锐特技术
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Rtelligent RS series Servo System Users' Guide

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Preface

Thank you first for purchasing RS series V3.0 servo drives!

RS series V3.0 servo driver is the third generation of general-purpose AC servo driver independently developed by Ruite. The power range of this series of products is 0.05 ~ 3KW, supports MODBUS communication protocol, and can be operated on a network. The drive also contains an internal PLC mode to facilitate customer customization.

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

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

This manual is a comprehensive user manual for RS series V3.0 servo drives. Please read this manual carefully to confirm the relevant information before the formal power-on connection. If you have any doubts about product functions and performance, please consult our company's technical support.

Due to the continuous improvement of the servo drive, the information provided by the company is subject to change without notice.

Manual version change record

Date	Version changed	Change content
2017.7	V1.0	Release 1
2018.5	V2.0	Release 2
2019.9	V2.1	Product Update of Release 2
2020.10	V3.0	Release 3

Packing list

RS servo drive (including one DB44 terminal kit + one main circuit terminal) * one
RSM servo motor *1
Motor supporting power extension cable*1
Motor matching encoder extension cable*1
Drive debugging software communication line * 1 (optional)
Drive Quick Start Guide*1
Brake extension cable for brake motor*1 (special for motor with brake)

Cautions

- 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.
- 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 drive.
- 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 onlycause 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 of, 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 (L1, L2 for single-phase, L1, L2, L3 for three-phase), please 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.

Contents

Chapter 1 RS Series Servo System Configuration Selection

Chapter 1 RS Series Servo System

1.1 Servo Driver Model Description

1.1.1 Servo drive naming and specifications

Servo drive naming

RS ① 400 ② E ③

① RS Series Servo Driver

② Drive power code
100: match 100W motor
200: match 200W motor
400: match 400W motor
750: match 750W motor

③ EtherCAT communication model

Servo drive specifications

1) basic specifications

Drive model	RS100	RS400	RS750	RS1000	RS2000	RS3000
Adapted motor power	100W	400W	750W	1000W	1500W	1500W
Continuous current	100W	400W	750W	1000W	1500W	1500W
Maximum current	100W	400W	750W	1000W	1500W	1500W
Input power	Single phase 220AC		Single phase 220AC		Single-phase or three-phase 220AC	
Size code	Type A		Type B		Type C	
Size	178*160*41		178*160*51		203*178*70	

2) Electrical parameters

Item	Content
Control mode	IPM PWM control, SVPWM drive mode
Encoder type	Matches 17~23Bit optical or magnetic coding, supports absolute encoder
Pulse input specification	5V differential pulse/500KHz; 24V single-ended/200KHz
Analog input specification general input	-10~+10V analog input
General input	8 channels/24V common anode or common cathode
General output	4 channels single-ended +2 channels differential output, single-ended (50mA) / differential (200mA)
Encoder output	ABZ 3 differential output (5V) + Z single-ended output (5-24V)

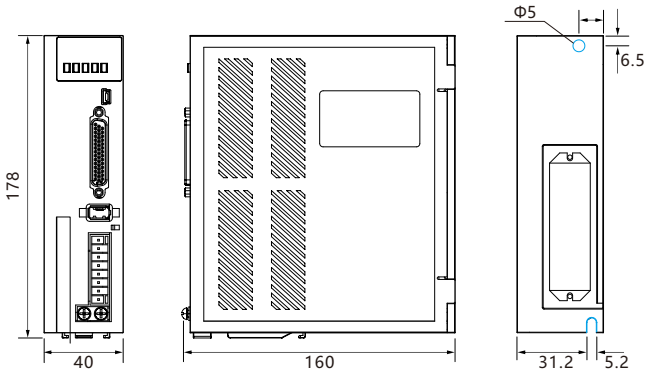
1.1.2 Drive installation

Drive environment

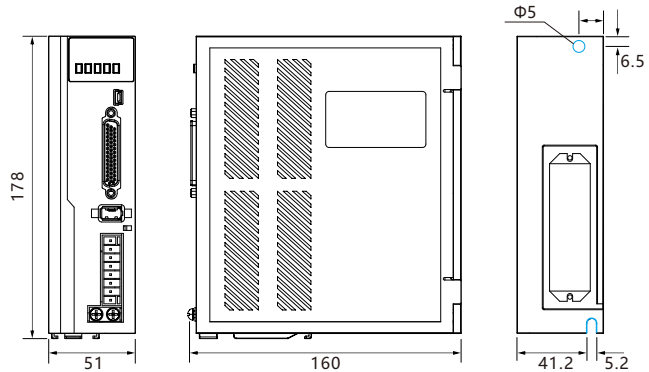
Item	Claim
Ambient temperature	0 ~ 55°C (The average load rate should not exceed 80% when the ambient temperature is above 45°C)
Storage temperature	-20 ~ 85°C
Use/storage humidity	Below 90%RH (no condensation)
Vibration resistance/ impact resistance	4.9m/s2 /19.6m/s2
Protection level	IP10
Altitude	less than 1000m

Drive size

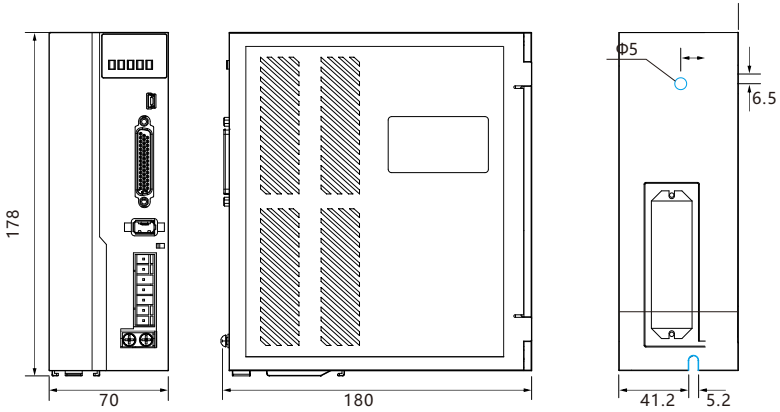
1) Size A Below 400W



2) Size B Below 1500W



1)Size C Below 3000W



Precautions for drive installation

Please install the drive in an electrical cabinet free from sunlight and rain.

Do not place the drive 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 drive. Fix the servo drive firmly on the mounting surface through 2 to 4 mounting holes (the number of mounting holes varies according to the capacity). 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 drive during installation, otherwise it may cause drive failure.

When multiple drives 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 drive 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 drive, it is easy to cause the drive 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, so it needs to be in the input of the drive. Install an insulating transformer on the end.

1.2 Servo motor model description

1.2.1 Motor naming and specifications

Servo motor naming

RSMA ① M ② 06 ③ J ④ 13 ⑤ 30 ⑥ A ⑦ - Z ⑧

① RSM Series Servo Motor
A: 5 pole pairs, Ultra thin
none: 4 pole pairs

② Motor inertia code
S: Small inertia M: Medium inertia
H: Large inertia

③ Motor flange size
06:60mm 13:130mm

④ Encoder resolution
J: 17bit magnetic encoder
H: 23bit optical encoder
G: 17bit magnetic Multi-turn absolute encoder
L: 23bit optical Multi-turn absolute encoder
W: 10000 lines optical encoder

⑤ Motor rated torque
13:1.3 Nm 150: 15 Nm

⑥ Motor rated speed
30: 3000 rpm 15: 1500 rpm

⑦ Oil seal or not
A: with oil seal
none: without

⑧ Brake or not
Z: With brake

Servo motor specifications

1) Basic specifications

Size	Model	Rated Power	Body length	Body length with brake	Suitable Driver
40	RSM-M04J0130A	50W	72	112	RS100
	RSM-M04J0330A	100W	80	120	RS100
60	RSMA-M06J0630A	200W	80	126	RS200
	RSMA-M06J1230A	400W	98	144	RS400
80	RSMA-M08J2430A	750W	113	153	RS750
	RSMA-M08J3230A	1000W	128	168	RS1000
110	RSM-M11W4030A	1.2KW	189	245	RS2000
	RSM-M11W5030A	1.5KW	204	260	RS2000
	RSM-M11W6030A	1.8KW	219	275	RS2000
130	RSM-M13W5025A	1.3KW	171	241	RS2000
	RSM-M13W6025A	1.5KW	179	249	RS2000
	RSM-M13W7725A	2.0KW	192	262	RS3000
	RSM-M13W10015A	1.5KW	213	283	RS3000
	RSM-M13W10025A	2.5KW	209	279	RS3000
	RSM-M13W15015A	2.3KW	241	311	RS3000
	RSM-M13W15025A	3.8KW	231	301	RS3000

2) Electrical parameters

Item	Description
Rated voltage	220V
Encoder style	17bit Magnetic encoder/23bit Optical encoder/ 10000 lines Optical encoder

Item	Description
Motor outlet specifications	A style:AMP Plug B style:Aviation plug
Motor insulation class	Class F(155℃)
Motor protection level	IP65
Brake supply voltage	24VDC

1.2.2 Type description of encoder

Encoder selection specifications

Encoder code	Description
J	Single-turn absolute value 17-bit magnetic encoder
H	Single-turn absolute value 23-bit optical encoder
G	Multi-turn absolute value 17-bit magnetic encoder
L	Multi-turn absolute value 23-bit optical encoder
W	10000 line optical encoder

Encoder performance selection instructions

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 drive.

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.

Absolute encoders can feed back the absolute number of encoder turns, and can be connected to an external battery to keep the motor position information even after the drive is powered off. It is generally used in some high-precision and precise positioning occasions.

Restricted by the encoder manufacturing process and servo drive acquisition capabilities, our company provides up to 23-bit photoelectric encoders with a maximum 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 according to your actual situation.

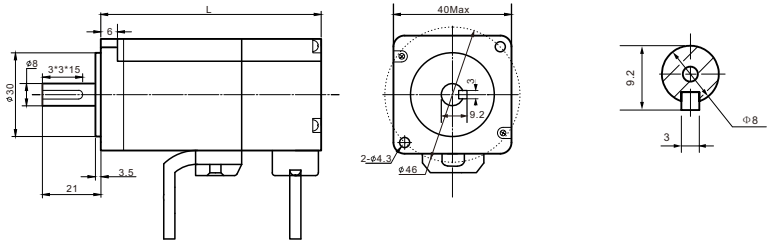
1.2.3 Motor installation

Servo motor use environment

Item	Description
Ambient temperature	0～40℃
storage temperature	-20～60℃
Use/storage humidity	Below 90%RH (no condensation)
Vibration resistance/impact resistance	49m/s2 /196m/s2
Protection level	IP65
Altitude	Below 1000m

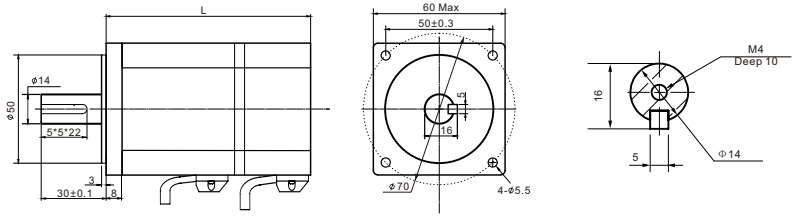
Servo motor size

1) Base 40 (AMP plug outlet*)



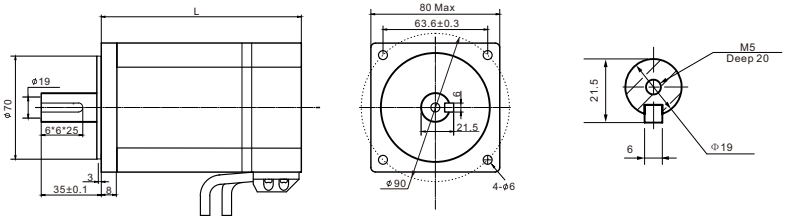
Description	Model	Motor body length L(mm)	Motor weight (kg)
50W	RSM-M04J0130A	72	0.3
100W	RSM-M04J0330A	80	0.45
50W With brake	RSM-M04J0130A-Z	112	0.5
100W With brake	RSM-M04J0330A-Z	120	0.62

2)Base 60 (AMP plug outlet*)



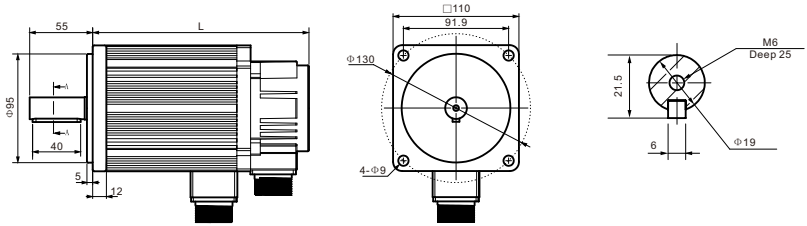
Description	Model	Motor body length L(mm)	Motor weight (kg)
200W	RSMA-M06J0630A	80	0.88
400W	RSMA-M06J1230A	98	1.26
200W With brake	RSMA-M06J0630A-Z	126	1.3
400W With brake	RSMA-M06J1230A-Z	144	1.7

3) Base 80 (AMP plug outlet*)



Description	Model	Motor body length L(mm)	Motor weight (kg)
750W	RSMA-M08J2430A	113	3.1
1000W	RSMA-M08J3230A	128	4.2
750W With brake	RSMA-M08J2430A-Z	163	3.9
1000W With brake	RSMA-M08J3230A-Z	188	5.0

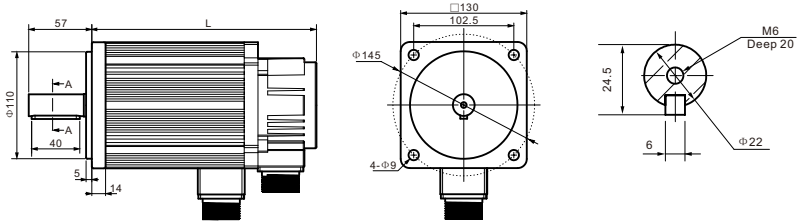
4) Base 110 (Aviation connector outlet*)



Description	Model	Motor body length L(mm)	Motor weight (kg)
1.2KW	RSM-M11W4030A	189	6
1.5KW	RSM-M11W5030A	204	6.8
1.2KW	RSM-M11W6020A	219	7.9
1.8KW	RSM-M11W6030A	219	7.9
1.2KW With brake	RSM-M11W4030A-Z	245	7.1

Description	Model	Motor body length L(mm)	Motor weight (kg)
1.5KW With brake	RSM-M11W5030A-Z	260	7.9
1.2KW With brake	RSM-M11W6020A-Z	275	9.0
1.8KW With brake	RSM-M11W6030A-Z	275	9.0

5) Base 130 (Aviation connector outlet*)



Description	Model	Motor body length L(mm)	Motor weight (kg)
1.3KW	RSM-M13W5025A	171	6.6
1.5KW	RSM-M13W6025A	179	7.4
2.0KW	RSM-M13W7725A	192	8.3
1.5KW	RSM-M13W10015A	213	9.8
2.5KW	RSM-M13W10025A	209	9.7
2.3KW	RSM-M13W15015A	241	12.6
3.8KW	RSM-M13W15025A	231	12.4
1.3KW With brake	RSM-M13W5025A-Z	241	7.7
1.5KW With brake	RSM-M13W6025A-Z	249	8.5
2.0KW With brake	RSM-M13W7725A-Z	262	9.4
1.5KW With brake	RSM-M13W10015A-Z	283	10.9
2.5KW With brake	RSM-M13W10025A-Z	279	10.8
2.3KW With brake	RSM-M13W15015A-Z	311	13.7
3.8KW With brake	RSM-M13W15025A-Z	301	13.5

Remarks:

The outlet specification of AMP plug is "4 holes motor wire + 9 holes encoder wire + 2 holes brake wire"

The outlet specification of the aviation plug is "4 holes motor wire + 7 holes encoder wire + 2 holes brake wire"

Precautions for motor installation

Please ensure that the installation direction is perpendicular to the wall, and use natural air convection or a fan to cool the servo drive. by2 to 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 drive during installation, otherwise it may cause drive failure.

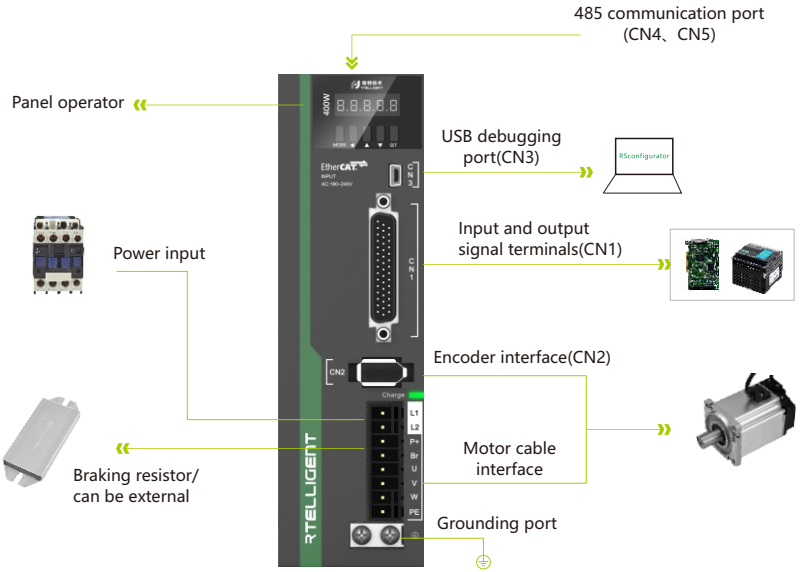
When multiple drives are installed in the control cabinet, please note that sufficient space must be reserved for the placement position to achieve sufficient heat dissipation.

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 drive, it is easy to cause the drive 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, so it needs to be in the input of the drive. Install an insulating transformer on the end.

1.2.4 Servo system configuration schematic



List of standard model combinations

Motor base	Model	Rated power	Matching driver	Encoder cable	Power extension cable
40	RSM-M04J0130A	50W	RS100(E)	SES4-030	SMS-030
	RSM-M04J0330A	100W	RS100(E)	SES4-030	SMS-030
60	RSMA-M06J0630A	200W	RS200(E)	SES4-030	SMS-030
	RSMA-M06J1330A	400W	RS400(E)	SES4-030	SMS-030
80	RSMA-M08J2430A	750W	RS750(E)	SES4-030	SMS-030
	RSMA-M08J3230A	1KW	RS1000(E)	SES4-030	SMS-030
110	RSM-M11W4030A	1.2KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M11W5030A	1.5KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M11W6020A	1.2KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M11W6030A	1.8KW	RS2000(E)	SEH4-030	SMH-030
130	RSM-M13W5025A	1.3KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M13W6025A	1.5KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M13W7725A	2.0KW	RS2000(E)	SEH4-030	SMH-030
	RSM-M13W10025A	2.5KW	RS3000(E)	SEH4-030	SMH-030
	RSM-M13W15015A	2.3KW	RS3000(E)	SEH4-030	SMH-030
	RSM-M13W15025A	3.8KW	RS3000(E)	SEH4-030	SMH-030

* Driver with E is EtherCAT function

** Cable is 3 meters as standard, other specifications please specify when ordering

1.3 Matching cable specifications

1.3.1 Motor and encoder wiring

Servo motor and encoder wiring naming

1 S: Voltage class 220VAC
H: Voltage class 380VAC

2 Wiring category
M: Motor power wiring
E: Motor encoder wiring

3 Plug category
S: AMP plug for motors below 80
H: Aviation plug for 110, 130 motors

4 Number of motor core wires
4: Encoder 4 cores (4 cores omitted for power cord)
6: Absolute encoder 6 core

5 Cable length
030: 3 meters
050: 3 meters

Motor wiring matching table

1) AMP plug type motor wiring (40/60/80 frame)

Cable Types of	Cable length		
	3meters	5meters	8meters
Motor wire	SMS-030	SMS-050	SMS-080
Encoder line	SES4-030	SES4-050	SES4-080
Brake line	SMBZ2-030	SMBZ2-050	SMBZ2-080
Multi-turn absolute encoder line	SES6-030	SES6-050	SES6-080

2) Aviation plug type motor wiring (110/130 frame)

Cable Types of	Cable length		
	3meters	5meters	8meters
Motor wire	SMH-030	SMH-050	SMH-080
Encoder line	SEH4-030	SEH4-050	SEH4-080
Brake line	HMBZ2-030	HMBZ2-050	HMBZ2-080
Multi-turn absolute encoder line	SEH6-030	SEH6-050	SEH6-080

Motor wiring requirements

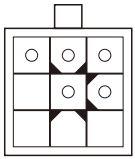
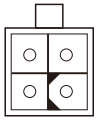
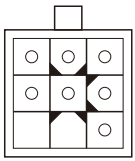
The motor power line must meet certain current carrying requirements:
Motors below 80 use wire diameter specifications above 0.5mm2
Motors below 130 use wire diameter specifications above 0.75mm2
Motor encoder wiring needs to meet the requirements of shielding isolation:
The standard configuration is 0.14mm2 wire diameter, twisted pair, shielded cable.
Another:
For drag chains or similar use environments, be sure to use flexible cables that meet the requirements to ensure the normal operation of the servo system.
The cables installed in the drag chain need to maintain a certain amount of space.
Do not increase the bending angle of the cables artificially.

Motor and encoder extension cord objects and definitions

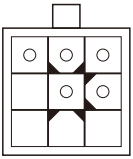
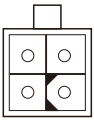
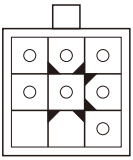
Motor wiring of 80 and below

110/130 motor wiring

Definition of motor extension cords and motor connection terminals below 80

Single-turn multi-position encoder extension cable SES4-030		Serial number 3 2 1 5 4	1	Shield		
			2	VCC		
			3	GND		
			4	PS+		
			5	PS-		
Motor power extension cord SMS-030		Serial number 2 1 4 3				
			1	U		
			2	V		
			3	W		
			4	PE		
Brake extension cord SMBZ2-030		Serial number 1 2				
			1	brake+		
			2	brake-		
Multi-turn absolute encoder extension SES6-030		Serial number 3 2 1 6 5 4 7				
			1	Shield	5	PS-
			2	VCC	6	BAT+
			3	GND	7	BAT-
			4	PS+		

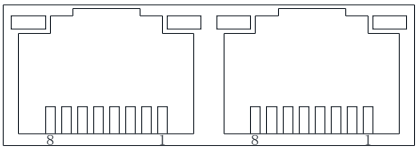
110/130 motor extension cable and motor connection end definition

Single-turn multi-position encoder extension cable SES4-030		Serial number 3 2 1 5 4	1	Shield		
			2	VCC		
			3	GND		
			4	PS+		
			5	PS-		
Motor power extension cord SMS4-030		Serial number 2 1 4 3				
			1	U		
			2	V		
			3	W		
			4	PE		
Brake extension cord SMS4-030		Serial number 1 2				
			1	brake+		
			2	brake-		
Multi-turn absolute encoder extension SES6-030		Serial number 3 2 1 6 5 4 7				
			1	Shield	5	PS-
			2	VCC	6	BAT+
			3	GND	7	BAT-
			4	PS+		

1.3.2 Mini-USB debugging wiring

Mini-USB debugging cable is used to connect the driver to the PC, and use the debugging software RS configurator provided by Rtelligent to monitor and adjust the status of the servo system in more detail.
Please apply for the cable from Rtelligent or provide it by the customer.

1.3.3 485 communication wiring



In order to facilitate the network connection, the RS servo drive 485 interface adopts a standard RJ45 network port form, of which only 3 pins required for 485 are used. When connecting with other drives, you can directly use a standard network cable.
When the drive needs to be connected with a debugging cable to connect the drive to the PC, use the debugging software RS configurator provided by Ruite to monitor and adjust the status of the servo system in more detail.
Please apply for the cable from Ruite or provide it by the customer.

1.4 Braking resistor configuration instructions

When the servo motor is decelerating, it will convert the high-speed kinetic energy at the load end into electrical energy and return it to the main circuit of the drive. The capacitor configured in the main circuit can absorb part of it, but when the motor power is large, the load is heavier, and the deceleration time is short, the conversion The electric energy is very large, and the driver capacitor cannot absorb it.
At this time, an external braking resistor is usually needed to absorb this part of the energy. The drives of Rite Size B and above are all equipped with a braking resistor. Due to the size of the drive, the power of the resistor is limited. When encountering more severe operating conditions (larger load, faster speed, etc.), an external braking resistor with larger power is required to replace the low-power resistor matching the drive.
It is only necessary to remove the cables at both ends of Pr and B and replace them with the ends of the external braking resistor. In addition, in order to ensure the neatness and heat dissipation of the electrical connection environment, the brake resistor needs to be fixed on a flat metal surface (easy to dissipate heat).

Model	RS100	RS400	RS750	RS1000	RS2000	RS3000
Adapted motor power	100W	400W	750W	1000W	2000W	3000W
Continuous current	1.5A	2.8A	4.5A	6.0A	7.4A	10.1A
Maximum current	4.5A	8.4A	13.5A	18.0A	22.2A	30.3A
Built-in braking resistor resistance	—	100Euro	50Euro		50Euro	
and power	—	50W	75W		100W	
Allowable braking power	—	25W	38W		50W	
Minimum resistance of external braking resistor	—	50Euro	30Euro		20Euro	

Brake resistor configuration reference

As mentioned in the above table, the braking energy of the drive returns to the DC bus first. When the feedback superimposed voltage exceeds the reference value set by the drive (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 drive 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 drive's built-in braking resistor. 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.

1.5 Accessories description of multi-turn absolute encoder

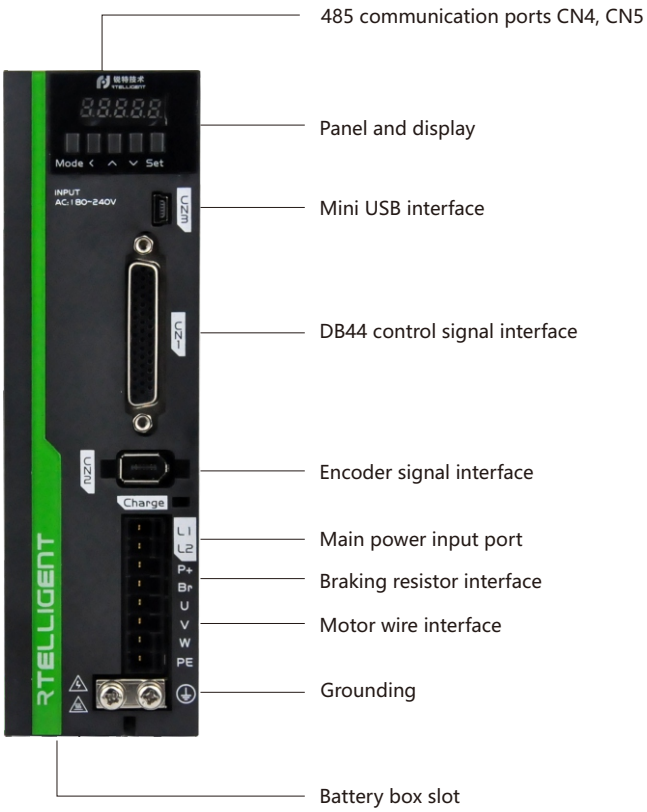
When using a servo motor with a multi-turn absolute encoder, you need to pay attention to selecting the corresponding encoder cable and the corresponding battery.
At the bottom left of the drive is a special card slot for the battery box. We are equipped with the battery and battery box of the corresponding specifications when leaving the factory. When the battery is exhausted, the drive will prompt related alarms. When replacing the battery, remove the battery box for replacement.
The standard battery specifications are: 3.6V, 2500mAh.

Chapter 2 Wiring instructions of drive and motor

Chapter 2 Wiring instructions of drive and motor

2.1 The interface of the servo driver

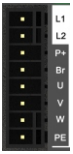
1) Size A/Size B driver interface



Remarks:
1. When you do not use our matching cables, please make sure that the wiring sequence is correct and the specifications need to meet the requirements of the use environment.
2. To protect the safety of the system, please use a dedicated leakage protection circuit breaker to ensure the safety of the working environment of the servo system.
3. To ensure safety, please check the wiring sequence and reliability of all wiring carefully before powering on.

2.2 Driver main circuit connection

1) Main circuit wiring terminals

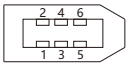
Functions	Terminal	Description	Illustration
Input power	L1	Single-phase 220VAC	
	L2		
Braking resistor	P+	When using an external braking resistor, just replace the P+ and Br wiring	
	Br		
Motor wiring	U、V、W	Connect the motor extension cable	
	PE		

2) Precautions for main circuit wiring

- Do not connect the input power cable to the output U, V, W, otherwise it will cause damage to the servo driver.
- Do not pass or bundle the power and signal cables together from the same conduit; they should be more than 30cm apart.
- Do not switch on and off the power supply of the driver frequently, and keep it below one time per minute when it is necessary to switch on and off the power supply repeatedly. Since the power supply part of the servo driver has a capacitor, a large charging current (charging time 0.2s) will flow when the power is turned on. If the power supply of the servo driver is switched on and off frequently, the performance of the main circuit components inside the servo driver will be decreased.
- Please connect the servo driver to the ground reliably.
- Even if the input power is turned off, high voltage may remain in the internal capacitance of the servo driver. Please do not touch the unit terminals within 5 minutes.
- Please do not power on and use the servo driver when the terminal block screws or cables are loose, otherwise it may cause a fire.

2.3 Connection of driver encoder signal terminal CN2

1) Definition of driver encoder terminal Cn2

Pin No.	Terminal	Description	Illustration
1	Vcc	The encoder power supply is provided internally by the driver	
2	Gnd		
5	PS+	Encoder communication terminal	
6	PS-		
3	Reserved		
4	Reserved		

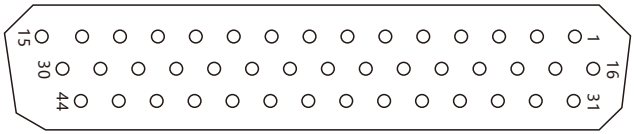
2) Encoder wiring requirements

- Please select Rtelligent's standard configuration cable SE series cables or cables with the same specifications.
- The encoder cable should be as far away as possible from other high-current circuits of the equipment to prevent interference.
- Do not place the encoder connector in the drag chain to prevent poor connection at the connector.
- The absolute encoder wiring comes with two battery connectors. Please pay attention to battery protection when purchasing.
- Pay attention to the distribution space when placing the cable in the drag chain to avoid excessive bending angle and the consequent reduction of the cable life.

2.4 Connection of driver control signal terminal CN1

Cn1 is a 44-pin, three-row DB connector, shipped with the driver, please check the pin definition and electrical specifications carefully

1) Pinout diagram of driver control signal terminal Cn1

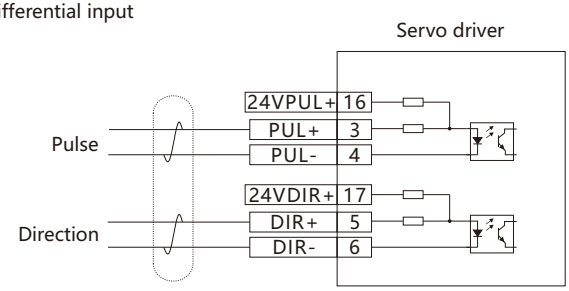


2) CN1 wiring definition

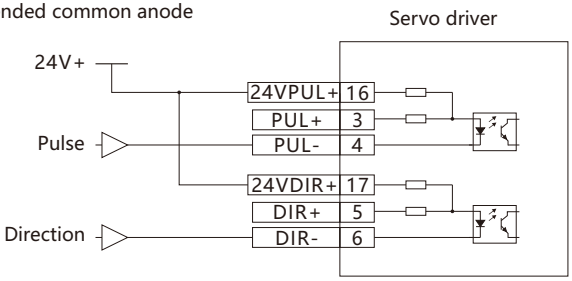
2.1) External pulse interface

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	24V positive
24VDIR+	17	24V direction positive	

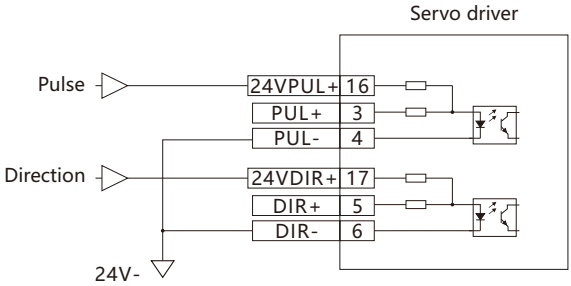
Differential input



Single-ended common anode



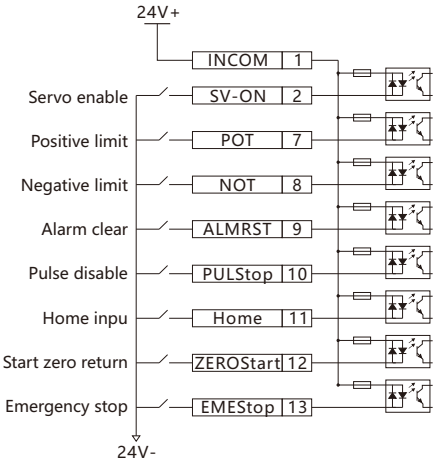
Single-ended common cathode



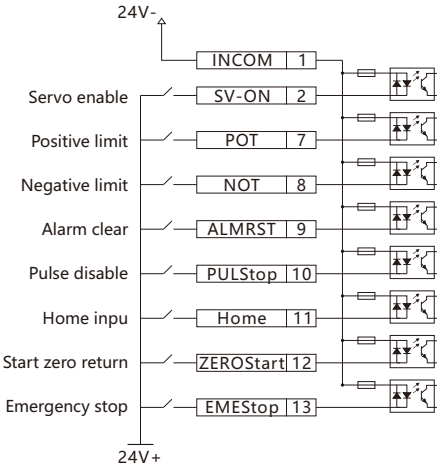
2.2) Common input interface

Signal Name	Pin No	Signal Definition	Default function	Description
IN1(SV-ON)	2	Input 1	Servo enable	Common anode or common cathode is supported below 24V, and NPN and PNP are not supported at the same time.
IN2(POT)	7	Input 1	Positive limit	
IN3(NOT)	8	Input 1	Negative limit	
IN4(ALMRST)	9	Input 1	Alarm clear	
IN5(PULStop)	10	Input 1	Pulse disable	
IN6(Home)	11	Input 1	Home inpu	
IN7(ZEROStart)	12	Input 1	Start zero return	
IN8(EMEStop)	13	Input 1	Emergency stop	
INCOM	1	Input common		

Common anode input(NPN)



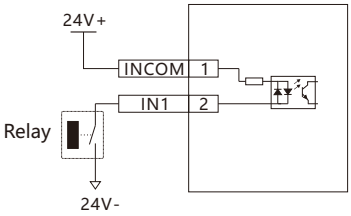
Common cathode input(PNP)



The driver has a total of 8 input ports. As shown in the figure above, the input uses a bidirectional optocoupler, which can support NPN and PNP type switching signals. The circuit of IN1~IN8 is the same, and the function can be selected and set according to P02.00~P02.15 (see parameter chapter).

Take IN1 as an example, the wiring example is as follows:

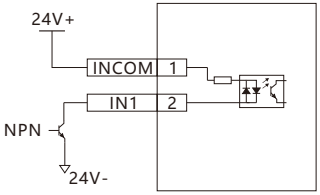
a) Relay type



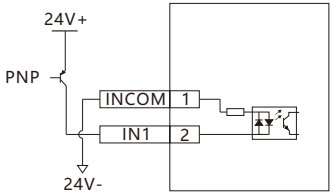
b) Open collector type

NPN or PNP type can be supported respectively, two mixed modes are not supported

Common anode input(NPN)

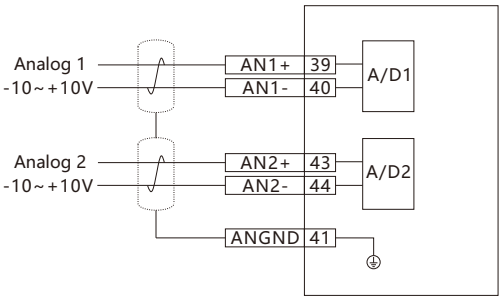


Common cathode input(NPN)



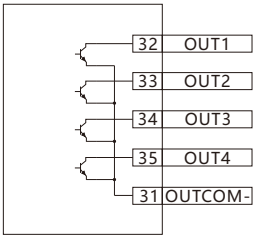
2.3) Analog input interface

Signal Name	Pin No	Signal Definition	Default function	Description
AN1+	39	Analog 1+		-10V~+10V Analog input Input impedance is about 9KΩ
AN1-	40	Analog 1-		
AN2+	43	Analog 2+		
AN2-	44	Analog 2-		
ANGND	41	Analog ground		

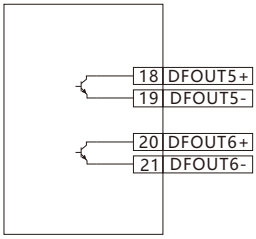


2.4) Common output interface

Signal Name	Pin No	Signal Definition	Default function	Description
OUT1(SV-RDY)	32	Output 1	Servo ready	Below 24V Common cathode output Current not exceeding 50mA
OUT2(INP)	33	Output 2	Positioning completed	
OUT3(ALM)	34	Output 3	Alarm Output	
OUT4(ZERODONE)	35	Output 4	Return to zero completed	
OUTCOM-	31	Output common ground	Output	
DFOUT5+(BRK+)	18	Output 5 positive	Brake positive	Below 24V Differential output Current not exceeding 200mA
DFOUT5-(BRK-)	19	Output 5 negative	Brake load	
DFOUT6+(PULO+)	20	Output 6 positive	Position command shutdown	
DFOUT6-(PULO-)	21	Output 6 negative	Position command shutdown	



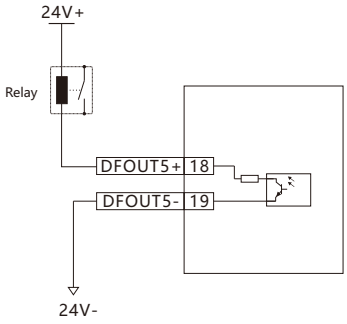
OUT1~OUT4,Common cathode output
Maximum current 50mA



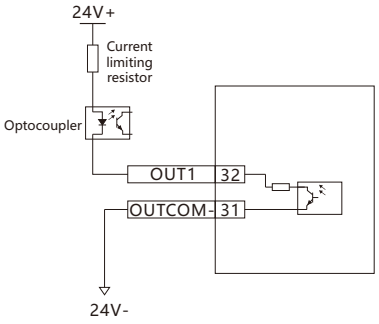
OUT5~OUT6,Differential output
Maximum current 200mA

The driver has a total of 6 output ports. As shown above, the common cathode output is driven at 50mA for low current output; the differential output is driven at a maximum of 200mA for driver relay type output.
Take OUT1 and DFOUT5 for example, the wiring is as follows:

a) Relay type (OUT5 and OUT6 only)



b) Optocoupler type (OUT1~OUT6)

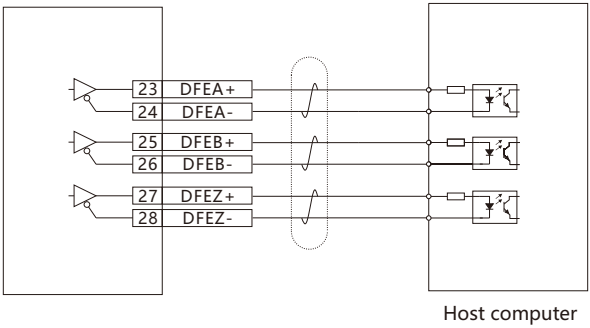


2.5) Encoder signal output interface

Signal Name	Pin No	Signal Definition	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-	
EZ	29	Single-ended EZ+	24V single-ended output
ECGND	30	Single-ended EZ ground	

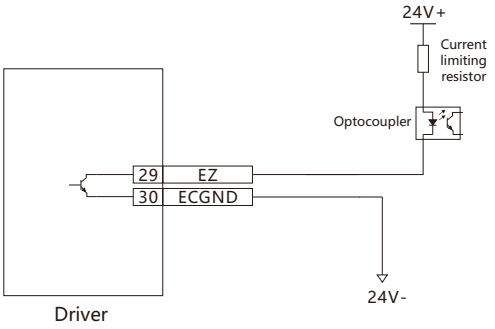
a) Differential A/B/Z output

There are 3 differential outputs of the driver encoder, the maximum output current is 20mA, which can be used for the host computer to collect the encoder signal.



b) Single-ended Z output

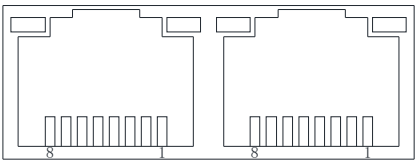
The single-ended collector output of the Z signal of the driver encoder is generally used to collect the Z signal separately.



2.5 Connection of the driver commissioning communication terminal CN3

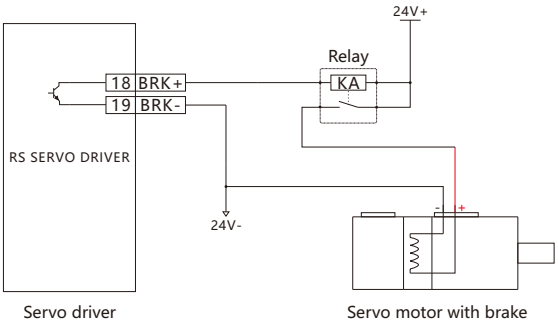
The CN3 interface is a standard mini-USB interface, which is used to connect to the computer's USB port for debugging software communication.
Please ask the manufacturer or prepare a cable of the same specification when you need to use it.

2.6 Connection of driver 485 communication terminal CN4 and CN5



CN4 and CN5 are parallel connection 485 ports, which adopt RJ45 specifications for 485 communication connection.
For specific wiring definitions, please refer to chapter 1.3.3

2.7 Control wiring of holding brake motor



Remarks:

1. The output signal of brake control can only be specified as OUT5 or OUT6 port, and OUT5 is shown as default.
2. Please pay attention to the polarity of the motor brake cable.

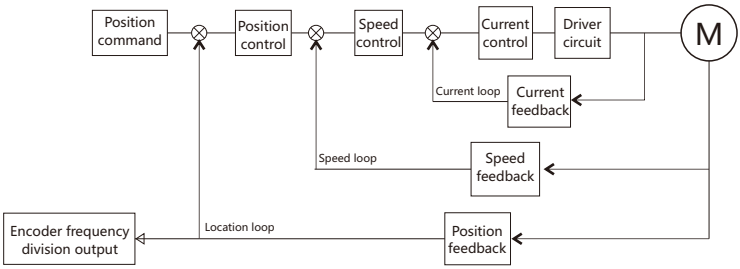
Chapter 3 Control mode and debugging method

Chapter 3 Control mode and debugging method

3.1 Position control mode

3.1.1 Instructions for using the position control mode

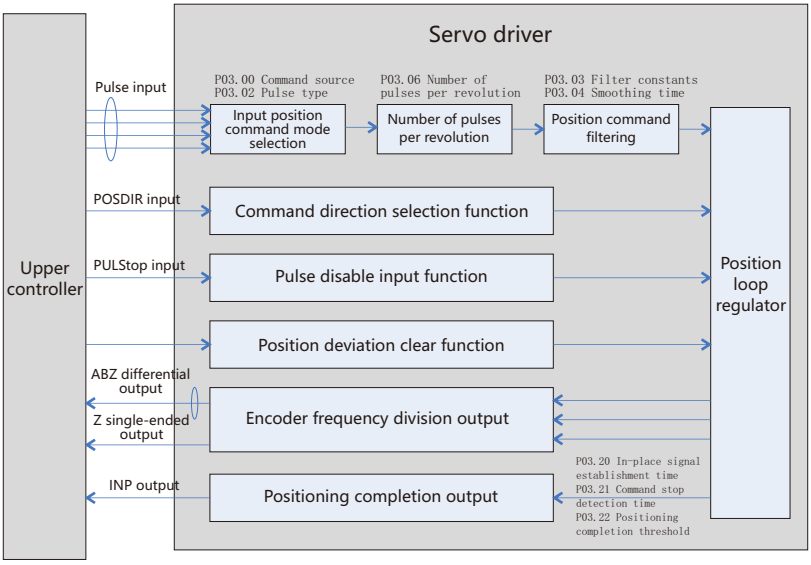
Block diagram of position mode



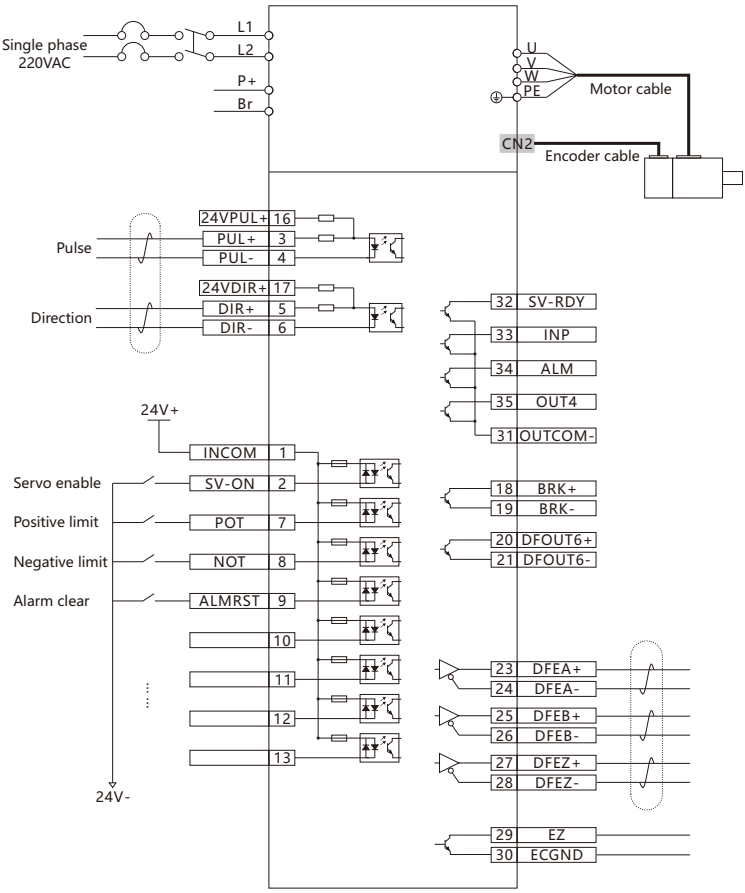
The position control mode takes the position of the motor as the control target, and is controlled by the three loops (current loop, speed loop, and position loop) of the driver to convert the position command into the displacement output of the corresponding motor.

The sources of positioning commands mainly include external input pulses or internal position commands.The external input pulse is counted by the driver circuit, and the number of pulses is converted into the corresponding displacement of the motor, and the speed of the motor rotation is determined by the pulse frequency. Since the position control mode can accurately control the position and speed, the position control mode is mainly used for precise positioning control applications.

The following is the internal logic diagram of the position control mode driver.



3.1.2 Position control mode wiring



Remark:

1. The general input signal is a two-way optocoupler circuit, which can be connected to a single common anode or a single common cathode (pin 1 is the common terminal)Common anode and common cathode cannot be mixed.

2. The general output signal is a common cathode connection, and pin 31 is a common ground. The maximum current of the output loop is 50mA.
The maximum current of the differential output signal output loop is 200mA, which can be used to drive the relay switch.

3. The encoder output signal Z signal has single-ended output (pin 29 and 30).

4. The input pulse frequency is up to 500KHz.

3.1.3 Position control mode related parameter setting (external pulse)

Referring to the position control mode logic diagram, the position control mode requires settings including control mode, input pulse type, number of pulses per revolution, input/output status, etc.

First, please set P01.00 to 0 and set the driver to "Position Control Mode".

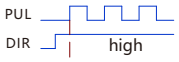
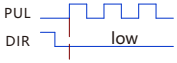
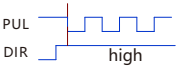
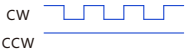
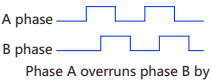
1. Position command input setting

a) Position command source

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.00	Position command source	0: Pulse command 2: Multi-segment position command 3: Internal test 4: Communication control 5: IO forward and reverse		Set the position command source. The pulse command is an external position command, others are internal position commands.	Set after stopping	Effective immediately	0

b) Position command source

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.01	Pulse command type	0: Pulse + direction (positive logic) 1: Pulse + direction (negative logic) 2: Double pulse 3: Orthogonal pulse		Set pulse command type	Set after stopping	Save and restart	0

Parameter	Pulse form	Forward pulse diagram	Reverse pulse diagram
P03.01	0 Pulse + direction (positive logic)		
P03.01	1 Pulse + direction (negative logic)		
	2 Double pulse		
			
	3 AB orthogonal pulse quadruple frequency		

c) Reverse the motor running direction

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P01.01	Pulse command reverse direction	0 : Not reversed 1 : Reversed		Set pulse command and reverse direction	Set after stopping	Save and restart	0

2.Pulse per revolution and electronic gear ratio setting

When the driver receives external pulses, it counts the received pulses, and the encoder feedback is determined (encoder resolution), so the driver needs to set the ratio between the counted pulses and the encoder feedback to determine how many pulses are needed for the motor to complete a revolution.
The driver has two sets of parameters related to this.
①P03.06 Number of pulses per motor revolution, directly set the number of pulses required for one revolution of the motor.
②The electronic gear ratio composed of P03.08 and P03.10, the number of pulses per revolution is determined by setting the ratio of numerator and denominator.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.06	Number of pulses per revolution of motor	0~1048576	P/r	Set the number of external pulses required for one revolution of the motor	Set after stopping	Effective immediately	10000
P03.08	Electronic gear ratio numerator A	1~1073741824		Set according to the following formula: $\frac{A}{B}=\frac{\text{Encoder resolution}}{\text{Number of pulses required for one revolution}}$	Set after stopping	Effective immediately	1
P03.10	Electronic gear ratio numerator B	1~1073741824		Remarks: When P03.06 is not 0, the electronic gear ratio is invalid, and the value of P03.06 shall prevail	Set after stopping	Effective immediately	1

3.Pulse command filtering setting

When the driver receives external pulses, it can make the input pulses have better electrical characteristics by adding certain filtering processes to improve the motor's operating performance.
RS series drivers provide two types of pulse command filtering:
①Pulse frequency low-pass filtering: P03.03 is used to set the low-pass filtering constant
② Position command average filtering: P03.04 is used to set the position command average filtering time
The low-pass filtering is mainly used to filter out the pulse high-frequency signal and improve the anti-interference capability of the driver.
The average filtering is used to make the external input pulse signal smoother and is mainly used when the external pulse command does not have acceleration or deceleration or the system requires better motion smoothness. Setting the time of P03.04 will cause the command delay of the corresponding time, and the value should be set according to the actual situation.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.03	Pulse frequency low-pass filtering constants	1~255	50ns	Set the pulse frequency low-pass filtering constants	Set after stopping	Effective immediately	10
P03.04	Position command average filtering time	1~512	0.1ms	Set the position command average filtering time	Set after stopping	Effective immediately	1

4.Encoder frequency division output and the general input and output setting

When the drive is running, the encoder signal can be output to the upper control system in real time, and the motor running status can be better fed back to the upper control system. For the relevant parameters of the encoder frequency division output, please refer to the P01 group parameters.

For general input and output functions and settings, please refer to the relevant parameters of group P02.

3.1.4 Position control mode related parameter setting (internal position command)

The position control mode of the internal position command input, that is, the mode outside the P03.00 parameter = 0, detailed analysis is as follows
2: multi-segment position command (multiple IO combinations switch the relative or absolute displacement of the motor)
3: internal test (key + panel operation, manual control of the motor fixed-length forward and reverse)
4: communication control (485 communication setting)
5: IO forward and reverse (IO control motor fixed-length forward and reverse)

First, please set P01.00 to 0 and set the driver to "position control mode".

1.Various internal mode related parameters setting

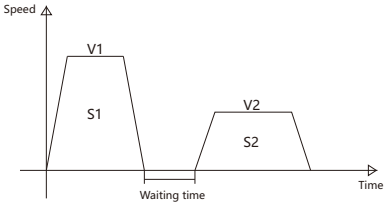
a) 2: Multi-segment position command

The RS series driver integrates 16-segment position commands, and parameters such as operating speed and displacement for each segment can be set individually. The waiting time between the segments can also be adjusted at will. The specific implementation steps are as follows.

①: Select multi-segment position operation mode
②: Set the number of pulses per revolution (P03.06)
③: Set the operating curve of each segment position (parameters P09.12~P09.91 set the operating curve of the 1st~Nth segment respectively)
④: Set enable IN port (select start IN port, set IN port function to FunIN.21 - multi-segment position enable input)
⑤: If it is the IN port switching operation, it is also necessary to set the switching IN port (select the IN port, set the IN port function to FunIN14~FunIN17 - multi-segment position switching input)
⑥: After enabling the driver, switch the relevant inputs of the multi-segment position operation mode in order to enter the multi-segment position operation mode

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P09.00	Number of running segments in multi-segment position	0: Single 1: Cycle operation 2: IN port switching		0:Single Single run after N-segment stop 1:Cycle operation Cycle operation 2:IN port switching Switch the IN port combination to select running segments	Set after stopping	Effective next time	1
P09.01	Number of running segments in multi-segment position	1~16	bout	Set the total number of segments N	Set after stopping	Effective next time	1
P09.03	Unit of waiting time	0: ms 1: s		Set the unit of waiting time after each segment of the position is completed	Set after stopping	Effective next time	0
P09.04	Position command type selection	0: Incremental operation 1: Absolute operation		0: Incremental operation The displacement set in the nth segment is X, and the position of the n-1 segment is Y. When the nth segment is triggered, the running displacement is X 1: Absolute operation (The position refers to the origin) The displacement set in the nth segment is X, and the position of the n-1 segment is Y. When the nth segment is triggered, the running displacement is X-Y	Set after stopping	Effective next time	0

- Single and cycle operation (mode 0 and mode 1)

Operation logic	Curve indication
①Set an IN port as the start signal: FunIN.21: Select an IN port and change the function of this input port to FunIN.21 (Multi-segment position mode enable input) ②Keep the selected IN port at the effective level The multi-segment position mode takes effect, and the motor runs from 1 to N segments in sequence If it is mode 0, it will run once and stop If it is mode 1, it will run in cycle ③Disconnect IN port (IN port level is invalid) The motor gives up the current segment operation and stops directly ④Re-enable the IN port, and the motor will start to run from the first segment	

Note:When P09.00 is 0 or 1, the multi-segment position mode enable input signal is level-remaining valid. When the input signal remains level-valid, the drive executes the multi-segment position command operation; when the level is invalid, the motor stops running immediately.

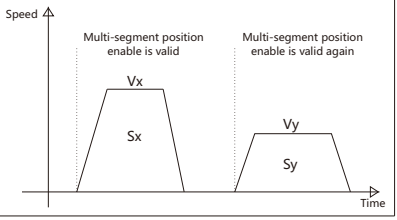
When the enable level is restored again, the motor restarts from the first segment.

After each segment command is sent, the internal command stop signal output of the driver is valid.

After each segment of movement is completed (the encoder feedback reaches the positioning completion threshold), the driver positioning completion signal output is valid.

During operation, the multi-segment position mode enable signal is suddenly disconnected, the motor stops, and the drive positioning completion signal output is valid.

- IN switching operation (mode 2)

Operation logic	Curve indication
①Set an IN port as the start signal: Select an IN port and change the function of this input port to FunIN.21 (Multi-segment position mode enable input) ②Set another IN port for combination switching of segments: FunIN14~FunIN7: Set the input port to FunIN14~FunIN7 (Multi-segment position switching input) ③Select the corresponding segment and start the enable signal Motor completes operation of the corresponding segment	

Note:
When P09.00 is 2, the multi-segment position mode enable input signal is edge valid. When the input signal level changes from invalid to valid (edge), the driver executes the segment motion corresponding to FunIN ports 14~17.
When the enabled level edge is triggered, no matter how the subsequent level changes, the driver will give priority to executing the segment operation.
The positioning completion command is issued after the segment target position is reached, and the external start signal does not respond until then.
When the command of segment x is issued, the next segment number corresponding to FunIN14~17 can be adjusted.
The waiting time between segments is not valid in this mode, and the delay interval is determined by the timing of the start signal.

IN switching combination

Segment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FunIN.14	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
FunIN.15	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
FunIN.16	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
FunIN.17	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Set the motion curve for each segmentP09.
12~P09.91 are the operation parameter tables of segments 1~16 in sequence, taking segment 1 as an example:

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P09.12 + P09.13	First displacement	-1073741824~ 1073741824	pulse	Set the total displacement of the first segment position S1	Set after stopping	Effective next time	10000
P09.14	Max. speed of first segment	0~6000	rpm	Sets the maximum speed of the first segment of operation	Set after stopping	Effective next time	200
P09.15	Acc and dec time of the first segment	1~65535	ms	Set the time for the first segment position to accelerate from 0 to 1000rpm (deceleration is the same).	Set after stopping	Effective next time	100
P09.16	Waiting time after completion of the first segment displacement	0~65535	ms(s), Refer to P09.04	Set the waiting time after completion of the first segment positioning	Set after stopping	Effective next time	100

b) 3：Internal test mode

In the internal test mode, it is possible to control the start/stop of the motor by communication or to operate the motor continuously in one direction/reciprocating direction, generally for demonstration or test purposes. This mode is for internal use and users do not need to master it.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.60 P04.61	Number of internal test pulses	0~1073741824	pulse	Total displacement for setting internal test mode	Set after stopping	Effective next time	50000
P04.62	Maximum speed for internal test	0~6000	rpm	Maximum speed for internal test	Set after stopping	Effective next time	1000
P04.63	Acceleration time for internal test	1~65535	ms	Set the time for the first segment position to accelerate from 0 to 1000 rpm	Set after stopping	Effective next time	200
P04.64	Deceleration time for internal test	1~65535	ms	Set the time for the first segment position to decelerate from 1000 to 0rpm	Set after stopping	Effective next time	200
P04.65	Internal demonstration operating mode	0~1	-	0:Motor reciprocating operation 1:Motor running in one direction	Set after stopping	Effective next time	0
P04.66	Starting direction of internal demo run	0~1	-	0:Positive direction 1:Negative direction	Set after stopping	Effective next time	0
P04.67	Number of internal demonstrations	0~65535	-	Set the number of internal demonstrations	Set after stopping	Effective next time	1
P12.09	Internal test displacement mode	0~1	-	0-Incremental mode 1-Absolute mode	Set after stopping	Effective next time	0
P12.10	Internal test start/stop	0~6	-	Set internal test start/stop command	Set after stopping	Effective next time	6
P12.12	Internal demo wait time	0~65535	ms	Set internal demo wait time	Set after stopping	Effective next time	100
P12.13	Internal demo start	0~2	-	Set internal demo start/stop command	Set after stopping	Effective next time	0
P01.33	Emergency stop deceleration time	0~65535	ms	Set emergency stop deceleration time (1000rpm~0)	Set after stopping	Effective next time	30

The internal test is started as follows:
1. The motor works in communication control mode:
By writing the start/stop command for operation via P12.10, and the motor will run in accordance with the operation curve determined by the command stroke, speed and acceleration/deceleration time constant set by P04.60 ~ P04.64.

P12.10 write value	Description
0	Trigger the motor to decelerate to stop. After the motor responds to the start-stop command, set P12.10 to 6;
1	Trigger the motor to run forward and stop after the running command set by P04.60. After the motor responds to the start-stop command, set P12.10 to 6;
2	Trigger the motor to run reversely and stop after the running command set by P04.60. After the motor responds to the start-stop command, set P12.10 to 6;
3	Trigger the motor to jog forward. After the motor responds to the start-stop command, set P12.10 to 6;
4	Trigger the motor to jog reversely. After the motor responds to the start-stop command, set P12.10 to 6;
5	Trigger an emergency stop of the motor. After the motor responds to the start-stop command, set P12.10 to 6;
6	Meaningless. Read: indicates that the motor is running or waiting to be triggered;

2. The motor works in cyclic operation (demonstration) mode:
he start/stop command for the demonstration is written via P12.13. In the demo running mode, the motor runs the number of times set by P04.67 in the reciprocating or single direction (P04.65=0/1), positive or negative start (P04.66=0/1) according to the running command, speed and acceleration/deceleration time constants set by P04.60 to P04.64. After each completion of the set running command, the delay time set by P12.12 is delayed and then started again, thus running in a cycle.

P12.13 write value	Description
0	Stop the operation of the demo mode. Read: it means that the motor is waiting for trigger operation;
1	Starts demonstration mode operation; After the motor responds to the start-stop command, set P12.13 to 2;
2	Starts demonstration mode operation; After the motor responds to the start-stop command, set P12.13 to 2;

c) 4：Communication trigger control mode

The RS series drivers include 485 communication function, CN4 and CN5 are 485 communication interfaces. Refer to the relevant part of the manual for port definitions and set the communication baud rate appropriately for proper connection.
In the position control mode of the communication mode, the relative stroke or absolute position parameter P03.58 can be written via communication. (P03.57 is displayed on the LED display panel of the driver, the position command stroke consists of two registers P03.57/P03.58 as a signed 32-bit integer value, where P03.57 is the low 16-bit value and P03.58 is the high 16-bit value. The trigger mode of communication control is to write the value of P03.58 (high 16-bit) to start operation),
During the motor operation, the upper controller can dynamically modify the stroke, speed, acceleration and deceleration through communication, and the driver responds to the operating parameters immediately.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.53	Communication position operation mode	0~1	-	0-Incremental position mode 1-Absolute position mode	Set after stopping	Effective immediately	0
P03.54	Communication control acceleration	1~65535	ms	Set communication control acceleration time 0~1000rpm	Set after stopping	Effective immediately	100
P03.55	Communication control deceleration	1~65535	ms	Set communication control deceleration time 1000~0rpm	Set after stopping	Effective immediately	100
P03.56	Communication control speed	0~60000	rpm	Set communication control target speed	Set after stopping	Effective immediately	500
P03.57 + P03.58	Communication control displacement	-1073741824~ 1073741824	Pulses	Sets the stroke/position of the communication control operation, Pn02.29 is the high 16-bit, Pn02.28 is the low 16-bit. Writing Pn02.29 by communication will immediately trigger a run (when the motor is stopped) or dynamically modify the running position (when the motor is running)	Set after stopping	Effective immediately	10000

- Write the high 16-bit register (P03.58) of the stroke/position through the host computer communication to realize the start of the motor
- In incremental position mode, when the motor is running and the reverse running stroke (P03.57/P03.58) is triggered by communication, the motor will decelerate to stop according to the set deceleration time constant and then run the user set reverse stroke at the stop position as the starting point;
  For communication mode and specific instructions, please refer to the following article section.

d) **5: IO fixed-length point motion mode**

When the position command source is set to fixed-length/jog control, it has the following functions:

- Control motor fixed-length forward and reverse through external input terminals
- Control motor jog forward and reverse through external input terminals
- Control motor jogging through external input terminals: start-stop + direction mode

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.20	Jog speed	0~60000	rpm	Set jog control target speed	Set after stopping	Effective immediately	200
P04.21	Jog reverse speed	1~65535	ms	Set the target speed when the jog control is reversed	Set after stopping	Effective immediately	200
P04.22	Jog acceleration	1~65535	ms	Set jog control acceleration time 0~1000rpm	Set after stopping	Effective immediately	100
P04.23	Jog deceleration	1~65535	ms	Set the jog control deceleration time 1000~0rpm	Set after stopping	Effective immediately	100
P04.24 + P04.25	Jog stroke	-1073741824~ 1073741824	Pulses	Set the jog stroke	Set after stopping	Effective immediately	10000
P01.33	Emergency stop deceleration time	0~60000	ms	Set the time for the motor speed to decelerate uniformly from 1000rpm to 0rpm during emergency stop	Set after stopping	Effective immediately	30

- Control motor fixed-length forward and reverse through external input terminals
  ①Set the jog parameters P04.20/P04.22/P04.23/P04.24+P04.25/P01.33
  ②Set the corresponding IN terminal function as: FunIN.27: USER4 (fixed length forward rotation), FunIN.28: USER5 (fixed length reverse rotation)
  ③Use external input to trigger start.
  Note: The trigger signal is valid at the edge. Before the motor's fixed-length motion is completed, triggering the start again will not work.
- Control motor jog forward and reverse through external input terminals
  ①Set the jog parameter P04.20/P04.21/P04.22/P04.23/P01.33
  ②Set the corresponding IN terminal function as: FunIN.25: USER2 (jogging forward), FunIN.26: USER3 (jogging reverse)
  ③Use external input to trigger start.
  Note: The trigger signal is level valid.
- Control motor jogging through external input terminals: start-stop + direction mode
  ①Set the jog parameter P04.20/P04.21 P04.22/P04.23/P01.33
  ②Set the corresponding IN terminal functions as: FunIN.24: USER1 (jogging start and stop), FunIN.18: torque command direction setting (jogging direction)
  ③Use external input to trigger start.
  Note: the trigger signal is level valid.

3.1.5 Position control mode related input/output and origin return function

In order to better complete the relevant functions of the position control mode, in addition to the aforementioned necessary settings, the driver also equipped with some parameters and functions to help customers to more fully complete the operation of position control.

In addition, the driver has added a home function, which can better complete the control action.

The home function needs to cooperate with the relevant settings of each method, please read the relevant content carefully.

1. Position control mode related input/output and status

		Effective time
Enabling signal (input)	SV-ON	Controls whether the driver is connected to the motor current circuit
Positive limit (input)	POT	Access to positive limit switch
Negative limit (input)	NOT	Access to negative limit switch
Alarm clear (input)	ALMRST	Alarm Clear (clears the fault that the driver can clear)
Pulse prohibition (input)	PULStop	Pulse prohibition (cut off the response of the driver to external pulse signals)
Home input (input)	Home	Home input (access to origin switch)
Start return to zero (input)	ZEROstart	Start zero return (start of zero return action)
Emergency stop (input)	EMEStop	Emergency stop (emergency stop)
Clear position deviation (input)		Set the driver position deviation to 0
Gain switching (input)		Switch the gain of the driver position loop
Gear ratio switch (input)		Switching driver electronic gear ratio
Servo ready (output)	SV-RDY	Driver is ready
Positioning completed (output)	INP	Pulse positioning completed output
Alarm (output)	ALM	Driver alarm status output
Return to zero completed (output)	ZERODone	Return to zero action completed output
Brake control (output)	BRK	Brake action output
Encoder signal output		
Z signal output		

2. Home return function

The home return function is generally used to cooperate with the position control mode to better complete the related functions of the position control mode.
①In internal position control, use the home return function to confirm the motor position.
②In absolute encoder control, the home position can be manually set.
③The torque return to zero can be used in some occasions where it is not convenient to load the sensor.
④During pulse control, the home return function of the driver can also be used to save the resources of the host computer.

Home point:
It is the mechanical origin, which can be expressed as the origin switch signal, set by the parameter P03.41 (Home return mode selection).
Zero point:
It is the positioning target point, which can be expressed as the home point + offset (P03.46/P03.47: mechanical origin offset).
When the offset is set to 0, the zero point and the home point coincide.

Home return function is in the driver enable state, after triggering the home return function, the motor will actively find the zero point to complete the positioning function.
During the home return operation, other position commands (including the home return enable signal triggered again) are blocked; after the home return operation is completed, the driver can respond to other position commands.

Home return function is in the driver enable state, after triggering the home return function, the motor will actively find the zero point to complete the positioning function.
During the home return operation, other position commands (including the home return enable signal triggered again) are blocked; after the home return operation is completed, the driver can respond to other position commands.

The home return function includes two modes: home return and electrical return.
Home return to zero (search for the mechanical origin):
After receiving the home return trigger signal, the drive actively locates the relative position of the motor shaft and the mechanical origin according to the pre-set mechanical origin. First find the origin, and then move the offset based on the origin to reach the zero position. Home return to zero is usually applied to the first time to find the zero point.
Electrical return to zero (after confirming the mechanical origin, the motor position has a relative distance from the mechanical origin, electrical return to zero means return to the mechanical origin):
After the zero position is determined by the home return operation, the current position is used as the starting point to move a section of relative displacement, because the difference between the current position and the zero point is known, the electrical zero return runsthe relative displacement at the high speed of zero return.

After the home return is completed (including home return to zero and electrical return to zero), the current position of the motor (P13.07/P13.08: position command counter) is the same as the mechanical origin offset (P03.46/P03.47: mechanical origin offset).
After the home return is completed, the driver outputs the home return to zero completion signal, and the host computer can confirm the home return completion after receiving the signal.

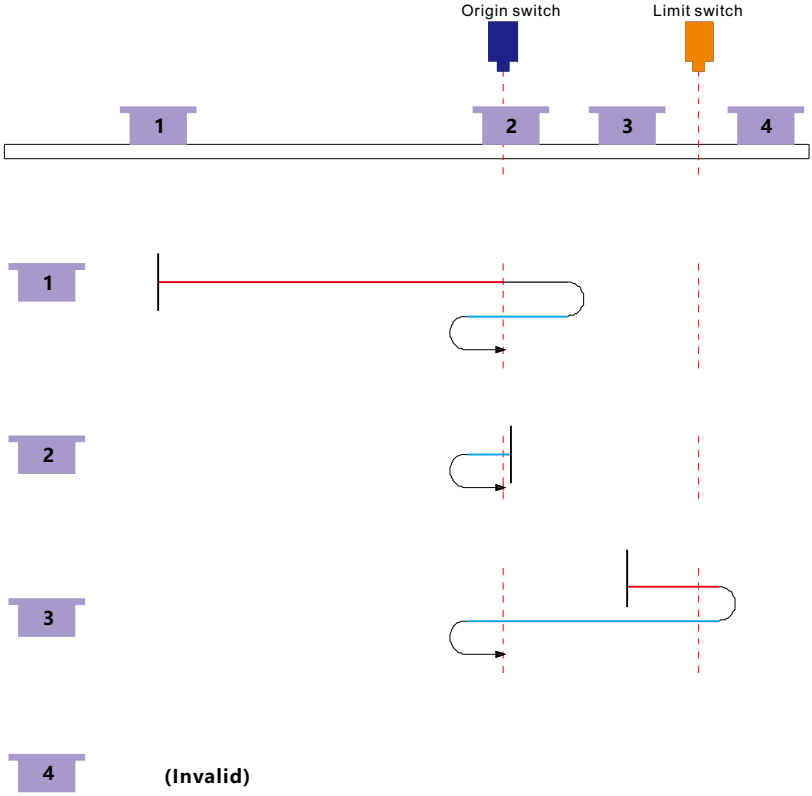
a) Selection of home return trigger mode:

Setting value	Speed command source	Remarks	
		Home return mode	Trigger signal
0	Disable home return	Prohibit home return	None
1	Input "Home return start" signal via IN terminal to enable home return to zero	Home return to zero	IN signal FunIN.22 (home return start)
2	Input " Home return start" via IN terminal to enable electrical return to zero	Electrical return to zero	IN signal FunIN.22 (home return start)
3	Home return to zero is enabled immediately after power on	Home return to zero	The driver is powered on and enabled for the first time
4	Immediately perform home return to zero	Home return to zero	After driver is enabled and home return is completed, P03.40 = 0
5	Immediately perform electrical return to zero	Electrical return to zero	After driver is enabled and home return is completed, P03.40 = 0
6	Take the current position as the origin	Home return to zero	After driver is enabled and home return is completed, P03.40 = 0

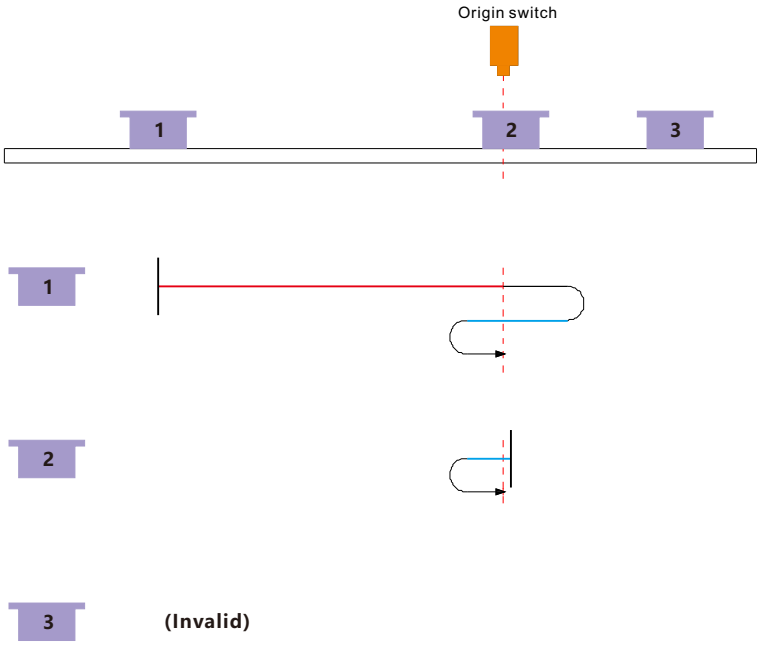
Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.40	Home return trigger method selection	0~6		Select the home return trigger method	Set after stopping	Save and restart	0

b) Home return to zero related mode selection:
combined with the actual process, various return to zero mode and sensor matching conditions, Rtelligent RS series servo driver provides the following home return to zero mode.
①P03.41=0 deceleration point, the origin is the origin switch; positive return to origin (two sensors)
②P03.41=1 deceleration point, the origin is the origin switch; negative return to origin (two sensors)
③P03.41=2 deceleration point, the origin is the positive limit switch; positive return to origin (a sensor)
④P03.41=3 deceleration point, the origin is the negative limit switch; negative return to origin (a sensor)
⑤P03.41=4 deceleration point, the origin is the positive mechanical hard limit; the positive torque returns to zero (no sensor)
⑥P03.41=5 deceleration point, the origin is the negative mechanical hard limit; the negative torque returns to zero (no sensor)
The following are examples of ①, ③, and ⑤ to illustrate the selection of the mode related to the origin return to zero.

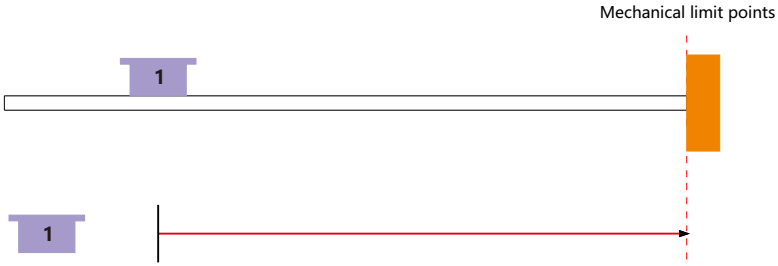
- **①P03.41=0(Two sensors)**



- **①P03.41=2(A sensor)**



- **①P03.41=4(No sensor, torque return to zero)**



Description of torque return to zero mode:
The motor first runs at low speed and forward at the set value of P03.43 (the speed of the low-speed search origin switch signal). After colliding to the mechanical limit position, if the motor torque reaches P03.52 (the torque limit of tripping to zero return), and the actual motor speed is lower than P03.51(threshold for the speed of zero return), and this state is maintained for a certain time P03.50(Threshold for the time to return to zero), it is judged that the motor runs to the mechanical limit position and stops immediately.

- **When P03.41=1,3,5, only the direction of return to zero is opposite and the operation mode is the same.**

- **Selection of zero return mode**

Zero return is mainly used for the first time to confirm the home position, RS pulse type driver collects several common zero return modes, customers can choose the corresponding zero return mode according to the actual needs, among which the torque zero return has a certain degree of repeated positioning error.

The above zero return mode is not applicable to the absolute zero return setting of absolute encoder, the absolute encoder has a definite encoder position value, if you need to use the absolute position of absolute encoder as zero return indication, please refer to the chapter of absolute encoder application.

The following is the setting of related parameters:

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P03.42	The speed of high-speed search origin switch signal	0~3000	rpm	Set the high speed of zero return	Set after stopping	Effective next time	500
P03.43	The speed of low-speed search origin switch signal	0~1000	rpm	Set the low speed of zero return	Set after stopping	Effective next time	50
P03.44	Search for the acceleration and deceleration time constant of the zero switch signal	1~1000	ms	Setting the acceleration time from 0 to 1000rpm for zero return operation	Set after stopping	Effective next time	100
P03.46 P03.47	Mechanical origin offset	-1073741824~ 1073741824	Command pulse	Set mechanical origin offset	Set after stopping	Effective next time	0
P03.49	Mechanical origin offset and limit processing method	0~3	-	Set the offset relationship between the mechanical origin and the mechanical zero when returning to the origin	Set after stopping	Effective next time	0
P03.50	The threshold value of the time to return to zero	0~65535	ms	Set the time threshold when the torque returns to zero to reach the mechanical limit	Set after stopping	Effective next time	100
P03.51	The threshold value of the speed to return to zero	0~1000	rpm	Set the speed threshold for the torque return to zero to reach the mechanical limit	Set after stopping	Effective next time	10
P03.52	Torque limit when tripping to return to zero	0~100	%	Set the positive and negative maximum torque limits for torque return to zero (take the motor rated torque as reference)	Set after stopping	Effective next time	50

c) Electrical return to zero related settings:

After the home zero return, the mechanical home point of the system has been determined, and the zero position of the home zero return is the combined position of the mechanical home point and P03.46/P03.47, which is the position indicated by P03.46/P03.47 (electrical home point).

Electrical return to zero is to allow the motor to return to the position determined by the home zero return at any position (position indicated by P03.46/P03.47), and the moving distance for electrical return to zero is the difference between the current position (P13.07/P13.08) and the position indicated by P03.46/P03.47.

The speed of electrical zero return is the high speed of zero return set by P03.42. After the electrical zero return is triggered, the motor will run to the electrical origin at high speed, and the motor will stop.

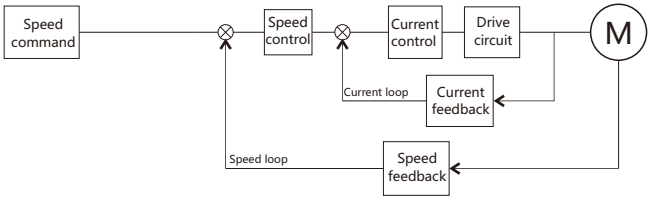
The following are examples of ①, ③, and ⑤ to illustrate the selection of the mode related to the home zero return.

- **①P03.41=0 (two sensors)**

3.2 Speed control mode

3.2.1 Instructions for speed control modeBlock diagram of speed mode

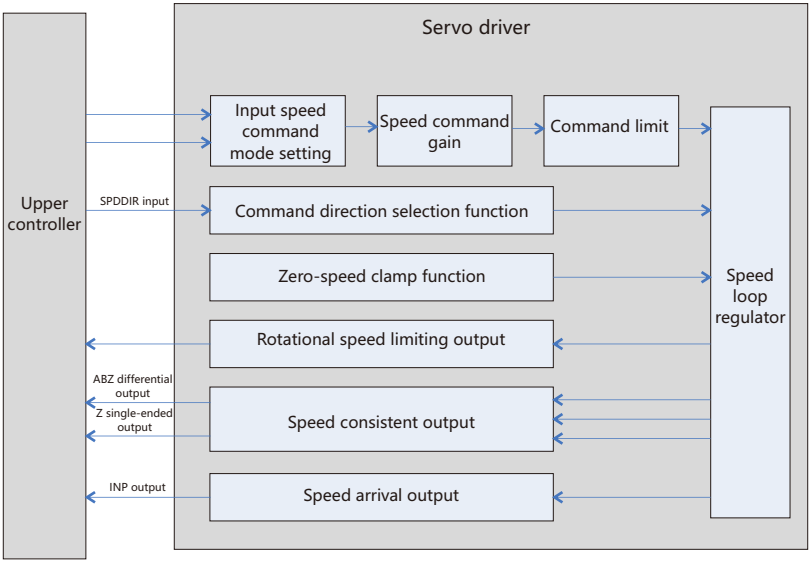
Block diagram of speed mode



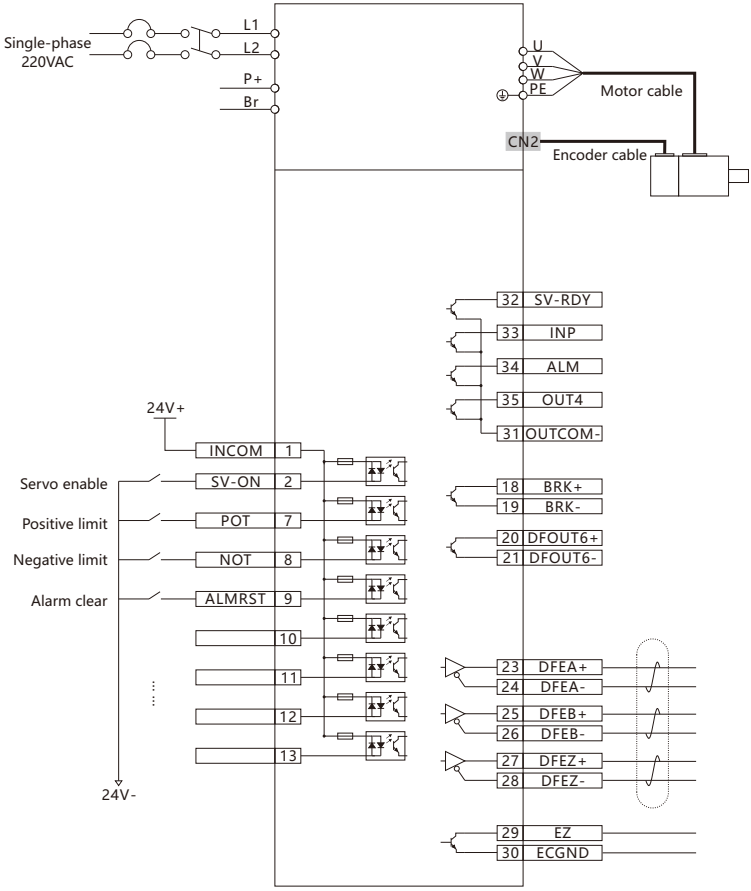
The speed control mode takes the motor speed as the control target, and converts the speed command into the speed output of the corresponding motor through the control of the driver current loop and speed loop.

The source of the speed command is mainly the internal speed command. Considering that the analog quantity has certain error, the driver does not open the external input analog signal as the source of speed command. The driver supports the control mode of the internal given target speed, which can realize the precise control of the speed. The speed control mode is mainly used for speed control applications.

The following is the internal logic diagram of the driver in speed control mode.



3.2.2 Speed control mode wiring



Remarks:

1. The general input signal is a two-way optocoupler circuit, which can be connected to a single common anode or a separate common cathode (pin 1 is the common terminal), and the common anode and common cathode cannot be mixed.

2. The general output signal is common cathode connection, and pin 31 is the common ground. The maximum current of the output loop is 50mA.
The maximum current of the differential output signal output loop is 200mA, which can be used to drive the relay switch.

3. The encoder output signal Z-signal has single-ended output (pin 29 and 30).

4. Speed mode is generally used for internal PLC control or 485 communication control, and the driver is not set with analog input.

3.2.3 Speed control mode related parameters setting

Refer to the speed control mode logic diagram, Rtelligent RS series drivers do not support the speed control mode of external analog input. Therefore, the driver speed command sources are all internal speed commands.

First of all, P01.00 should be set to 1 to set the driver to "speed control mode".

1. Speed command input selection

Speed command source

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.00	Speed command source	0:Internal digital giving 1:Multi-segment speed command 2:Internal test speed		Set the speed command source. Speed commands are internal speed commands	Set after stopping	Effective immediately	0

a) Internal digital giving

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.01	Given target speed	-6000~6000	rpm	Set target speed - indicates reverse rotation	Set after stopping	Effective immediately	1000
P04.05	Acceleration	1~65535	ms	Set acceleration time from 0 to 1000rpm	Set after stopping	Effective immediately	200
P04.06	Deceleration	1~65535	ms	Set deceleration time from 1000 to 0rpm	Set after stopping	Effective immediately	200
P01.33	Emergency stop deceleration time	0~65535	ms	Set the time for the motor speed to decelerate uniformly from 1000rpm to 0rpm during emergency stop	Set after stopping	Effective immediately	30

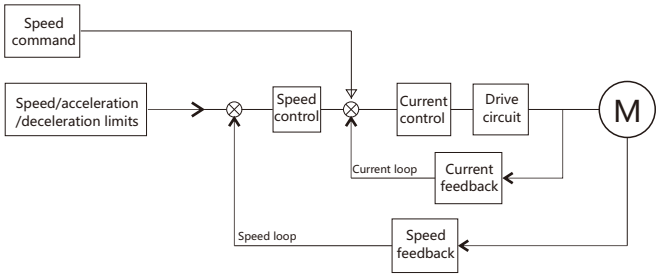
c) : Reverse the motor running direction

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P01.01	The direction of pulse command is reversed	0: Not reversed 1: Reversed		Set the direction of pulse command reverse	Set after stopping	Save and restart	0

3.3 Torque control mode

3.3.1 Instructions for using the speed control mode

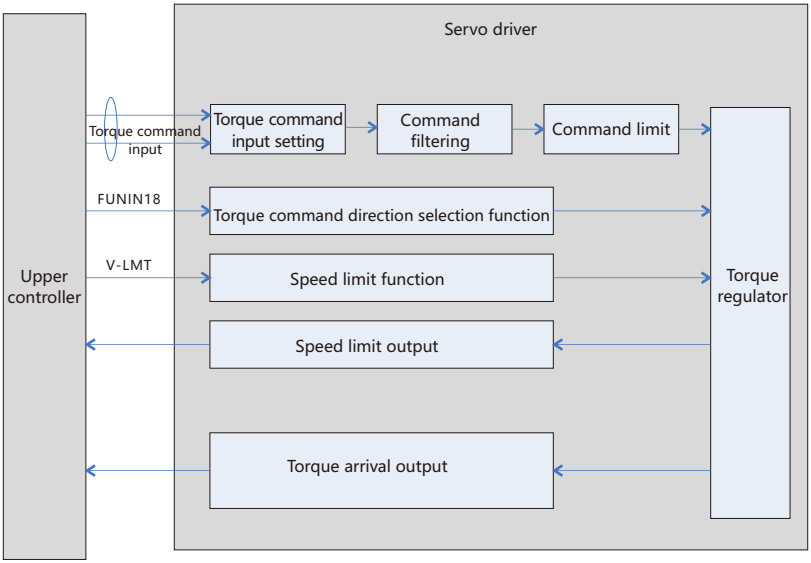
Block diagram of torque mode



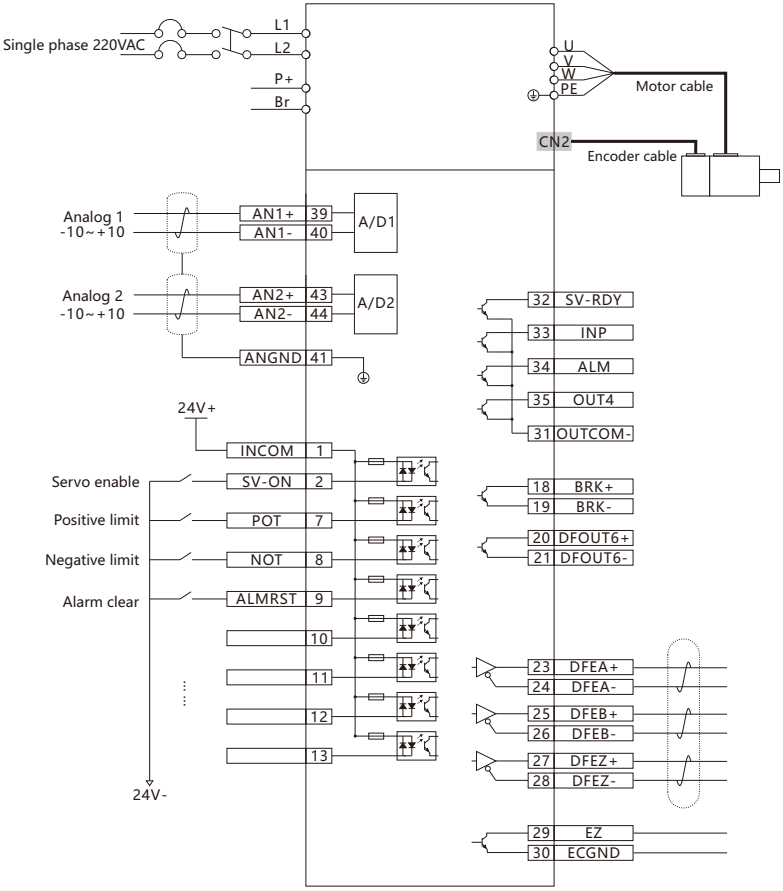
The torque control mode takes the motor torque as the control target, and converts the torque command into the corresponding motor torque output through the control of the driver current loop and speed loop (speed limit).

The source of torque command mainly includes external analog input or internal torque assignment command. The external input analog signal is processed by the driver circuit to convert the analog signal to the corresponding torque of the motor. The internal torque assignment outputs the required torque value to the motor. The torque control mode is suitable for applications that require the force of processing materials.

The following is the internal logic diagram of the driver in torque control mode.



3.3.2 Torque control mode wiring



Remark:

1. The general input signal is a two-way optocoupler circuit, which can be connected to a single common anode or a single common cathode (pin 1 is the common terminal) Common anode and common cathode cannot be mixed.
2. The general output signal is a common cathode connection, and pin 31 is a common ground. The maximum current of the output loop is 50mA.
The maximum current of the differential output signal output loop is 200mA, which can be used to drive the relay switch.
3. Analog 1 is the torque command input and analog 2 is the speed limit input.
4. Analog input specification is -10~+10V.

3.3.3 Torque control mode related parameter setting

Referring to the logic diagram of the torque control mode, there are two sources of commands for torque control: external analog and internal digital giving. Combined with some auxiliary input and output control modes, the RS series drivers contain two analog channels and internal parameter settings, both of which can be used as the source of torque commands.

In the process of torque control, it is necessary to ensure that the output torque cannot exceed the maximum limit of the motor at any given moment. Therefore, we need to set the torque limit to protect the normal operation of the motor and the system. When the torque exceeds the maximum limit (the maximum limit cannot exceed the maximum output torque specified by the motor), the motor outputs at the maximum limit torque.

Speed limit and torque limit can also be selected by analog and internal parameter settings.

For analog input to the driver, low-pass filtering is first required to prevent the unstable analog voltage from causing large fluctuations in the torque output. Therefore, it is necessary to set the parameters of analog low-pass filtering.

The filtered analog voltage needs to be converted by AD before it can be used as the final torque command. Because of the characteristics of the AD conversion circuit, we need to set the three parameters of zero drift (can be set to adjust automatically), offset, and dead zone to get a relatively perfect command voltage.

In the torque control process, when the output torque of the driver reaches the set target value, the driver can output the state of the torque arrival to the outside. In addition, when the torque and speed reach the maximum limit, the driver can also output related states externally.

The above is a general description of the torque output. Before starting the relevant settings, you first need to set P01.00 to 2 and set the driver to the "torque control mode".

1. Torque command input selection

a) Torque command source setting

Torque command can be provided by analog quantity or internal setting. In some special applications, we can also use a mixed input method of the two. Therefore, we assume that there are two channels A and B, which can be used to complete the combination of torque command sources. Both A and B can be set as analog or internally given.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.02	Torque command source	0:Command source A 1:Command source is B 2:Command source is communication control		Set torque command source	Set after stopping	Effective immediately	0

- Selection of the source of command A and B

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.00	Channel A command source	0:Internal given 1:Analog channel 1 input 2:Analog channel 2 input		Set channel A command source	Set after stopping	Effective immediately	0
P05.01	Channel B command source	0:Internal given 1:Analog channel 1 input 2:Analog channel 2 input		Set channel B command source	Set after stopping	Effective immediately	0

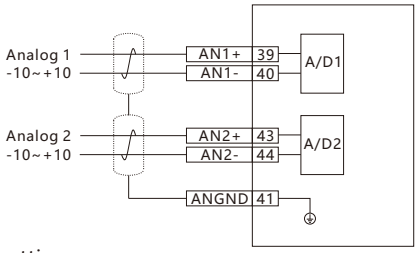
Notes:

① Make sure that the analog channel settings of channel A and B cannot be the same.

②The serial number of the internally set parameter is P05.03

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.03	Internally set torque command value	-3000~3000	0.1% rated torque	The magnitude of the internal setting torque command	Set after stopping	Effective immediately	200

③The circuit diagram of the analog input is as follows



b) Speed limit setting

In torque mode, when the target torque exceeds the load, the motor will accelerate. To avoid mechanical damage to the system due to excessive speed, we need to limit the maximum speed of the motor. When the motor speed reaches the limit speed, the motor speed will not increase anymore. The speed limit can be set by the combination of internal settings or external inputs.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.12	Torque control mode speed limit source selection	0:Internal given 1:External analog input giving		Set the source of speed limit	Set after stopping	Effective immediately	0

Notes:

① Internal given speed limit setting

By setting the maximum speed limit parameter for
forward and reverse rotation, the limit value of the speed in the torque mode is limited.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.14	Forward speed limit setting value	Cannot exceed the maximum speed allowed for the motor	rpm	Set the forward speed limit value	Set after stopping	Effective immediately	0
P05.15	Reverse speed limit setting value	Cannot exceed the maximum speed allowed for the motor	rpm	Set the reverse speed limit value	Set after stopping	Effective immediately	0

② External analog input to set the maximum speed limit value

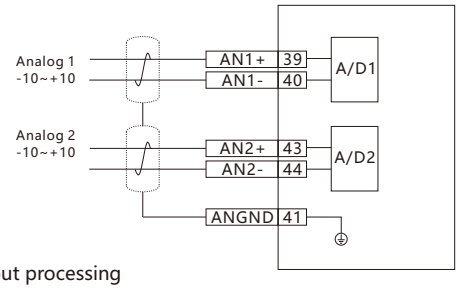
Use the external analog input port as the speed limit setting, P05.13 selects the analog input port. Note that it should be different from the analog channel port for torque command input.

When the speed limit indicated by the analog is lower than the internal setting P05.14 or P05.15, the speed limit indicated by the analog port is the speed limit;

When the speed limit indicated by the analog is higher than the internal setting P05.14 or P05.15, the speed limit of the internal setting parameter is the speed limit.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.13	Speed limit channel selection	1:AN1 channel 1 input 2:AN2 channel 2 input	-	Set speed limit analog input channel	Set after stopping	Effective immediately	0

The circuit diagram of analog input is as follows



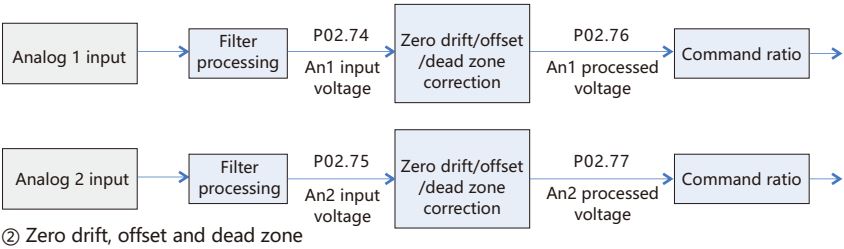
c) Analog input processing

In torque mode, the analog input channel can be used as torque command input and speed limit input. After the analog signal is input to the driver, it needs some processing to be converted to the corresponding input command.

①Analog command filtering

Analog command filtering is used to filter the analog signal input from external sources to remove small fluctuations in the analog signal. When using, set the appropriate filter time constant according to the actual situation.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.65	An1 channel 1 analog command filter cut-off frequency	0~1000	Hz	Set the analog channel 1 filter cut-off frequency	Set after stopping	Effective immediately	100
P02.69	An2 channel 1 analog command filter cut-off frequency	0~1000	Hz	Set the analog channel 2 filter cut-off frequency	Set after stopping	Effective immediately	100



② Zero drift, offset and dead zone

Zero drift: When the analog input voltage is 0, the voltage value sampled inside the driver should also be 0. Because of the circuit characteristics of the analog voltage, the uncalibrated sampled voltage value is not necessarily 0. This phenomenon is called the zero drift phenomenon of AD conversion, and the value of this deviation is called the zero drift value. Therefore, during use, we need to calibrate the zero-drift phenomenon by setting parameters.

Zero-drift calibration: When the actual input voltage is 0, record the sampled voltage value and fill the sampled voltage value into the zero-drift calibration parameter. The calibration can also be completed by the auto-adjustment function.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.67	An1 channel 1 analog zero drift correction value	-1000~1000	mV	Set the zero drift correction value of analog channel 1	Set after stopping	Effective immediately	0
P02.71	An2 channel 2 analog zero drift correction value	-1000~1000	mV	Set the zero drift correction value of analog channel 2	Set after stopping	Effective immediately	0

Offset: When the sampling voltage is 0, the actual analog voltage input value is not 0. This value is called offset value.

Offset calibration: preset the sampling voltage to 0, record the actual analog voltage input, and fill the value into the offset calibration parameter.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.64	An1 channel 1 analog offset correction value	-5000~5000	mV	Set the offset value of analog channel 1	Set after stopping	Effective immediately	0
P02.68	An2 channel 2 analog offset correction value	-5000~5000	mV	Set the offset value of analog channel 2	Set after stopping	Effective immediately	0

Dead zone: In order to ensure an accurate "zero" state, we set a dead zone for the analog input, after the offset is set, the offset value is the "zero " value, and the dead zone is the range before and after the "zero ", and the voltage range in the dead zone is the "zero" state.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.66	An1 channel 1 analog dead zone range	0~1000	mV	Set the dead zone range of analog channel 1	Set after stopping	Effective immediately	0
P02.70	An1 channel 2 analog dead zone range	0~1000	mV	Set the dead zone range of analog channel 2	Set after stopping	Effective immediately	0

d) Corresponding value ratio of analog

The processed analog command can be converted into a corresponding torque command or speed limit command by setting the voltage-torque or voltage-speed ratio. Since the 2 channels are normally set at different control inputs (torque command input or torque mode speed limit), it is necessary to set the voltage - torque ratio and voltage - speed ratio of the channels correspondingly.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.78	Set the analog voltage - speed ratio	0~6000	rpm	Set the speed corresponding to the analog channel voltage 10V	Set after stopping	Effective immediately	0
P02.79	Set the analog voltage - torque ratio	0~3000	Rated torque 0.1%	Set the torque corresponding to the analog channel voltage 10V	Set after stopping	Effective immediately	0

2. Other settings related to torque mode

a) Torque command direction selection

When the torque command can be provided by analog, the direction of torque command can be changed by external IO. Select the corresponding IO port and set this IO port as the torque command direction switching trigger function to complete the direction switching in the torque mode.

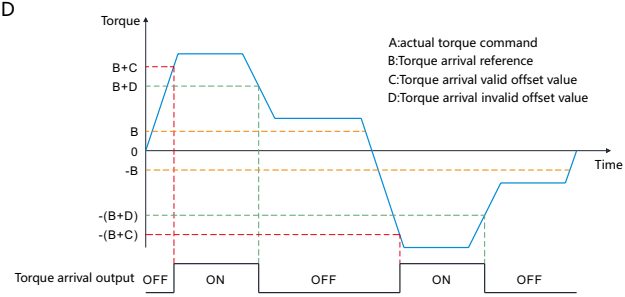
For example, set the IN1 port as the torque direction switching input (FUNIN.18).

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.00	In1 function selection	18		Set IN1 function as torque command direction switch	Set after stopping	Effective immediately	0

When the torque command can be provided by analog, the direction of torque command can be changed by external IO. Select the corresponding IO port and set this IO port as the torque command direction switching trigger function to complete the direction switching in the torque mode.
For example, set the IN1 port as the torque direction switching input (FUNIN.18).

b) Torque arrival output

When the actual torque reaches the set target torque, the driver can output a torque arrival signal. The target torque is B (P05.16), the effective torque offset is C (P05.17), and the ineffective torque offset is D (P05.18).
As shown below:
When the torque arrival signal changes from invalid to valid, the actual torque needs to satisfy $|A| \geq B+C$;
When the torque arrival signal changes from valid to invalid, the actual torque needs to satisfy $|A| \leq B+D$



- Related parameter settings

① Set the values of B, C and D.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P05.16	Torque arrival reference	0~3000	Rated torque 0.1%	Set the torque reference value of the torque arrival signal	Set after stopping	Effective immediately	1000
P05.17	Torque arrival valid offset value	0~3000	Rated torque 0.1%	Set the torque valid offset value of the torque arrival signal	Set after stopping	Effective immediately	1000
P05.18	Torque arrival invalid offset value	0~3000	Rated torque 0.1%	Set the torque invalid offset value of the torque arrival signal	Set after stopping	Effective immediately	1000
P05.19	Torque arrival signal detection time	0~65535	ms	Set the detection time of the torque arrival signal	Set after stopping	Effective immediately	50

②Torque arrival output setting

The torque arrival signal can be output to the upper computer through the driver output port for reference.
Select the corresponding output port and set the function of this OUT port as FunOUT13 (torque arrival output).
For example, set OUT1 as the torque arrival output.

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P02.33	OUT1 function selection	13		Set the OUT1 function as the torque arrival output	Set after stopping	Effective immediately	0

3.4 Absolute encoder application and soft limit function

3.4.1 Absolute encoder application description

Review of encoder selection specifications

Encoder code	Description
J	Single-turn absolute 17-bit magnetic encoder
H	Single-turn absolute 23-bit optical encoder
G	Multiturn absolute 17-bit magnetic encoder
L	Multiturn absolute 23-bit optical encoder
W	10000 line optical encoder

As shown in the table, the absolute encoder has the function of absolute positioning, where the single-turn absolute can only memorize the position within one circle, and the multiturn absolute can memorize the absolute position of multiple turns (the number of turns is 16-bit data).

We can choose single-turn and multiturn absolute encoder applications according to our needs. The following is an example of the application process of multiturn absolute encoder.

①Connect the encoder power supply battery

②Check and change the encoder type

③Clear the encoder alarm

④Clear the multiturn data and determine the home position

⑤Set the resolution of one turn of encoder return

⑥Read the position information of encoder

Description:
RS series servo driver can automatically identify the encoder type of our supporting motor, but when using the customer's own motor, the driver cannot identify it, and you need to manually confirm the encoder specifications. If it does not match, the drive will report an error.

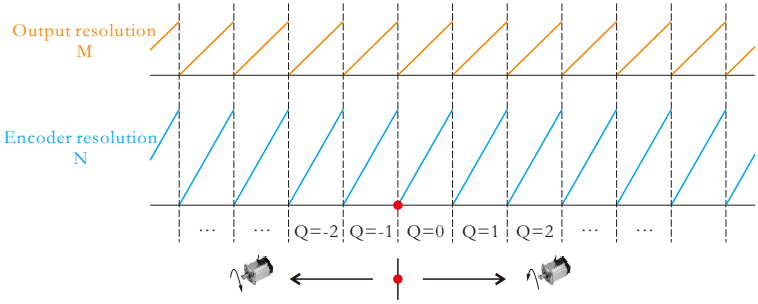
When the battery is powered on for the first time, it will report an encoder battery error (AL221 encoder multiturn data is inaccurate and AL222 multiturn data is invalid).

Therefore, after connecting the battery and modifying the encoder type, we need to perform the action of clearing the encoder alarm:When the servo enable signal is invalid, the encoder alarm can be cleared by setting P12.06 (clear encoder fault) to 1 or through the auxiliary function AF.CEE of the panel keys.

After connecting the motor to the machine, in order to react the required mechanical home position on the encoder, you can move the motor to the mechanical home and then clear the multiturn data to zero [in the state where the servo enable signal is invalid, set P12.05 (reset encoder multiturn data) to 1 or through the panel key auxiliary function AF.CEn, complete the encoder multiturn value in the current state to 0], at this time the encoder multiturn data is 0, and the single-turn data is the encoder's current position corresponding to the position within one turn. When the multiturn reset is completed, if no operation is performed on the driver at this time, the default home position of the driver will be the point where the multiturn data is 0 and the single-turn data is 0. When the electrical zero return operation is performed directly, the driver will return to the point where both multi-turn and singleturn data are 0.

To set the current position as the home position, you need to set P00.44 to 1, the driver performs an electrical return to zero operation with the current position as the home position, and the driver can still remember that home position even after it is powered off.

When the position information of the encoder needs to be read, it is usually done in real time via 485 communication. When the multiturn and single-turn data related registers of the encoder are read in real time, sometimes not all the feedback information of the encoder is retained in order to facilitate analysis and memory (for example, when the 23-bit multiturn absolute encoder is applied, the read unit is not set to 8388608), but set a smaller value, so that we can have a more intuitive experience of the position of the encoder and make corresponding processing. The encoder output resolution of the driver is determined by the electronic gear ratio: P00.50~P00.51 sets the numerator M (required resolution) and P00.52~P00.53 sets the denominator N (encoder resolution). For example, for a 23-bit encoder, you can set P00.50 to the required resolution of 10000, and P0052 to the encoder resolution of 8388608.



After the multiturn position of the encoder is reset to 0, the driver records the position information of the encoder in sequence with the single-turn position at 0 (as the red dot in the above figure) as the reference, counterclockwise CCW direction as positive, and clockwise CW direction as negative. The range of Q is -32768~32767 (16-bit data).

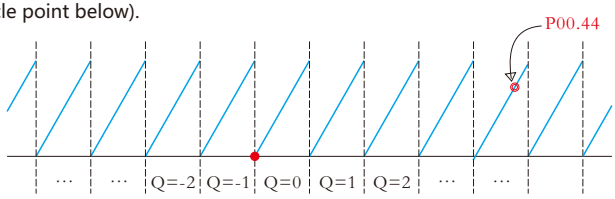
The position information feedback of the encoder in one revolution is related to the resolution and the output electronic gear ratio. As shown in the figure above, the blue slash is the encoder feedback value N, and the corresponding output orange slash is the value M returned to the host computer.

The encoder multiturn and single-turn position information can be displayed by the debugging panel monitoring d25.(position within a single turn) and d26 (number of multiturn), or by parameter communication.

3.4.2 Brief description of absolute encoder zero return

After the multiturn data of the absolute encoder is cleared, we cannot confirm the zero position of a single turn with the naked eye. In actual use, we can confirm by means of electrical zero return. Under the premise of ensuring the mechanical movement space, after resetting the multiturn data, the electrical zero return can be started directly to make the motor move to the 0 circle, 0 position (i.e. the red solid point in the figure below).

In actual use, we need to set the current position as the home position and ignore the multiturn and single-turn position information, you can use P00.44 to set the current position as the home position, and then use the electrical zero return, the motor will return to that point position (i.e. the red double circle point below).



3.2.3 Related parameter settings of multiturn absolute encoder

Referring to the logic diagram of the torque control mode, there are two kinds of command sources for torque control: external analog and internal digital.

First set P01.00 to 2 and set the driver to "torque control mode".

Combined with the torque command input and other auxiliary configurations, the torque control mode of Rtelligent RS series driver is set as follows:

a) Internal digital setting

Torque command source	Torque limit source	Speed limit source	Effective time	Factory setting
External analog 1 input	External analog 2 input	Internal parameter setting	Effective immediately	1000
External analog 1 input	Internal parameter setting	External analog 2 input	Effective immediately	200
External analog 1 input	Internal parameter setting	Internal parameter setting	Effective immediately	200
			Effective immediately	30

1. Speed command input selection

Speed command source

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.00	Speed command source	0:Internal digital 1:Multi-segment speed command 2:Internal test speed		Set the speed command source. Speed commands are internal speed commands.	Set after stopping	Effective immediately	0

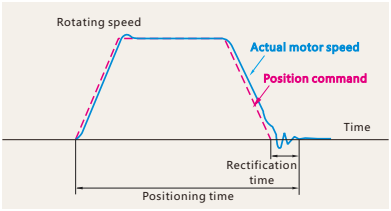
a) Internal digital

Parameter	Name	Setting range	Unit	Function	Setting method	Effective time	Factory setting
P04.01	Given target speed	-6000~6000	rpm	Set target speed - indicates reverse rotation	Set after stopping	Effective immediately	1000
P04.05	Acceleration	1~65535	ms	Set acceleration time from 0~1000rpm	Set after stopping	Effective immediately	200
P04.06	Deceleration	1~65535	ms	Set deceleration time from 1000~0rpm	Set after stopping	Effective immediately	200
P01.33	Emergency stop deceleration time	0~65535	ms	Set the time for the motor speed to decelerate uniformly from 1000rpm to 0rpm during emergency stop	Set after stopping	Effective immediately	30

3.5 Adjustment of control parameters

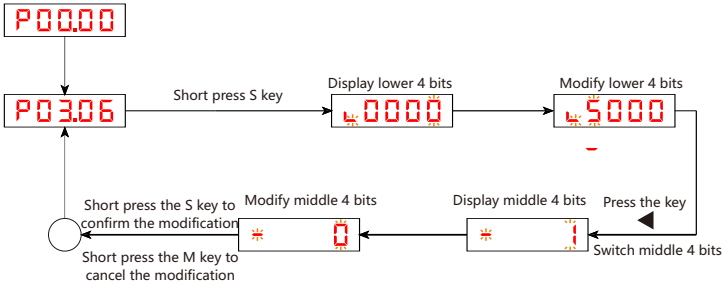
3.5.1 Overview of control parameter adjustment

Target curve diagram of servo control

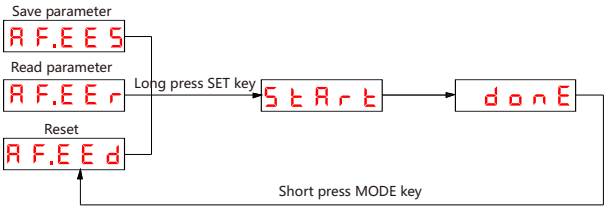


As shown in the figure above, the control goal of the servo system is to make the motor respond faster to the commands sent by the control system to the servo driver. Smaller overshoot, shorter rectification time, vibration and response can adapt to more application environment, requiring servo control system to make efforts in algorithm and parameter adjustment. Rtelligent RS series servos are designed to be more convenient for customers. The parameters at the factory are suitable for normal occasions and customers only need to adjust a few key parameters to complete the configuration of the stability performance of the whole system when using. Customers can modify the relevant parameters through the button panel.

Panel modification parameter operation process



Panel save parameter operation process

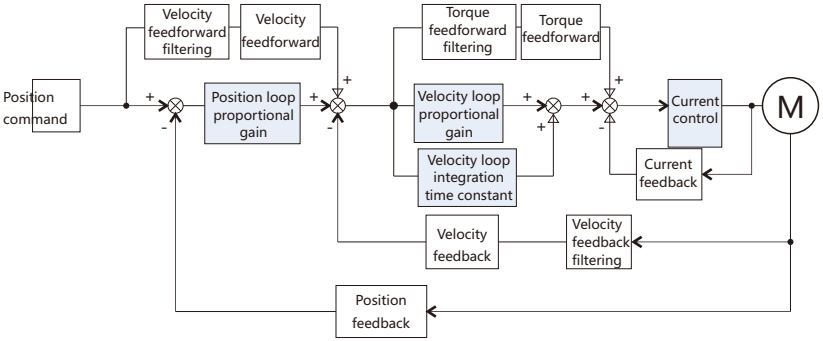


When modifying parameters, you need to be careful not to exceed the maximum range of the parameter. If it exceeds the maximum range of the parameter, the system will automatically set the parameter to the maximum value.

When saving the parameters, make sure the interface shows "Done" before confirming the power off.

3.5.2 Control gain parameter adjustment

Three-loop structure of RS servo driver



As shown in the figure above, the internal control sequence of the servo follows the nested structure of three loops, from the inside to the outside are the current loop, the speed loop, and the position loop. The system configuration also follows the inside-out sequence to adjust the three loops to the appropriate state in turn.

The loop parameters of the current loop are related to the electrical parameters of the motor itself, which are generally adjusted to the appropriate state before leaving the factory, and no additional adjustments are required during use. Therefore, the gain adjustment of the servo system is mainly for the parameters related to the speed and position loops.

In the actual adjustment, the stability of the three loops must be ensured. The relevant parameters cannot be adjusted too large or too small to avoid the system being in an oscillating state, which may cause mechanical and electrical damage.

The gain adjustment parameters of Rtelligent RS series servo drivers are mainly "velocity loop proportional gain", "velocity loop integration time constant", and "position loop proportional gain". When using, the first group of parameters can be combined and debugged first to meet most occasions, which is "P06.00", "P06.01", "P06.02".

The gain adjustment parameters of Rtelligent RS series servo drivers are mainly "velocity loop proportional gain", "velocity loop integration time constant", and "position loop proportional gain". When using, the first group of parameters can be combined and debugged first to meet most occasions, which is "P06.00", "P06.01", "P06.02".

3.5.3 Filter parameter adjustment

Driver filter parameter list

Parameter	Name	Function	Remark
P03.03	Pulse command filter constants	Filtering the high-frequency interference during the external pulse input, making the input pulse as close as possible to the upper computer output.	Setting too large will filter out normal pulses and cause high frequency pulses to be lost.
P03.04	Position command smoothing filter	S-shaped smoothing is performed on the input pulse speed curve to make the acceleration and deceleration transition smoother and have less mechanical impact.	Setting too large will delay the command and slow down the response.
P02.65 P02.69	Analog filter cut-off frequency	Prevent the command fluctuation caused by the analog voltage fluctuation; and weaken the influence of interference voltage.	Setting too large will delay the command and slow down the response.
	Velocity feedback filter, torque feedback filter, etc	Make the internal loop calculation more accurate and the system more stable. Generally do not need external adjustment	

Chapter 4 Panel display and operation

Chapter 4 Panel display and operation

4.1 Overview of panel display

Panel composition introduction

The display panel of the servo drive 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:

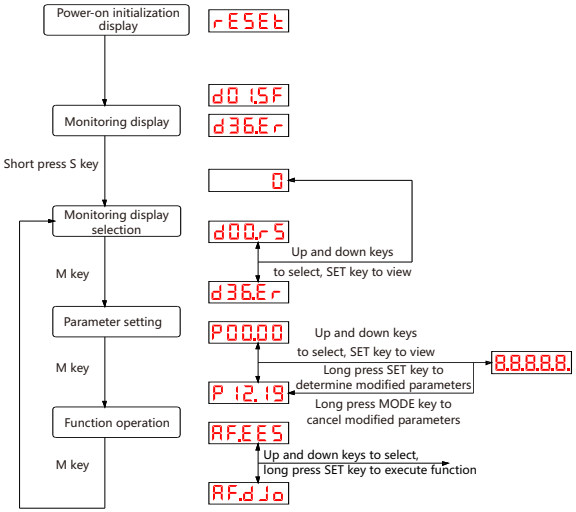
Functions	Symbol	Description	Icon
Mode/return	MODE	Mode switching	
Shift key	◀	Shift to the left	
Increase	▲ SET ▼	Switch up selection or increase value	
Decrease		Switch down to select or decrease the value	
Confirm		Confirms the operation	

Panel display and operable 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 operating status of the servo;
Parameter display: display servo control parameter setting value;
Function display: Internal trial operation;
Parameter management: used to manage servo control parameters;
Encoder adjustment and open-loop operation: functions reserved by the manufacturer.

Panel display operation method



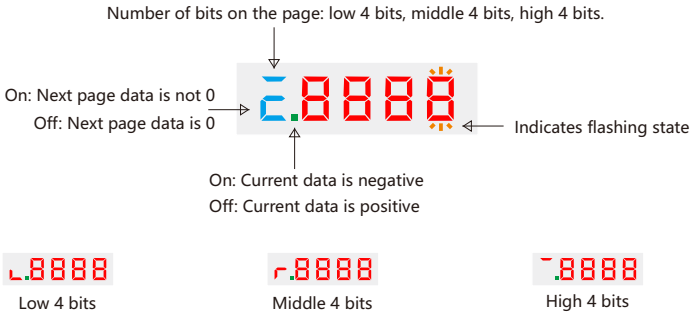
LED display data

The RS servo driver has a 5-digit LED digital tube that can display up to 5 digits of data at a time. Therefore parameters that require more than 5 bits of data to be represented require more display paragraphs to be used.

1) Signed numbers with less than 4 digits or unsigned numbers with less than 5 digits

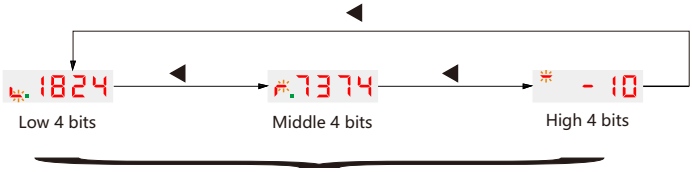
2) Signed numbers with more than 4 digits or unsigned numbers with more than 5 digits

The RS servo driver can display up to 12 digits of data, and each 4 digits is a page, and it is displayed in up to three pages according to the number of digits from low to high. When viewing and modifying, you need to switch the corresponding digits through the M key.



Example ①, displaying 1073741824

Example ②, displaying -1073741824



4.2 Monitoring mode

The monitor display is used to monitor the operation status of the servo driver. By setting the parameter code ------ (the default monitoring object of the panel), the monitor will display the monitoring value of the object after the servo drive is powered on and initialized.

The detailed description of the monitoring display is as follows:

Monitor serial number	Unit	Monitor content
d00.rS	——	Operating status
d01.SF	rpm	Motor speed
d02.SC	rpm	Speed command
d03.tF	%	Motor torque
d04.tC	%	Torque command
d05.CU	%	Operating curren
d07.PC	Command unit (pulse)	Position command counter
d11.PF	Encoder unit (pulse)	Position feedback counter
d15.PE	Encoder unit (pulse)	Position error
d17.FS	rpm	Pulse command speed
d18.Fr	KHz	Pulse command frequency
d19.1S	——	Input signal status
d20.oS	——	Output signal status
d21.MA	Encoder unit (pulse)	Motor mechanical position
d22.EA	°	Motor electrical angle
d23.Ub	V	Bus voltage
d24.ES	——	Encoder status
d25.Eo	Encoder unit (pulse)	Motor single-turn value
d26.En	Turns	Motor multiturn value
d36.Er	——	Alarm code

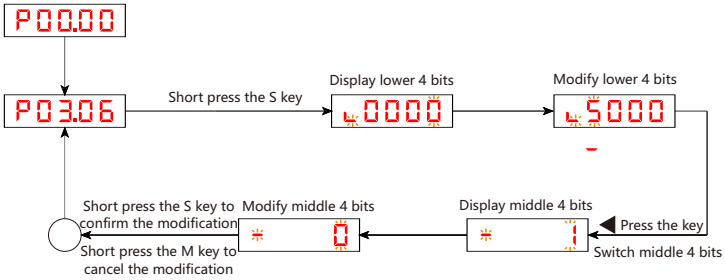
4.3 Fault display

When the drive is in an error state, the LED panel can display relevant fault information. If the driver generates multiple fault alarms at the same time, the driver panel will jump to display each alarm in turn, and you can also view it through the "up and down keys" on the debugging panel.

Please refer to section 4.6 for specific troubleshooting

4.4 Parameter setting and operation

The parameters can be set using the driver panel. There are 13 different groups of parameters in the driver, please refer to "Chapter 5 Parameter overview" for details. The following is a demonstration of changing the default value of "P03.06" from 10000 to 5000.

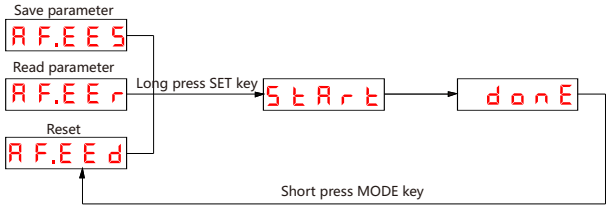


The modified parameters are only saved in the RAM of the driver and expire after power failure; permanent saving requires the "Save Parameters" operation.

4.5 Auxiliary Functions

1) Save parameters, read parameters, restore factory settings

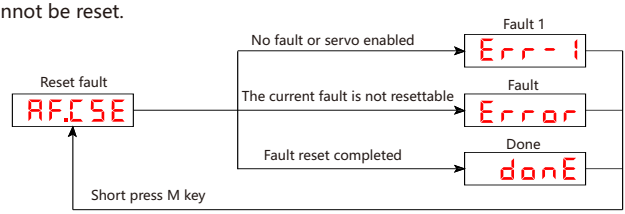
Save parameters: save the set parameters from the memory to the driver EEPROM, and the modified parameters can be memorized after power off.
Read parameters: read the parameters in the EEPROM of the driver into the memory. In the process of modifying the parameters, if you are not satisfied with the current parameters, you can restore to the parameters initially saved in the EEPROM.
Restore factory settings: write the factory default parameters into the driver EEPROM.



2) Reset fault

When a resettable fault or warning occurs in the servo driver, the fault information of the servo driver can be reset without power failure, so that the servo driver can resume normal working mode.

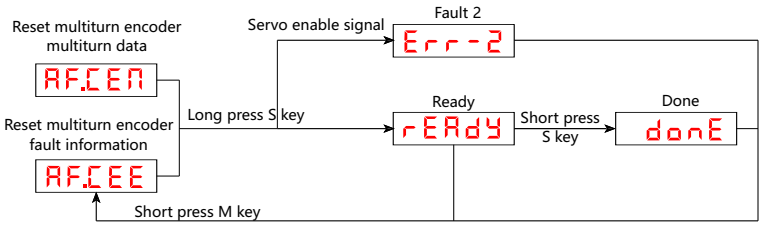
Note: When using this operation, please disable the servo enable signal, otherwise the fault information cannot be reset.



3) Absolute encoder reset

The absolute encoder reset function can be used when there is a multiturn encoder failure or when the absolute encoder multiturn data is to be cleared.

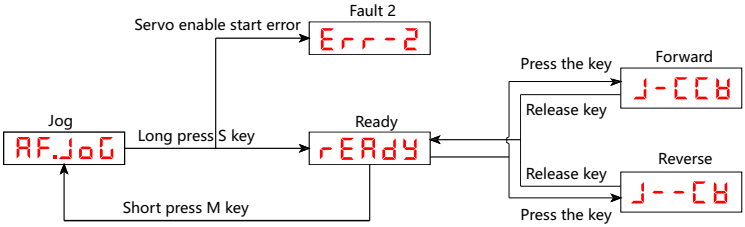
Note: When using this operation, please disable the servo enable signal, otherwise it cannot be reset.



4) Jog test

Perform jog test operation on the driver.

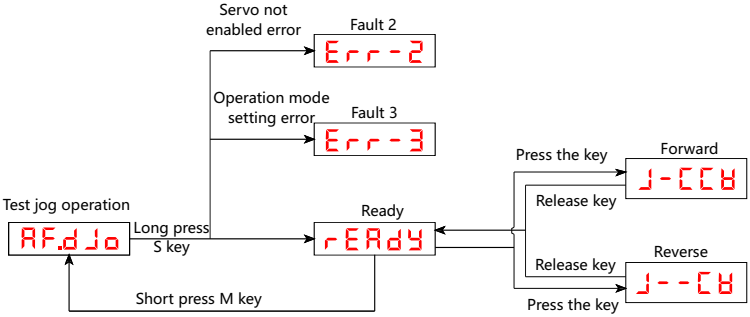
Note: When using this operation, please disable the servo enable signal.



5) Test jog operation

Control the mode and speed of test operation by setting parameters P01.00 (control mode), P04.62 (test operation speed), P04.63 (test operation acceleration time), P04.64 (test operation deceleration time).

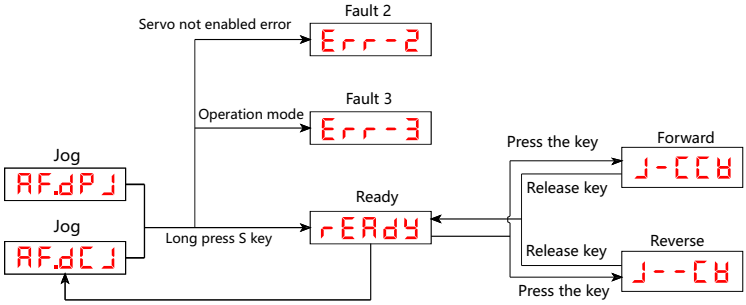
Note: When using this operation, please keep the servo enable signal in the valid state.



6) Test fixed-length operation, continuous operation

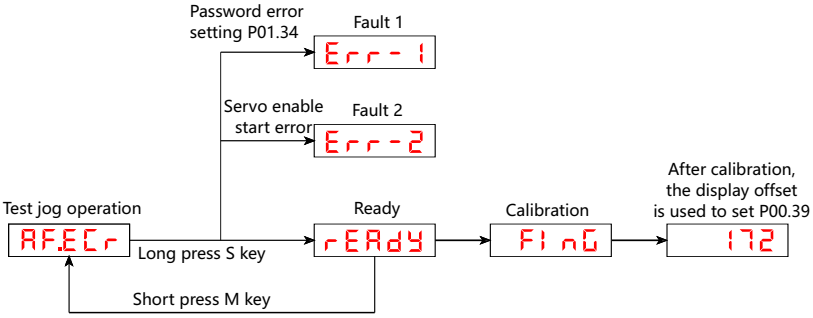
The mode, speed, and stroke of the test operation are controlled by setting parameters P01.00 (control mode), P04.60/P04.61 (number of test command pulses), P04.62 (test run speed), P04.63 (test run acceleration time), and P04.64 (test run deceleration time).

Note: When using this operation, please keep the servo enable signal in the valid state.



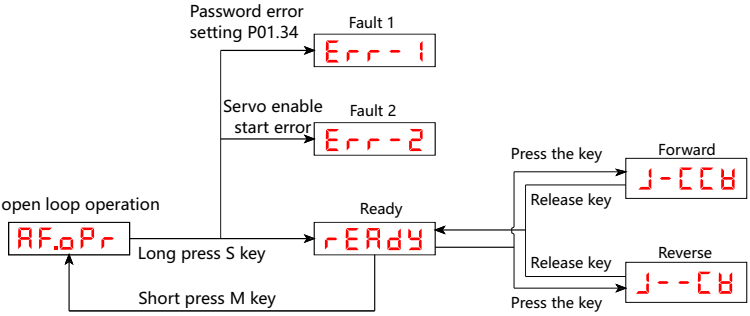
7) Encoder calibration

Note: This operation is the manufacturer's internal test, please do not operate.



8) open loop operation

Note: This operation is the manufacturer's internal test, please do not operate.



4.6 Error reporting and troubleshooting

If the drive malfunctions during use, the panel will display the corresponding alarm code.
Please operate according to the contents of this section and use again only after the corresponding fault is removed.

4.6.1 Driver alarm classification

According to the characteristics of the driver, the driver faults are classified into two types according to the severity:
Type 1, non-resettable faults
Type 2, resettable fault, reset by ALMRST input signal or panel clear alarm operation.
Note: When resetting a resettable fault, the servo enable signal needs to be turned off first, otherwise the fault cannot be reset.

4.6.2 Driver Alarm Codes

1) Type 1: Non-resettable faults

Fault code	Fault content		Fault content
AL.000	Normal	AL.115	Controller internal voltage fault
AL.100	Parameter reading fault	AL.120	Encoder interference fault
AL.101	Parameter save fault 1	AL.121	Encoder data error fault
AL.102	Parameter save fault 2	AL.123	Encoder CRC check error fault
AL.103	irmware operation failure	AL.124	Encoder Z-phase signal error fault
AL.104	Product mismatch fault	AL.125	Encoder count error fault
AL.105	Encoder mismatch fault	AL.126	Encoder disconnection fault
AL.110	IPM module overload protection fault	AL.127	Incremental encoder Hall signal error fault
AL.111	Controller ADC sampling overload protection fault	AL.128	Encoder type error fault
AL.112	Command overload protection fault	AL.130	Speed protection fault
AL.113	Motor thermal protection fault	AL.140	Position error calculation overflow fault
AL.114	IPM module overheat protection fault		

2) Type 2: Resettable faults

Fault code	Fault content		Fault content
AL.200	Illegal control mode fault	AL.221	Encoder battery voltage too low 2
AL.201	Illegal position command source fault	AL.230	Motor overspeed protection fault
AL.202	Illegal speed command source fault	AL.231	Speed regulator saturation protection fault
AL.203	Illegal torque command source fault	AL.240	Position command out of tolerance protection fault
AL.210	Bus voltage too high protection fault	AL.250	Brake inactivity protection fault
AL.211	Bus voltage too low protection fault	AL.251	Brake action timeout fault
AL.220	Encoder battery voltage too low 1	AL.252	Positive and negative limits are valid at the same time fault

4.6.3 Typical troubleshooting and processing

1) Type 1: Non-resettable fault

Fault code	Fault content		Fault content
AL.000	Normal	AL.115	Controller internal voltage fault
AL.100	Parameter reading fault	AL.120	Encoder interference fault
AL.101	Parameter save fault 1	AL.121	Encoder data error fault
AL.102	Parameter save fault 2	AL.123	Encoder CRC check error fault
AL.103	irmware operation failure	AL.124	Encoder Z-phase signal error fault
AL.104	Product mismatch fault	AL.125	Encoder count error fault
AL.105	Encoder mismatch fault	AL.126	Encoder disconnection fault
AL.110	IPM module overload protection fault	AL.127	Incremental encoder Hall signal error fault
AL.111	Controller ADC sampling overload protection fault	AL.128	Encoder type error fault
AL.112	Command overload protection fault	AL.130	Speed protection fault
AL.113	Motor thermal protection fault	AL.140	Position error calculation overflow fault
AL.114	IPM module overheat protection fault		

2) Type 2: Resettable faults

Fault code	Fault content		Fault content
AL.200	Illegal control mode fault	AL.221	Encoder battery voltage too low 2
AL.201	Illegal position command source fault	AL.230	Motor overspeed protection fault
AL.202	Illegal speed command source fault	AL.231	Speed regulator saturation protection fault
AL.203	Illegal torque command source fault	AL.240	Position command out of tolerance protection fault
AL.210	Bus voltage too high protection fault	AL.250	Brake inactivity protection fault
AL.211	Bus voltage too low protection fault	AL.251	Brake action timeout fault
AL.220	Encoder battery voltage too low 1	AL.252	Positive and negative limits are valid at the same time fault

Chapter 5 Parameter overview

5.1 Group P00: Servo driver/motor parameters

P00.00	Name	Motor number			Related mode	-
	Setting range	10000 ~ 65535	Unit	-	Factory setting	10604

Set the matching motor number, each motor has a unique number.

Motor flange	Motor power	Motor model	Motor number
40	50W	RMS-S04S0230	10401
	100W	RMS-S04S0330	10401
60	200W	RSM-S06S0630	10602
	400W	RSM-S06S1330	10604
80	750W	RSM-S06S2430	10807

Setting method:
Set the parameter to the required motor ID number value;
Execute AF.EEd function, and DonE appears.
Power off and restart the servo driver, them it will work normally.

P00.01	Name	Servo driver number			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.02	Name	MCU software version number			Related mode	Display
	Setting range	XXX.YY	Unit	-	Factory setting	-

P00.03	Name	FPGA version			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.04	Name	EtherCAT version			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.05	Name	Reserved			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P00.17	Name	Rated power			Related mode	-
	Setting range	1 ~ 65535	Unit	0.01KW	Factory setting	-

P00.18	Name	Rated voltage			Related mode	-
	Setting range	1 ~ 380	Unit	V	Factory setting	-

P00.19	Name	Rated current			Related mode	-
	Setting range	1 ~ 65535	Unit	0.1A	Factory setting	-

P00.20	Name	Rated speed			Related mode	-
	Setting range	1～6000	Unit	rpm	Factory setting	-

P00.21	Name	Maximum speed			Related mode	-
	Setting range	1～6000	Unit	rpm	Factory setting	-

P00.22	Name	Rated torque			Related mode	-
	Setting range	1～65535	Unit	0.01Nm	Factory setting	-

P00.23	Name	Maximum torque			Related mode	-
	Setting range	1～65535	Unit	0.01Nm	Factory setting	-

P00.24	Name	Moment of Inertia Jm			Related mode	-
	Setting range	1～65535	Unit	$kgcm^2$	Factory setting	-

P00.25	Name	Number of motor pole pairs			Related mode	-
	Setting range	2～360	Unit	poles	Factory setting	-

P00.26	Name	Stator resistance			Related mode	-
	Setting range	1～65535	Unit	0.001Ω	Factory setting	-

P00.27	Name	Stator inductance Lq			Related mode	-
	Setting range	1～65535	Unit	0.01mH	Factory setting	-

P00.28	Name	Stator inductance Lq			Related mode	-
	Setting range	1～65535	Unit	0.01mH	Factory setting	-

P00.29	Name	Line back-EMF coefficient			Related mode	-
	Setting range	1～65535	Unit	0.01mV/rpm	Factory setting	-

P00.30	Name	Torque coefficient Kt			Related mode	-
	Setting range	1～65535	Unit	0.01Nm/Arms	Factory setting	-

P00.31	Name	Electrical time constant Te			Related mode	-
	Setting range	1～65535	Unit	0.01ms	Factory setting	-

P00.32	Name	Mechanical time constant Tm			Related mode	-
	Setting range	1～65535	Unit	0.01ms	Factory setting	-

P00.34	Name	Encoder type			Related mode	-
	Setting range	0 ~ 4	Unit	-	Factory setting	-

Set the motor encoder type, please set this parameter correctly, otherwise the driver will not work properly.

Setting value	Encoder type
0	Incremental
1	Multiturn absolute
2	Single-turn absolute
3	Reserved
4	Reserved

P00.35 P00.36	Name	Absolute encoder offsets			Related mode	-
	Setting range	0 ~ 1073741824	Unit	P	Factory setting	0

P00.37	Name	Absolute encoder bits			Related mode	-
	Setting range	10 ~ 23	Unit	Bit	Factory setting	17

P00.38	Name	Incremental encoder pulse number			Related mode	-
	Setting range	1000 ~ 65535	Unit	P/r	Factory setting	10000

P00.39	Name	Encoder Z-phase signal offset			Related mode	-
	Setting range	0 ~ 65535	Unit	P	Factory setting	1250

P00.40	Name	Offset of rising edge of encoder U-phase signal			Related mode	-
	Setting range	0 ~ 65535	Unit	P	Factory setting	0

P00.41	Name	Prohibit multiturn encoder battery fault output			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P00.42	Name	Multiturn encoder multiturn bits			Related mode	-
	Setting range	0 ~ 24	Unit	Bit	Factory setting	16

P00.44	Name	Set current position as mechanical zero point			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

In the absolute system, the mechanical zero point is set by setting P00.44=1. The specific method is: move the load to the mechanical zero position by JOG, and then set the P00.44 parameter to 1 to automatically set the current position as the mechanical zero point.

P00.45 P00.46	Name	Encoder single-turn value corresponding to the mechanical zero of the absolute system			Related mode	-
	Setting range	0 ~ 16777216	Unit	P	Factory setting	0

Used in absolute system to save the current single-turn value of the mechanical zero position motor encoder. After P00.4 is set to 1, the driver will automatically update the current single-turn value of the encoder to P00.45/P00.46

P00.47 P00.48	Name	The encoder multiturn value corresponding to the mechanical zero of the absolute system			Related mode	-
	Setting range	-16777216 ~ 16777216	Unit	ring	Factory setting	0
Used in absolute systems to save the current multiturn value of the motor encoder at the mechanical zero position. After P00.44 is set to 1, the driver will automatically update the current multiturn value of the encoder to P00.47/P00.48						

P00.49	Name	Absolute encoder position update of the current position command is prohibited			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

5.2 Group P01: Basic control parameters

P01.00	Name	Control mode selection			Related mode	-
	Setting range	0 ~ 2	Unit	-	Factory setting	0

Select the servo driver control mode

Setting value	Control mode
0	Position mode
1	Speed mode
2	Torque mode

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

Set the positive direction of motor rotation when viewed from the motor output shaft

Setting value	Rotation direction	Remarks
0	Take the CCW direction as the forward direction	When the forward command is given, the motor rotation direction is CCW when viewed from the motor shaft side, the motor rotates counterclockwise
1	Take the CW direction as the forward direction	When the forward command is given, the motor rotation direction is CW when viewed from the motor shaft side, the motor rotates clockwise.

P01.02	Name	Servo forced enable			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0
Used for software control of the servo enable state. Set to 1, the driver will be enabled for use when there is no external IN enable signal input.						

P01.07	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P01.20	Name	Minimum value of braking resistor allowed by the driver			Related mode	Display
	Setting range	-	Unit	Ω	Factory setting	-
Check the minimum value of braking resistance allowed by a certain model of driver, which is only related to the servo driver model.						

P01.21	Name	Built-in braking resistor power			Related mode	Display
	Setting range	-	Unit	W	Factory setting	-
Check the built-in braking resistor power of a certain model of driver, it cannot be changed, and it is only related to the servo driver model.						

P01.22	Name	Built-in braking resistor resistance value			Related mode	Display
	Setting range	-	Unit	Ω	Factory setting	-
Check the minimum value of braking resistance allowed by a certain model of driver, which is only related to this driver.						

P01.23	Name	Resistor heat dissipation coefficient			Related mode	-
	Setting range	1 ~ 100	Unit	-	Factory setting	20
When setting and using a braking resistor, the heat dissipation coefficient of the resistor is valid for both internal and external braking resistors. Please set this parameter according to the actual heat dissipation conditions of the resistor. Suggested value: Under normal circumstances, P01.23 does not exceed 30% in natural cooling; P01.23 does not exceed 50% in forced air cooling.						

P01.24	Name	Braking resistor setting			Related mode	Display
	Setting range	0: Use built-in braking resistor 1: Use external braking resistor	Unit	-	Factory setting	0

P01.25	Name	External braking resistor power			Related mode	-
	Setting range	1 ~ 65535	Unit	W	Factory setting	100

P01.26	Name	External braking resistor resistance value			Related mode	-
	Setting range	1 ~ 1000	Unit	Ω	Factory setting	50

P01.33	Name	Emergency stop deceleration time constant			Related mode	-
	Setting range	1 ~ 65535	Unit	ms	Factory setting	30
Set the time for the speed to change uniformly from 1000rpm to 0rpm when the motor is stopped in an emergency.						

P01.34	Name	User password			Related mode	-
	Setting range	0 ~ 65535	Unit	-	Factory setting	512

P01.35	Name	Panel default monitoring function			Related mode	-
	Setting range	0 ~ 99	Unit	-	Factory setting	1

Selects the default display state of the LED display panel after the servo driver is powered on. This register is used to set the group offset of the P13 group parameter.

Setting value	P13 group parameters	Panel display
0	P13.00	Servo driver operation status
1	P13.01	Motor speed
...	...	...
36	P13.36	The current alarm code of the driver

Note
For the monitoring parameters of 32-bit data, please set the address of the lower 16-bit data of the P13 group parameters.
If a non-existent P13 group parameter is set, the LED display panel will not automatically switch to the P13 group parameter display after power on.

P01.36	Name	Servo enable delay shutdown time			Related mode	-
	Setting range	1 ~ 65535	Unit	ms	Factory setting	0

Set the delay time for the servo driver to change from "enable" to "disable" when the servo driver enable signal changes from " valid" to " invalid".

P01.37	Name	Speed regulator saturation detection time			Related mode	-
	Setting range	0 ~ 65535	Unit	10ms	Factory setting	450

When the continuous saturation time of the internal speed regulator in the system exceeds this setting value, a speed regulator saturation alarm will be generated. It is used to prevent the continuous current from being too large due to mechanical jamming or other reasons.
Note: When the setting value is 0, the speed regulator saturation detection fault alarm is prohibited.

P01.39	Name	Encoder disconnection detection function control			Related mode	-
	Setting range	0: Enable encoder disconnection detection function 1: Disable encoder disconnection detection function	Unit	-	Factory setting	0

P01.42	Name	Command overload start detection point			Related mode	-
	Setting range	0 ~ 300	Unit	1%	Factory setting	100

Set the starting torque point of the servo driver command overload protection, and the setting value is the percentage of the rated current of the servo motor. When the current torque of the servo motor is higher than this value, the system internal command overload counter will count the command overload, and when the count value exceeds, the servo driver will output the command overload alarm.
Note: If the P01.42 parameter is larger than the P01.43 parameter, the command overload protection detection function will be disabled.

P01.43	Name	Command overload peak detection point			Related mode	-
	Setting range	0 ~ 300	Unit	1%	Factory setting	300

Set the peak torque point of the servo driver command overload protection, the setting value is the percentage of the servo motor rated current. Together with P01.42 and P01.44, they form the command overload protection feature of the servo driver.
Note: If the P01.42 parameter is larger than the P01.43 parameter, the command overload protection detection function will be disabled.

P01.44	Name	Command overload detection time			Related mode	-
	Setting range	0 ~ 65535	Unit	10ms	Factory setting	450

Set the command overload protection detection time, which is set based on the motor overload characteristic parameters.

P01.45	Name	Thermal overload start detection point			Related mode	-
	Setting range	0 ~ 300	Unit	1%	Factory setting	100
Set the starting torque point of the thermal overload protection of the servo driver. The thermal overload protection of the servo driver uses the method of I*I*T to calculate. The setting value is the percentage of the rated current of the servo motor. Note: If the P01.45 parameter is larger than the P01.46 parameter, the thermal overload protection detection function will be disabled.						

P01.46	Name	Thermal overload peak detection point			Related mode	-
	Setting range	0 ~ 300	Unit	1%	Factory setting	300
Set the peak torque point of the servo driver thermal overload protection, the setting value is the percentage of the servo motor rated current. Together with P01.45 and P01.47, they form the thermal overload protection characteristics of the servo driver. Note:When the P01.45 parameter is greater than the P01.46 parameter, the thermal overload protection detection function will be disabled.						

P01.47	Name	Thermal overload detection time			Related mode	-
	Setting range	0 ~ 65535	Unit	10ms	Factory setting	450
Set the command overload protection detection time, which is set based on the motor thermal overload characteristics parameters.						

5.3 Group P02: Input and output setting parameters

P02.00	Name	In1 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	1

Set the IN function corresponding to the hardware IN1 terminal. For the parameter value setting, please refer to the following table:

Setting value	IN terminal function	Setting value	IN terminal function
0	FunIN.0:Normal input	15	FunIN.15:Multi-segment operation command switching 2
1	FunIN.1:Servo enable	16	FunIN.16:Multi-segment operation command switching 3
2	FunIN.2:Alarm clear	17	FunIN.17:Multi-segment operation command switching 4
3	FunIN.3:Pulse command disable	18	FunIN.18:Torque command direction setting
4	FunIN.4:Clear position deviation	19	FunIN.19:Speed command direction setting
5	FunIN.5:Positive limit signal	20	FunIN.20:Position command direction setting
6	FunIN.6:Negative limit signal	21	FunIN.21:Multi-segment position command enable
7	FunIN.7:Gain switching	22	FunIN.22:Home return start
8	FunIN.8:Electronic gear ratio switching	23	FunIN.23:Home switch signal
9	FunIN.9:Reserved	24	FunIN.24:USER1
10	FunIN.10:Reserved	25	FunIN.25:USER2
11	FunIN.11:Emergency stop	26	FunIN.26:USER3
12	FunIN.12:Position command disable	27	FunIN.27:USER4
13	FunIN.13:Step position triggering	28	FunIN.28:USER5
14	FunIN.14:Multi-segment operation command switching 1	29	FunIN.29:USER6

P02.01	Name	IN1 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

Set the level logic of the hardware IN1 terminal when the IN function selected by IN1 is valid. Please set the valid level logic correctly according to the host computer and peripheral circuit.

Setting value	IN terminal logic when IN function is valid
0	Low level
1	High level

P02.02	Name	IN2 terminal function selection			Related mode	-
	Setting range	0～29	Unit	-	Factory setting	5

P02.03	Name	IN2 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

P02.04	Name	IN3 terminal function selection			Related mode	-
	Setting range	0～29	Unit	-	Factory setting	6

P02.05	Name	IN3 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

P02.06	Name	IN4 terminal function selection			Related mode	-
	Setting range	0～29	Unit	-	Factory setting	2

P02.07	Name	IN4 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

P02.08	Name	IN5 terminal function selection			Related mode	-
	Setting range	0～29	Unit	-	Factory setting	3

P02.09	Name	IN5 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

P02.10	Name	IN6 terminal function selection			Related mode	-
	Setting range	0～29	Unit	-	Factory setting	23

P02.11	Name	IN6 terminal logic selection			Related mode	-
	Setting range	0～1	Unit	-	Factory setting	0

P02.12	Name	In7 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	22

P02.13	Name	IN7 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.14	Name	IN8 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	11

P02.15	Name	IN8 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.16	Name	IN9 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	0

P02.17	Name	IN9 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.32	Name	OUT1 terminal function selection			Related mode	-
	Setting range	0 ~ 12	Unit	-	Factory setting	0

Set the OUT function corresponding to the hardware OUT1 terminal. Please refer to the table below for parameter setting.

Setting value	OUT terminal function	Setting value	OUT terminal function
0	FunOUT.0: Brake	7	FunOUT.7: USER1
1	FunOUT.1: Alarm	8	FunOUT.8: USER2
2	FunOUT.2: Position arrival	9	FunOUT.9: USER3
3	FunOUT.3: Speed arrival	10	FunOUT.10: USER4
4	FunOUT.4: Servo ready	11	FunOUT.11: USER5
5	FunOUT.5: Internal position command shutdown	12	FunOUT.12: USER6
6	FunOUT.6: Return to home position complete	13	FunOUT.13: Torque arrived

P02.33	Name	OUT1 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

Set the output level logic of the hardware OUT1 terminal when the OUT function selected by OUT1 is valid.

Setting value	OUT1 terminal logic when OUT function is valid	Transistor status
0	Low level	On
1	High level	Off

P02.34	Name	OUT2 terminal function selection			Related mode	-
	Setting range	0 ~ 12	Unit	-	Factory setting	1

P02.35	Name	OUT2 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.36	Name	OUT3 terminal function selection			Related mode	-
	Setting range	0 ~ 12	Unit	-	Factory setting	2

P02.37	Name	OUT3 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.38	Name	OUT4 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	0

P02.39	Name	OUT4 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.40	Name	OUT5 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	0

P02.41	Name	OUT5 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.42	Name	OUT6 terminal function selection			Related mode	-
	Setting range	0 ~ 29	Unit	-	Factory setting	0

P02.43	Name	OUT6 terminal logic selection			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P02.52	Name	IN terminal forced valid			Related mode	-
	Setting range	0 ~ 127	Unit	-	Factory setting	0

The FunIN function corresponding to the IN terminal is set to be forced valid. For 16-bit data, the lower 7 corresponds to 7 IN input terminals. If the corresponding bit is set to 1, the FunIN function corresponding to the IN terminal is forced valid; if it is set to 0, it has no effect. As shown below:

BIT	Corresponding IN terminal	BIT	Corresponding IN terminal
9 ~ 15	Reserved	4	IN5
8	IN9	3	IN4
7	IN8	2	IN3
6	IN7	1	IN2
5	IN6	0	IN1

P02.53	Name	OUT terminal forced valid			Related mode	-
	Setting range	0~127	Unit	-	Factory setting	0

Set OUT terminal output forced valid. For 16-bit data, low 6 corresponds to 6 OUT output terminals respectively. If the corresponding bit is set to 1, the OUT terminal is forced to be valid; if it is set to 0, it has no effect. As shown below:

BIT	Corresponding OUT terminal	BIT	Corresponding OUT terminal
6 ~ 15	Reserved	2	OUT3
5	OUT6	1	OUT2
4	OUT5	0	OUT1
3	OUT4		

P02.64	Name	An1 analog channel offset			Related mode	T
	Setting range	-5000~5000	Unit	mV	Factory setting	0

P02.65	Name	AN1 analog filter cut-off frequency			Related mode	T
	Setting range	1~3000	Unit	Hz	Factory setting	100

P02.66	Name	AN1 analog channel dead zone range setting			Related mode	T
	Setting range	0~1000	Unit	mV	Factory setting	100

P02.67	Name	AN1 analog channel zero drift			Related mode	T
	Setting range	-1000~1000	Unit	mV	Factory setting	0

P02.68	Name	AN2 analog channel offset			Related mode	T
	Setting range	-5000~5000	Unit	mV	Factory setting	0

P02.69	Name	AN2 analog filter cut-off frequency			Related mode	T
	Setting range	1~3000	Unit	Hz	Factory setting	100

P02.70	Name	AN2 analog channel dead zone range setting			Related mode	T
	Setting range	0~1000	Unit	mV	Factory setting	100

P02.71	Name	AN2 analog channel zero drift			Related mode	T
	Setting range	-1000~1000	Unit	mV	Factory setting	0

P02.78	Name	10V corresponding speed			Related mode	T
	Setting range	0~6000	Unit	rpm	Factory setting	100

P02.79	Name	10V corresponding torque			Related mode	T
	Setting range	0~3000	Unit	0.1% of rated motor torque	Factory setting	0

P02.72	Name	An1 analog channel sampling voltage value			Related mode	T
	Setting range	-5000~5000	Unit	mV	Factory setting	0

P02.73	Name	AN2 analog channel sampling voltage value			Related mode	T
	Setting range	1~3000	Unit	Hz	Factory setting	100

P02.74	Name	AN1 analog channel input voltage (filtered voltage)			Related mode	T
	Setting range	0~1000	Unit	mV	Factory setting	100

P02.75	Name	AN2 analog channel input voltage (filtered voltage)			Related mode	T
	Setting range	-1000~1000	Unit	mV	Factory setting	0

P02.76	Name	An1 analog channel processed voltage (zero drift offset calibration voltage)			Related mode	T
	Setting range	-5000~5000	Unit	mV	Factory setting	0

P02.77	Name	An2 analog channel processed voltage (zero drift offset calibration voltage)			Related mode	T
	Setting range	-1000~1000	Unit	mV	Factory setting	0

P02.80	Name	Analog channel zero drift automatic calibration			Related mode	T
	Setting range	1~2	Unit	Channel selection	Factory setting	0

Analog channel zero drift automatic calibration:
If P02.80 is set to 1, the driver will automatically calibrate the zero drift value of analog channel 1, and the zero drift value after calibration will be displayed in P02.67, and the driver parameters need to be saved, so that the automatic calibration parameters can be written to the driver automatically and saved by power off.
If P02.80 is set to 2, the driver will automatically calibrate the zero drift value of analog channel 2, and the zero drift value after calibration will be displayed in P02.71, and the driver parameters need to be saved, so that the automatic calibration parameters can be written to the driver automatically and saved by power off.

5.4 Group P03: Position control parameters

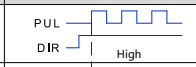
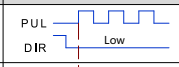
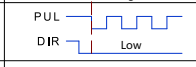
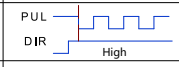
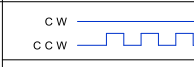
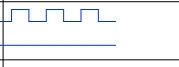
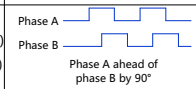
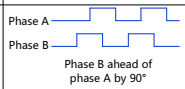
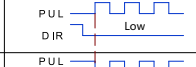
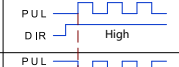
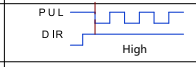
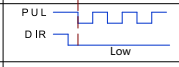
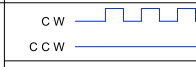
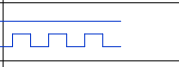
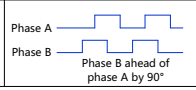
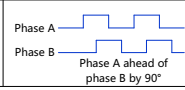
P03.00	Name	Position command source			Related mode	-
	Setting range	0 ~ 10	Unit	-	Factory setting	0

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

Setting 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	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 P09 group parameters, and is triggered by IN function FunIN.21
3	Internal test	Communication given position, speed and other parameters as well as start/stop command
4	USER1	User customized application 1
5 ~ 10	Reserved	Please do not set

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.

P01.01Rotation direction selection	P03.02Command type setting	Command type	Signal	Forward pulse diagram	Reverse pulse diagram
0	0	PUL+DIR Positive logic	PUL DIR		
	1	PUL+DIR Negative logic	PUL DIR		
	2	CW+CCW	PUL(CW) DIR(CCW)		
	3	Phase A + Phase B Orthogonal pulse 4 times frequency	PUL(Phase A) DIR(Phase B)		
1	0	PUL+DIR Positive logic			
	1	PUL+DIR Negative logic			
	2	CW+CCW			
	3	Phase A + Phase B Orthogonal pulse 4 times frequency			

P03.03	Name	Pulse command filter constant			Related mode	-
	Setting range	1 ~ 255	Unit	50ns	Factory setting	10
The filter time of the pulse command input port can be used to filter high-frequency interference pulses. The larger the setting value, the better the filtering effect, and it may also cause the normal pulse signal to be filtered.						

P03.04	Name	Position command smoothing constant			Related mode	-
	Setting range	1 ~ 512	Unit	0.1ms	Factory setting	1
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.						

P03.06 P03.07	Name	Number of position commands for one revolution of the motor			Related mode	-
	Setting range	0 ~ 1048576	Unit	P/r	Factory setting	10000
Sets the number of position commands required for each revolution of the motor. P03.06 and P03.07 are combined to form a 32-bit value, where P03.06 is the low 16-bit value and P03.07 is the high 16-bit value. P03.06 will be used to represent the 32-bit parameter. When P03.06=0, the parameters of electronic gear ratio 1 and 2 (P03.08 ~ P03.15) are valid. When P03.06 ≠ 0, the electronic gear ratio B/A = encoder resolution / P03.06, at this time, electronic gear ratio 1 and electronic gear ratio 2 are invalid.						

P03.08 P03.09	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) division. P03.08 and P03.09 are combined to form a 32-bit value, where P03.08 is the low 16-bit value and P03.09 is the high 16-bit value. P03.08 will be used to represent the 32-bit parameter.P03.06 (number of position command pulses per motor revolution)=0 is valid.						

P03.10 P03.11	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) division. P03.10 and P03.11 are combined to form a 32-bit value, where P03.10 is the low 16-bit value and P03.11 is the high 16-bit value. P03.10 will be used to represent the 32-bit parameter.P03.06 (number of position command pulses per motor revolution)=0 is valid.						

P03.12 P03.13	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) division. P03.12 and P03.13 are combined to form a 32-bit value, where P03.12 is the low 16-bit value and P03.13 is the high 16-bit value. P03.12 will be used to represent the 32-bit parameter.P03.06 (number of position command pulses per motor revolution)=0 is valid.						

P03.14 P03.15	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) division. P03.14 and P03.15 are combined to form a 32-bit value, where P03.14 is the low 16-bit value and P03.15 is the high 16-bit value. P03.14 will be used to represent the 32-bit parameter.P03.06 (number of position command pulses per motor revolution)=0 is valid.						

P03.20	Name	Arrival signal establishment time			Related mode	P
	Setting range	0~65535	Unit	0.1ms	Factory setting	10
It is used to set the establishment time of the arrival signal output from invalid to valid state. After the driver has passed the delay time set by P03.21, if the position command error is less than the setting value of positioning accuracy P03.22, and the time set by P03.20 is maintained, then the driver will output an arrival completion signal.						

P03.21	Name	Position command stop detection time			Related mode	P
	Setting range	0~65535	Unit	0.1ms	Factory setting	10
It is used to set the detection time of position command stop. After the driver detects that the position command is stopped, and the set time has elapsed, the output logic of the arrival signal will be processed.						

P03.22	Name	Positioning completion threshold			Related mode	P
	Setting range	1~65535	Unit	Encoder unit	Factory setting	10
Set the threshold of the absolute of the position deviation when the servo driver outputs the positioning completion signal.						

P03.23	Name	Clear position deviation action selection			Related mode	P
	Setting range	0~1	Unit	-	Factory setting	0

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

Setting value	Clear position deviation mode
0	Servo enable OFF, clear position deviation
1	Servo enabled OFF, position deviation not cleared

P03.24	Name	Position deviation fault detection prohibition			Related mode	P
	Setting range	0:Enable position deviation fault detection 1:Prohibit position deviation fault detection	Unit	-	Factory setting	0

P03.25 P03.26	Name	Position deviation fault detection threshold			Related mode	P
	Setting range	1 ~ 1073741824	Unit	Encoder unit	Factory setting	80000
Set the fault threshold value 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). P03.25 and P03.26 are combined to form a 32-bit value, where P03.25 is the low 16-bit value and P03.26 is the high 16-bit value. P03.25 will be used to represent the 32-bit parameter.						

P03.27	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.28 P03.29	Name	Step			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command unit	Factory setting	10000
Set the number of position commands when the position command source is the step amount (P03.00=00). P03.28 and P03.29 are combined to form a 32-bit value, where P03.28 is the low 16-bit value and P03.29 is the high 16-bit value. P03.28 will be used to represent the 32-bit parameter. Motor displacement = P03.28 x electronic gear ratio, the positive or negative value of P03.28 determines the positive or negative motor speed.						

P03.30	Name	Speed of step operation			Related mode	P
	Setting range	0~6000	Unit	rpm	Factory setting	1000
Set the maximum operating speed during step operation.						

P03.31	Name	Acceleration time constant of step operation			Related mode	P
	Setting range	1～65535	Unit	ms	Factory setting	200
Set the variable speed time when the motor speed changes from 0 rpm to 1000 rpm during step operation.						

P03.32	Name	Deceleration time constant of step operation			Related mode	P
	Setting range	1～65535	Unit	ms	Factory setting	200
Set the variable speed time when the motor speed changes from 1000 rpm to 0 rpm during step operation.						

P03.33	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.34 P03.35	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.36	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.37	Name	Reserved			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P03.40	Name	Home return enable control			Related mode	P
	Setting range	0～6	Unit	-	Factory setting	1

Set the home return mode and source of the trigger signal

Setting value	Speed command source	Remarks	
		Home return mode	Trigger signal
0	Home return off	Home return prohibited	
1	Input the "Home return start" signal via the IN terminal to enable home return	Home return to zero	IN signal FunIN.22 (start home return)
2	Input the "Home return start" signal via the IN terminal to enable the electrical return to zero	Electrical return to zero	IN signal FunIN.22 (start home return)
3	Start home return immediately after power on	Home return to zero	The driver is powered on and enabled for the first time
4	Immediate start home return to zero	Home return to zero	The driver is enabled, after home return complete, P03.40=0
5	Immediate start electrical return to zero	Electrical return to zero	The driver is enabled, after home return complete, P03.40=0
6	Take the current position as the origin	Home return to zero	The driver is enabled, after home return complete, P03.40=0

P03.41	Name	Home return mode selection			Related mode	P
	Setting range	0 ~ 13	Unit	-	Factory setting	0

Set the motor rotation direction, deceleration point and origin when returning to home, where 4 and 5 are torque return to zero modes.

Setting value	Speed command source			Remarks
	Home direction	Deceleration point	Home	
0	Forward	Home switch	Home switch	Forward/reverse: consistent with the definition of P01.01 (rotation direction selection) Home switch: IN function FunIN.23 (home switch signal)
1	Reverse	Home switch	Home switch	
2	Forward	Home switch		Forward/reverse: consistent with the definition of P01.01 (rotation direction selection) Home switch: IN function FunIN.23 (home switch signal)
3	Reverse	Home switch		
4	Forward	Positive mechanical hard limit		
5	Reverse	Negative mechanical hard limit		
Other	Reserved			

P03.42	Name	The speed of high-speed search origin switch signal			Related mode	P
	Setting range	0 ~ 3000	Unit	rpm	Factory setting	500

Set the motor speed when searching for the home signal at high speed when returning to zero.

P03.43	Name	The speed of low-speed search origin switch signal			Related mode	P
	Setting range	0 ~ 1000	Unit	rpm	Factory setting	500

Set the motor speed when searching the deceleration point signal at low speed when returning to zero.

P03.44	Name	Acceleration and deceleration time constants for searching the zero switch signal			Related mode	P
	Setting range	0 ~ 1000	Unit	ms	Factory setting	100

Set the time for the motor speed to change from 0rpm to 1000rpm uniformly when returning to zero.

P03.46 P03.47	Name	Mechanical home position offset			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command pulse	Factory setting	0

Sets the offset of the mechanical home position from the mechanical zero point when returning to zero. P03.46 and P03.47 are combined to form a 32-bit value, where P03.46 is the low 16-bit value and P03.47 is the high 16-bit value. P03.46 will be used to represent the 32-bit parameter.

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

Set the offset relationship between the mechanical home position and the mechanical zero point when returning to zero.

Setting value	Processing method of mechanical home position offset	Remarks	
		Mechanical home position	Processing method of limit
0	P03.46 is the coordinates of the home position after the home return, and the home position is reversed after the home return is re-triggered by a limit.	The mechanical home point and the zero point do not coincide, the motor stops at the mechanical home point after the zero return is completed and the mechanical home point coordinates are forced to P03.46	The home return trigger signal is given again and the servo reverses to execute the home return.
1	P03.46 is the relative offset after home return, and the home position is reversed after a limit re-triggers the home return function.	The mechanical home point and the mechanical zero point coincide. After the motor has positioned the mechanical home point, it continues to move the displacement set by P03.46 and then stops.	The home return trigger signal is given again and the servo reverses to execute the home return.

2	P03.46 is the coordinate after the origin return. When the limit is encountered, it will automatically find the zero point in the reverse direction.	The mechanical origin coincides with the mechanical zero point. After the motor locates the mechanical origin, it continues to move the displacement set by P03.46 and then stops.	The home return trigger signal is given again and the servo reverses to execute the home return.
3	P03.46 is the relative offset after the origin return. When the limit is encountered, it will automatically find the zero point in the reverse direction.	The machine origin does not coincide with the machine zero point. After the origin return is completed, the motor stops at the machine origin, and the machine origin coordinate is forced to P03.46.	The home return trigger signal is given again and the servo reverses to execute the home return.

P03.50	Name	Judgment threshold of trigger stop return to zero time			Related mode	P
	Setting range	0 ~ 65535	Unit	ms	Factory setting	100
Set the time threshold for judging that the load reaches the mechanical position in the the process of stopping and returning to zero.						

P03.51	Name	Judgment threshold of trigger stop return to zero speed			Related mode	P
	Setting range	0 ~ 1000	Unit	rpm	Factory setting	10
Set the speed threshold for judging that the load reaches the mechanical position in the process of stopping and returning to zero.						

P03.52	Name	Trigger stop and return to zero torque limit			Related mode	P
	Setting range	0 ~ 100	Unit	%	Factory setting	50
Set the positive and negative maximum torque limit value in the process of touch stop and return to zero.						

P03.53	Name	Communication control position command type			Related mode	P
	Setting range	0 ~ 1	Unit	-	Factory setting	0
Set in the position control mode (P01.00=0), the position command source is set to the type of position command in communication control (P03.00=4). 0: Incremental position mode 1: Absolute position mode						

P03.54	Name	Communication control acceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100
Set the time for the motor speed to change from 0rpm to 1000rpm uniformly when setting communication control mode.						

P03.55	Name	Communication control deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100
Set the time for the motor speed to change from 1000rpm to 0rpm uniformly when setting communication control mode.						

P03.56	Name	Communication control operating speed			Related mode	P
	Setting range	0 ~ 6000	Unit	rpm	Factory setting	500

P03.57 P03.58	Name	Communication control position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command unit	Factory setting	10000
When setting the communication control mode, the motor position command. Among them, P03.57 is the low 16-bit value, and P03.58 is the high 16-bit value. The two form a 32-bit signed integer value. Note: In the communication control mode, the upper computer triggers the operation of the motor by writing P03.58.						

5.5 Group P04: Speed control parameters

P04.00	Name	Speed command source selection			Related mode	S
	Setting range	0 ~ 10	Unit	-	Factory setting	0

Set the source of speed command.

Set value	Speed command source	Command acquisition method
0	Number given	The motor running speed is set by P04.01, and the operation is triggered by the servo enable signal
1	Multi-segment speed command	The multi-segment position operation mode is set by the P10 group parameters, and the operation is triggered by the servo enable signal
2	Internal test speed	Communication given position, speed and other parameters and start-stop command
3 ~ 10	Reserved	Do not set

P04.01	Name	Speed command digital setpoint			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1000

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 P04.04 and P04.05.

P04.04	Name	Jog speed setting			Related mode	S
	Setting range	0 ~ 6000	Unit	rpm	Factory setting	1000

When setting the jog function of the servo driver, set the jog speed command value. To use the key jog function of the servo driver, please set the servo enable to OFF.Its running acceleration time constant and deceleration time constant are set by PO4.04 and P04.05.

P04.05	Name	Speed command acceleration time constant			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

Set the time for the motor speed to change from 0rpm to 1000rpm uniformly when setting P04.01 and P04.04 to move.

P04.06	Name	Speed command deceleration time constant			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

Set the time for the motor speed to change from 1000rpm to 0rpm uniformly when setting P04.01 and P04.04 to move.

P04 14	Name	Speed arrival detection threshold			Related mode	
	Setting range	-	Unit	rpm	Factory setting	1000

When the absolute value of the actual speed of the servo motor exceeds the threshold set by P0414 after filtering, it is considered that the actual speed of the servo motor has reached the desired value, and the servo driver can output the speed arrival signal at this time. On the contrary, if the absolute value of the actual speed of the servo motor is not greater than this value after filtering, the speed arrival signal is invalid. The judgment of the speed arrival signal is not affected by the operating status and control mode of the driver.

P04.15	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P04.16	Name	Speed mode jog forward speed			Related mode	S
	Setting range	0～6000	Unit	rpm	Factory setting	200

P04.17	Name	Speed mode jog reverse speed			Related mode	S
	Setting range	0～6000	Unit	rpm	Factory setting	200

P04.18	Name	Speed mode jog acceleration time constant			Related mode	S
	Setting range	1～65535	Unit	ms	Factory setting	100

P04.19	Name	Speed mode jog deceleration time constant			Related mode	S
	Setting range	1～65535	Unit	ms	Factory setting	100

P04.20	Name	Position mode jog forward speed			Related mode	P
	Setting range	0～6000	Unit	rpm	Factory setting	200

P04.21	Name	Position mode jog reverse speed			Related mode	P
	Setting range	0～6000	Unit	rpm	Factory setting	200

P04.22	Name	Position mode jog acceleration time constantode jog reverse speed			Related mode	P
	Setting range	1～65535	Unit	ms	Factory setting	100

P04.23	Name	Position mode jog deceleration time constant			Related mode	P
	Setting range	1～65535	Unit	ms	Factory setting	100

P04.24 P04.25	Name	Position mode fixed-length stroke			Related mode	P
	Setting range	0～1073741824	Unit	Command pulse	Factory setting	10000

P04.60 P04.61	Name	Internal test command pulse number			Related mode	S
	Setting range	0～1073741824	Unit	Command pulse	Factory setting	50000

P04.62	Name	Internal test speed			Related mode	S
	Setting range	0～6000	Unit	rpm	Factory setting	100

P04.63	Name	Internal test acceleration time constant			Related mode	S
	Setting range	1～65535	Unit	ms	Factory setting	200
Set the time for the motor speed to change from 0rpm to 1000rpm uniformly when setting the internal test.						

P04.64	Name	Internal test deceleration time constant			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200
Set the time for the motor speed to change from 1000rpm to 0rpm uniformly when setting the internal test.						

P04.65	Name	Internal test operation mode			Related mode	S
	Setting range	0 ~ 1	Unit	-	Factory setting	0

Set the operation mode of the internal test run.

Set value	Operation mode
0	Motor reciprocating operation
1	Motor runs in one direction

P04.66	Name	Initial running direction of internal test			Related mode	S
	Setting range	0 ~ 1	Unit	-	Factory setting	0

Set the initial running direction of the internal test run

Set value	Starting direction
0	Positive direction
1	Negative direction

P04.67	Name	Number of internal test runs			Related mode	S
	Setting range	0 ~ 65535	Unit	-	Factory setting	0

Set the number of internal test runs.In the reciprocating operation mode, the motor reciprocates completely once, and the number of runs is counted once.
In single-direction operation mode, the motor stops after running, and the number of runs is counted once.

Set value	Starting direction
0	Unlimited times
1 ~ 65535	Run the set number of times

P04.68	Name	Open-loop operation speed			Related mode	-
	Setting range	0 ~ 3000	Unit	rpm	Factory setting	100

P04.69	Name	Open-loop operation acceleration			Related mode	-
	Setting range	1 ~ 100	Unit	r/s^2	Factory setting	10

P04.70	Name	Open-loop operation deceleration			Related mode	-
	Setting range	1 ~ 100	Unit	r/s^2	Factory setting	10

P04.71	Name	Open loop operation torque			Related mode	-
	Setting range	0 ~ 100	Unit	%	Factory setting	50

P04.72	Name	Open loop operation start-stop command			Related mode	-
	Setting range	0 ~ 6	Unit	-	Factory setting	0

Set the start-stop command for motor open-loop operation

Set value	Start-stop command
0	Read: The motor is in a waiting state/in a running state Write: No effect
3	Motor open loop forward running
4	Motor open loop reverse running
6	Motor open loop reverse running
Other	Invalid

P04.73	Name	Lock shaft position			Related mode	-
	Setting range	0 ~ 65535	Unit	-	Factory setting	0

P04.74	Name	Lock shaft torque			Related mode	-
	Setting range	0 ~ 100	Unit	%	Factory setting	50

P04.75	Name	Lock shaft start-stop command			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P04.76	Name	Encoder calibration speed			Related mode	-
	Setting range	1 ~ 100	Unit	rpm	Factory setting	10

P04.77	Name	Encoder calibration acceleration			Related mode	-
	Setting range	1 ~ 10	Unit	r/s^2	Factory setting	1

P04.78	Name	Encoder calibration deceleration			Related mode	-
	Setting range	1 ~ 10	Unit	r/s^2	Factory setting	1

Set the time for the motor speed to change from 1000rpm to 0rpm uniformly when setting the internal test.

P04.79	Name	Encoder calibration torque			Related mode	-
	Setting range	0 ~ 100	Unit	%	Factory setting	85

P04.80	Name	Encoder calibration start command			Related mode	-
	Setting range	0 ~ 1	Unit	%	Factory setting	0

P04.81	Name	Encoder receiving insufficient data fault counter			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P04.82	Name	Encoder receiving disconnection fault counter			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P04.83	Name	Encoder receiving CRC fault counter			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P04.84	Name	Encoder receiving module fault counter			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

P04.85	Name	Encoder receiving continuous fault counter			Related mode	Display
	Setting range	-	Unit	-	Factory setting	-

5.6 Group P05: Torque control parameters

P05.00	Name	Channel A command source			Related mode	T
	Setting range	0~2	Unit	-	Factory setting	0

Set the command source of virtual channel A

Set value	Torque command source
0	Internally given
1	Analog channel 1 setting
2	Analog channel 2 setting

P05.01	Name	Channel B command source			Related mode	T
	Setting range	0~2	Unit	-	Factory setting	0

Set the command source of virtual channel B

Set value	Torque command source
0	Internally given
1	Analog channel 1 setting
2	Analog channel 2 setting

Note: Channel A and Channel B cannot select the same analog channel input at the same time, please check carefully

P05.02	Name	Torque command source			Related mode	T
	Setting range	0~2	Unit	-	Factory setting	0

Set the source of torque command

Set value	Torque command source
0	Torque command comes from A
1	Torque command comes from B
2	Torque command comes from communication control

P05.03	Name	Internally set torque command value			Related mode	T
	Setting range	0~3000	Unit	0.1% of rated torque	Factory setting	500

Set the torque command value when the torque command source is internal setting (P05.00=0 or P05.01=0).
100% corresponds to 1 times the rated torque of the motor

P05.04	Name	Driver overload factor			Related mode	T
	Setting range	0~3000	Unit	0.1%	Factory setting	3000

Set the maximum torque command of the servo driver. 100% corresponds to 1 times the rated torque of the motor.

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

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

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

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

P05.12	Name	Source of speed limit			Related mode	T
	Setting range	0~1	Unit	-	Factory setting	0

Set the source of speed limit in torque mode

Set value	The source of the speed limit
0	Internally given
1	External analog channel input

P05.13	Name	VLMT source			Related mode	T
	Setting range	1~2	Unit	0.1%	Factory setting	2

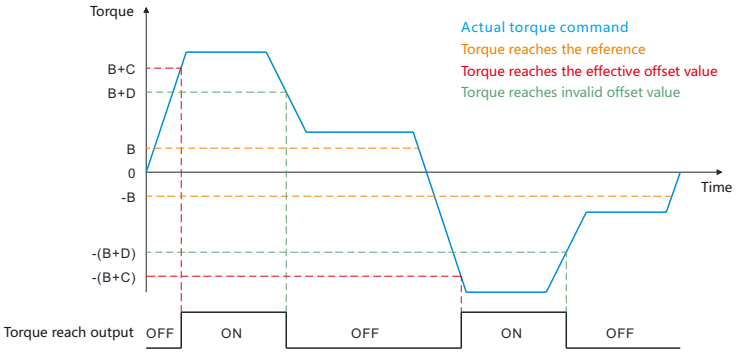
When P05.12=1, select analog channel: 1 is analog channel 1; 2 is analog channel 2

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

P05.15	Name	Negative internal speed limit			Related mode	T
	Setting range	0~6000	Unit	rpm	Factory setting	3000
When P05.12=0, set the speed limit value in torque mode						

P05.16	Name	Torque reaches the output reference value			Related mode	T
	Setting range	0~6000	Unit	0.1%	Factory setting	3000

Set the torque to reach the reference value related to the output, as indicated by B in the figure



P05.17	Name	The torque reaches the output effective value (C in the above figure)			Related mode	T
	Setting range	0~6000	Unit	0.1%	Factory setting	3000

P05.18	Name	The torque reaches the output invalid value (D in the above figure)			Related mode	T
	Setting range	0~6000	Unit	0.1%	Factory setting	3000

P05.19	Name	Torque reaches output detection time			Related mode	T
	Setting range	0~65535	Unit	ms	Factory setting	50

P05.20	Name	Communication given torque command			Related mode	T
	Setting range	0~6000	Unit	0.1%	Factory setting	0
When P05.00=0 or P05.01=0, set the torque command value in torque mode						

5.7 Group P06: Gain parameters

P06.00	Name	1st speed gain			Related mode	-
	Setting range	0 ~ 50000	Unit	0.1Hz	Factory setting	1500
Set the proportional gain of the speed regulator.This parameter determines the response of the speed regulator. The greater the value, the faster the speed response, but too large a value may cause vibration.In position mode, if you increase the position gain, you need to increase the speed gain at the same time.						

P06.01	Name	1st speed integral time constant			Related mode	-
	Setting range	1 ~ 10000	Unit	0.1ms	Factory setting	1500
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 0. Note: When P06.01 is set to 10000, there is no integral effect						

P06.02	Name	1st position gain			Related mode	-
	Setting range	0 ~ 5000	Unit	0.1Hz	Factory setting	700
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	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.04	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.05	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.14	Name	Speed feedforward low-pass filter cut-off frequency			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	2000
Set the filter cutoff frequency of the speed feedforward.						

P06.15	Name	Speed feedforward gain			Related mode	-
	Setting range	1 ~ 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.						

P06.16	Name	Torque feedforward low-pass filter cut-off frequency			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	2000

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

P06.19	Name	Speed low pass filter cutoff frequency 1			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	200
Set the cutoff frequency 1 for the low-pass filter of the speed feedback value.The smaller the setting, the smaller the speed feedback fluctuation, but the larger the feedback delay.						

P06.20	Name	Speed low pass filter cutoff frequency 2			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	600

P06.21	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.24	Name	Torque command low-pass filter cut-off frequency 1			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	1000
Set the torque command low-pass filter cutoff frequency. Through the low-pass filtering of the torque command, the torque command can be made smoother and vibration can be reduced. If the set value of the filter cutoff frequency constant is too small, the responsiveness will be reduced. Set it while confirming the responsiveness.						

P06.25	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.26	Name	Torque feedback low-pass filter cut-off frequency 1			Related mode	-
	Setting range	1 ~ 10000	Unit	Hz	Factory setting	1000
Set the torque feedback low-pass filter cutoff frequency. Through the low-pass filtering of the torque feedback, the torque feedback can be made smoother and vibration can be reduced. If the set value of the filter cutoff frequency constant is too small, the responsiveness will be reduced. Set it while confirming the responsiveness.						

P06.27	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P06.28	Name	Current loop proportional gain			Related mode	-
	Setting range	1 ~ 50000	Unit	Hz	Factory setting	300

P06.29	Name	Current loop integral time constant			Related mode	-
	Setting range	1 ~ 10000	Unit	0.1ms	Factory setting	1000
Set the integral time constant of the torque loop. The smaller the setting value, the faster the integration speed and the smaller the current tracking error. However, if the integration is too small, oscillation or noise is likely to occur. When the set value is 10000, the integrator does not work.						

P06.30	Name	PVIA proportional gain KP			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	3000

P06.31	Name	PVIA integral gain KI			Related mode	-
	Setting range	0 ~ 10000	Unit	-	Factory setting	1000

P06.32	Name	PVIA speed gain Kv1			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	1000

P06.33	Name	PVIA speed gain Kv2			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	100

P06.34	Name	PVIA acceleration gain KA			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	0

P06.35	Name	PVIA speed gain KVFF			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	1000

P06.36	Name	PVIA acceleration gain KAFF			Related mode	-
	Setting range	0 ~ 50000	Unit	-	Factory setting	0

P06.37	Name	PVIA command speed low-pass filter cut-off frequency			Related mode	-
	Setting range	0 ~ 10000	Unit	-	Factory setting	1000

P06.38	Name	PVIA command acceleration low-pass filter cut-off frequency			Related mode	-
	Setting range	0 ~ 10000	Unit	-	Factory setting	2000

P06.39	Name	PVIA feedback acceleration low-pass filter cut-off frequency			Related mode	-
	Setting range	0 ~ 10000	Unit	-	Factory setting	2000

P06.40	Name	PVIA enable control			Related mode	-
	Setting range	0: Use the three-loop control algorithm. 1: Use PVIA control algorithm	Unit	-	Factory setting	0

P06.41	Name	Torque feedback average filter constant			Related mode	-
	Setting range	0 ~ 25	Unit	-	Factory setting	0

P06.42	Name	Motor speed display average filter constant			Related mode	-
	Setting range	0 ~ 100	Unit	-	Factory setting	50

P06.43	Name	Speed regulator KC1 gain			Related mode	-
	Setting range	0 ~ 10000	Unit	-	Factory setting	512

P06.44	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

5.8 Group P07: Self-adjusting parameters

P07.11	Name	Adaptive notch filter mode selection			Related mode	PS
	Setting range	0 ~ 5	Unit	-	Factory setting	0

Set the mode of the adaptive notch filter:

Set value	Adaptive notch filter mode selection
0	Manual mode
1 ~ 4	Keep
5	Test, Keep

P07.12	Name	Group 1 notch filter frequency			Related mode	PS
	Setting range	50 ~ 5000	Unit	Hz	Factory setting	5000

Set the frequency of the first group notch filters.
When the set value is 5000, the notch filter is not effective.

P07.13	Name	Group 1 notch filter width level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	1024

P07.14	Name	Group 1 notch filter depth level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	128

P07.15	Name	Group 2 notch filter frequency			Related mode	PS
	Setting range	50 ~ 5000	Unit	Hz	Factory setting	5000

P07.16	Name	Group 2 notch filter width level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	1024

P07.17	Name	Group 2 notch filter depth level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	128

P07.18	Name	Group 3 notch filter frequency			Related mode	PS
	Setting range	50 ~ 5000	Unit	Hz	Factory setting	5000

P07.19	Name	Group 3 notch filter width level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	1024

P07.20	Name	Group 3 notch filter depth level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	128

P07.21	Name	Group 4 notch filter frequency			Related mode	PS
	Setting range	50 ~ 5000	Unit	Hz	Factory setting	5000

P07.22	Name	Group 4 notch filter depth level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	1024

P07.23	Name	Group 4 notch filter depth level			Related mode	PS
	Setting range	0 ~ 32768	Unit	-	Factory setting	128

P07.95	Name	Notch test original frequency			Related mode	PS
	Setting range	0 ~ 5000	Unit	Hz	Factory setting	5000

P07.96	Name	Notch test interference frequency 1			Related mode	PS
	Setting range	0 ~ 5000	Unit	Hz	Factory setting	5000

P07.97	Name	Notch test interference frequency 2			Related mode	PS
	Setting range	0 ~ 5000	Unit	Hz	Factory setting	5000

P07.98	Name	Notch test interference frequency 3			Related mode	PS
	Setting range	0 ~ 5000	Unit	Hz	Factory setting	5000

P07.99	Name	Notch test interference frequency 4			Related mode	PS
	Setting range	0 ~ 5000	Unit	Hz	Factory setting	5000

5.9 Group P08: Communication parameters

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

Set the servo driver axis address.

0: Broadcast address. The host device can write to all servo drivers through the broadcast address. The driver performs corresponding operations according to the broadcast data frame, but does not respond.

1 ~ 247: When multiple servo drivers are networked, each servo driver can only have a unique address, otherwise it will cause abnormal communication or communication failure.

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

Set the communication baud rate between the servo driver and the upper computer device.
The communication baud rate of the servo driver must be the same as the communication baud rate of the upper computer device, otherwise communication cannot be performed.

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

P08.02	Name	RS485 communication data format selection			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 the servo driver must be consistent with that of 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

P08.03	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P08.04	Name	RS232 independent enable			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

In RS400 V2.0 hardware version, it is used to set whether to enable RS232 independently.
Unless otherwise specified, please set this parameter to 0.
In RS400 V1.0 hardware version driver, this parameter has no effect.

P08.30	Name	RS232 communication axis address			Related mode	-
	Setting range	-	Unit	-	Factory setting	1

P08.31	Name	RS232 communication serial port baud rate selection			Related mode	-
	Setting range	0 ~ 5	Unit	-	Factory setting	5
Set RS232 communication baud rate, please refer to parameter P08.01 for the setting method (RS485 communication data format selection).						

P08.32	Name	RS232 communication data format selection			Related mode	-
	Setting range	0 ~ 5	Unit	-	Factory setting	0
RS232 communication data format, please refer to parameter P08.02 for the setting method (RS485 communication data format selection).						

P08.33	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P08.95	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P08.96	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

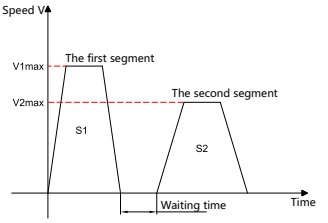
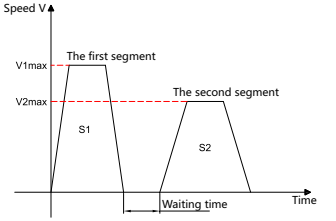
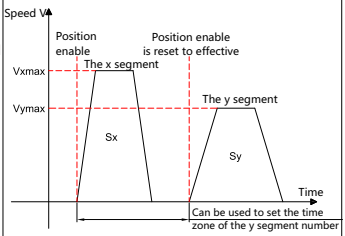
P08.97	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P08.98	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P08.99	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

5.10 Group P09: Multi-segment position control parameters

<table>
<tr><td rowspan="2">P09.00</td><td>Name</td><td colspan="3">Multi-segment position operation mode</td><td>Related mode</td><td>P</td></tr>
<tr><td>Setting range</td><td>0 ~ 2</td><td>Unit</td><td>-</td><td>Factory setting</td><td>1</td></tr>
<tr><td colspan="7">In the position control mode, when the position command source is set to multi-segment position command (P03.00=2), the multi-segment position operation mode is set.</td></tr>
</table>

Set value	Operation mode	Remarks	Running waveform
0	Single run End shutdown	Stop after one round of operation; The segment number is automatically incremented and switched; A waiting time can be set between the segment and the segment; Multi-segment position enable is level effective;	 V_{1max}、V_{2max}: Maximum operating speed of the first segment and the second segment; S_1、S_2: Displacement of the first segment and the second segment;
1	Loop operation	Cycle operation, the starting segment number after the first round is 1; The segment number is automatically incremented and switched; A waiting time can be set between the segment and the segment; Multi-segment position enable is level effective;	 V_{1max}、V_{2max}: Maximum operating speed of the first segment and the second segment; S_1、S_2: Displacement of the first segment and the second segment;
2	IN Switch operation	The segment number is updated to be sustainable; The segment number has the IN terminal logic decision; The interval between the segment and the segment is determined by the delay time of the upper computer command; Multi-segment position enable is effective for edge change;	 V_{xmax}、V_{ymax}: The maximum running speed of the x segment and y segment; S_x、S_y: The displacement of the x segment and the y segment;

P09.01	Name	Number of segments at the end of the position command			Related mode	P
	Setting range	1 ~ 16	Unit	-	Factory setting	1

Set the total number of segments of multiple position commands.
Different segments can set different displacement, running speed, acceleration and deceleration.
When P09.00 = 0/1, the multi-segment number will automatically increase and switch, and the switching sequence: 1, 2, 3, ..., P09.01
When PO9.01=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 switch the segment number.
The multi-segment segment number is a 4-digit binary number, the corresponding relationship between CMD1 ~ CMD4 and the segment number is as follows

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

If the IN terminal logic is valid, the CMD(n) value is 1; otherwise, it is 0.

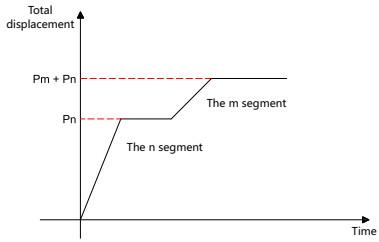
P09.03	Name	Time unit selection			Related mode	P
	Setting range	0 ~ 1	Unit	-	Factory setting	0

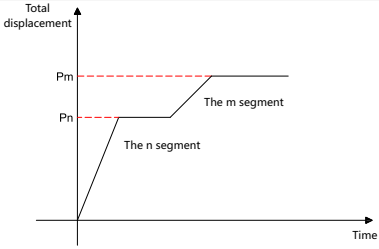
When running with multi-segment position function and setting P09.00=0/1, set the unit of waiting time between segments.Waiting time: the time interval from the end of the command operation of this segment to the start of the next command.

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, set the type of displacement command.
Displacement command: The sum of position commands in a period of time.
The relative displacement is the position increment of the target position relative to the current position of the motor;
The absolute displacement is the position 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	Displacement command type	Remarks
0	Relative displacement command	 Actual displacement of the m segment: Pm

Set value	Displacement command type	Remarks
1	Absolute displacement command	 The actual movement displacement of the m segment: Pm-Pn

P09.12 P09.13	Name	1st segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000
The first segment movement displacement of multi-segment position (command unit). P09.12 and P09.13 are combined into a 32-bit value, where P09.12 is the low 16-bit value and P09.13 is the high 16-bit value. P09.12 will be used later to represent the 32-bit parameter.						

P09.14	Name	1st segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200
The first segment maximum operating speed of multi-segment position The maximum operating speed refers to the constant running speed when the motor is not in the acceleration/deceleration process. If the position command (P09.12) of the first segment is too small, the actual motor speed will be less than P09.14.						

P09.15	Name	1st segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100
The time for the first segment motor in the multi-segment position to change uniformly from 0rpm to 1000rpm.						

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

P09.17 P09.18	Name	2nd segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.19	Name	2nd segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.20	Name	2nd segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.21	Name	Waiting time after the completion of the 2nd segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.22 P09.23	Name	3rd segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.24	Name	3rd segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.25	Name	3rd segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.26	Name	Waiting time after the completion of the 3rd segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.27 P09.28	Name	4th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.29	Name	4th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.30	Name	4th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.31	Name	Waiting time after the completion of the 4th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.32 P09.33	Name	5th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.34	Name	5th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.35	Name	5th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.36	Name	Waiting time after the completion of the 5th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.37 P09.38	Name	6th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.39	Name	6th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.40	Name	6th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.41	Name	Waiting time after the completion of the 6th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.42 P09.43	Name	7th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.44	Name	7th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.45	Name	7th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.46	Name	Waiting time after the completion of the 7th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.47 P09.48	Name	8th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.49	Name	8th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.50	Name	8th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.51	Name	Waiting time after the completion of the 8th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.52 P09.53	Name	9th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.54	Name	9th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.55	Name	9th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.56	Name	Waiting time after the completion of the 9th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.57 P09.58	Name	10th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.59	Name	10th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.60	Name	10th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.61	Name	Waiting time after the completion of the 10th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.62 P09.63	Name	11th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.64	Name	11th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.65	Name	11th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.66	Name	Waiting time after the completion of the 11th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.67 P09.68	Name	12th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.69	Name	12th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.70	Name	12th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.71	Name	Waiting time after the completion of the 12th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.72 P09.73	Name	13th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.74	Name	13th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.75	Name	13th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.76	Name	Waiting time after the completion of the 13th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.77 P09.78	Name	14th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

P09.79	Name	14th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.80	Name	14th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

P09.81	Name	Waiting time after the completion of the 14th segment position command			Related mode	P
	Setting range	0 ~ 65535	Unit	ms(s)	Factory setting	100

P09.82 P09.83	Name	15th segment position command			Related mode	P
	Setting range	-1073741824 ~ 1073741824	Unit	Command Unit	Factory setting	10000

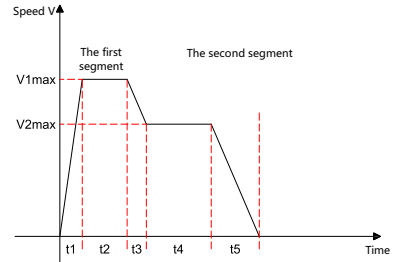
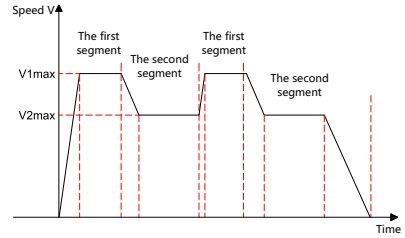
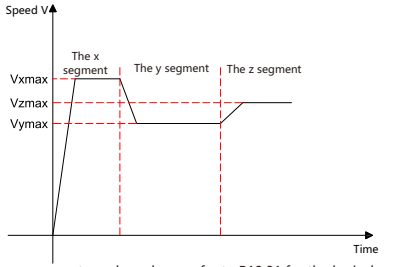
P09.84	Name	15th segment maximum operating speed			Related mode	P
	Setting range	1 ~ 6000	Unit	rpm	Factory setting	200

P09.85	Name	15th segment position command acceleration/deceleration time constant			Related mode	P
	Setting range	1 ~ 65535	Unit	ms	Factory setting	100

5.11 Group P10: Multi-segment speed control parameters

P10.00	Name	Multi-segment speed command operation mode			Related mode	S
	Setting range	0 ~ 2	Unit	-	Factory setting	1

In speed control mode, when the speed command source is multi-segment speed command (P04.00=1), set the multi-segment speed command operation mode:

Set value	Operation mode	Remarks	Operation curve
0	Single run End shutdown	Stop after one round of operation; The segment number is automatically incremented and switched;	 V_{1max}、V_{2max}: The command speeds of the first segment and second segment; t_1: The actual acceleration and deceleration time of the first segment; t_3、t_5: The acceleration and deceleration time of the second segment;
1	Cycle operation	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 operation state is always maintained.	 V_{1max}、V_{2max}: Maximum operating speed of the first segment and second segment;
2	Switch via 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 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; V_x, V_y: speed command of the xth segment and yth segment; The segment number determined by IN does not change, and the speed command of this segment continues 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 segments at the end of the speed command			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 number is automatically increased and switched, and the switching sequence: 1, 2, ..., P10.01.
When P10.00=2, 4 IN should be set as IN functions 14~17 (FunIN.14~FunIN.17), and the upper computer controls the IN logic to switch the segment number.
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 table below.

FunIN.17	FunIN.16	FunIN.15	FunIN.14	Cornet
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-speed running time unit. 0: sec (second); 1min (minute)

P10.03	Name	Acceleration time constant 1			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

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	1 ~ 65535	Unit	ms	Factory setting	200

P10.05	Name	Acceleration time constant 2			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.06	Name	Deceleration time constant 2			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.07	Name	Acceleration time constant 3			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.08	Name	Deceleration time constant 3			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.09	Name	Acceleration time constant 4			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.10	Name	Deceleration time constant 4			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.11	Name	Acceleration time constant 5			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.12	Name	Deceleration time constant 5			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.13	Name	Acceleration time constant 6			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.14	Name	Deceleration time constant 6			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.15	Name	Acceleration time constant 7			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.16	Name	Deceleration time constant 7			Related mode	S
	Setting range	1 ~ 65535	Unit	ms	Factory setting	200

P10.20	Name	1st segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	100

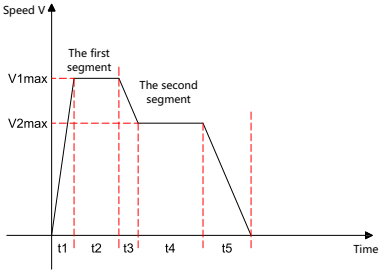
P10.21	Name	1st segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec/0.1min	Factory setting	10

Set the running time of the 1st 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 driver 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	1st segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

Select the acceleration/deceleration time constant of the 1st segment speed command

Set value	Acceleration and deceleration time constant	Remarks
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: P10.07
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 command speeds of the first segment and second 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 period (for example: the first running time in the figure is t1+t2, the second running time 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 stage;

P10.23	Name	2nd segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	200

P10.24	Name	2nd segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	20

P10.25	Name	2nd segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.26	Name	3rd segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	300

P10.27	Name	3rd segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	30

P10.28	Name	3nd segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.29	Name	4th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	400

P10.30	Name	4th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	40

P10.31	Name	4th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.32	Name	5th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	500

P10.33	Name	5th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	50

P10.34	Name	5th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.35	Name	6th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	600

P10.36	Name	6th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	60

P10.37	Name	6th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.38	Name	7th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	700

P10.39	Name	7th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	70

P10.40	Name	7th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.41	Name	8th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	800

P10.42	Name	8th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	80

P10.43	Name	8th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.44	Name	9th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	900

P10.45	Name	9th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	90

P10.46	Name	9th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

10.47	Name	10th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1000

P10.48	Name	10th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	100

P10.49	Name	10th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.50	Name	11th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1100

P10.51	Name	11th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	110

P10.52	Name	11th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.53	Name	12th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1200

P10.54	Name	12th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	120

P10.55	Name	12th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.56	Name	13th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1300

P10.57	Name	13th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	130

P10.58	Name	13th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.59	Name	14th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1400

P10.60	Name	14th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	140

P10.61	Name	14th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.62	Name	15th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1500

P10.63	Name	15th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	150

P10.64	Name	15th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.65	Name	16th segment speed command			Related mode	S
	Setting range	-6000 ~ 6000	Unit	rpm	Factory setting	1600

P10.66	Name	16th segment speed command running time			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1sec 0.1min	Factory setting	160

P10.67	Name	16th segment acceleration and deceleration time constant selection			Related mode	S
	Setting range	1 ~ 7	Unit	-	Factory setting	1

P10.68	Name	IN select command switching delay			Related mode	S
	Setting range	0 ~ 65535	Unit	0.1ms	Factory setting	0

5.12 Group P12: Auxiliary function parameters

P12.00	Name	Save parameters to the EEPROM of the driver			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.01	Name	Read parameters from the EEPROM of the driver			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.02	Name	Restore factory default parameter values			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.03	Name	Reset driver failure			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.04	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P12.05	Name	Reset the encoder multi-turn value			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.06	Name	Reset encoder multi-turn value and fault			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.07	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P12.08	Name	Reset fault record			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.09	Name	Internal test run position command type			Related mode	PS
	Setting range	0 ~ 1	Unit	-	Factory setting	0

In position control mode (P01.00=0), when the position command source is set to internal test (P03.00=3), set the type of position command.
0: Incremental position mode
1: Absolute position mode

P12.10	Name	Internal test run start/stop command			Related mode	PS
	Setting range	0 ~ 6	Unit	0.1ms	Factory setting	6

In the position control mode (P01.00=0), when the position command source is set to the internal test (PO3.00=3), it is used for communication to write the motor start/stop command.

P12.10 Write value	Description
0	Write: Trigger the motor to stop. Set P12.10 to 6 after the motor responds to the start-stop command;
1	Write: Trigger the motor to run forward and stop after the run command set by P04.60. After the motor responds to the start-stop command, set P12.10 to 6;
2	Write: Trigger the motor to run reversely and stop after the run command set by P04.60. After the motor responds to the start-stop command, set P12.10 to 6;
3	Write: Trigger the motor to jog forward. After the motor responds to the start-stop command, set P12.10 to 6;
4	Write: Trigger the motor jog reverse. After the motor responds to the start-stop command, set P12.10 to 6;
5	Write: Trigger an emergency stop of the motor. After the motor responds to the start-stop command, set P12.10 to 6;
6	Write: meaningless; Read: indicate that the motor is running or waiting to be triggered;

P12.11	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P12.12	Name	Internal test demonstration run delay time			Related mode	PS
	Setting range	0 ~ 65535	Unit	ms	Factory setting	100

P12.13	Name	Internal test demonstration run start / stop command			Related mode	PS
	Setting range	0 ~ 2	Unit	-	Factory setting	0

In the position control mode (P01.00=0), when the position command source is set to the internal test (P03.00=3), it is used for communication to write the start/stop command of the motor demonstration operation.
In the demo running mode, the motor will start in reciprocating or single direction (P04.65=0/1) according to the operating command, speed, acceleration and deceleration time constant set by P04.60 ~ P04.64, and start in positive or negative direction (P04.66=0/1), run the number of times set by P04.67.
After completing the set operating command each time, after delaying the delay time set by P12.12, it restarts and runs in this cycle.

P12.13Write value	Description
0	Write: Trigger the motor to stop the operation of the internal test demonstration.
1	Write: Trigger the motor to start the demonstration operation. After the driver responds to the command, set P12.13 to 2
2	Write: meaningless; Read: indicate that the motor is working in the demo mode

P12.14	Name	Clear position error			Related mode	P
	Setting range	0 ~ 1	Unit	-	Factory setting	0

P12.15	Name	Reserve			Related mode	-
	Setting range	-	Unit	-	Factory setting	-

P12.16	Name	Data sampling channel 1			Related mode	-
	Setting range	0 ~ 11	Unit	-	Factory setting	0

P12.17	Name	Data sampling channel 2			Related mode	-
	Setting range	0 ~ 11	Unit	-	Factory setting	0

P12.18	Name	Data sampling interval			Related mode	-
	Setting range	0 ~ 65535	Unit	0.1ms	Factory setting	0

P12.19	Name	Data sampling start flag			Related mode	-
	Setting range	0 ~ 1	Unit	-	Factory setting	0

5.13 Group P13: Monitoring parameter

P13.00	Name	Operating status			Related mode	-
	Setting range	-	Unit	-	Factory setting	Display
Display the operating status of the servo driver. 0: Servo driver is not enabled; 1: Servo driver is enabled.						

P13.01	Name	Motor speed			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	Display
Display the actual speed of the servo motor, after rounding the display, the accuracy is 1rpm. P01.66 (speed LED display low-pass filter cut-off frequency) can set the P13.01 low-pass filter cut-off frequency.						

P13.02	Name	Speed command			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	Display
Display the current speed command value of the servo driver, after rounding the display, the accuracy is 1rpm.						

P13.03	Name	Motor torque			Related mode	-
	Setting range	-	Unit	%	Factory setting	Display
Display the actual torque of the servo motor, 100% corresponds to 1 times the rated torque of the motor.						

P13.04	Name	Torque command			Related mode	-
	Setting range	-	Unit	%	Factory setting	Display
Display the current torque command value of the servo driver, 100% corresponds to 1 times the rated torque of the motor.						

P13.05	Name	Operating current			Related mode	-
	Setting range	-	Unit	%	Factory setting	Display
Display the actual operating current of the servo motor, 100% corresponds to the rated current of the servo motor.						

P13.07 P13.08	Name	Position command counter			Related mode	-
	Setting range	-	Unit	Command unit	Factory setting	Display
In position control mode, during servo operation, statistics and display the number of position commands that have not been multiplied by the electronic gear ratio. 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. P13.07 will be used later to represent the 32-bit parameter.						

P13.11 P13.12	Name	Position feedback counter			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	Display
Used to count the number of encoder feedback pulses since the last reset. P13.11 and P13.12 are combined into a 32-bit value, where P13.11 is the low 16-bit value and P13.12 is the high 16-bit value. P13.11 will be used later to represent the 32-bit parameter.						

P13.15 P13.16	Name	Position deviation counter			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	Display
In position control mode, statistics and display the position deviation value of the electronic gear ratio after frequency division and multiplication. 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. P13.15 will be used later to represent the 32-bit parameter.						

P13.17	Name	Position command speed			Related mode	-
	Setting range	-	Unit	rpm	Factory setting	Display
Display the speed value corresponding to the position command of a single position control cycle of the driver.						

P13.18	Name	Position command frequency			Related mode	-
	Setting range	-	Unit	KHz	Factory setting	Display
Display the pulse frequency 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	Display
Display the current level status of the 7 IN hardware terminals. Display mode: The lower part of the nixie tube is light, indicating that the input optocoupler is on (indicated by "1") If the lower part is not light, it means that the input optocoupler is not conducting (indicated by "0"). Take IN1 and IN2 terminal optocoupler not conducting, IN3~IN7 terminal optocoupler conducting as an example: Corresponding to binary encoder bit "1111100", LED panel display as follows:						

P13.20	Name	Output signal monitoring			Related mode	-
	Setting range	-	Unit	-	Factory setting	Display
Display the current status of the 3 OUT hardware terminals. Display mode: The lower part of the nixie tube is light, indicating that the optocoupler inside the output terminal is turned on (indicated by "1"); If the lower part is not light, it means that the optocoupler inside the output terminal is not conducting (indicated by "0"). Take the internal optocoupler of the OUT1 terminal output terminal being turned on, and the internal optocoupler of the OUT2 and OUT3 output terminals not conducting as an example: the corresponding binary code is "110", and the panel display is as follows:						

P13.21 P13.22	Name	Current mechanical angle of motor			Related mode	-
	Setting range	-	Unit	Encoder unit	Factory setting	Display
Display the current mechanical angle of the motor (encoder unit), 0 corresponds to the mechanical angle 0. P13.21 and P13.22 are combined into a 32-bit value, where P13.21｜ is the low 16-bit value, and P13.22 is the high 16-bit value. P13.21 will be used later to represent the 32-bit parameter. The actual mechanical angle=(P13.21+encoder pulse number)×360°.						

P13.23	Name	Current electrical angle of the motor			Related mode	-
	Setting range	-	Unit	degree	Factory setting	Display

P13.24	Name	Current voltage value of the driver			Related mode	-
	Setting range	-	Unit	degree	Factory setting	Display

P13.25 P13.26	Name	Encoder status register			Related mode	-
	Setting range	-	Unit	V	Factory setting	Display

Display encoder status information.
P13.25 and P13.26 are combined into a 32-bit value, where P13.25 is the low 16-bit value and P13.26 is the high 16-bit value.
P13.25 will be used later to represent the 32-bit parameter.
The 32-bit data corresponding to 1 means that the event has occurred, and 0 means that there is no such event. The detailed description is as follows:

BIT	Description
0	Absolute encoder failure
1	Absolute encoder command check bit failure
2	Absolute encoder delimiter failure
3	Absolute encoder overspeed fault
4	Absolute encoder status failure
5	Absolute encoder count failure
6	Absolute encoder count overflow fault
7	Absolute encoder overheating fault
8	Absolute encoder multi-turn data failure
9	Absolute encoder battery failure 1
10	Absolute encoder battery failure 2
11	Absolute encoder data receiving timeout fault 1
12	Absolute encoder data receiving timeout fault 2
13	Absolute encoder receiving command failure
14	Absolute encoder calibration failure
15	Absolute encoder calibration command error, if this error occurs, please contact the manufacturer
16	Absolute encoder receiving status flag failure
17	Absolute encoder receiving failure
18	Incremental encoder hall signal failure
19	Incremental encoder disconnection fault
20 ~ 31	Reserve

Chapter 6 Communication

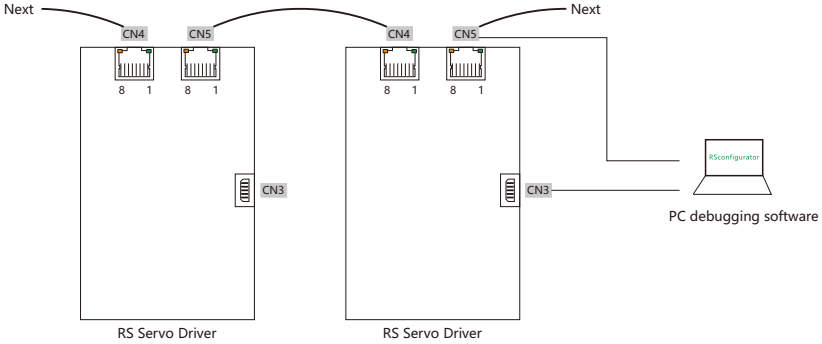
Chapter 6 Communication configuration

The RS 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 drive status monitoring.

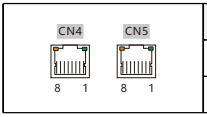
6.1 MODBUS communication

RS driver hardware interface

RS servo driver has two hardware interfaces: RS-232 and RS-485
Among them, CN3 is a Micro-USB interface, a 232 communication interface, which cannot be networked, and is mainly used for the connection of debugging software and drivers.
CN4/CN5 is a dual RJ45 network interface, a 485 communication interface, which can be connected to the network, and can also be used for the connection of debugging software and drivers.



CN4/CN5 pin definition
Cn4 and CN5 are two parallel network ports. The wiring definition and sequence of each network port are the same, and there is no difference when used.



1	2	7
RS485-A	RS485-B	GND
Other pins are undefined		

6.1.2 Communication parameter setting

Driver default communication settings:

	Communication mode	Default axis address	Default baud rate	Default data format
CN3	Rs232 communication	1	115200 bps	1 start bit + 8 data bits + 1 stop bit
CN4/CN5	Rs485 communication	1	115200 bps	

1.232 Communication settings:

The driver 232 communication is mainly used for the connection of the debugging software, and the default setting can be kept under normal circumstances.
Only when the driver is in a special state (such as interference environment), the 232 communication baud rate P08.31 needs to be modified;
In addition, the 232 communication data format p08.32 can also be modified, and the data format is the same as the definition of 485 communication data format (p08.02 on the next page)

2.485 communication settings:

Driver 485 communication can be used for networking connection, and also for driver debugging software connection.
After the upper computer and the driver complete the networking, the control parameters of the driver can be read and written through the upper computer.
The following are the main setting parameters

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

Set the servo driver axis address
0: Broadcast address. The upper computer can write to all servo drivers through the broadcast address. The driver performs corresponding operations according to the broadcast data frame, but does not respond.
1~247: When multiple servo drivers are networked, each servo driver can only have a unique address, otherwise it will cause abnormal communication or communication failure.

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

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

Setting value	Baud rate setting
0	4800 Kbp/s
1	9600 Kbp/s
2	19200 Kbp/s
3	38400 Kbp/s
4	57600 Kbp/s
5	115200 Kbp/s

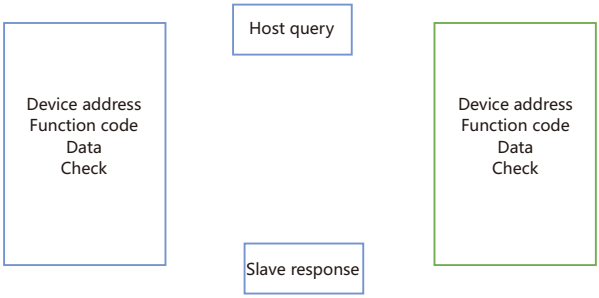
P08.02	Name	RS485 communication data format selection			Related mode	-
	Setting range	0 ~ 5	Unit	-	Factory setting	0

Set the data format when the servo driver communicates with the upper computer device.
The data format of the servo driver must be the same as that of 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

6.2 MODBUS communication protocol

Modbus protocol, designed by MODDICON company, is a bus protocol that allows the master station and one or more slave stations to share data. The data consists of 16-bit registers.
The standard Modbus port on the Modicon controller uses an RS-232 compatible serial interface, which defines the connector, wiring cable, signal level, transmission baud rate and parity.
Controller communication uses master-slave technology, that is, the host initiates data transmission, which is called query. Other devices (slave) return response data to the query, or process the actions required by the query. The host device includes a processor, a programmer and a PLC. Slave machines include programmable controllers, servo drives and stepper drives.
The master-slave query-feedback mechanism is as follows:
The master station can read and write a single register or multiple registers.



Note: The communication data frame structure of this servo driver adopts RTU mode.
The MODBUS communication function code used by the servo driver is described as follows:

Function code definition	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).

6.2.1 Read register data: 0x03

Master request frame format:

START	Idle time greater than or equal to 3.5 characters, indicating the beginning 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 number of registers ranges from 0x1 to 0x7D

Slave response frame format:

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code: 0x03
DATA_LENGTH	The number of data bytes returned is equal to the number of registers N*2
DATA[0]	High byte of starting data value
DATA[1]	Low byte of starting data value
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

Example:
The host sends a request frame, and reads 2 (0x0002) word length data from the servo driver whose axis address is 0x01 and the starting register address is 100 (0x0064).

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA _NUMBERH	DATA _NUMBERL	CRCL	CRCH
0x01	0x03	0x00	0x64	0x00	0x02	CRCL	CRCH

The slave sends a response frame, the servo driver whose axis address is 0x01, returns 4 bytes (2 words long) of data, and the data content is 0x0120, 0x0059.

ADDR	CMD	DATA _LENGTH	DATA [0]	DATA [1]	DATA [2]	DATA [3]	CRCL	CRCH
0x01	0x03	0x04	0x01	0x00	0x00	0x59	CRCL	CRCH

6.2.2 Write single register data: 0x06

Master request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code: 0x06
REGISTER_ADDRH	Write the high byte of the start address of the target register
REGISTER_ADDRL	Write the low byte of the start address of the target register
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

Master request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code: 0x06
REGISTER_ADDRH	The high byte of the register address is written
REGISTER_ADDRL	The low byte of the register address is written
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

Example:

The host sends a request frame to the servo driver whose axis address is 0x01, and write data 0x0002 in the register address of 100 (0x0064).

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA [0]	DATA [1]	CRCL	CRCH
0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

The slave sends a response frame, indicating that the master successfully writes the data into the corresponding register of the driver.

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA [0]	DATA [1]	CRCL	CRCH
0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

6.2.3 Write multiple register data: 0x10

Master request frame format

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code: 0x10
REGISTER_ADDRH	Write the high byte of the start address of the target register
REGISTER_ADDRL	Write the low byte of the start address of the target 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	The number of bytes corresponding to the total number of registers to be written (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

Slave response frame format:

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code: 0x10
REGISTER_ADDRH	The high byte of the start address of the written register
REGISTER_ADDRL	The 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.

Example:

The host sends a request frame and writes 2 (0x0002) word length data (4 bytes) to the servo driver whose axis address is 0x01 and the starting register address is 100 (0x0064), and the write data is 0x1200, 0x0052.

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA_ NUMBERH	DATA_ NUMBERL	DATA_ LENGTH	DATA[0]	DATA[1]	DATA[2]	DATA[3]	CRCL	CRCH
0x01	0x10	0x00	0x64	0x00	0x02	0x04	0x12	0x00	0x00	0x52	CRCL	CRCH

The slave sends a response frame, indicating that the master successfully writes data into the corresponding multiple registers of the driver.

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA _NUMBERH	DATA _NUMBERL	CRCL	CRCH
0x01	0x10	0x00	0x64	0x00	0x02	CRCL	CRCH

6.2.4 Error response frame format

During the communication between the master station and the slave station, if an abnormal situation is encountered, the slave station generates an incorrect request. The Modbus protocol specifies several wrong coding types. The slave station sends out an error response frame in the corresponding format when abnormal.

START	Idle time greater than or equal to 3.5 characters, indicating the beginning of a frame
ADDR	Servo axis address
CMD	Function code + 0X80 (If the function code is 0x03, the error CMD is 0x83)
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

Error code

Error code	Error description
0x01	Illegal function code
0x02	Illegal data address
0x03	Illegal data
0x04	Slave equipment failure

Example:

The host sends a request frame to the servo drive whose axis address is 0x01, and write data 0x0002 in the register address of 100 (0x0064).

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA [0]	DATA [1]	CRCL	CRCH
0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

Normal: The slave sends a response frame, indicating that the master successfully writes the data into the corresponding register of the driver.

ADDR	CMD	REGISTER _ADDRH	REGISTER _ADDRL	DATA [0]	DATA [1]	CRCL	CRCH
0x01	0x06	0x00	0x64	0x00	0x02	CRCL	CRCH

Abnormal: The slave sends an error response frame, indicating a communication error, for example, the following indicates an illegal data address error

ADDR	CMD	ERROR_CODE	CRCL	CRCH
0x01	0x86	0x02	CRCL	CRCH

6.2.5 CRC check

During the communication between the master station and the slave station, a consistent CRC check algorithm must be used, otherwise a CRC check error will be generated, resulting in communication failure, and the servo driver will not report the CRC check error.The servo driver adopts 16-bit CRC, with low byte first and high byte after. 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;
}
```

6.3 Connection and use of debugging software

The RS servo driver can be connected to the PC debugging software through the Micro-USB or 485 network port.