22	Segment 1 speed command acceleration and deceleration time constant selection	0~6	-	Select the first segment acceleration and deceleration mode	Set when running	Effective immediately	1

There are 7 groups of acceleration and deceleration time for selection in the multi-segment speed command parameters, except for the 1 to 16 segments of command value and command running time. The default mode is acceleration and deceleration time constant 1. In the multi-segment speed, P10.00=1, the end of a single operation is taken as an example, and the actual acceleration and deceleration time and running time are explained:



As shown in the figure above, the speed command of this segment is V1, and the actual acceleration time t1 is:

$$t_1 = \frac{V_1}{1000} * The\ acceleration\ time\ of\ the\ speed\ setting$$

Actual deceleration time t2:

$$t_2 = \frac{V_1}{1000} * The\ deceleration\ time\ of\ the\ speed\ setting$$

Running time: the shift time when the previous speed command is switched to this speed command + the constant speed running time of this segment, as shown in t3 in the figure.

(4) The speed command source is communication control (P04.02=4)

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.30	Communication given speed	-9000000 ~ 9000000	0.001rpm	Set the maximum speed of motor operation **Speed is a signed value, a positive number means positive rotation, a negative number means reverse rotation**	Set when running	Effective immediately	0
P04.05	Acceleration time constant	0~65535	ms	Set the time for the motor speed to uniformly accelerate from 0rpm to 1000rpm	Set when running	Effective immediately	100
P04.06	Deceleration time constant	0~65535	ms	Set the time for the motor speed to uniformly decelerate from 1000rpm to 0rpm	Set when running	Effective immediately	100

The startup method is as follows:

The motor starts running when the servo is enabled, that is, the start and stop of the drive are controlled by the driver enable signal.

◆ The motor can choose its running direction by setting the input terminal function to "FunIN.19 (speed command direction selection)". The actual running direction of the motor is as follows:

P01.01 (Rotation direction selection)	P04.30 (Communication given speed)	Speed command direction setting	Motor actual running speed
0	+	Invalid	CCW
	+	Valid	CW
	-	Invalid	CW
	-	Valid	CCW
1	+	Invalid	CW
	+	Valid	CCW
	-	Invalid	CCW
	-	Valid	CW

6.2.2. Speed Related Output Signal

To use the speed signal output function, you need to set the driver output port function parameter to the corresponding output function value.

(1) Motor rotation signal

When the absolute value of the actual motor speed after filtering reaches P04.08 (motor rotation speed), the motor can be regarded as rotating. At this time, the servo driver outputs a motor rotation signal, which is used to transmit that the motor has rotated. Conversely, when the absolute value of the actual motor speed is less than P04.08, it is considered that the motor is not in a rotating state.The judgment of the motor rotating output signal is not affected by the driver operation state and control mode.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.08	Motor rotation speed	0~6000	rpm	Set the motor rotation signal judgment threshold	Set when running	Effective immediately	10

(2) Speed consistent signal

In speed control mode, when the absolute value of the deviation between the actual speed of the servo motor and the speed command after filtering is within the value range set by P04.09, it is considered that the actual speed of the motor reaches the speed command setting value, and the driver outputs a speed consistent signal at this time. Conversely, after filtering, the absolute value of the deviation between the

actual speed of the servo motor and the speed command exceeds the set threshold, and the speed consistent signal is invalid.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.09	Speed consistent width threshold	0~500	rpm	Set speed consistent signal threshold	Set when running	Effective immediately	10

(3) Speed arrival signal

When the absolute value of the actual speed of the servo motor after filtering exceeds the set value of P04.10, it is considered that the actual speed of the servo motor has reached the expected value, and the servo driver can output a speed arrival signal at this time. Conversely, if the absolute value of the actual speed of the servo motor after filtering is not greater than the set value, the speed arrival signal is invalid. The judgment of the motor speed reaching the output signal is not affected by the driver operation state and control mode.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.10	Speed reached threshold	0~6000	rpm	Set speed reached signal judgment threshold	Set when running	Effective immediately	1000

(4) Zero speed signal

When the absolute value of the actual speed of the servo motor after filtering is less than the value set in P04.11, it is considered that the actual speed of the servo motor is close to static, and the servo driver can output a zero speed signal at this time. Conversely, if the absolute value of the actual speed of the servo motor is greater than the set value, it is considered that the motor is not at a standstill and the zero speed signal is invalid.The judgment of the zero speed output signal of the motor is not affected by the operating state and control mode of the driver.

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P04.11	Zero speed output signal threshold	0~6000	rpm	Set the threshold for determining the zero-speed output signal of the motor	Set when running	Effective immediately	10

6.3. Torque Control Mode

6.3.1. Torque Command Input Setting

In the torque control mode, the speed command source should first be set via parameter P05.00

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P05.00	Torque command source A	0: Digital given torque 1: AI1 given torque 2: AI2 given torque 3: Reserved (Don't set) 4: Reserved (Don't set) 5: Reserved (Don't set) 6: Reserved (Don't set) 7: Reserved (Don't set)	-	Set the command source of torque command source A	Set after stopping	Effective immediately	0
P05.01	Torque command source B	0: Digital given torque 1: AI1 given torque 2: AI2 given torque 3: Reserved (Don't set) 4: Reserved (Don't set) 5: Reserved (Don't set) 6: Reserved (Don't set) 7: Reserved (Don't set)	-	Set the command source of torque command source B	Set after stopping	Effective immediately	0
P05.02	Torque command source	0: Torque command source A 1: Torque command source B 2: Torque command source A+B 3: Torque command source A/B switching 4: Communication given torque	-	Set the torque command source in torque mode	Set after stopping	Effective immediately	0

(1) The source of torque command is digital given torque (P05.00=0 / P05.01=0)

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P05.03	Digital given torque	-3000 ~ 3000	0.1%	Set the torque command of motor running ● **Torque command is a signed value, a positive number means positive torque, a negative number means negative torque**	Set when running	Effective immediately	0

The startup method is as follows:

The motor starts to run when the servo is enabled, that is, the driver start and stop are controlled by the driver enable signal.

◆ The motor can select the running direction by setting the input terminal function to "FunIN.18 (torque command direction selection)". The actual running direction of the motor is as follows:

P01.01 (Rotation direction selection)	P05.03 (Torque command digital given value)	Torque command direction setting	Motor actual running speed
0	+	Invalid	CCW
	+	Valid	CW
	-	Invalid	CW
	-	Valid	CCW
1	+	Invalid	CW
	+	Valid	CCW
	-	Invalid	CCW
	-	Valid	CW

(2) The source of torque command is an analog (P05.00/P05.01=1/2)

★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P02.64	AI1 offset	-10000~10000	mV	Set the offset of analog input channel AI1	Set when running	Effective immediately	0
P02.65	AI1 filter time	0~65535	0.01ms	Set the low-pass filter time of analog input channel AI1	Set when running	Effective immediately	200
P02.66	AI1 dead zone	0~10000	0.1mV	Set the dead zone of analog input channel AI1	Set when running	Effective immediately	100
P02.67	AI1 zero drift	-5000~5000	0.1mV	Set the zero drift of analog input channel AI1	Set when running	Effective immediately	0
P02.68	AI2 offset	-10000~10000	mv	Set the offset of analog input channel AI2	Set when running	Effective immediately	0
P02.69	AI2 filter time	0~65535	0.01ms	Set the low-pass filter cutoff frequency of analog input channel AI2	Set when running	Effective immediately	200
P02.70	Ali2 dead zone	0~10000	0.1mV	Set the dead zone of analog input channel AI2	Set when running	Effective immediately	100
P02.71	AI2 zero drift	-5000~5000	0.1mV	Set the zero drift of analog input channel AI2	Set when running	Effective immediately	0
P02.78	Speed value corresponding to 10V	0~6000	rpm	Set the corresponding motor speed when the analog input voltage is 10V	Set when running	Effective immediately	3000
P02.79	Torque value corresponding to 10V	0~5000	0.1%	Set the corresponding motor torque when the analog input voltage is 10V	Set when running	Effective immediately	1000

P12.14	AI zero drift calibration	0~2	-	Calibrate analog channel zero drift 1: Calibrate analog channel AI1 2: Calibrate analog channel AI2 After the zero drift calibration of the analog channel is completed, this parameter automatically changes to 0	Set when running	Effective immediately	0
P13.29	AI1 voltage	-	0.01V	Monitor the current AI1 input voltage (input voltage after zero drift and filtering)	Display	-	-
P13.34	AI2 voltage	-	0.01V	Monitor the current AI2 input voltage (input voltage after zero drift and filtering)	Display	-	-

The startup method is as follows:

The motor starts running when the servo is enabled, that is, the start and stop of the drive are controlled by the drive enable signal.

- The motor can choose its running direction by setting the input terminal function to "FunIN.19 (speed command direction selection)". The actual running direction of the motor is as follows:

P01.01 (Rotation direction selection)	P04.01 (Torque command digital given value)	Torque command direction setting	Actual running speed of motor
0	+	Invalid	CCW
	+	Valid	CW
	-	Invalid	CW
	-	Valid	CCW
1	+	Invalid	CW
	+	Valid	CCW
	-	Invalid	CCW
	-	Valid	CW

6.3.2. Torque Limit Function

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P05.06	Torque limit source	0: Internal torque limit 1: Internal/external torque limit 2: AI channel input limit 3: AI channel input limit or switching the external torque small value 4: Internal torque limit and AI channel input limit switching	Set the torque limit source/mode of the drive	Set when running	Effective immediately	2

P05.06 set value	Running direction	Torque limit input signal	Torque limit value
0	Forward	---	P05.08
	Reverse	---	P05.09
1	Forward	---	P05.08
			P05.10
	Reverse	---	P05.09
			P05.11
2	Forward	-	AIx control (P05.07=0：AI1；P05.07=1：AI2)
	Reverse		
3	Forward	FunIN.33 is invalid	AIx control (P05.07=0：AI1；P05.07=1：AI2)
		FunIN.33 is valid	If AIx input is greater than P05.10: P05.10 If AIx input is less than P05.10: AIx Among than: AIx (P05.07=0: AI1; P05.07=1: AI2)
	Reverse	FunIN.34 is valid	AIx control (P05.07=0：AI1；P05.07=1：AI2)
		FunIN.34 is invalid	If AIx input is greater than P05.11: P05.11 If AIx input is less than P05.11: AIx Among than: AIx (P05.07=0: AI1; P05.07=1: AI2)
4	Forward	FunIN.33 is invalid	P05.08
		FunIN.33 is valid	AIx control (P05.07=0: AI1; P05.07=1: AI2)
	Reverse	FunIN.34 is invalid	P05.09
		FunIN.34 is valid	AIx control (P05.07=0: AI1; P05.07=1: AI2)

6.3.3. Speed Limit in Torque Mode

In the torque control mode, if the given torque command is too large and greater than the mechanical side load torque, the motor will continue to accelerate, overspeed may occur, and the mechanical equipment may be damaged. Therefore, in order to protect the machine, the speed of the motor must be limited.

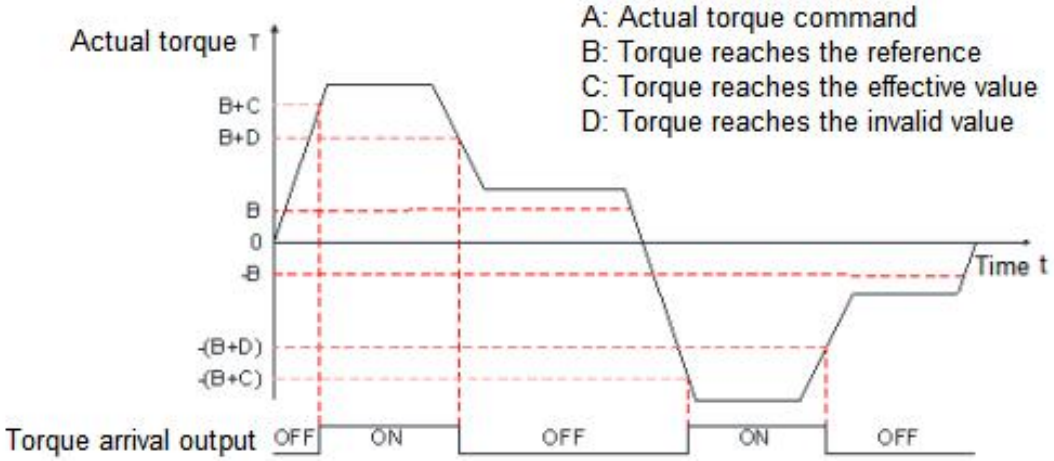
★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P05.12	Torque mode speed limit source	0: Internal speed limit 1: AI input speed limit 2: Select internal speed limit by IN	Set the forward speed limit value in torque control mode	Set when running	Effective immediately	1

P05.12 set value	Running direction	Torque limit input signal	Torque limit value
0	Forward	-	P05.14
	Reverse	-	P05.15
1	Forward	-	If AIx input is less than P05.14: AIx If AIx input is greater than P05.14: P05.14 AIx control (P05.13=0: AI1; P05.13=1: AI2)
	Reverse	-	If AIx input is less than P05.15: AIx If AIx input is greater than P05.15: P05.15 AIx control (P05.13=0: AI1; P05.13=1: AI2)
2	Forward	FunIN.35 is invalid	P05.14
		FunIN.35 is valid	P05.15
	Reverse	FunIN.35 is invalid	P05.14
		FunIN.35 is valid	P05.15

6.3.4. Torque Arrival Output

The torque arrival function is used to determine whether the actual torque command has reached the set interval. When the actual torque command reaches the torque command threshold, the driver can output the corresponding output signal (torque arrival) for the host computer to use the "Group P02: Input/Output Terminal Parameters".



Actual torque command (The value of parameter P13.03 can be read by communication):

When the torque reaches the output signal from invalid to valid, the actual torque command must satisfy:

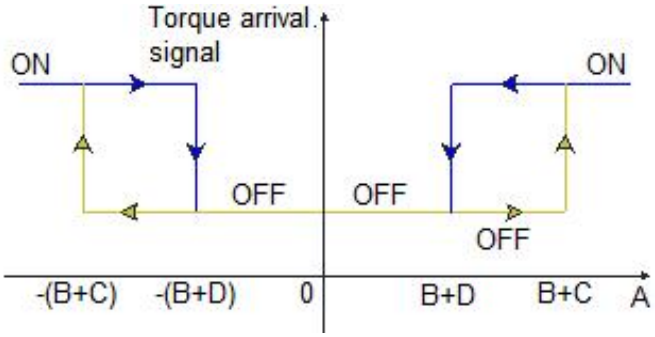
$$|\mathrm{A}| \geq B + C$$

Otherwise, the torque arrival output signal remains invalid.

Conversely, when the torque arrival signal from valid to invalid, the actual torque command must satisfy:

$$|\mathrm{A}| < \mathrm{B} + \mathrm{D}$$

Otherwise, the torque arrival output signal remains valid



★ Associated parameter description

Parameter	Name	Range	Unit	Function	Setting method	Effective time	Default
P05.16	Torque reaches output reference value	0~3000	0.1%	Set the reference value of the motor torque when the running torque reaches the signal output	Set when running	Effective immediately	0
P05.17	Torque reaches output effective value	0~3000	0.1%	Set the effective value of the motor torque when the running torque reaches the signal output	Set when running	Effective immediately	300
P05.18	Torque reaches output invalid value	0~3000	0.1%	Set the invalid value of the motor torque when the running torque reaches the signal output	Set when running	Effective immediately	200

6.4. Hybrid Control Mode

The hybrid control mode means that when the servo enable bit is ON and the servo state is running, the working mode of the servo driver can be switched between different control modes

- ◆ Speed mode - Torque mode
- ◆ Position mode - Speed mode
- ◆ Position mode - Torque mode
- ◆ Position mode - Speed mode - Torque mode

Set by parameter P01.00 (control mode selection), as shown in the following table:

★ Associated parameter description

Parameter	Name	Range	Function	Setting method	Effective time	Default
P01.00	Control mode selection	0: Position control mode 1: Speed control mode 2: Torque control mode 3: EtherCAT/CANopen control mode 4：Speed mode – Torque mode 5：Position mode – Speed mode 6：Position mode – Torque mode 7：Position mode – Speed mode - Torque mode 8: CANopen control mode	Set the control mode of the servo drive	Set after stopping	Effective immediately	0

When P01.00 is set to 4/5/6, please configure an IN terminal of the servo driver as function 10 (FunIN.10: control mode selection 1), and determine the effective logic level value of the IN terminal. When P01.00 is set to 7, please configure the two IN terminals of the servo driver as function 10 (FunIN.10: control mode selection 1) and function 29 (FunIN.29: control mode selection 2) respectively. And determine the effective logic level of these two IN terminals.

★ Associated function coding

<table>
<tr><th>Coding</th><th>Name</th><th>Function</th></tr>
<tr><td>FunIN.10</td><td>Control mode selection 1</td><td>Used to set the current control mode of servo drive in hybrid control mode:
<table>
<tr><th>P01.00</th><th>FunIN.10 logic</th><th>Control mode</th></tr>
<tr><td rowspan="2">4</td><td>Invalid</td><td>Speed control mode</td></tr>
<tr><td>Valid</td><td>Torque control mode</td></tr>
<tr><td rowspan="2">5</td><td>Invalid</td><td>Position control mode</td></tr>
<tr><td>Valid</td><td>Speed control mode</td></tr>
<tr><td rowspan="2">6</td><td>Invalid</td><td>Position control mode</td></tr>
<tr><td>Valid</td><td>Torque control mode</td></tr>
</table></td></tr>
<tr><td>FunIN.29</td><td>Control mode selection 2</td><td>Used to set the current control mode of servo drive in hybrid control mode:
<table>
<tr><th>P01.00</th><th>FunIN.29 logic</th><th>FunIN.10 logic</th><th>Control mode</th></tr>
<tr><td rowspan="3">7</td><td>Invalid</td><td>Invalid</td><td>Position control mode</td></tr>
<tr><td>Invalid</td><td>Valid</td><td>Speed control mode</td></tr>
<tr><td>Valid</td><td>-</td><td>Torque control mode</td></tr>
</table></td></tr>
</table>

6.5. Absolute System

6.5.1. Absolute System Instructions

The absolute encoder not only detects the position of the motor within one revolution, but also counts the number of motor rotations, and can memorize 16-bit multi-turn data. The absolute system composed of absolute encoders is divided into absolute position linear mode and absolute position rotation mode, which can be used in position, speed, and torque control modes. When the driver is powered off, the encoder backs up data through the battery. After power on, the driver calculates the mechanical absolute position through the encoder's absolute position, without the need to repeat the mechanical origin homing operation.

When the absolute value motor is first connected, AL.221 (encoder battery fault) or AL.222 (encoder multi-turn counting fault) will occur. After connecting the battery, set P12.05=1 (reset encoder fault), and then perform the homing operation.

◆ Note: When modifying P01.01 (running positive direction selection) or executing P12.05 (absolute value encoder reset), the absolute position of the encoder will undergo a sudden change, resulting in a change in the mechanical absolute position reference. Therefore, it is necessary to perform the mechanical zero return operation again. When using the internal zero return function of the driver, after the zero return is completed, the driver will automatically calculate the mechanical absolute position and encoder absolute position deviation, and store them in the EEPROM chip of the driver.

★ Associated parameter description

P01.03	Name	Position mode selection					Data structure	-	Data type	Uint16
	Data range	0~2	Factory setting	0	Accessibility	RW	Related mode	ALL	Mapping	NO
Used to set the absolute position mode: 0- Incremental position mode 1- Absolute linear position mode 2- Absolute rotation position mode (reserved, do not set) ● Note: After reading the parameters stored in the encoder storage chip when powered on by the driver, if the motor is a multi turn absolute value motor (i.e. when P00.34 is set to 1), the default factory parameters will automatically set the value of P01.03 to 1. If this function needs to be disabled, it can be resolved by setting P01.18 to 1.										

P01.18	Name	Auto setting absolute mode					Data structure	-	Data type	Uint16
	Data range	0~1	Factory setting	1	Accessibility	RW	Related mode	ALL	Mapping	NO
Set whether to automatically set the parameters of P01.03 to absolute linear position mode function based on encoder type P00.34: 0- Prohibit (the parameter value of P01.03 is set by the user) 1- Enable (if the current encoder type is multi turn absolute and the value of P01.03 is not 2 (absolute rotation position mode), automatically set the value of P01.03 to 1 (absolute linear position mode)) ● Note: The parameters need to be powered off and restarted before taking effect.										

P01.51	Name	Disable encoder multi-turn overflow fault					Data structure	-	Data type	Uint16
	Data range	0~1	Factory setting	0	Accessibility	RW	Related mode	ALL	Mapping	NO
Used to set the absolute position mode: 0- When encountering encoder multi-turn overflow fault, the drive reports an error 1- Prohibit encoder multi-turn overflow fault reporting										

P12.05	Name	Absolute encoder reset					Data structure	-	Data type	Uint16
	Data range	0~2	Factory setting	0	Accessibility	RW	Related mode	ALL	Mapping	NO
Used to set the absolute position mode: 0- No effect/reset operation completed 1- Reset absolute value encoder fault 2- Reset absolute encoder fault and multi-turn data										

6.5.2. Encoder Position Feedback

P13.24	Name	Encoder single-turn value (Encoder unit)					Data structure	-	Data type	Int32
P13.25	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.26	Name	Encoder multi-turn value (Revolutions)					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.60 P13.61	Name	Encoder real-time position, low 32-bit (Encoder unit)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.62 P13.63	Name	Encoder real-time position, high 32-bit (Encoder unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

- The absolute encoder number of turns (P13.26) is an unsigned number, ranging from 0 to 65535. Assuming the encoder resolution is R_E(R_E=2^{17}), the absolute encoder single-turn value (P13.24) ranges from 0 to R_E。
- Encoder real-time position (P13.62×2^{32}+P13.60) can be calculated through P13.24、P13.26 and R_E, and the calculation formulas are as follows:
  When the value of P13.26 is less than 32768: (P13.62×2^{32}+P13.60) = P13.24 × R_E + P13.24
  When the value of P13.26 is greater than or equal to 32768:
  (P13.62 × 2^{32} + P13.60) = (P13.24 - 65536) × R_E + P13.24

6.5.3. Absolute Linear Position Mode

P13.09	Name	Actual position (Command unit)					Data structure	-	Data type	Int32
P13.10	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.60 P13.61	Name	Encoder real-time position, low 32-bit (Encoder unit)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.62 P13.63	Name	Encoder real-time position, high 32-bit (Encoder unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.64 P13.65	Name	Real-time mechanical position, low 32-bit (Encoder unit)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.66 P13.67	Name	Real-time mechanical position, high 32-bit (Encoder unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

At the initial stage of power on, its value is equal to the selected load single-turn position (P13.70/P13.72), and then the monitoring object accumulates and calculates based on the encoder position feedback. If the position feedback exceeds the value range of the object, there will be a winding phenomenon.

Assuming that the number of encoder pulses corresponding to one revolution of the load is R_M, then real-time mechanical position $(\mathrm{P13.64} * 2^{32} + P13.66)$ = number of turntable revolutions * R_M+P13.74.

- The absolute linear position mode is mainly used in situations where the load stroke range of the device is fixed and the encoder's multi-turn data will not overflow.
- Assuming the real-time mechanical absolute position P13.64/P13.66 is P_M (P_M=P13.66×2^{32}+P13.67), encoder real-time position P13.60/P13.62 is P_E (P_E=P13.60×2^{32}+P13.62), with an absolute zero offset of P_O (P_O=P03.64×2^{32}+P03.66), then the relationship between the three is P_M=P_E-P_O。
- Assuming that the numerator/denominator of the electronic gear ratio is N/D then the real-time position (P13.09)=P_M×D/N。
- The absolute zero offset (P03.64/P03.66) defaults to 0. After the internal homing function of the driver is completed, the driver automatically calculates the deviation between the encoder's real-time position and the real-time mechanical position. The deviation value is the value of P03.64/P03.66 and is saved in the driver's EEPROM.
- The absolute zero offset (P03.64/P03.66) defaults to 0. After the internal homing function of the driver is completed, the driver automatically calculates the deviation between the encoder's real-time position and the real-time mechanical position. The deviation value is the value of P03.64/P03.66 and is saved in the driver's EEPROM.
- The absolute linear position mode encoder has a multi-turn data range of -32768 to 32767. If the number of forward turns is greater than 32767 or the number of reverse turns is less than -32768, the driver will experience AL.223 (encoder multi-turn count overflow fault), which can be masked by setting P01.51.

6.5.4. Absolute Rotation Position Mode

P03.68	Name	Absolute rotation mode mechanical gear ratio numerator					Data structure	-	Data type	Uint16
	Data range	1~65535	Factory setting	1	Accessibility	RW	Related mode	ALL	Mapping	NO
It only works when the number of encoder pulses (P03.70/P03.72) for one revolution of the load in absolute value rotation mode is set to 0. In this setting, assuming the encoder resolution is R_E and the number of encoder pulses corresponding to one revolution of the load is R_M, then $R_M = R_E \times P03.68 / P03.69$.										

P03.69	Name	Absolute rotation mode mechanical gear ratio denominator					Data structure	-	Data type	Uint16
	Data range	1~65535	Factory setting	1	Accessibility	RW	Related mode	ALL	Mapping	NO

P03.70 P03.71	Name	Number of encoder pulses for one revolution of the load in absolute rotation mode, low 32-bit					Data structure	-	Data type	Uint32
	Data range	$0 \sim 2^{32} - 1$	Factory setting	1	Accessibility	RW	Related mode	ALL	Mapping	NO

P03.72 P03.73	Name	Number of encoder pulses for one revolution of the load in absolute rotation mode, high 32-bit					Data structure	-	Data type	Int32
	Data range	$-2^{31} \sim 2^{31} - 1$	Factory setting	0	Accessibility	RW	Related mode	ALL	Mapping	NO
When the number of encoder pulses (P03.70/P03.72) for one revolution of the load in absolute value rotation mode is set to 0, the number of encoder pulses corresponding to one revolution of the load is determined by P03.68 and P03.69. When the value set for this object is non-zero, assuming the encoder resolution is R_E and the number of encoder pulses corresponding to one revolution of the load is R_M, then $R_M = P03.72 * 2^{32} + P03.70$.										

P13.09 P13.10	Name	Actual position (Command unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO
At the initial stage of power on, its value is equal to the selected load single-turn position (P13.74/P13.75), and then the monitoring object accumulates and calculates based on the encoder position feedback. If the position feedback exceeds the value range of the object, there will be a winding phenomenon. Assuming that the number of encoder pulses corresponding to one revolution of the load is R_M, then P13.09=number of turntable revolutions * R_M+P13.74.										

P13.64 P13.65	Name	Real-time mechanical position, low 32-bit (Encoder unit)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.66 P13.67	Name	Real-time mechanical position, high 32-bit (Encoder unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

At the initial stage of power on, its value is equal to the selected load single-turn position (P13.70/P13.72), and then the monitoring object accumulates and calculates based on the encoder position feedback. If the position feedback exceeds the value range of the object, there will be a winding phenomenon.

Assuming that the number of encoder pulses corresponding to one revolution of the load is R_M, then real-time mechanical position $(\mathrm{P13.64} * 2^{32} + P13.66)$ = number of turntable revolutions * R_M+P13.74.

P13.70 P13.71	Name	Rotation load single-turn position, low 32-bit (Encoder unit)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

P13.72 P13.73	Name	Rotation load single-turn position, high 32-bit (Encoder unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

Assuming that the number of encoder pulses corresponding to one revolution of the load is R_M, then the numerical range for rotation load single-turn position (encoder unit, $\mathrm{P13.72} * 2^{32} + P13.70$) is 0~$R_M$

P13.74 P13.75	Name	Rotation load single-turn position (Command unit)					Data structure	-	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related mode	ALL	Mapping	NO

Assuming that the numerator/denominator of the electronic gear ratio is N/D, the numerical range for rotation load single-turn position is $0 \sim R_M * D/N$. $\mathrm{P13.74} = (\mathrm{P13.72} * 2^{32} + \mathrm{P13.70} * D/N$.

6.5.5. Precautions for Using the Absolute System Battery Box

- When the battery is first connected, AL.221 (encoder battery failure) will occur. P12.05=1 needs to be set to reset the encoder fault before proceeding with absolute position system operation.
- When the detected battery voltage is less than 3.0V, AL.418 (encoder battery warning) will occur. Please replace the battery with a new one as follows:
  Step 1: Power on the drive and put it in a non-operating state;
  Step 2: Replace the battery;
  Step 3: After the driver automatically releases AL.418 (encoder battery warning), there are no other abnormal warnings and it can operate normally.
- In the case of servo power failure, replacing the battery and powering on again will cause AL.221 (encoder battery failure), causing sudden changes in multi-turn data. Please set P12.05=1 to reset the encoder fault and perform the origin homing function operation again.
- If the driver is in a power-off state, please ensure that the maximum motor speed does not exceed 6000rpm to ensure that the encoder position information is accurately recorded..
- During storage, please store according to the specified ambient temperature and ensure reliable battery contact and sufficient power, otherwise it may cause the loss of encoder position information.
- Encoder battery specification: 3.6V, 2500mAh.

7. Parameter Description

Parameter group	Parameter group description
P00	Servo parameters
P01	Basic control parameters
P02	Input/output terminal parameters
P03	Position control parameters
P04	Speed control parameters
P05	Torque control parameters
P06	Gain parameters
P07	Auto-tuning parameters
P08	Communication parameters
P09	Multi-segment position control parameters
P10	Multi-segment speed control parameters
P12	Auxiliary function parameters
P13	Monitor parameters
P14	Auxiliary parameters

7.1. Group P00: Servo Parameters

P00.00	Name	Motor model			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	50000

P00.01	Name	Drive model			Related mode	Display
	Setting range	0~65535	Unit	-	Factory setting	34

Display servo drive model

Display value	Description
0x22(34)	R6L028M
0x23(35)	R6L042M
0x27(39)	R6L076M
0x26(38)	R6L120M

P00.02	Name	Servo software version			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.05	Name	Drive hardware version			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.07	Name	Servo customized No.			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.09	Name	Software build number			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.10	Name	Reserved			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.13	Name	Internal marco			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.16	Name	Motor ID			Related mode	Display
	Setting range	0~65535	Unit	-	Factory setting	50604

P00.17	Name	Motor rated power			Related mode	-
	Setting range	0~65535	Unit	0.01KW	Factory setting	40

P00.18	Name	Motor rated voltage			Related mode	-
	Setting range	0~65535	Unit	V	Factory setting	220

P00.19	Name	Motor rated current			Related mode	-
	Setting range	0~65535	Unit	0.1A	Factory setting	23

P00.20	Name	Motor rated speed			Related mode	-
	Setting range	0~65535	Unit	rpm	Factory setting	3000

P00.21	Name	Motor maximum speed			Related mode	-
	Setting range	0~65535	Unit	rpm	Factory setting	5000

P00.22	Name	Motor rated torque			Related mode	-
	Setting range	0~65535	Unit	0.01Nm	Factory setting	127

P00.23	Name	Motor maximum torque			Related mode	-
	Setting range	0~65535	Unit	0.01Nm	Factory setting	381

P00.24	Name	Motor moment of inertia			Related mode	-
	Setting range	0~65535	Unit	0.01kg.cm^2	Factory setting	63

P00.25	Name	Motor pole pairs			Related mode	-
	Setting range	0~65535	Unit	Pole-pairs	Factory setting	5

P00.26	Name	Motor stator resistance			Related mode	-
	Setting range	0~65535	Unit	0.001Ω	Factory setting	3350

P00.27	Name	Motor stator inductance Lq			Related mode	-
	Setting range	0~65535	Unit	0.01mH	Factory setting	725

P00.28	Name	Motor stator inductance Ld			Related mode	-
	Setting range	0~65535	Unit	0.01mH	Factory setting	725

P00.29	Name	Motor back-EMF coefficient			Related mode	-
	Setting range	0~65535	Unit	0.01mV/rpm	Factory setting	3530

P00.30	Name	Motor torque coefficient			Related mode	-
	Setting range	0~65535	Unit	0.01Nm/Arms	Factory setting	55

P00.31	Name	Motor electric time constant			Related mode	-
	Setting range	0~65535	Unit	0.01ms	Factory setting	50

P00.32	Name	Motor mechanical time constant			Related mode	-
	Setting range		Unit	0.01ms	Factory setting	360

P00.34	Name	Motor encoder type			Related mode	-
	Setting range	1~2	Unit	-	Factory setting	2

Set the motor encoder type, please set this parameter correctly, otherwise the drive cannot work normally.

Set value	Encoder type
1	Multi-turn absolute
2	Single-turn absolute

P00.35	Name	Encoder zero offset			Related mode	-
	Setting range	0~4294967295	Unit	Encoder unit	Factory setting	0

P00.37	Name	Encoder resolution			Related mode	-
	Setting range	0~65535	Unit	Bits	Factory setting	17

P00.50	Name	Frequency-division output numerator			Related mode	-
	Setting range	1~8388608	Unit	-	Factory setting	10000

P00.52	Name	Frequency-division output denominator			Related mode	-
	Setting range	1~8388608	Unit	-	Factory setting	131072

P00.54	Name	Exchange frequency-division output AB phase sequence			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P00.55	Name	Encoder version			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P00.56	Name	Frequency-division output Z-phase width			Related mode	-
	Setting range	1~255	Unit	-	Factory setting	8

P00.57	Name	Frequency-division output Z-phase polarity			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P00.58	Name	Disable frequency-division output Z-phase configuration error			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

7.2. Group P01: Basic Control Parameters

P01.00	Name	Control mode selection			Related mode	-
	Setting range	0~8	Unit	-	Factory setting	0

Select the servo drive control mode.

Set value	Control mode
0	Position control mode
1	Speed control mode
2	Torque control mode
3	EtherCAT control mode
4	Speed - Torque control mode
5	Position - Speed control mode
6	Position - Torque control mode
7	Position -Speed - Torque control mode
8	CANopen control mode

P01.01	Name	Rotation direction selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

Set the forward direction of motor rotation when observed from the motor output shaft.

Set value	Direction of rotation	Remark
0	Take the CCW direction as the forward direction	In the case of a forward command, from the side of the motor shaft, the motor rotation direction is the CCW direction, that is, the motor rotates counterclockwise.
1	Take the CW direction as the forward direction	In the case of a positive command, from the side of the motor shaft, the motor rotation direction is the CW direction, that is, the motor rotates clockwise.

P01.03	Name	Position mode selection			Related mode	Display
	Setting range	0: Incremental position mode 1: Absolute linear position mode 2: Absolute rotation position mode	Unit	-	Factory setting	-

P01.04	Name	Delay from servo OFF to brake output			Related mode	Display
	Setting range	0~1000	Unit	ms	Factory setting	500

P01.05	Name	Servo OFF to brake output speed limit			Related mode	Display
	Setting range	0~3000	Unit	rpm	Factory setting	30

P01.06	Name	Servo OFF stop mode selection			Related mode	Display
	Setting range	0~4	Unit	-	Factory setting	3

Set value	Servo OFF stop mode selection
0	Coast to stop, keeping de-energized state
1	Stop at zero speed, keeping de-energized state
2	Coast to stop, keeping DB state
3	Stop by DB, keeping DB state
4	Stop at zero speed, keeping DB state

P01.07	Name	Overtravel stop mode selection			Related mode	Display
	Setting range	0~4	Unit	-	Factory setting	3

Set value	Servo OFF stop mode selection
0	Coast to stop, keeping de-energized state
1	Coast to stop, keeping DB state
2	Stop by DB, keeping DB state
3	Stop at zero speed, keeping position lock state
4	Stop at zero speed, keeping de-energized state

P01.08	Name	Fault 2 stop mode selection			Related mode	Display
	Setting range	0~5	Unit	-	Factory setting	2

Set value	Servo OFF stop mode selection
0	Coast to stop, keeping de-energized state
1	Coast to stop, keeping DB state
2	Stop by DB, keeping DB state
3	Stop at zero speed, keeping de-energized state
4	Stop at zero speed, keeping DB state
5	Stop by DB, keeping de-energized state

P01.09	Name	Fault 1 stop mode selection			Related mode	Display
	Setting range	0~3	Unit	-	Factory setting	2

Set value	Servo OFF stop mode selection
0	Coast to stop, keeping de-energized state
1	Coast to stop, keeping DB state
2	Stop by DB, keeping DB state
3	Stop by DB, keeping de-energized state

P01.10	Name	S-ON OFF zero speed stop function			Related mode	Display
	Setting range	0: Disable 1: Enable	Unit	-	Factory setting	0

P01.11	Name	Delay from servo ON to brake output			Related mode	Display
	Setting range	0~2000	Unit	ms	Factory setting	0

P01.12	Name	Delay from brake output to command received			Related mode	Display
	Setting range	0~2000	Unit	ms	Factory setting	100

P01.13	Name	Delay from brake output to servo OFF			Related mode	Display
	Setting range	1~2000	Unit	ms	Factory setting	200

P01.16	Name	Servo ON filter time			Related mode	Display
	Setting range	0~999	Unit	ms	Factory setting	10

P01.17	Name	Disable warning display			Related mode	Display
	Setting range	0: Enable 1: Disable	Unit	-	Factory setting	0

P01.18	Name	Auto setting absolute mode			Related mode	Display
	Setting range	0: Enable 1: Disable	Unit	-	Factory setting	0

P01.19	Name	Disable frequency-division output alarm			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

Set value	Disable frequency-division output alarm mode
0	Enable frequency-division bandwidth/Enable gear ratio fault
1	Disable frequency-division bandwidth/Enable gear ratio fault

P01.20	Name	Permissible minimum resistance of brake resistor			Related mode	Display
	Setting range	-	Unit	Ω	Factory setting	40

P01.23	Name	Resistance heat dissipation coefficient			Related mode	-
	Setting range	10~100	Unit	-	Factory setting	30

When setting and using a braking resistor, the heat dissipation coefficient of the resistor is valid for both built-in and external braking resistors. Please set this parameter according to the actual heat dissipation conditions of the resistor. Recommended value: generally, when natural cooling, P01.23 does not exceed 30%; when forced air cooling, P01.23 does not exceed 50%.

P01.24	Name	Brake resistor type selection			Related mode	Display
	Setting range	0~3	Unit	-	Factory setting	1

Set value	Brake resistor type
0	Internal brake resistor
1	External brake resistor
2	No brake resistor
3	External brake resistor withair-cooled

P01.25	Name	External brake resistor power			Related mode	-
	Setting range	1~65535	Unit	W	Factory setting	75

P01.26	Name	External brake resistor resistance			Related mode	-
	Setting range	1~2000	Unit	Ω	Factory setting	50

P01.27	Name	Brake threshold voltage			Related mode	-
	Setting range	0~999	Unit	V	Factory setting	380

P01.28	Name	Brake feedback mode			Related mode	-
	Setting range	0: Enable feedback detection 1: Disable feedback detection	Unit	-	Factory setting	1

P01.29	Name	Brake maximum duration			Related mode	-
	Setting range	500~65535	Unit	ms	Factory setting	8000

P01.30	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P01.31	Name	Fan voltage control			Related mode	-
	Setting range	0~8	Unit	-	Factory setting	0

Set value	Fan voltage control	Set value	Fan voltage control
0	100%	5	75%
1	95%	6	70%
2	90%	7	65%
3	85%	8	60%
4	80%		

P01.32	Name	Disable update current gain			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P01.34	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.35	Name	LED default monitoring object selection			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	1

The value set in parameter P01.35 indicates the parameter for monitoring the intra-group migration of group P13, for example:

If P01.35 = 0, it indicates monitoring parameter P13.00.

If P01.35 = 1: it indicates monitoring parameter P13.01.

P01.36	Name	LED blinking setting			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	0

P01.37	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.38	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.39	Name	Manufacturer password			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.40	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.41	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.42	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.48	Name	Overvoltage protection			Related mode	-
	Setting range	0~999	Unit	V	Factory setting	420

P01.49	Name	Undervoltage protection			Related mode	-
	Setting range	0~999	Unit	V	Factory setting	200

P01.50	Name	Disable encoder eeprom			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P01.51	Name	Disable encoder multi-turn overflow fault			Related mode	-
	Setting range	0: Enable multi-turn overflow fault 1: Disable multi-turn overflow fault	Unit	-	Factory setting	0

P01.52	Name	Enable power-off parameter saving function			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P01.53	Name	Soft limit function selection			Related mode	-
	Setting range	0: Disable soft limit 1: Enable soft limit immediately 2: Enable after successful homing	Unit	-	Factory setting	0

P01.54	Name	Maximum input pulse frequency			Related mode	-
	Setting range	100~4000	Unit	KHz	Factory setting	2000

P01.55	Name	Overspeed decision threshold			Related mode	-
	Setting range	0~10000	Unit	-	Factory setting	0

P01.56	Name	Enable runaway protection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	1

P01.57	Name	Locked rotor fault detection time			Related mode	-
	Setting range	10~65535	Unit	ms	Factory setting	200

P01.58	Name	Enable locked rotor fault			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	1

Set value	Enable locked rotor fault
0	Disable
1	Alarm when the command torque is greater than or equal to the positive/negative torque limit
2	Alarm when command torque is greater than P01.82 set value
3	Alarm when the command torque is greater than the larger values of P01.82 and positive/negative torque limit value

P01.59	Name	Motor overload protection coefficient			Related mode	-
	Setting range	40~500	Unit	%	Factory setting	100

P01.60	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.61	Name	Overload setting			Related mode	-
	Setting range	0~3	Unit	-	Factory setting	3

Set value	Overload setting
0	Disable
1	Enable motor overload, disable drive load
2	Disable motor overload, enable drive load
3	Enable motor overload, enable drive load

P01.62	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.63	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.64	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.65	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.66	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.67	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.68	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.69	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P01.78	Name	Disable running timeout fault			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	1

P01.79	Name	ECAT limit warning locked			Related mode	-
	Setting range	0~7	Unit	-	Factory setting	0

Select ECAT limit warning locked mode:

Set value	ECAT limit warning locked mode
0	Update status word, update fault code, enable limit warning
1	No update status word, update fault code, enable limit warning
2	Update status word, no update fault code, enable limit warning
3	No update status word, no update fault code, enable limit warning
4	Update status word, update fault code, disable limit warning
5	No update status word, update fault code, disable limit warning
6	Update status word, no update fault code, disable limit warning
7	No update status word, no update fault code, disable limit warning

P01.80	Name	Disable overspeed fault			Related mode	-
	Setting range	0: Enable overspeed fault 1: Disable overspeed fault	Unit	-	Factory setting	0

P01.82	Name	Stall detection initial torque			Related mode	-
	Setting range	10~3000	Unit	0.1%	Factory setting	2400

P01.83	Name	Electrical angle compensation coefficient			Related mode	-
	Setting range	0~100	Unit	1%	Factory setting	0

P01.84	Name	Current bias sampling mode			Related mode	-
	Setting range	0: First enable 1: Each enable	Unit	-	Factory setting	0

P01.85	Name	Power cable phase loss initial detection torque (0: Disable)			Related mode	-
	Setting range	0~300	Unit	1%	Factory setting	20

P01.86	Name	Power cable phase loss detection time			Related mode	-
	Setting range	1~65535	Unit	1ms	Factory setting	50

P01.87	Name	Power cable phase loss detection speed limit			Related mode	-
	Setting range	500~10000	Unit	1rpm	Factory setting	4500

7.3. Group P02: Input/Output Terminal Parameters

P02.00	Name	DI1 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	1

Set the DI function corresponding to the hardware DI1 terminal. Please refer to the following table for parameter setting:

Set value	DI terminal function	Set value	DI terminal function
0	FunIN.0: No function selection	21	FunIN.21: Position/speed table running enable
1	FunIN.1: Servo enable	22	FunIN.22: Homing enable
2	FunIN.2: Fault reset	23	FunIN.23: Home switch
3	FunIN.3: Pulse command inhibit	24	FunIN.24: USER1
4	FunIN.4: Position deviation clearing	25	FunIN.25: USER2
5	FunIN.5: Positive limit	26	FunIN.26: USER3
6	FunIN.6: Negative limit	27	FunIN.27: USER4
7	FunIN.7: Gain switching	28	FunIN.28: USER5
8	FunIN.8: Electronic gear ratio switching	29	FunIN.29: Control mode selection 2
9	FunIN.9: Zero speed clamping enable	30	FunIN.30: ECAT probe 1
10	FunIN.10: Control mode selection 1	31	FunIN.31: ECAT probe 2
11	FunIN.11: Emergency stop	32	FunIN.32: Speed table direction selection
12	FunIN.12: Position command inhibit	33	FunIN.33: Forward external torque limit
13	FunIN.13: Step amount enable	34	FunIN.34:Reverse external torque limit
14	FunIN.14: Position/speed table 1	35	FunIN.35: Torque mode speed limit source selection
15	FunIN.15: Position/speed table 2	36	FunIN.36: Interrupt fixed length state release
16	FunIN.16: Position/speed table 3	37	FunIN.37: Interrupt fixed length inhibit
17	FunIN.17: Position/speed table 4	38	FunIN.38: Speed command source selection
18	FunIN.18: Torque command direction selection	39	FunIN.39: Jog forward enable
19	FunIN.19: Speed command direction selection	40	FunIN.40: Jog reverse enable
20	FunIN.20: Position command direction selection		

P02.01	Name	DI1 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	1

Set the level logic of the hardware DI1 terminal when the IN function selected by DI1 is valid. Please set the effective level logic correctly according to the host computer and peripheral circuit.

Set value	DI terminal logic when DI function is valid
0	Normally open
1	Normally closed
2	Rising edge
3	Falling edge
4	Rising/falling edge

P02.02	Name	DI2 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	5

P02.03	Name	DI2 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.04	Name	DI3 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	6

P02.05	Name	DI3 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.06	Name	DI4 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.07	Name	DI4 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.08	Name	DI5 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.09	Name	DI5 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.10	Name	DI6 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.11	Name	DI6 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.12	Name	DI7 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.13	Name	DI7 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.14	Name	DI8 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.15	Name	DI8 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.16	Name	DI9 function selection			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	2

P02.17	Name	DI9 logic selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

P02.32	Name	DO1 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	1

Set the DO function corresponding to the DO1 terminal. Refer to the following table for parameter Settings.

Set value	DO1 terminal function	Set value	DO terminal function
0	FunOUT.0: Brake	16	FunOUT.16: Interrupt fixed length completed
1	FunOUT.1: Fault	17	FunOUT.17: Motor rotation state
2	FunOUT.2: Positioning completed	18	FunOUT.18: Speed consistent
3	FunOUT.3: Speed reached	19	FunOUT.19: Motor zero speed state
4	FunOUT.4: Servo ready	20	FunOUT.20: Warning
5	FunOUT.5: Internal command completed	21	FunOUT.21: Reserved (Don't set)
6	FunOUT.6: Origin homing completed	22	FunOUT.22: Reserved (Don't set)
7	FunOUT.7: USER1	23	FunOUT.23: Reserved (Don't set)
8	FunOUT.8: USER2	24	FunOUT.24: Positioning proximity
9	FunOUT.9: USER3	25	FunOUT.25: Torque limited
10	FunOUT.10: USER4	26	FunOUT.26: Speed limited
11	FunOUT.11: USER5	27	FunOUT.27: Electrical homing completed
12	FunOUT.12: USER6	28	FunOUT.28: Reserved (Don't set)
13	FunOUT.13: Torque reached	29	FunOUT.29: Reserved (Don't set)
14	FunOUT.14: Reserved (Don't set)	30	FunOUT.30: Reserved (Don't set)
15	FunOUT.15: Reserved (Don't set)	31	FunOUT.31: No function selection

P02.33	Name	DO1 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

Set the DO function corresponding to the DO1 terminal. Refer to the following table for parameter Settings.

Set value	DO1 terminal logic when the DO function is valid
0	Normally open
1	Normally closed

P02.34	Name	DO2 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	2

P02.35	Name	DO2 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P02.36	Name	DO3 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	6

P02.37	Name	DO3 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P02.38	Name	DO4 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	0

P02.39	Name	DO4 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P02.40	Name	DO5 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	0

P02.41	Name	DO5 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P02.42	Name	DO6 function selection			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	0

P02.43	Name	DO6 logic selection			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P02.54	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P02.55	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P02.56	Name	Reserved (Don’t set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P02.57	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P02.58	Name	Reserved (Don't set)			Related mode	-
	Setting range	0~63	Unit	-	Factory setting	0

P02.64	Name	AI1 offset			Related mode	-
	Setting range	-10000~10000	Unit	1mV	Factory setting	0

P02.65	Name	AI1 filter time			Related mode	-
	Setting range	0~65535	Unit	0.01ms	Factory setting	200

P02.66	Name	AI1 dead zone			Related mode	-
	Setting range	0~10000	Unit	0.1mV	Factory setting	100

P02.67	Name	AI1 zero drift			Related mode	-
	Setting range	0~65535	Unit	0.1mV	Factory setting	0

P02.68	Name	AI2 offset			Related mode	-
	Setting range	-10000~10000	Unit	0.1mV	Factory setting	0

P02.69	Name	AI2 filter time			Related mode	-
	Setting range	0~65535	Unit	0.01ms	Factory setting	200

P02.70	Name	AI2 dead zone			Related mode	-
	Setting range	0~10000	Unit	0.1mV	Factory setting	100

P02.71	Name	AI2 zero drift			Related mode	-
	Setting range	0~65535	Unit	0.1mV	Factory setting	0

P02.78	Name	Speed value corresponding to 10V			Related mode	-
	Setting range	0~6000	Unit	rpm	Factory setting	3000

P02.79	Name	Torque value corresponding to 10V			Related mode	-
	Setting range	0~5000	Unit	0.1%	Factory setting	1000

P02.83	Name	IN terminal filter time			Related mode	-
	Setting range	0~999	Unit	ms	Factory setting	0

P02.84	Name	AI1 full scale gain			Related mode	-
	Setting range	0~250000	Unit	1mV	Factory setting	18268

P02.85	Name	AI2 full scale gain			Related mode	-
	Setting range	0~250000	Unit	1mV	Factory setting	18268

7.4. Group P03: Position Control Parameters

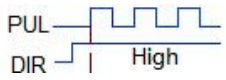
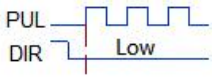
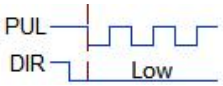
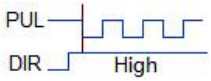
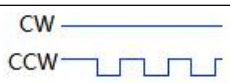
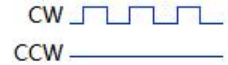
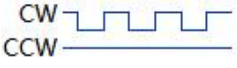
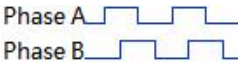
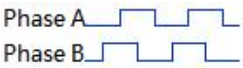
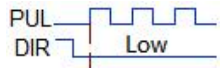
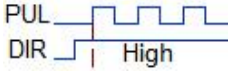
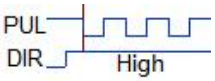
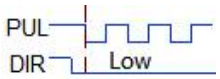
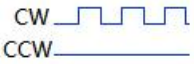
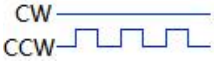
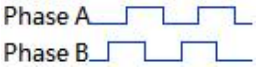
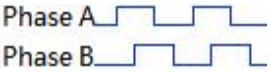
P03.00	Name	Position command source			Related mode	-
	Setting range	0~5	Unit	-	Factory setting	0

In position control mode, it is used to select the source of position command. Among them, the pulse command belongs to the external position command, and the step operation, the multi-segment position command, and the internal test position command belong to the internal position command.

Set value	Command source	Command acquisition method
0	Pulse command	The host computer or other pulse generating devices generate position commands and input them to the servo drive through hardware terminals.
1	Step amount command	The step displacement is set by the parameter P03.28/P03.29, and the step operation is triggered by the IN function FunIN.13.
2	Multi-segment position command	The multi-segment position operation mode is set by the P09 group parameters, and the multi-segment position operation is triggered by the IN function FunIN.21.
3	Communication control 1	
4	Reserved (Don’t set)	
5	IO control	

P03.02	Name	Pulse command type			Related mode	-
	Setting range	0～3	Unit	-	Factory setting	0

When setting the position command source as pulse command (P03.00=0), input the pulse form.

P01.01 Rotation direction selection	P03.02 Command type setting	Command type	Signal	Schematic diagram of positive pulse	Schematic diagram of reverse pulse
0	0	Pulse + direction positive logic	PUL DIR		
	1	Pulse + direction negative logic	PUL DIR		
	2	CW+CCW	PUL(CW) DIR(CCW)	 	 
	3	A phase + B phase quadrature pulse 4 times frequency	PUL(A phase) DIR(B phase)	 ● Phase A ahead of phase B by 90°.	 ● Phase B ahead of phase A by 90°.
1	0	Pulse + direction positive logic	PUL DIR		
	1	Pulse + direction negative logic	PUL DIR		
	2	CW+CCW	PUL(CW) DIR(CCW)	 	 
	3	A phase + B phase quadrature pulse 4 times frequency	PUL(A phase) DIR(B phase)	 ● Phase B ahead of phase A by 90°.	 ● Phase A ahead of phase B by 90°.

P03.03	Name	Pulse filter time/bandwidth			Related mode	-
	Setting range	0~7	Unit	0.1ms	Factory setting	6

Display value	Description
2	4000KHz
3	3600KHz
4	3100KHz
5	2800KHz
6	2500KHz
7	2200KHz
10	1600KHz
16	1100KHz
18	1000KHz
21	850KHZ
25	700KHZ
28	650KHZ
36	500KHZ
46	400KHZ
63	300KHZ
96	200KHZ
129	150KHZ
196	100KHZ
246	80KHZ
255	50KHZ

P03.04	Name	Position command average filter time			Related mode	-
	Setting range	1~1280	Unit	0.1ms	Factory setting	0

Set the average filter time constant of the position command (encoder unit). This function has no effect on the total number of position commands. If the set value is too large, the response delay will increase. The filter time constant should be set according to the actual situation.

P03.05	Name	Position command low-pass filter time			Related mode	-
	Setting range	0~65535	Unit	0.1ms	Factory setting	0
Set the first-order low-pass filter time constant of the position command (encoder unit). This function has no effect on the total number of position commands. If the set value is too large, the response delay will increase. The filter time constant should be set according to the actual situation.						

P03.06	Name	Pulse per revolution			Related mode	-
	Setting range	0~8388608	Unit	Pulse/revolution	Factory setting	10000

P03.08	Name	Electronic gear ratio numerator 1			Related mode	P
	Setting range	1~1073741824	Unit	-	Factory setting	1
Set the first group of electronic gear ratio numerator for position command (command unit) frequency division. P03.08 and P03.09 are combined into a 32-bit value, where P03.08 is the low 16-bit value, and P03.09 is the high 16-bit value. Subsequent use P03.08 to represent the 32-bit parameter. P03.06 (number of position command pulses per motor rotation)=0 is valid.						

P03.10	Name	Electronic gear ratio denominator 1			Related mode	P
	Setting range	1～1073741824	Unit	-	Factory setting	1
Set the first group of electronic gear ratio denominator for position command (command unit) frequency division. P03.10 and P03.11 are combined into a 32-bit value, where P03.10 is the low 16-bit value, and P03.11 is the high 16-bit value. Subsequent use P03.10 to represent the 32-bit parameter. P03.06 (number of position command pulses per motor rotation)=0 is valid.						

P03.12	Name	Electronic gear ratio numerator 2			Related mode	P
	Setting range	1~1073741824	Unit	-	Factory setting	1
Set the second group of electronic gear ratio numerator for position command (command unit) frequency division. P03.12 and P03.13 are combined into a 32-bit value, where P03.12 is the low 16-bit value, and P03.13 is the high 16-bit value. Subsequent use P03.12 to represent the 32-bit parameter. P03.06 (number of position command pulses per motor rotation)=0 is valid.						

P03.14	Name	Electronic gear ratio denominator 2			Related mode	P
	Setting range	1~1073741824	Unit	-	Factory setting	1

Set the second group of electronic gear ratio denominator for position command(command unit) frequency division. P03.14 and P03.15 are combined into a 32-bit value, where P03.14 is the low 16-bit value, and P03.15 is the high 16-bit value. Subsequent use P03.14 to represent the 32-bit parameter.

P03.06 (number of position command pulses per motor rotation) = 0, valid

P03.16	Name	Enable electronic gear ratio switching			Related mode	P
	Setting range	1~1	Unit	-	Factory setting	0

P03.17	Name	Reserved (Don't set)			Related mode	P
	Setting range	0~65535	Unit	-	Factory setting	0

P03.18	Name	Positioning completed detect time			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	0

P03.20	Name	Positioning completed output setting			Related mode	P
	Setting range	0~2	Unit	-	Factory setting	0

P03.21	Name	Positioning completed threshold			Related mode	P
	Setting range	0~65535	Unit	-	Factory setting	91

Set the threshold for the absolute value of position deviation when the servo drive outputs the positioning completed signal.

P03.22	Name	Positioning proximity threshold			Related mode	P
	Setting range	0~65535	Unit	-	Factory setting	0

P03.23	Name	Position deviation clearing mode			Related mode	P
	Setting range	0~2	Unit	-	Factory setting	0

Set the clear mode of position deviation when servo enable is OFF.

Set value	Position deviation clearing mode
0	Servo OFF and fault
1	Servo fault
2	IN input terminal

P03.24	Name	Disable excessive position deviation alarm			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

P03.25	Name	Excessive deviation fault threshold			Related mode	P
	Setting range	1~1073741824	Unit	-	Factory setting	1310720

Set the fault threshold for excessive position deviation in position control mode. When the position deviation of the servo motor is greater than the threshold, the servo driver will generate AL.240 (excessive position deviation).

P03.28	Name	Number of step running pulse			Related mode	-
	Setting range	-32768~32767	Unit	Pulse	Factory setting	10000

P03.40	Name	Homing control			Related mode	P
	Setting range	0~7	Unit	-	Factory setting	0

Set the homing mode and trigger signal source.

Set value	Speed command source	Remark	
		Homing mode	Trigger signal
0	Disable homing	Disable homing	None
1	IN trigger mechanical homing	Origin homing	IN signal FunIN.22 (homing start)
2	IN trigger electrical homing	Electrical homing	IN signal FunIN.22 (homing start)
3	Mechanical homing immediately after power on	Origin homing	The drive is powered on and enabled for the first time
4	Communication trigger mechanical homing	Origin homing	The drive is enabled, after returning to the origin is completed, P03.40=0
5	Communication trigger electrical homing	Electrical homing	The drive is enabled, after returning to the origin is completed, P03.40=0
6	The present position is used as the home	Origin homing	The drive is enabled, after returning to the origin is completed, P03.40=0

P03.41	Name	Homing mode			Related mode	P
	Setting range	0~9	Unit	-	Factory setting	0

Set the motor rotation direction, deceleration point and origin when returning to the origin.

Set value	Homing mode	Set value	Homing mode
0	Positive homing	8	Positive - Origin switch (deceleration point)- Z phase (Origin)
1	Negative homing	9	Negative - Origin switch (deceleration point)- Z phase (Origin)
2	Positive limit	10	Positive - Positive limit (deceleration point)- Z phase (Origin)
3	Negative limit	11	Negative - Negative limit (deceleration point)- Z phase (Origin)
4	Positive mechanical limit position (Reserved, don't set)	12	Positive - Mechanical limit (deceleration point)- Z phase (Origin) (Reserved, don't set)
5	Negative mechanical limit position (Reserved, don't set)	13	Negative - Mechanical limit (deceleration point)- Z phase (Origin) (Reserved, don't set)
6	Positive Z phase	14	Nearby back to Z-phase
7	Negative Z phase	15	Nearby back to Z-phase

P03.42	Name	Speed in high-speed homing			Related mode	P
	Setting range	0~3000	Unit	rpm	Factory setting	100

Set the motor speed when the origin is back to zero and search the origin signal at high speed.

P03.43	Name	Speed in low-speed homing			Related mode	P
	Setting range	0~1000	Unit	rpm	Factory setting	10

Set the motor speed when the origin is back to zero and the signal of the deceleration point is searched at low speed.

P03.44	Name	Homing acceleration and deceleration time			Related mode	P
	Setting range	0~1000	Unit	ms	Factory setting	100

Set the time for the speed to change uniformly from 0rpm to 1000rpm when the origin is back to zero.

P03.45	Name	Homing time limit			Related mode	-
	Setting range	0~65535	Unit	ms	Factory setting	5000

P03.46	Name	Home offset			Related mode	P
	Setting range	0~65535	Unit	Command pulse	Factory setting	0

Set the offset relationship between the mechanical origin and the mechanical zero when returning to the origin.

P03.48	Name	Homing stable waiting time			Related mode	-
	Setting range	0~65535	Unit	ms	Factory setting	1000

P03.49	Name	Homing limit and offset processing			Related mode	P
	Setting range	0~3	Unit	-	Factory setting	0

Set the offset relationship between the mechanical origin and the mechanical zero point when origin homing.

Set value	Mechanical origin offset processing method	Remark	
		Mechanical origin	Limit processing method
0	P03.46 is the coordinate after homing, when the limit is met, the homing function is triggered again and the homing is enabled to find the origin in the reverse direction.	The mechanical origin does not coincide with the mechanical zero point. After the origin homing is completed, the motor stops at the mechanical origin, and the mechanical origin coordinate is forced to P03.46.	Give the homing trigger signal again, the servo will perform the homing in the reverse direction.
1	P03.46 is the relative offset after homing. Re-trigger the homing function when the limit is met, and find the origin in the reverse direction after the homing is enabled.	The mechanical origin coincides with the mechanical zero point. After the motor locates the mechanical origin, it will continue to move the displacement set by P03.46 and then stop.	Give the homing trigger signal again, the servo will perform the origin return in the reverse direction.
2	P03.46 is the coordinate after homing, and it will automatically change in the reverse direction when it encounters a limit.	The mechanical origin does not coincide with the mechanical zero point. After the origin homing is completed, the motor stops at the mechanical origin, and the mechanical origin coordinate is forced to P03.46.	Servo automatically reverses, continue to perform homing function.
3	P03.46 is the relative offset after homing, and it will automatically change in the reverse direction when it encounters a limit.	The mechanical origin coincides with the mechanical zero point. After the motor locates the mechanical origin, it will continue to move the displacement set.	Servo automatically reverses, continue to perform homing function.

P03.50	Name	Torque homing time determination			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	1000
Set the time threshold for judging that the load reaches the mechanical position during the touch stop homing.						

P03.51	Name	Torque homing speed determination			Related mode	P
	Setting range	0~6000	Unit	rpm	Factory setting	10
Set the speed threshold for judging that the load reaches the mechanical position during the touch stop homing.						

P03.52	Name	Torque homing torque determination			Related mode	P
	Setting range	0~3000	Unit	0.1%	Factory setting	500
Set the maximum positive and negative torque limits during touch stop homing.						

P03.53	Name	Communication control position mode			Related mode	P
	Setting range	0: Incremental position mode 1: Absolute position mode	Unit	-	Factory setting	0

P03.54	Name	Communication control acceleration time			Related mode	P
	Setting range	0～65535	Unit	ms	Factory setting	0

P03.55	Name	Communication control acceleration time			Related mode	P
	Setting range	0～65535	Unit	ms	Factory setting	100

P03.56	Name	Communication control speed			Related mode	P
	Setting range	-32768～32767	Unit	rpm	Factory setting	100

P03.57	Name	Communication control stroke			Related mode	P
	Setting range	-2147483648～2147483647	Unit	Command pulse	Factory setting	10000

P03.59	Name	Communication control command			Related mode	P
	Setting range	0～10	Unit	-	Factory setting	0

Set value	Communication control command
0	Null/No function
1	Fixed-length forward
2	Fixed-length reverse
3	Jog forward
4	Jog reverse
5	Slow down stop
6	Slow down stop
7	Jog start (speed symbol indicates running direction)
8	Reserved
9	Reserved

P03.63	Name	Absolute multi-turn offset			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P03.64	Name	Absolute zero offset			Related mode	-
	Setting range	-2^{63}~$2^{63}-1$	Unit	-	Factory setting	0

P03.68	Name	Absolute rotation mode mechanical gear ratio numerator			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	1

P03.69	Name	Absolute rotation mode mechanical gear ratio denominator			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	1

P03.70	Name	Absolute rotation mode position upper limit			Related mode	-
	Setting range	0~$2^{63}-1$	Unit	-	Factory setting	0

P03.75	Name	Frequency division output line number display			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.77	Name	Position out of tolerance threshold source			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

Set value	Position out of tolerance threshold mode
0	Encoder eeprom
1	Drive eeprom

P03.78	Name	Internal trajectory actual position source			Related mode	P
	Setting range	0: Shaft actual position 1: Shaft command position	Unit	-	Factory setting	0

P03.79	Name	Absolute position mode actual position mode			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

Set value	Absolute position mode actual position mode
0	The actual position is within the positive/negative upper limit
1	The actual position is within 0 to the positive upper limit

P03.80	Name	Shaft command position monitoring			Related mode	P
	Setting range	-2147483648~2147483647	Unit	-	Factory setting	0

7.5. Group P04: Speed Control Parameters

P04.00	Name	Speed command source A			Related mode	S
	Setting range	0~5	Unit	-	Factory setting	0

Set the source of the speed command.

Set value	Speed command source
0	Digital given speed
1	AI1
2	AI2
3	Reserved (Don’t set)
4	Reserved (Don’t set)
5	Multi-segment speed command

P04.01	Name	Speed command source B			Related mode	S
	Setting range	0~5	Unit	-	Factory setting	0

Set the source of the speed command.

Set value	Speed command source
0	Digital given speed
1	AI1
2	AI2
3	Reserved (Don’t set)
4	Reserved (Don’t set)
5	Multi-segment speed command

P04.02	Name	Speed command selection			Related mode	S
	Setting range	0~4	Unit	-	Factory setting	0

Set the source of the speed command.

Set value	Speed command source
0	Speed command source A
1	Speed command source B
2	Speed command source A+B
3	Speed command source A/B switching
4	Communication given

P04.03	Name	Digital given speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100
Set the speed command source as the speed command value when digital setting (P04.00=0). The running acceleration time constant and deceleration time constant are set by P04.05 and P04.06.						

P04.04	Name	Jog speed			Related mode	S
	Setting range	0~6000	Unit	rpm	Factory setting	100
When setting the keystroke jog function of the servo drive, set the jog speed command value. To use the keystroke jog function of the servo drive, please set the servo enable to OFF. The operation acceleration time constant and deceleration time constant are set by P04.04 and P04.05.						

P04.05	Name	Acceleration time constant			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100
Set the time for the speed to change uniformly from 0rpm to 1000rpm.						

P04.06	Name	Deceleration time constant			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100
Set the time for the speed to change uniformly from 1000rpm to 0rpm when P04.01 and P04.04 are in motion.						

P04.07	Name	Zero clamp speed			Related mode	S
	Setting range	0~65535	Unit	rpm	Factory setting	10
Set the speed threshold for the zero speed clamp operation to take effect only when the actual motor speed is lower than the set value. **Note: The host computer gives a zero speed clamp signal, and when the actual motor speed is lower than the set value, the motor is clamped at the current position.**						

P04.08	Name	Motor rotation speed			Related mode	S
	Setting range	0~6000	Unit	rpm	Factory setting	10

P04.09	Name	Motor speed consistent width threshold			Related mode	S
	Setting range	0~500	Unit	rpm	Factory setting	10

P04.10	Name	Speed reached threshold			Related mode	-
	Setting range	0~6000	Unit	rpm	Factory setting	1000

When the filtered absolute value of the actual speed of the servo motor exceeds the threshold set by P04.10, it is considered that the actual speed of the servo motor has reached the desired value, and the servo driver can output a speed arrival signal at this time. On the contrary, if the absolute value of the actual speed of the servo motor after filtering is not greater than this value, the speed arrival signal is invalid. The judgment of the speed arrival signal is not affected by the operating state and control mode of the driver.

P04.11	Name	Zero speed state threshold			Related mode	-
	Setting range	1~6000	Unit	rpm	Factory setting	10

P04.12	Name	Maximum speed limit			Related mode	-
	Setting range	0~6000	Unit	rpm	Factory setting	5000

P04.13	Name	Forward speed limit			Related mode	-
	Setting range	0~6000	Unit	rpm	Factory setting	5000

P04.14	Name	Reverse speed limit			Related mode	-
	Setting range	0~6000	Unit	rpm	Factory setting	5000

P04.15	Name	Speed feedforward selection			Related mode	-
	Setting range	0~3	Unit	-	Factory setting	1

Set the speed feedforward selection mode:

Set value	Speed feedforward selection
0	No speed feedforward
1	Internal speed feedforward
2	AI1 input as speed feedforward
3	AI2 input as speed feedforward

P04.16	Name	Start mode selection of speed control mode			Related mode	S
	Setting range	0: Servo on control 1: DI signal control	Unit	ms	Factory setting	10

P04.20	Name	IO control speed/forward speed			Related mode	S
	Setting range	0~9999	Unit	RPM	Factory setting	100

P04.21	Name	IO control reverse speed			Related mode	S
	Setting range	0~9999	Unit	RPM	Factory setting	100

P04.22	Name	IO control acceleration time constant			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P04.23	Name	IO control deceleration time constant			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P04.24	Name	IO control stroke			Related mode	S
	Setting range	-2147483648～2147483647	Unit	Command pulse	Factory setting	10000

P04.28	Name	Speed state filter time			Related mode	S
	Setting range	0~5000	Unit	ms	Factory setting	10

P04.29	Name	Speed display filter time			Related mode	S
	Setting range	0~5000	Unit	ms	Factory setting	50

P04.30	Name	Communication given speed			Related mode	S
	Setting range	-9000000~9000000	Unit	0.01rpm	Factory setting	0

P04.81	Name	Encoder data length error counter			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.82	Name	Encoder data null error counter			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.83	Name	Encoder data check error counter			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.84	Name	Encoder count error counter			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.85	Name	Encoder real-time error times			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.86	Name	Encoder error tolerance threshold			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	10

P04.87	Name	Encoder receive command error times			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

7.6. Group P05: Torque Control Parameters

P05.00	Name	Torque command source A			Related mode	T
	Setting range	0~4	Unit	-	Factory setting	0

Set the command source of torque command source A.

Set value	Torque command source
0	Digital given torque
1	AI1 given torque
2	AI2 given torque
3	Reserved (Don't set)
4	Reserved (Don't set)
5	Reserved (Don't set)
6	Reserved (Don't set)
7	Reserved (Don't set)

P05.01	Name	Torque command source B			Related mode	T
	Setting range	0~7	Unit	-	Factory setting	0

Set the command source of torque command source B.

Set value	Torque command source
0	Digital given torque
1	AI1 given torque
2	AI2 given torque
3	Reserved (Don't set)
4	Reserved (Don't set)
5	Reserved (Don't set)
6	Reserved (Don't set)
7	Reserved (Don't set)

P05.02	Name	Torque command source			Related mode	T
	Setting range	0~4	Unit	-	Factory setting	0

Set the source of torque command

Set value	Torque command source
0	Torque command source A
1	Torque command source B
2	Torque command source A+B
3	Torque command source A/B switching
4	Communication given torque
5	Multi-stage torque

P05.03	Name	Digital given torque			Related mode	T
	Setting range	-3000~3000	Unit	0.1%	Factory setting	0

Set the torque command value when the torque command source is digital setting (P05.00=0). 100% corresponds to 1 times the rated torque of the motor.

P05.06	Name	Torque limit source			Related mode	T
	Setting range	0~4	Unit	0.1%	Factory setting	2

Set the torque limit source mode:

Set value	Torque limit source mode
0	Internal torque limit
1	Internal/external torque limit
2	AI channel input limit
3	AI channel input limit or switching the external torque small value
4	Internal torque limit and AI channel input limit switching

P05.07	Name	Analog torque limit channel selection			Related mode	T
	Setting range	0: AI1 channel 1: AI2 channel	Unit	-	Factory setting	0

P05.08	Name	Forward internal torque limit			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	3000

P05.09	Name	Reverse internal torque limit			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	3000

P05.10	Name	Forward external torque limit			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	3000

P05.11	Name	Reverse external torque limit			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	3000

P05.12	Name	Torque mode speed limit source			Related mode	T
	Setting range	0~2	Unit	-	Factory setting	1

Set the source of speed limit in torque mode:

Set value	Torque mode speed limit source mode
0	Internal speed limit
1	AI input speed limit
2	Select internal speed limit by IN
3	Multi-speed command

P05.13	Name	Torque mode speed limit AI channel selection			Related mode	T
	Setting range	0: AI1 channel 1: AI2 channel	Unit	-	Factory setting	0

P05.14	Name	Torque mode forward internal speed limit			Related mode	T
	Setting range	0~6000	Unit	rpm	Factory setting	3000

Set the forward speed limit value in torque control mode.

P05.15	Name	Torque mode reverse internal speed limit			Related mode	T
	Setting range	0~6000	Unit	rpm	Factory setting	3000

Set the reverse speed limit value in torque control mode.

P05.16	Name	Torque reaches the reference value			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	0

P05.17	Name	Torque reaches output effective value			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	300

P05.18	Name	Torque reaches output invalid value			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	200

P05.19	Name	Torque arrival signal filter time			Related mode	T
	Setting range	0～65535	Unit	ms	Factory setting	5

P05.20	Name	Communication given torque			Related mode	T
	Setting range	-300000~300000	Unit	0.001%	Factory setting	0

P05.25	Name	Multi-stage torque command 1			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.26	Name	Multi-stage torque command 2			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.27	Name	Multi-stage torque command 3			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.28	Name	Multi-stage torque command 4			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.29	Name	Multi-stage torque command 5			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.30	Name	Multi-stage torque command 6			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.31	Name	Multi-stage torque command 7			Related mode	T
	Setting range	-3000～3000	Unit	0.1%	Factory setting	0

P05.42	Name	Torque mode overrun processing mode			Related mode	T
	Setting range	0: Normal mode 1: Speed loop mode	Unit	-	Factory setting	0

P05.43	Name	Torque mode speed is lower than the overrun judgment time			Related mode	T
	Setting range	0~65535	Unit	0.1ms	Factory setting	10

P05.44	Name	Torque feedforward selection			Related mode	T
	Setting range	0: No torque feedforward 1: Internal torque feedforward 2: ECAT control	Unit	-	Factory setting	1

P05.45	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P05.46	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P05.47	Name	Torque mode speed overrun judgment time			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	10

P05.48	Name	Torque command filter time constant 1			Related mode	T
	Setting range	0~3000	Unit	0.01ms	Factory setting	80

P05.49	Name	Torque command filter time constant 2			Related mode	T
	Setting range	0~3000	Unit	0.01ms	Factory setting	80

P05.50	Name	Emergency stop torque			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	1000

P05.51	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P05.52	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P05.53	Name	Current PI parameter source			Related mode	T
	Setting range	0: Encoder eeprom 1: Drive eeprom	Unit	-	Factory setting	0

P05.54	Name	Torque feedback filter time constant 1			Related mode	T
	Setting range	0~3000	Unit	0.01ms	Factory setting	80

P05.55	Name	Torque feedback filter time constant 2			Related mode	T
	Setting range	0~3000	Unit	0.01ms	Factory setting	80

P05.56	Name	Torque command filter time constant 3			Related mode	T
	Setting range	0~3000	Unit	0.01ms	Factory setting	20

P05.60	Name	Motor actual torque			Related mode	T
	Setting range	0~3000	Unit	0.01Nm	Factory setting	0

7.7. Group P06: Gain Parameters

P06.00	Name	Speed loop gain			Related mode	-
	Setting range	1~50000	Unit	0.1Hz	Factory setting	250
Set the proportional gain of the speed regulator. This parameter determines the response of the speed regulator. The larger the value, the faster the speed response. However, too large a value may cause vibration. In position mode, if the position gain is increased, the speed gain must be increased.						

P06.01	Name	Speed loop integration time			Related mode	-
	Setting range	15~51200	Unit	0.1ms	Factory setting	3183
Set the integral time constant of the speed regulator. The smaller the set value, the stronger the integral effect, and the faster the speed deviation when stopping is close to zero. ● Note: When P06.01 is set to 30000, there is no integral effect.						

P06.02	Name	Position loop gain			Related mode	-
	Setting range	0~50000	Unit	0.1Hz	Factory setting	400
Set the proportional gain of the position. This parameter determines the response performance of the position. Setting a larger position gain can shorten the positioning time. But too large a set value may cause mechanical vibration.						

P06.03	Name	Speed loop gain 2			Related mode	-
	Setting range	1~50000	Unit	0.1Hz	Factory setting	400

P06.04	Name	Speed loop integration time 2			Related mode	-
	Setting range	15~51200	Unit	0.01ms	Factory setting	2000

P06.05	Name	Position loop gain 2			Related mode	-
	Setting range	0~50000	Unit	0.1Hz	Factory setting	640

P06.06	Name	Speed loop gain 3			Related mode	-
	Setting range	1～50000	Unit	0.1Hz	Factory setting	400

P06.07	Name	Speed loop integration time 3			Related mode	-
	Setting range	15~51200	Unit	0.01ms	Factory setting	2000

P06.08	Name	Position loop gain 3			Related mode	-
	Setting range	0~50000	Unit	0.1Hz	Factory setting	640

P06.11	Name	Current PI selection			Related mode	-
	Setting range	0: PI group 1 1: PI group 2	Unit	-	Factory setting	0

P06.12	Name	Load inertia ratio			Related mode	-
	Setting range	0~12000	Unit	1%	Factory setting	200

P06.14	Name	Speed feedforward filter time			Related mode	-
	Setting range	0~6400	Unit	0.01ms	Factory setting	50
Set the speed feedforward filter time						

P06.15	Name	Speed feedforward gain			Related mode	-
	Setting range	0~1000	Unit	0.1%	Factory setting	0
In the position control mode, multiply the speed feedforward signal by the parameter P06.15, and the result obtained becomes the speed feedforward as part of the speed command. Increasing this parameter can increase the response speed of the position command and reduce the position deviation at a fixed speed.						

P06.16	Name	Torque feedforward filter time			Related mode	-
	Setting range	0~6400	Unit	0.01ms	Factory setting	50
Set the filter frequency of the torque feedforward.						

P06.17	Name	Torque feedforward gain			Related mode	-
	Setting range	0~1000	Unit	0.1%	Factory setting	0
In the non-torque control mode, multiply the torque feedforward signal by the parameter P06.17, and the result obtained becomes the torque feedforward as part of the torque command. Increasing this parameter can improve the response speed to changing speed commands.						

P06.18	Name	Speed feedback source			Related mode	-
	Setting range	0: No filtering 1: After filtering	Unit	-	Factory setting	0

P06.19	Name	Speed feedback smoothing filtering			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

Set value	Function
0	No filtering
1	2 times of smooth filtering
2	4 times of smooth filtering
3	8 times of smooth filtering
4	16 times of smooth filtering

P06.20	Name	Speed feedback low-pass filter cut-off frequency			Related mode	-
	Setting range	100~4000	Unit	1Hz	Factory setting	4000

P06.21	Name	Speed PDFF control Kref			Related mode	-
	Setting range	0~1000	Unit	0.1%	Factory setting	1000

P06.22	Name	Speed PDFF control Krdb			Related mode	-
	Setting range	0~1000	Unit	0.1%	Factory setting	0

P06.23	Name	Velocity feedforward filter time 2			Related mode	-
	Setting range	0～6400	Unit	0.01ms	Factory setting	50

P06.24	Name	Velocity Feedforward Gain 2			Related mode	-
	Setting range	0～1000	Unit	0.1%	Factory setting	0

P06.50	Name	2nd gain mode			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

Set value	Function
0	1st gain fixed
1	1st and 2nd gain switching

P06.51	Name	Gain switching condition			Related mode	-
	Setting range	0~10	Unit	-	Factory setting	0

Set value	Function
0	1st gain fixed
1	Gain switching with input IN signal
2	Torque command
3	Speed command
4	Speed command change rate
5	Speed command high and low speed thresholds
6	Position deviation
7	With position command
8	Positioning incomplete
9	Actual speed
10	With position command and actual speed
11	With position command and actual speed mode 2
12	DI switching speed loop feedforward filtering time
13	There is a speed command switching gain 2, and then switch the gain 3 according to the speed command high or low
14	There is a position command switching gain, DI switches speed feedforward parameters

P06.52	Name	Gain switching delay time			Related mode	-
	Setting range	0~50000	Unit	0.1ms	Factory setting	50

P06.53	Name	Gain switching level			Related mode	-
	Setting range	0~50000	Unit	-	Factory setting	50

P06.54	Name	Gain switching hysteresis			Related mode	-
	Setting range	0~50000	Unit	-	Factory setting	30

P06.55	Name	Position gain switching ramp time			Related mode	-
	Setting range	0~50000	Unit	0.1ms	Factory setting	30

P06.56	Name	Third gain switching delay time			Related mode	-
	Setting range	0~65535	Unit	0.1ms	Factory setting	30

P06.57	Name	Current gain switching delay time (0: no switching)			Related mode	-
	Setting range	0~65535	Unit	0.1ms	Factory setting	0

P06.58	Name	Position gain switching ramp time (Gain2→Gain3)			Related mode	-
	Setting range	0-50000	Unit	0.1ms	Factory setting	30

P06.60	Name	D-axis current proportional gain 1			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	180

P06.61	Name	D-axis current integral gain 1			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	200

P06.62	Name	D-axis back electromotive force compensation coefficient			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	600

P06.63	Name	Q-axis current proportional gain 1			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	180

P06.64	Name	Q-axis current integral gain 1			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	200

P06.65	Name	Q-axis back electromotive force compensation coefficient			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	1000

P06.66	Name	D-axis current proportional gain 2			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	180

P06.67	Name	D-axis current integral gain 2			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	200

P06.68	Name	Q-axis current proportional gain 2			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	180

P06.69	Name	Q-axis current integral gain 2			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	200

P06.76	Name	Flux-weakening control coefficient			Related mode	-
	Setting range	0~2250	Unit	0.1%	Factory setting	2250

P06.77	Name	Flux-weakening control single increment			Related mode	-
	Setting range	0~3000	Unit	0.1%	Factory setting	10

P06.78	Name	Flux-weakening control single reduction			Related mode	-
	Setting range	0~3000	Unit	0.1%	Factory setting	50

P06.79	Name	Flux-weakening control performs frequency division coefficient			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	10

P06.80	Name	Vd output limit			Related mode	-
	Setting range	350~1000	Unit	0.1%	Factory setting	707

P06.81	Name	Flux-weakening voltage reference coefficient			Related mode	-
	Setting range	75~100	Unit	1%	Factory setting	90

7.8. Group P07: Auto-tunning Parameters

P07.00	Name	Auto-tuning mode			Related mode	-
	Setting range	0~8	Unit	-	Factory setting	0

Set value	Function
0	Invalid
1	Standard stiffness table mode
2	Positioning mode

P07.01	Name	Stiffness table level setting			Related mode	-
	Setting range	0~31	Unit	-	Factory setting	12
The larger the value, the higher the rigidity. Excessive rigidity can cause vibration and noise.						

P07.05	Name	Offline inertia auto-tuning mode			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P07.06	Name	Maximum speed of inertia auto-tuning			Related mode	-
	Setting range	100~1000	Unit	rpm	Factory setting	500

P07.07	Name	Acceleration time of inertia auto-tuning			Related mode	-
	Setting range	20~800	Unit	ms	Factory setting	125

P07.08	Name	Inertia auto-tuning interval			Related mode	-
	Setting range	50~10000	Unit	ms	Factory setting	1000

P07.09	Name	Number of motor revolutions per inertia auto-tuning			Related mode	-
	Setting range	-	Unit	0.1 turns	Factory setting	-

P07.11	Name	Adaptive notch mode selection			Related mode	-
	Setting range	0~4	Unit	-	Factory setting	0

Set value	Function
0	Disable adaptive notch
1	Adaptive notch setting group 3
2	Adaptive notch setting group 3/4
3	Restore default notch settings

P07.12	Name	Frequency of the 1st notch			Related mode	-
	Setting range	50~4000	Unit	1Hz	Factory setting	4000

P07.13	Name	Width level of the 1st notch			Related mode	-
	Setting range	0~20	Unit	-	Factory setting	2

P07.14	Name	Depth level of the 1st notch			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	0

P07.15	Name	Frequency of the 2nd notch			Related mode	-
	Setting range	50~4000	Unit	1Hz	Factory setting	4000

P07.16	Name	Width level of the 2nd notch			Related mode	-
	Setting range	0~20	Unit	-	Factory setting	2

P07.17	Name	Depth level of the 2nd notch			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	0

P07.18	Name	Frequency of the 3rd notch			Related mode	-
	Setting range	50~4000	Unit	1Hz	Factory setting	4000

P07.19	Name	Width level of the 3rd notch			Related mode	-
	Setting range	0~20	Unit	-	Factory setting	2

P07.20	Name	Depth level of the 3rd notch			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	0

P07.21	Name	Frequency of the 4th notch			Related mode	-
	Setting range	50~4000	Unit	1Hz	Factory setting	4000

P07.22	Name	Width level of the 4th notch			Related mode	-
	Setting range	0~20	Unit	-	Factory setting	2

P07.23	Name	Depth level of the 4th notch			Related mode	-
	Setting range	0~99	Unit	-	Factory setting	0

P07.28	Name	Disturbance compensation gain			Related mode	-
	Setting range	-1000~1000	Unit	0.1%	Factory setting	0

P07.29	Name	Disturbance observer filter time			Related mode	-
	Setting range	0~2500	Unit	0.01ms	Factory setting	50

P07.30	Name	Gravity compensation value			Related mode	-
	Setting range	-1000~1000	Unit	0.1%	Factory setting	0

P07.31	Name	Forward friction compensation value			Related mode	-
	Setting range	-1000~1000	Unit	0.1%	Factory setting	0

P07.32	Name	Reverse friction compensation value			Related mode	-
	Setting range	-1000~1000	Unit	0.1%	Factory setting	0

7.9. Group P08: Communication Parameters

P08.00	Name	RS485 station address			Related mode	-
	Setting range	1~247	Unit	-	Factory setting	1

Set the servo driver axis address.

0: broadcast address. The upper computer device can write to all servo drivers through the broadcast address. The driver operates according to the broadcast data frame, but does not respond.

1~247: when multiple servo drivers are networking, each servo driver can only have a unique address, otherwise it will lead to abnormal communication or failure of communication.

P08.01	Name	RS485 communication baud rate			Related mode	-
	Setting range	0~5	Unit	-	Factory setting	5

Set the communication baud rate between the servo drive and the upper computer device. The communication baud rate of the servo driver must be consistent with the communication baud rate of the upper computer device, otherwise it cannot communicate.

Set value	Baud rate setting
0	4800 Kbps
1	9600 Kbps
2	19200 Kbps
3	38400 Kbps
4	57600 Kbps
5	115200 Kbps

P08.02	Name	RS485 communication data format			Related mode	-
	Setting range	0~5	Unit	-	Factory setting	0

Set the data format when the servo driver communicates with the upper computer device. The data format of servo driver must be consistent with the upper computer device, otherwise it cannot communicate.

Set value	Data Format
0	8-bit data、no parity、1 stop bit
1	8-bit data、no parity、2 stop bits
2	8-bit data、even parity、1 stop bit
3	8-bit data、even parity、2 stop bits
4	8-bit data、odd parity、1 stop bit
5	8-bit data、odd parity、2 stop bits

P08.11	Name	EEPROM operation mode			Related mode	-
	Setting range	0~7	Unit	-	Factory setting	0

EEPROM operation mode selection:

Set value	EEPROM operation mode
0	Communication modification parameters are not saved to eeprom
1	Modbus communication modification parameters are saved to eeprom
2	ECAT modification factory parameters are saved to eeprom
3	Modbus and ECAT modification factory parameters are saved to eeprom
4	ECAT modification CIA402 parameters are saved to eeprom
5	Modbus and ECAT modification CIA402 parameters are saved to eeprom
6	ECAT modification factory and CIA402 parameters are saved to eeprom
7	Modbus and ECAT modification parameters are saved to eeprom

P08.12	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.13	Name	Modbus response timeout			Related mode	T
	Setting range	0~5000	Unit	-	Factory setting	0

P08.14	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.15	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.16	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.17	Name	Enable virtual IN			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	0

P08.18	Name	Virtual IN default initial value			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.19	Name	Enable virtual OUT			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	0

P08.20	Name	Reserved (Don't set)			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.31	Name	RS232 communication baud rate			Related mode	-
	Setting range	0~5	Unit	-	Factory setting	5

Set the RS232 communication baud rate, please refer to parameter P08.01 (RS485 communication data format selection) for the setting method.

Set value	Baud rate setting
0	4800 Kbps
1	9600 Kbps
2	19200 Kbps
3	38400 Kbps
4	57600 Kbps
5	115200 Kbps

P08.32	Name	RS232 communication data format			Related mode	-
	Setting range	0~5	Unit	-	Factory setting	0

Set the RS232 communication data format, please refer to parameter P08.02 (RS485 communication data format selection) for the setting method.

Set value	Baud rate setting
0	4800 Kbps
1	9600 Kbps
2	19200 Kbps
3	38400 Kbps
4	57600 Kbps
5	115200 Kbps

P08.33	Name	Reinitialize USB			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	0

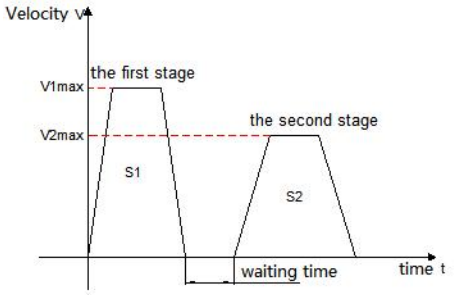
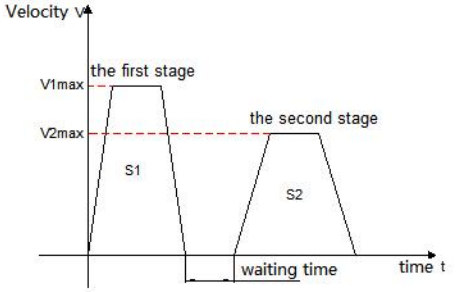
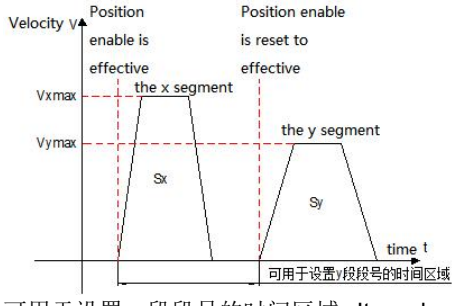
P08.55	Name	Serial port receiving error count			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

P08.56	Name	Modbus CRC error count			Related mode	T
	Setting range	0~65535	Unit	-	Factory setting	0

7.10. Group P09: Multi-segment Position Control Parameters

P09.00	Name	Multi-segment position operation mode			Related mode	P
	Setting range	0~2	Unit	-	Factory setting	0

In the position control mode, when the source of the set position command is multi-stage position command (p03.00=2), set the multi-stage position operation mode.

Set value	Operation mode	Remark	Operating waveform
0	Shutdown at the end of a single operation	Stop after running for 1 round; The segment number is automatically switched in increasing order; Waiting time can be set between segments; Multi-segment position enable is level effective.	 V_{1max}、V_{2max}: maximum operating speed of the first and second segments; S1、S2: displacement of the first and second segments;
1	Cyclic operation	Cycle operation, the starting segment number after the first round is 1; The segment number is automatically switched in increasing order; Waiting time can be set between segments; Multi-segment position enable is level effective.	 V_{1max}、V_{2max}: maximum operating speed of the first and second segments; S1、S2: displacement of the first and second segments;
2	IN switching operation	If the segment number is updated, it can run continuously; The segment number is determined by IN terminal logic; The interval between segments is determined by the command delay time of the host computer; Multi-segment position enable is effective for edge change.	 可用于设置 y 段段号的时间区域：It can be used to set the time zone of the y segment number. V_{xmax}、V_{ymax}: maximum operating speed of the x and y segments; S1、S2: displacement of the x and y segments;

P09.01	Name	Number of displacement			Related mode	P
	Setting range	1~16	Unit	-	Factory setting	1

Set the total number of segments of the multi-segment position command. Different segments can set different displacement, running speed, acceleration and deceleration.

When P09.00=0/1, the multi-segment segment number will automatically increase and switch, and the switching sequence: 1, 2, 3,..., P09.01.

When P09.01=2, 4 INs should be set as input functions FunIN.14~FunIN.17 (multi-segment running command switching 1: CMD1~multi-segment running command switching 4: CMD4), and the logic of the IN terminal is controlled by the upper computer to achieve Segment number switching. The multi-segment segment number is a 4-digit binary number, and the corresponding relationship between CMD1 ~ CMD4 and the segment number is shown below.

FunIN.17	FunIN.16	FunIN.15	FunIN.14	segment number
CMD4	CMD3	CMD2	CMD1	
0	0	0	0	1
0	0	0	1	2
……				
1	1	1	0	15
1	1	1	1	16

The value of CMD(n) is 1 when the IN terminal logic is valid, otherwise it is 0.

P09.02	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	1

P09.03	Name	Waiting time unit			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

When the multi-segment position function is used for operation and p09.00=0/1 is set, the unit of waiting time between segments is set.

Waiting time: the time interval from the end of this command to the beginning of the next command.

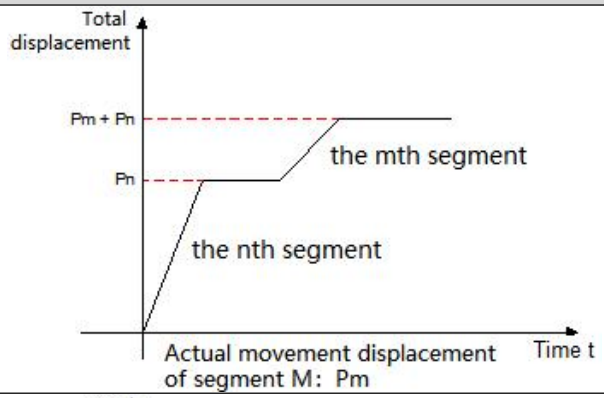
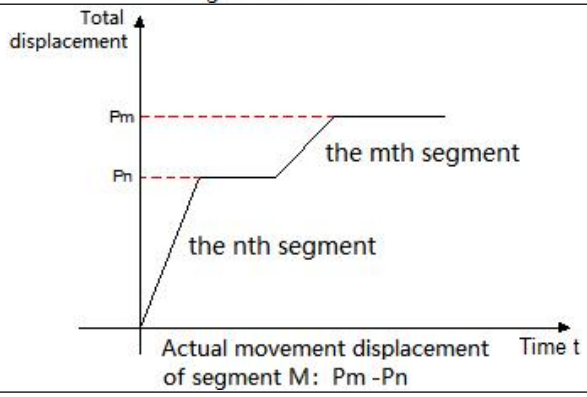
Set value	Time unit
0	ms
1	s

P09.04	Name	Position command type selection			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

When using the multi-segment position function to run, set the type of displacement command.

Displacement command: the sum of position commands in a period of time.

The relative displacement is the increment of the target position relative to the current position of the motor; the absolute displacement is the increment of the target position relative to the motor origin. For example: the movement displacement of the nth segment is Pn (Pn＞0), and the movement displacement of the mth segment is Pm (Pm＞0). Assuming Pm＞Pn, the comparison is as follows:

Set value	Position command type	Remark
0	Relative displacement command	
1	Absolute displacement command	

P09.05	Name	Reserved (Don’t set)			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	1

P09.12	Name	1st displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

Multi-segment position first segment movement displacement (command unit). P09.12 and p09.13 are combined into a 32-bit signed value, where p09.12 is the low 16 bit value and p09.13 is the high 16 bit value. Subsequently, p09.12 is used to represent this 32-bit parameter.

P09.14	Name	Running speed of the 1st displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100
Maximum operating speed of the first segment at multi-segment position. The maximum running speed refers to the uniform running speed at which the motor is not in the acceleration and deceleration process. If the 1st position command (p09.12) is too small, the actual speed of the motor will be less than p09.14.						

P09.15	Name	Acceleration and deceleration time of the 1st displacement			Related mode	P
	Setting range	1~65535	Unit	ms	Factory setting	100
In the first stage of multi-segment position, the time of the motor from 0rpm uniform speed to 1000rpm.						

P09.16	Name	Waiting time upon completion of the 1st displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100
After the first stage of the multi-segment position is completed, the waiting time before running the next stage of displacement.						

P09.17	Name	2nd displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.19	Name	Running speed of the 2nd displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.20	Name	Acceleration and deceleration time of the 2nd displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.21	Name	Waiting time upon completion of the 2nd displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.22	Name	3rd displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.24	Name	Running speed of the 3rd displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.25	Name	Acceleration and deceleration time of the 3rd displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.26	Name	Waiting time upon completion of the 3rd displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.27	Name	4th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.29	Name	Running speed of the 4th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.30	Name	Acceleration and deceleration time of the 4th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.31	Name	Waiting time upon completion of the 4th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.32	Name	5th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.34	Name	Running speed of the 5th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.35	Name	Acceleration and deceleration time of the 5th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.36	Name	Waiting time upon completion of the 5th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.37	Name	6th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.39	Name	Running speed of the 6th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.40	Name	Acceleration and deceleration time of the 6th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.41	Name	Waiting time upon completion of the 6th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.42	Name	7th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.44	Name	Running speed of the 7th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.45	Name	Acceleration and deceleration time of the 7th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.46	Name	Waiting time upon completion of the 7th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.47	Name	8th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.49	Name	Running speed of the 8th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.50	Name	Acceleration and deceleration time of the 8th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.51	Name	Waiting time upon completion of the 8th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.52	Name	9th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.54	Name	Running speed of the 9th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.55	Name	Acceleration and deceleration time of the 9th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.56	Name	Waiting time upon completion of the 9th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.57	Name	10th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.59	Name	Running speed of the 10th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.60	Name	Acceleration and deceleration time of the 10th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.61	Name	Waiting time upon completion of the 10th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.62	Name	11th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.64	Name	Running speed of the 11th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.65	Name	Acceleration and deceleration time of the 11th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.66	Name	Waiting time upon completion of the 11th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.67	Name	12th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.69	Name	Running speed of the 12th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.70	Name	Acceleration and deceleration time of the 12th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.71	Name	Waiting time upon completion of the 12th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.72	Name	13th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.74	Name	Running speed of the 13th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.75	Name	Acceleration and deceleration time of the 13th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.76	Name	Waiting time upon completion of the 13th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.77	Name	14th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.79	Name	Running speed of the 14th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.80	Name	Acceleration and deceleration time of the 14th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.81	Name	Waiting time upon completion of the 14th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.82	Name	15th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

P09.84	Name	Running speed of the 15th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.85	Name	Acceleration and deceleration time of the 15th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.86	Name	Waiting time upon completion of the 15th displacement			Related mode	P
	Setting range	0～65535	Unit	ms(s)	Factory setting	100

P09.87	Name	16th displacement			Related mode	P
	Setting range	-1073741824~1073741824	Unit	Command pulse	Factory setting	10000

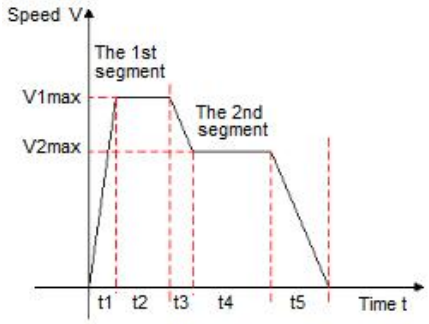
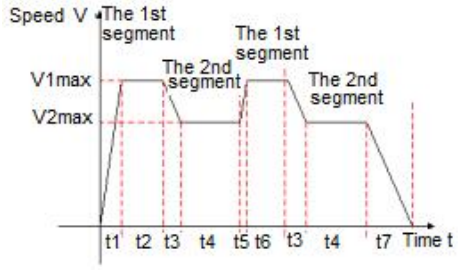
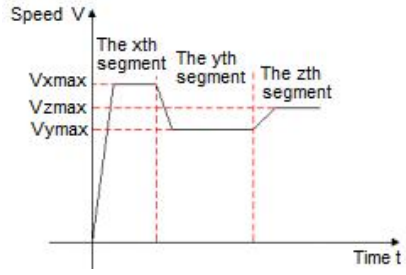
P09.89	Name	Running speed of the 16th displacement			Related mode	P
	Setting range	1~6000	Unit	rpm	Factory setting	100

P09.90	Name	Acceleration and deceleration time of the 16th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

P09.91	Name	Waiting time upon completion of the 16th displacement			Related mode	P
	Setting range	0~65535	Unit	ms	Factory setting	100

7.11. Group P10: Multi-segment Speed Control Parameters

P10.00	Name	Multi-segment speed running mode			Related mode	S
	Setting range	0~2	Unit	-	Factory setting	0
In speed control mode, when the speed command source is a multi-segment speed command (P04.00=1), set the multi-segment speed command operation mode:						

Set value	Operation mode	Remark	Operating waveform
0	Shutdown at the end of a single operation	Stop after running for 1 round; The segment number is automatically switched in increasing order.	 V1max, V2max: the first and second command speeds; t1: the actual acceleration and deceleration time of the first segment; t3, t5: the second segment of acceleration and deceleration time.
1	Cyclic operation	Cycle operation, the starting segment number of each round is 1; the segment number is automatically switched in increasing order; If the servo enable is valid, the cycle running state will always be maintained.	 V1max、V2max：the first and second segment maximum operating speeds.
2	Switch through the external IN port	If the servo is enabled, it can run continuously; The segment number is determined by the IN terminal logic; The running time of each speed command is only determined by the switching interval time of the segment number; FunIN.19 (speed command direction setting) can be used to switch the speed command direction.	 x, y: segment number, please refer to P10.01 for the logical relationship between segment number and IN terminal; Vx, Vy: the speed command of the xth section and the yth section; The segment number determined by IN will not change, and the speed command of this segment will continue to run without being affected by the command running time.

During the operation of each speed command, the servo enable must be ensured, otherwise, the servo driver will stop.

P10.01	Name	Number of speeds			Related mode	S
	Setting range	1~16	Unit	-	Factory setting	16

Set the total number of segments of the speed command. Different segments can set different speeds and running times, and there are 7 groups of acceleration and deceleration times for selection.

When P10.00≠2, the multi-segment segment numbers are automatically switched in increasing order, the switching sequence: 1, 2, ..., P10.01.

When P10.00=2, 4 INs should be set as IN functions 14~17 (FunIN.14~FunIN.17), and the upper computer controls the IN logic to realize the segment number switching. The multi-segment segment number is a 4-digit binary number. The corresponding relationship between FunIN.14~FunIN.17 and the segment number is shown in the following table.

FunIN.17	FunIN.16	FunIN.15	FunIN.14	Segment number
0	0	0	0	1
0	0	0	1	2
0	0	1	0	3
……				
1	1	1	1	16

When the IN terminal logic is valid, the value of FunIN.n is 1, otherwise it is 0.

P10.02	Name	Running time unit			Related mode	S
	Setting range	0~1	Unit	-	Factory setting	0

Set multi-segment speed running time unit.

Set value	Time unit
0	0.1s (second)
1	1min (minute)

P10.03	Name	Acceleration time constant 1			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

For each multi-segment speed command, there are 7 groups of acceleration and deceleration time constants for selection.

Acceleration time constant: the time for the servo motor to uniformly accelerate from 0rpm to 1000rpm.

Deceleration time constant: the time for the servo motor to decelerate uniformly from 1000rpm to 0rpm.

P10.04	Name	Deceleration time constant 1			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.05	Name	Acceleration time constant 2			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.06	Name	Deceleration time constant 2			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.07	Name	Acceleration time constant 3			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.08	Name	Deceleration time constant 3			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.09	Name	Acceleration time constant 4			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.10	Name	Deceleration time constant 4			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.11	Name	Acceleration time constant 5			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.12	Name	Deceleration time constant 5			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.13	Name	Acceleration time constant 6			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.14	Name	Deceleration time constant 6			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.15	Name	Acceleration time constant7			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.16	Name	Deceleration time constant 7			Related mode	S
	Setting range	0~65535	Unit	ms	Factory setting	100

P10.20	Name	1st speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.21	Name	Running time of the 1st speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

Set the running time of the first segment speed command.

Running time: the shifting time of the previous speed command switching to this speed command + this constant speed running time.

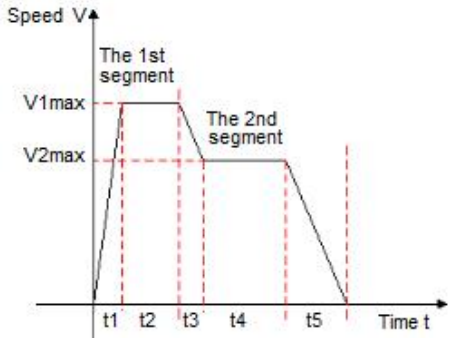
If the running time is set to 0, the servo drive will automatically skip this speed command.

When P10.02=2, as long as the segment number determined by the external IN terminal does not change, the speed command of this segment will continue to run without being affected by the command running time.

P10.22	Name	Acceleration and deceleration selection of the 1st speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

Select the acceleration and deceleration time constant of the first segment speed command.

Set value	Acceleration and deceleration time constant	Remark
1	Acceleration and deceleration time constant 1	Acceleration time: P10.03 Deceleration time: P10.04
2	Acceleration and deceleration time constant 2	Acceleration time: P10.05 Deceleration time: P10.06
3	Acceleration and deceleration time constant 3	Acceleration time: P10.07 Deceleration time: P10.08
4	Acceleration and deceleration time constant 4	Acceleration time: P10.09 Deceleration time: P10.10
5	Acceleration and deceleration time constant 5	Acceleration time: P10.11 Deceleration time: P10.12
6	Acceleration and deceleration time constant 6	Acceleration time: P10.13 Deceleration time: P10.14
7	Acceleration and deceleration time constant 7	Acceleration time: P10.15 Deceleration time: P10.16



V1max, V2max: the first and second segment command speeds;

t1: the actual acceleration and deceleration time of the first segment;

t3、 t5: the actual acceleration and deceleration time of the second segment;

A certain period of running time: the shifting time of the previous speed command switching to this speed command + the constant speed running time of this section (for example: the running time of the first segment in the figure is t1+t2, and the running time of the second segment is t3+t4. And so on);

When a certain period of running time is set to 0, the driver will skip this section of speed command and execute the next section;

$$t_1 = \frac{V_1}{1000} \times \ Acceleration\ time\ set\ for\ this\ speed\ segment$$

$$t_3 = \frac{|V_2 - V_1|}{1000} \times \ The\ acceleration\ time\ set\ in\ the\ second\ segment$$

P10.23	Name	2nd speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.24	Name	Running time of the 2nd speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.25	Name	Acceleration and deceleration selection of the 2nd speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.26	Name	3rd speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.27	Name	Running time of the 3rd speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.28	Name	Acceleration and deceleration selection of the 3rd speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.29	Name	4th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.30	Name	Running time of the 4th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.31	Name	Acceleration and deceleration selection of the 4th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.32	Name	5th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.33	Name	Running time of the 5th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.34	Name	Acceleration and deceleration selection of the 5th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.35	Name	6th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.36	Name	Running time of the 6th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.37	Name	Acceleration and deceleration selection of the 6th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.38	Name	7th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.39	Name	Running time of the 7th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.40	Name	Acceleration and deceleration selection of the 7th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.41	Name	8th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.42	Name	Running time of the 8th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.43	Name	Acceleration and deceleration selection of the 8th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.44	Name	9th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.45	Name	Running time of the 9th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.46	Name	Acceleration and deceleration selection of the 9th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.47	Name	10th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.48	Name	Running time of the 10th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.49	Name	Acceleration and deceleration selection of the 10th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.50	Name	11th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.51	Name	Running time of the 11th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.52	Name	Acceleration and deceleration selection of the 11th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.53	Name	12th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.54	Name	Running time of the 12th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.55	Name	Acceleration and deceleration selection of the 12th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.56	Name	13th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.57	Name	Running time of the 13th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.58	Name	Acceleration and deceleration selection of the 13th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.59	Name	14th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.60	Name	Running time of the 14th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.61	Name	Acceleration and deceleration selection of the 14th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.62	Name	15th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.63	Name	Running time of the 15th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.64	Name	Acceleration and deceleration selection of the 15th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

P10.65	Name	16th speed			Related mode	S
	Setting range	-6000~6000	Unit	rpm	Factory setting	100

P10.66	Name	Running time of the 16th speed			Related mode	S
	Setting range	0~65535	Unit	0.1s/1min	Factory setting	10

P10.67	Name	Acceleration and deceleration selection of the 16th speed			Related mode	S
	Setting range	0~6	Unit	-	Factory setting	1

Set value	Function
0	Acceleration and deceleration time 1
1	Acceleration and deceleration time 2
2	Acceleration and deceleration time 3
3	Acceleration and deceleration time 4
4	Acceleration and deceleration time 5
5	Acceleration and deceleration time 6
6	Acceleration and deceleration time 7

7.12. Group P12: Auxiliary Function Parameters

P12.00	Name	Parameters initialization			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

Set value	Function
0	No effect
1	Reset
2	Clear fault log

P12.05	Name	Absolute encoder reset			Related mode	-
	Setting range	0~2	Unit	-	Factory setting	0

Set value	Function
0	No effect
1	Reset
2	Clear encoder fault and multi-turn value

P12.06	Name	Communication encoder storage operation			Related mode	-
	Setting range	0~3	Unit	-	Factory setting	0

Set value	Function
0	No effect
1	Write encoder data
2	Read encoder data
3	Read-write operation fault display

P12.07	Name	Software reset DSP			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.08	Name	Fault reset			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.09	Name	Emergency stop			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.10	Name	JOG running			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P12.11	Name	Offline inertia auto-tuning			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	0

P12.14	Name	Parameters initialization			Related mode	P
	Setting range	0~2	Unit	-	Factory setting	0

Set value	Function
0	No effect / Calibration complete
1	AI1 zero drift correction
2	AI2 zero drift correction

P12.16	Name	Reserved			Related mode	PS
	Setting range	0~65535	Unit	-	Factory setting	0

P12.17	Name	Reserved			Related mode	PS
	Setting range	0~65535	Unit	-	Factory setting	0

P12.18	Name	Reserved			Related mode	PS
	Setting range	0~65535	Unit	-	Factory setting	0

P12.19	Name	Reserved			Related mode	PS
	Setting range	0~65535	Unit	-	Factory setting	0

P12.20	Name	Enable torque PI auto-tuning			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.25	Name	Torque PI auto-tuning mode			Related mode	-
	Setting range	0: PI tuning 1 1: PI tuning 2	Unit	-	Factory setting	0

P12.26	Name	Torque PI auto-tuning torque			Related mode	-
	Setting range	0~3000	Unit	0.1%	Factory setting	200

P12.27	Name	Disable heartbeat function			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.28	Name	Reserved			Related mode	-
	Setting range	0~1	Unit	-	Factory setting	0

P12.29	Name	Debug command (manufacturer reserved)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	100

P12.30	Name	Debug data (manufacturer reserved)			Related mode	-
	Setting range	0~65535	Unit	-	Factory setting	200

7.13. Group P13: Monitor Parameters

P13.00	Name	Servo running status			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.01	Name	Motor speed			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	-
Display the actual speed of the servo motor, after rounding the display, the accuracy is 1rpm.						

P13.02	Name	Speed command			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	-
Display the current speed command value of the servo drive, after rounding the display, the accuracy is 1rpm.						

P13.03	Name	Motor torque			Related mode	-
	Setting range	-	Unit	0.1%	Factory setting	-
Display actual servo motor torque, 100% corresponding to 1 times motor rated torque.						

P13.04	Name	Torque command			Related mode	-
	Setting range	-	Unit	0.1%	Factory setting	-
Display the current torque command value of the servo driver, 100% corresponding to 1 times the motor rated torque.						

P13.05	Name	Average load ratio			Related mode	-
	Setting range	-	Unit	0.1%	Factory setting	-

P13.07	Name	Position command			Related mode	-
	Setting range	-	Unit	Command pulse	Factory setting	-
In position control mode, during servo operation, the number of position commands that have not been divided and multiplied by the electronic gear ratio are counted and displayed. P13.07 and P13.08 are combined into a 32-bit value, where P13.07 is the low 16-bit value, and P13.08 is the high 16-bit value. Subsequent use P13.07 to represent the 32-bit parameter.						

P13.09	Name	Actual position			Related mode	-
	Setting range	-	Unit	Command pulse	Factory setting	-
In position control mode, during servo operation, the number of position commands that have not been divided and multiplied by the electronic gear ratio are counted and displayed. P13.09 and P13.10 are combined into a 32-bit value, where P13.09 is the low 16-bit value, and P13.10 is the high 16-bit value. Subsequent use P13.09 to represent the 32-bit parameter.						

P13.11	Name	Position feedback counter			Related mode	-
	Setting range	-	Unit	Encoder pulse	Factory setting	-
Used to count the number of encoder feedback pulses since the last clearing. P13.11 and P13.12 are combined into a 32-bit value, where P13.11 is the lower 16-bit value and P13.12 is the upper 16-bit value. Subsequent use P13.11 to represent the 32-bit parameter.						

P13.13	Name	Position error			Related mode	-
	Setting range	-	Unit	Command pulse	Factory setting	-
In position control mode, statistics and display the position command deviation value. P13.13 and P13.14 are combined into a 32-bit value, where P13.13 is the low 16-bit value, and P13.14 is the high 16-bit value. Subsequent use P13.13 to represent the 32-bit parameter.						

P13.15	Name	Position error			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	-
In the position control mode, statistics and display the position deviation value after the electronic gear ratio is divided and multiplied. P13.15 and P13.16 are combined into a 32-bit value, where P13.15 is the low 16-bit value, and P13.16 is the high 16-bit value. Subsequent use P13.15 to represent the 32-bit parameter.						

P13.17	Name	Position command speed			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	-
Display the speed value corresponding to the position command of a single position control cycle of the driver.						

P13.19	Name	Input signal monitoring			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.20	Name	Output signal monitoring			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.21	Name	Mechanical angle			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	-
Display the current mechanical angle of the motor (encoder unit), 0 corresponds to the mechanical angle 0.						

P13.22	Name	Electrical angle			Related mode	-
	Setting range	-	Unit	0.1°	Factory setting	-
Display the current electrical angle of the motor, P13.22 = (P13.21 ÷ encoder pulse number) * 360°						

P13.23	Name	Bus voltage			Related mode	-
	Setting range	-	Unit	0.1V	Factory setting	-

P13.24	Name	Encoder single-turn value			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.26	Name	Encoder multi-turn value			Related mode	-
	Setting range	-	Unit	Revolutions	Factory setting	-

P13.29	Name	AI1 voltage			Related mode	-
	Setting range	-	Unit	0.01V	Factory setting	-

P13.30	Name	Actual position			Related mode	-
	Setting range	-	Unit	Command pulse	Factory setting	-

P13.32	Name	Total servo running time			Related mode	-
	Setting range	-	Unit	0.1s	Factory setting	-

P13.34	Name	AI2 voltage			Related mode	-
	Setting range	-	Unit	0.01V	Factory setting	-

P13.35	Name	History fault selection			Related mode	-
	Setting range	0~9	Unit	-	Factory setting	-

P13.36	Name	Fault code of the selected fault			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.37	Name	U-phase current upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	0.01A	Factory setting	-

P13.38	Name	V-phase current upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	0.01A	Factory setting	-

P13.39	Name	Input status upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.40	Name	Output status upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.41	Name	Bus voltage upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	V	Factory setting	-

P13.42	Name	Motor speed upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	RPM	Factory setting	-

P13.43	Name	Running time upon occurrence of the selected fault			Related mode	-
	Setting range	-	Unit	0.1s	Factory setting	-

P13.51	Name	Abnormal group No.			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.52	Name	Abnormal intra-group offset			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.53	Name	Internal fault code			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.54	Name	Real-time pulse counter			Related mode	-
	Setting range	-	Unit	Command pulse	Factory setting	-

P13.59	Name	Internal fault code of the selected fault			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.60	Name	Encoder real-time position			Related mode	-
	Setting range	-	Unit	Encoder pulse	Factory setting	-

P13.64	Name	Real-time mechanical position			Related mode	-
	Setting range	-	Unit	Encoder pulse	Factory setting	-

P13.70	Name	Absolute rotation mode mechanical single-turn position			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	-

P13.74	Name	Absolute rotation mode mechanical single-turn position			Related mode	-
	Setting range	-	Unit	Command unit	Factory setting	-

P13.76	Name	Motor speed			Related mode	-
	Setting range	-	Unit	0.1rpm	Factory setting	-

P13.82	Name	Cycle running cycle			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.83	Name	Cycle running time			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.84	Name	Speed loop running time			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.85	Name	Position loop running time			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.88	Name	D-axis given torque			Related mode	-
	Setting range	-	Unit	0.1%	Factory setting	-

P13.89	Name	D-axis feedback torque			Related mode	-
	Setting range	-	Unit	0.1%	Factory setting	-

P13.90	Name	Deviation value at ECAT synchronous deviation alarm			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.91	Name	ECAT synchronous deviation compensation excessive count			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.92	Name	ECAT synchronous deviation real-time value			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.93	Name	Maximum value of ECAT synchronous deviation			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.94	Name	Status flag			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P13.96	Name	Status flag			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

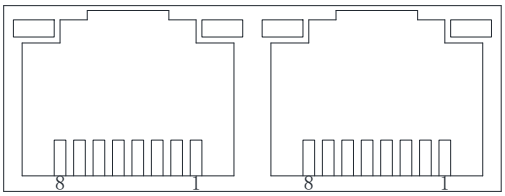
8. Communication

The servo driver has Modbus RTU (RS-232, RS-485) communication function, with the upper computer communication software, it can realize multiple functions such as parameter modification, parameter query and servo driver status monitoring.

8.1. MODBUS Communication

The RS-485 communication protocol has a single-master multi-slave communication mode, which can support network operation of multiple servo drivers. RS-232 communication protocol does not support networking of multiple servo drivers.

8.1.1. Hardware Interface Definition



Signal name		Pin	Function
Communication signal	RS485+	1	RS485 communication port
	RS485-	2	
	---	3	---
	---	4	---
	---	5	
	---	6	---
	DGND	7	GND signal
	---	8	---

8.1.2. Communication Parameters Setting

The RS-485 communication protocol has a single-master multi-slave communication mode, which can support network operation of multiple servo drivers. RS-232 communication protocol does not support networking of multiple servo drivers.

◆ Servo driver default communication settings

Communication mode	Axis address	Baud rate	Data Format
RS485 communication	1	115200 bps	1 start bit + 8 data bits + 1 stop bit
RS232 communication	1 (Fixed and unchangeable)	115200 bps	1 start bit + 8 data bits + 1 stop bit

(1) RS485 communication settings

1) Set the servo driver axis address P08.00

When multiple servo drivers are networked, each drive can only have a unique address, otherwise it will cause communication abnormalities and fail to communicate. Among them:

- 0: broadcast address
- 1~127: slave address

The host computer can write to all slave drivers through the broadcast address. The slave driver receives the broadcast address data frame and performs corresponding operations, but does not respond to data.

2) Set the communication rate between the servo driver and the host computer P08.01

The speed of the servo driver and the communication speed of the host computer must be set to be consistent, otherwise the communication will not be possible. When multiple servo drivers are networked, if the communication baud rate of a servo driver is inconsistent with the host, it will cause the servo axis communication error and may affect the normal communication of other servo drivers.

3) Set the data frame format P08.02 for the communication between the driver and the master

- Servo driver provides 6 communication data formats

P08.02 setting value	Communication data frame format
0	1 start bit + 8 data bits + 1 stop bit
1	1 start bit + 8 data bits + 2 stop bits
2	1 start bit + 8 data bits + 1 even parity bit + 1 stop bit
3	1 start bit + 8 data bits + 1 even parity bit + 2 stop bits
4	1 stop bit + 8 data bits + 1 odd parity bit + 1 stop bit
5	1 stop bit + 8 data bits + 1 odd parity bit + 2 stop bits

Remark:

- The data frame format of the host computer must conform to the above format, otherwise it cannot communicate with the driver.

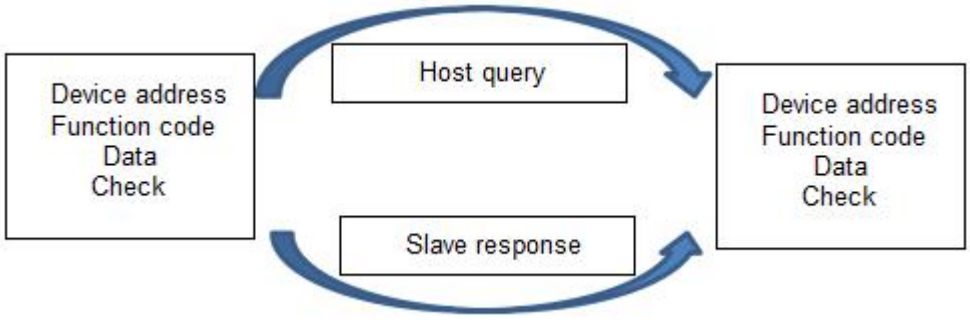
(2) RS232 communication settings

★ Associated parameter description

Parameter	Name	Range	Function	Effective time	Default
P08.30	RS232 communication axis address	-	Set the station number of RS232 communication	After saving and restarting	1
P08.31	RS232 communication baud rate	0~5	Set the baud rate of RS232 communication	After saving and restarting	5
P08.32	RS232 communication data format	0~5	Set the data format of RS232 communication	After saving and restarting	0

8.2. MODBUS Communication Protocol

The Modbus protocol, designed by MODDICON company, is a bus protocol that allows a master and one or more slaves to share data, which consists of 16-bit registers. The master can read and write a single register or multiple registers. The standard Modbus port on a Modicon controller is using an RS-232 compatible serial interface that defines the connector, wiring cable, signal class, transmission baud rate and parity. Controller communication uses master-slave technology, where the master initiates the data transfer, called a query. And other devices (slaves) return data in response to the query, or process the action requested by the query. Master devices include processors, programmers, and PLCs, and slaves include programmable controllers, servo drivers, and stepper drivers. The master-slave query-feedback mechanism is shown below:



◆ Note: The communication data frame structure of this servo drive adopts RTU mode.

The MODBUS communication function code used by the servo driver is described as follows:

Function code	Definition
0x03	Read register data
0x06	Write single register data
0x10	Write multiple register data

◆ Note: The relationship between the parameter number in the manual and the register address in Modbus communication: if the parameter number is P08.02, the Modbus communication register address is 802 (Decimal)

8.2.1. Read Register Data 0x03

(1) Request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x03
REGISTER_ADDRH	Register start address high byte
REGISTER_ADDRL	Register start address low byte
DATA_NUMBERH	The number of registers to be read N (H), high byte
DATA_NUMBERL	The number of registers to be read N (L), low byte
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

◆ Note: The register start address range is 0x0000 to 0xFFFF, and the register number range is 0x1 to 0x7D

(2) Response frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x03
DATA_LENGTH	Number of data bytes returned, equal to the number of registers N*2
DATA[0]	Starting data value, high byte
DATA[1]	Starting data value, low byte
DATA[…]	……
DATA[N*2-1]	Last data value, low byte
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

(3) Example

1) Host sends request frame

0x01	0x03	0x00	0x64	0x00	0x02	CRCL	CRCH

This request frame means: read 2 (0x0002) word length data from the servo driver whose axis address is 0x01 and the start register address is 100 (0x0064).

2) Slave response frame

0x01	0x03	0x04	0x01	0x20	0x00	0x59	CRCL

The response frame means: the slave returns 4 bytes (2 words long) of data, and the data content is 0x0120, 0x0059

8.2.2. Write a Single Register: 0x06

(1) Request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x06
REGISTER_ADDRH	High byte of written register address
REGISTER_ADDRL	Low byte of written register address
DATA[0]	Write data, high byte
DATA[1]	Write data, low byte
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

(2) Response frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x06
REGISTER_ADDRH	High byte of written register address
REGISTER_ADDRL	Low byte of written register address
DATA[0]	Write data, high byte
DATA[1]	Write data, low byte
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

(3) Example

1) Host sends request frame

0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

This request frame means: write data value 0x0002 to the servo driver with axis address 0x01 and register address 100 (0x0064).

2) Slave response frame

0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

This response frame indicates that the host has successfully written data into the servo drive register.

8.2.3. Write Multiple Registers: 0x10

(1) Request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x10
REGISTER_ADDRH	High byte of the start address of the written register
REGISTER_ADDRL	Low byte of the start address of the written register
DATA_NUMBERH	The number of registers to be written N (H), high byte
DATA_NUMBERL	The number of registers to be written N (L), low byte
DATA_LENGTH	Need to write the number of bytes corresponding to the number of registers N*2
DATA[0]	Write high byte of start register data
DATA[1]	Write low byte of start register data
DATA[…]	……
DATA[N*2-1]	Write low byte of last register data
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

(2) Response frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	Function code: 0x10
REGISTER_ADDRH	High byte of the start address of the written register
REGISTER_ADDRL	Low byte of the start address of the written register
DATA_NUMBERH	The number of registers to be written N (H), high byte
DATA_NUMBERL	The number of registers to be written N (L), low byte
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

◆ Note: The maximum number of registers that can be written at one time is 120.

(3) Example

1) Host sends request frame

0x01	0x10	0x00	0x64	0x00	0x02	0x04	0x12	0x00	0x00	0x52	CRCL	CRCH

The request frame indicates that 2 (0x0002) words long data (4 bytes) are written to the servo driver with the axis address of 0x01, the starting register address of 100 (0x0064), and the written data are 0x1200 and 0x0052.

2) Slave response frame

0x01	0x10	0x00	0x64	0x00	0x02	CRCL	CRCH

This response frame means: the host successfully writes the data into the servo driver register.

8.2.4. Error Response Frame Format

(1) Error response frame format

START	Idle time greater than or equal to 3.5 characters, indicating the start of a frame
ADDR	Servo axis address
CMD	0x80 + Function code
ERROR_CODE	Error code
CRCL	CRC check code, low byte
CRCH	CRC check code, high byte
END	Idle time greater than or equal to 3.5 characters, one frame ends

(2) Error code

Error code	Coding description
0x01	Illegal function code
0x02	Illegal data address
0x03	Illegal data
0x04	Slave equipment failure

(3) Example

1) Host sends request frame

0x01	0x03	0x00	0x64	0x00	0x02	CRCL	CRCH

This request frame means: read 2 (0x0002) word length data from the servo driver whose axis address is 0x01 and the start register address is 100 (0x0064).

2) Slave response frame

0x01	0x03	0x04	0x01	0x20	0x00	0x59	CRCL

The response frame means: the slave returns 4 bytes (2 words long) of data, and the data content is 0x0120, 0x0059.

If the slave response is:

0x01	0x83	0x02	CRCL	CRCH

The response frame means that 0x83 indicates an error occurred in communication, and the error coding is 0x02.

8.2.5. CRC Check

The upper computer and the servo must use the same CRC check algorithm for communication, otherwise CRC check error will occur, resulting in communication failure, and the servo driver will not report CRC check error. The servo driver adopts 16-bit CRC, with low byte first and high byte last. The CRC function is as follows

```
unsigned short CalcCRCbyAlgorithm(unsigned char* pDataBuffer, unsigned long usDataLen)
{
const unsigned short POLYNOMIAL = 0xA001;
unsigned short wCrc;
int iBite, iBit;
wCrc = 0xFFFF;
for(iBite = 0; iByte < usDataLen; iBite++)
{
      wCrc ^= *(pDataBuffer + iByte);
      for(iBit = 0; iBit <= 7; iBit++)
      {
          if(wCrc & 0x0001)
        {
            wCrc >>= 1;
            wCrc ^= POLYNOMIAL;
        }
          else
          {
                wCrc >>= 1;
           }
   }
}
return wCrc;
}
```

9. Troubleshooting

When the servo fails, the servo driver LED will display the error code: AL.xxx, where xxx is a three digit decimal value:

Range of error code values	Description
100-199	The first type of non resettable fault can only be reset through power outage and restart.
200-299	The first type of resettable fault can be reset through IO or software.
300-399	The second type of resettable fault can be reset through IO or software.
400-499	Driver warning code, which does not affect the enabled operation of the driver when it appears, is only used as a warning prompt.

9.1. Error Code

Error code	Fault content
AL.000	**Normal state**
AL.100	**System parameter error** Most cases occur after system firmware updates, when unsupported parameters are set on the driver. It is necessary to restore the factory settings and power off for 30 seconds before restarting the driver. If the driver still alarms, please contact the manufacturer's after-sales service to check the relevant abnormal parameters. If there is no alarm, please reset the parameters before continuing to use it again.
AL.101	**The driver failed or timed out reading parameters stored in EEPROM** Generally, due to abnormal communication of the EEPROM chip, please completely power off the driver for 30s before restarting it. If the alarm code still appears, please contact the manufacturer's after-sales service or replace it.
AL.102	**Failure or timeout in writing driver parameters to EEPROM** Generally, due to abnormal communication of the EEPROM chip, please completely power off the driver for 30 seconds before restarting it. If the alarm code still appears after modifying the parameters, please contact the manufacturer's after-sales service or replace it.
AL.103	**The driver parameters are abnormal or the parameter range is incorrect** It usually occurs after firmware update, and the parameter range of the new and old firmware is inconsistent. The abnormal parameter number can be determined by P13.51 (parameter abnormal group number) and P13.52 (parameter abnormal group offset).
AL.104	The parameter settings of the driver system are incorrect. Please contact the manufacturer's

	after-sales service or replace it.
AL.105	The parameter settings of the drive system are incorrect. Please contact the manufacturer's after-sales service or replace it.
AL.106	**The interrupt timeout triggered an exception**
AL.107 AL.108	**FPGA data timeout write exception**
AL.109	**Encoder timeout response**
AL.110 AL.111	**AL.110: Drive IPM module overcurrent** **AL.111: Drive ADC overcurrent** A. Whether the motor collides or not causes a blockage B. Motor P06.00、P06.01、P06.02、P06.60、P06.61、P06.63、P06.64 improper settings caused. Try to restore the driver parameters and restart to see if the warning still exists. If a warning still appears, please contact the manufacturer for after-sales service. C. By setting the P05.04 parameter, try to reduce the overload multiple of the driver to test whether there is an alarm.
AL.114	Undervoltage of the control power supply usually occurs in situations where the power is quickly turned on and off, and the fault can be cleared by restarting after 30s of power outage.
AL.115	**Drive internal voltage error** The internal voltage fault of the drive is usually caused by the internal hardware of the driver. If the error persists after restarting the power supply, please contact the manufacturer's after-sales service.
AL.116 AL.117 AL.118	**Current sampling timeout exception**
AL.119	The operation time of the control loop exceeds the control cycle time. Please contact the manufacturer for after-sales treatment.
AL.120	**Driver Encoder Interference** A. Please check whether the motor PE cable connection is reliable B. Check that the encoder plug is connected reliably C. Replace the driver to check whether the fault is caused by the motor encoder
AL.121	**Encoder communication error** A. The fault occurs when power-up, generally will alarm AL.170 at the same time, please check that the encoder extension cord connection is reliable. B. If the driver simply alarms AL.121, usually caused by a faulty encoder, replace the motor.

AL.122	**Encoder busy/Response timeout**
AL.123	**Encoder CRC check failure**
AL.124	**Encoder Z-phase signal failure**
AL.125	**Encoder zero adjustment failed**
AL.126	**Encoder EEPROM read and write failure** It generally occurs during power on or operation of the encoder EEPROM. When power on occurs, try restarting the driver to confirm if the fault still exists. After restarting, the fault still occurred. Please check if the encoder extension cable contact is reliable, or replace the driver for comparison and confirmation.
AL.127	**Encoder failure** A. Appears during power-on initialization, the incremental encoder reads the hall signal incorrectly when power-on, and the communication encoder shows that the driver cannot communicate with the encoder. B. Please check that the encoder cable connection is reliable
AL.128	**The motor model setting is incorrect** Please restore the factory settings and restart to confirm if the fault is cleared. If the fault still exists, please contact after-sales and inform the P00.00 value.
AL.129	**Incremental encoder interference**
AL.130	**Motor runaway fault** Please check if the UVW cable sequence of the motor power cable is correct. If it is the Z-axis up and down mechanism, it may be caused by the drive's false alarm. You can set P01.56 to 0 to prohibit flying and reporting errors.
AL.133	**The parameter value range is abnormal** Use P13.51 to check the abnormal group number, and P13.52 to check the intra group offset of the abnormality.
AL.134	**Driver peripheral initialization, PHY initialization failed.**
AL.135	**Unsupported motor encoder type** please check if P00.00 motor model is set to 50000.
AL.136	**Product mismatch, unsupported motor Model**
AL.137	**The driver model is set incorrectly** Please check if the P00.02 parameter is set abnormally. Please contact the manufacturer's after-sales service and inform them of the parameter value.
AL.138	**The driver and motor do not match** The rated current of the driver is less than the rated current of the motor. Replace with a higher

	power driver or reduce the rated current of the motor.
AL.139	**Driver rated voltage parameter setting error.**
AL.141	**The absolute value mode setting error** It generally caused by P01.03 being set to absolute value mode, but the motor is not an absolute value motor. Please check if the motor is an absolute value motor. If so, please contact the manufacturer's after-sales service to change the motor encoder type.
AL.142	Encoder Model does not match, set the encoder type that the driver does not support.
AL.160	**FPGA parameter initialization error** It appears when the driver is powering on and initializing, power off the driver for 30s, then restart it to see if it still alarms, if it still alarms, please replace the driver.
AL.162	Encoder EEPROM read and write operation failure, power off and retry.
AL.164	**Encoder data is incorrect** It appears during power-on initialization, because the encoder has not been calibrated, please contact the manufacturer for after-sales service.
AL.171	**FPGA initialization error** A. It appears during power-on initialization and is caused by abnormal communication between DSP and FPGA. B. Check if P00.50, P00.52, and P00.56 are set incorrectly, such as 0.
AL.180	**Driver Q-axis feedback overcurrent**
AL.181	**Driver U-phase feedback overcurrent**
AL.182	**Driver V-phase feedback overcurrent**
AL.183	**Driver W-phase feedback overcurrent**
AL.184	**Driver hardware overcurrent fault**
AL.185 AL.186	**Driver output short circuit**
AL.187	**Abnormal phase sequence of motor power cable UVW**
AL.189	**Analog input overvoltage saturation**
AL.190	**AD sampling error**
AL.191	**The incremental encoder UVW phase sequence is abnormal**
AL.192	**Incremental encoder Z-phase signal disconnected**
AL.200	**Control mode setting error** Please check the P01.00 parameter setting value, whether it meets the requirements of the manual, or contact the manufacturer.

AL.201	**Position command source setting error** Please check whether the P03.00 parameter setting value meets the requirements of the manual, or contact the manufacturer.
AL.202	**Speed command source setting error** Please check the P04.00, P04.02, P04.03 parameter setting values, whether they meets the requirements of the manual, or contact the manufacturer.
AL.203	**Torque command source setting error** Please check whether the parameter setting values of P05.00, P05.01 and P05.02 meet the requirements of the manual or contact the manufacturer.
AL.204	**Motor power cable phase loss** A. Check whether the motor power cable has a missing phase. B. Detect whether the motor winding is disconnected and whether the three-phase resistance is balanced. C. Check whether P01.85 settings are correct. D. If the false alarm is caused by high speed, the alarm detection at high speed can be limited by the P01.87 parameter.
AL.210	**Driver bus voltage is high** A. Please plug in the brake resistance or check the quality of the brake resistance and whether the resistance value is appropriate. B. Please check if it is indeed caused by high AC input power supply; Please check if the parameter setting of P01.48 (overvoltage protection) is correct; Replace the driver with a new one to check if it is caused by damage to the driver.
AL.211	**Driver bus voltage is low** Please check if it is indeed caused by low AC input power supply; Please check if the parameter setting of P01.49 (undervoltage protection) is correct; Replace the drive with a new one to check if it is caused by damage to the driver.
AL.212	**Driver bus voltage is high** A. It occurs when the bus voltage of the driver is momentarily higher than the alarm threshold. B. Please plug in the brake resistance or check the quality of the brake resistance and whether the resistance value is appropriate. C. Please check whether the AC input power is too high and the drive input power requirement is below 260VAC.
AL.221	**Encoder battery failure** Encoder battery failure, this fault code is provided by the encoder, usually caused by low battery

	voltage. When this fault occurred, the encoder was no longer able to correctly remember the absolute position of multiple turns, so after replacing the battery, it was necessary to reset the zero point. It is necessary to manually set the P12.05 parameter to 1 to clear this fault.
AL.222	**Encoder multi-turn data alarm** Encoder multi-turn data alarm occurs during power on initialization, usually due to the disconnection of the encoder battery and encoder before. This alarm also appears when the battery voltage is too low or there is an abnormality in the battery connection cable. When this alarm occurs, the data of the driver's multi turn encoder is no longer correct and needs to be reset to zero. It is necessary to manually set the P12.05 parameter to 1 to clear this fault.
AL.223 AL.224	**The multi-turn encoder counts overflow** The multi-turn encoder counts overflow, which is caused by the number of rotations exceeding the resolution of the multi-turn motor. It can also be set to 1 through P01.51 to prevent multi-turn overflow from reporting errors.
AL.225 AL.226	**The speed feedback exceeds the maximum motor speed setting value**
AL.240	**Position is out of tolerance** A. Check that the power cable is properly connected B. Check that the electronic gear ratio parameters are set correctly C. Check that the frequency of the pulse input exceeds the maximum speed of the motor
AL.241	The input frequency of the position command exceeds P01.54 (maximum input pulse frequency), which is caused. Please check if the setting value of P01.54 is correct.
AL.242	**The position deviation of the full closed loop is too large.**
AL.244	**Driver overload fault**
AL.245 AL.246	**Motor overload fault**
AL.247	**Motor stall fault**
AL.248	**Driver over temperature fault**
AL.249	**Motor over temperature fault**
AL.270	**Digital input port function parameter setting fault**
AL.271	**Digital output port function parameter setting fault**
AL.272	**Current D/Q axis calculation overflow**
AL.273	**Inertia identification anomaly**
AL.274	**Angle identification fault**

AL.275	**External encoder exception**
AL.284	**EtherCAT synchronization deviation too large fault**
AL.285	**EtherCAT synchronization time setting error fault**
AL.286	**EtherCAT initialization error fault**
AL.287	**The EtherCAT configuration information is abnormal**
AL.288 AL.289	**EtherCAT parameters are abnormal**
AL.292	**EtherCAT synchronization loss fault**
AL.293 AL.294 AL.295 AL.296 AL.297 AL.298 AL.299	**EtherCAT bus error fault**
AL.300	The servo enable input failure is usually caused by the input of an enable signal through the digital input port when the driver is internally enabled.
AL.301	**STO signal input protection**
AL.302 AL.303 AL.304 AL.305	**Power supply phase failure**
AL.306	**Frequency division output frequency too high fault**
AL.310 AL.311 AL.312 AL.313	**Electronic gear ratio setting error fault**
AL.314	**Communication connection exception**
AL.315	**The multi-segment position absolute value mode parameter is incorrectly set**
AL.320	**CANopen communication timeout**
AL.321	**CANopen enters the initialization state**
AL.322	**CANopen enters the stopped state**
AL.323	**CAN bus off**

AL.324	**The PDO transmission length of the CAN bus is incorrectly set**
AL.325	**Soft limit setting abnormal fault**
AL.326	**Soft limit setting abnormal fault**
AL.327	**ECAT synchronization deviation is too large alarm**
AL.330	**Pulse mode set an unsupported homing mode**
AL.331	**CAN bus disconnection**
AL.332	**CAN receive cache overflow fault**
AL.333	**Data loss caused by CAN reception not being processed in a timely manner**
AL.334	**CAN transmission error counter is in passive error state**
AL.335	**CAN receive error counter is in a passive error state**
AL.336	**CAN transmission error**
AL.337	**CAN transmission cache overflow fault**
AL.338	**CAN frame bit filling detection error**
AL.339	**CAN frame format error**
AL.340	**CAN frame response bit error**
AL.341	**CAN frame bit0 error**
AL.342	**CAN frame bit1 error**
AL.343	**CAN frame CRC error**
AL.400	Warning of abnormal setting of electronic gear ratio in frequency division output, due to the number of pulses in frequency division output exceeding the encoder resolution.
AL.410 AL.411 AL.412 AL.413 AL.415 AL.416 AL.417	**Parameter identification exception**
AL.418	**Absolute encoder battery warning** When this warning appears, the absolute encoder can still remember the position correctly, but the battery needs to be replaced in a timely manner to prevent position loss. When replacing the battery, please power on and operate the driver normally before replacing the encoder battery.
AL.420	**Warning of abnormal origin homing** Timeout of zero return, abnormal positive and negative limit positions, etc. can all cause this

	warning. Please check if the sensor is correct, etc.
AL.421	**Origin homing mode setting error warning**
AL.430	**AI channel zero drift set value too large warning**
AL.440	**Emergency stop input warning**
AL.450	The external braking resistance value is less than the minimum braking resistance value required by the driver.
AL.452	**Brake resistor overload warning** Check if the brake parameter settings are correct. If frequent braking causes significant heating of the braking resistor, it can be solved by extending the deceleration time or replacing it with a higher power braking resistor.
AL.460	**Motor overload warning**
AL.461	**Motor power cable disconnection warning**
AL.463	**Power supply phase failure**
AL.470 AL.473	**Encoder abnormal**
AL.475	**Encoder overheat warning**
AL.480	**Positive limit valid warning**
AL.481	**Negative limit valid warning**
AL.482	**Frequent parameter storage warning**
AL.483 AL.484 AL.485	**EtherCAT bus abnormal**
AL.486	**Position command calculation overflow**
AL.490	Performed an operation that requires a restart to take effect or modified parameters that require a restart to take effect.

SUPPORTS

Shenzhen Rtelligent Technology Co.,Ltd

www.rtelligentglobal.com

ADDRESS: 2-6F, A BUILDING, RUITECH INDUSTRIAL PARK, XINGYU ROAD NO.23, XIXIANG STREET, BAO AN DISTRICT, SHENZHEN,GUANG DONG PROVINCE, CHINA

PHONE/WHATSAPP: +86 13826536186

OFFICE DIRECT LINE: +86 755 27440012

EMAIL: info@rtelligent.cn

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