Preface

Thank you for choosing EA180 series servo drive!

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EA180 series servo drive is a high performance small and medium power AC servo unit developed by Shenzhen Sine Electric Co.,Ltd. This series of products adopts advanced motor control special DSP chip, large scale programmable gate array (CPLD/FPGA) and PIM power module, which has the characteristics of high integration, small volume, perfect protection and high reliability. The optimized PID control algorithm realizes precise digital control of torque, position and speed, with high precision and fast response.

It provides advanced functions such as rigid selection, real-time automatic gain setting and automatic resonance suppression. Has rich digital and analog interface, support MODBUS communication protocol, convenient networking. Two sub series respectively support the use of 2500PPR incremental pulse encoder or Tamagawa 17 bit, 23 bit absolute incremental motor encoder with high precision, to meet the different requirements of cost and performance. Can be widely used in CNC machine tools, printing and packaging machinery, textile machinery, robotics, automated production lines and other automation fields.

EA180 series servo drive, there are two kinds of models that support EtherCAT bus and Canopen bus separately.

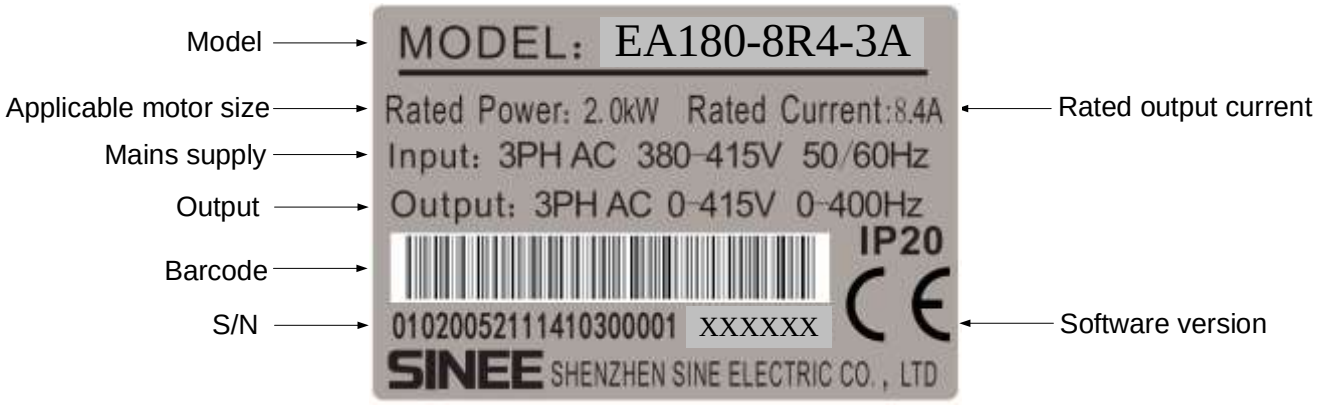
Because we have always been committed to the continuous improvement of product and product information, and therefore. The information provided by our company is subject to change without notice.

For the latest changes and more,please visit **www.sineedrive.com**

Chapter 1 Product information

1.1 EA180 servo drive

1.1.1 Description of the nameplate



1.1.2 Model Description

EA 180 E – 8R4 – 3B-XX

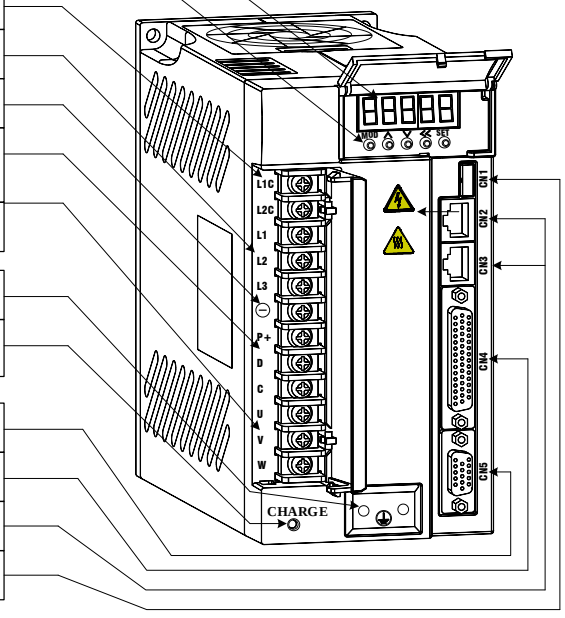
EA	Servo drive
180	Product series: 180 series
E	Interface: None: Analog pulse; C: Canopen; E: EtherCAT
8R4	Rated Output Current: 1R6 = 1.6A; 2R8 = 2.8A; 5R5 = 5.5A; … ; 026 = 26A
3B	Mains Supply: 1: 1 phase 220V; 2: 1 or 3 phase 220V; 3: 3 phase 380V
XX	Special Version

Encoder Type: A: Pulse incremental; B: Serial communi.

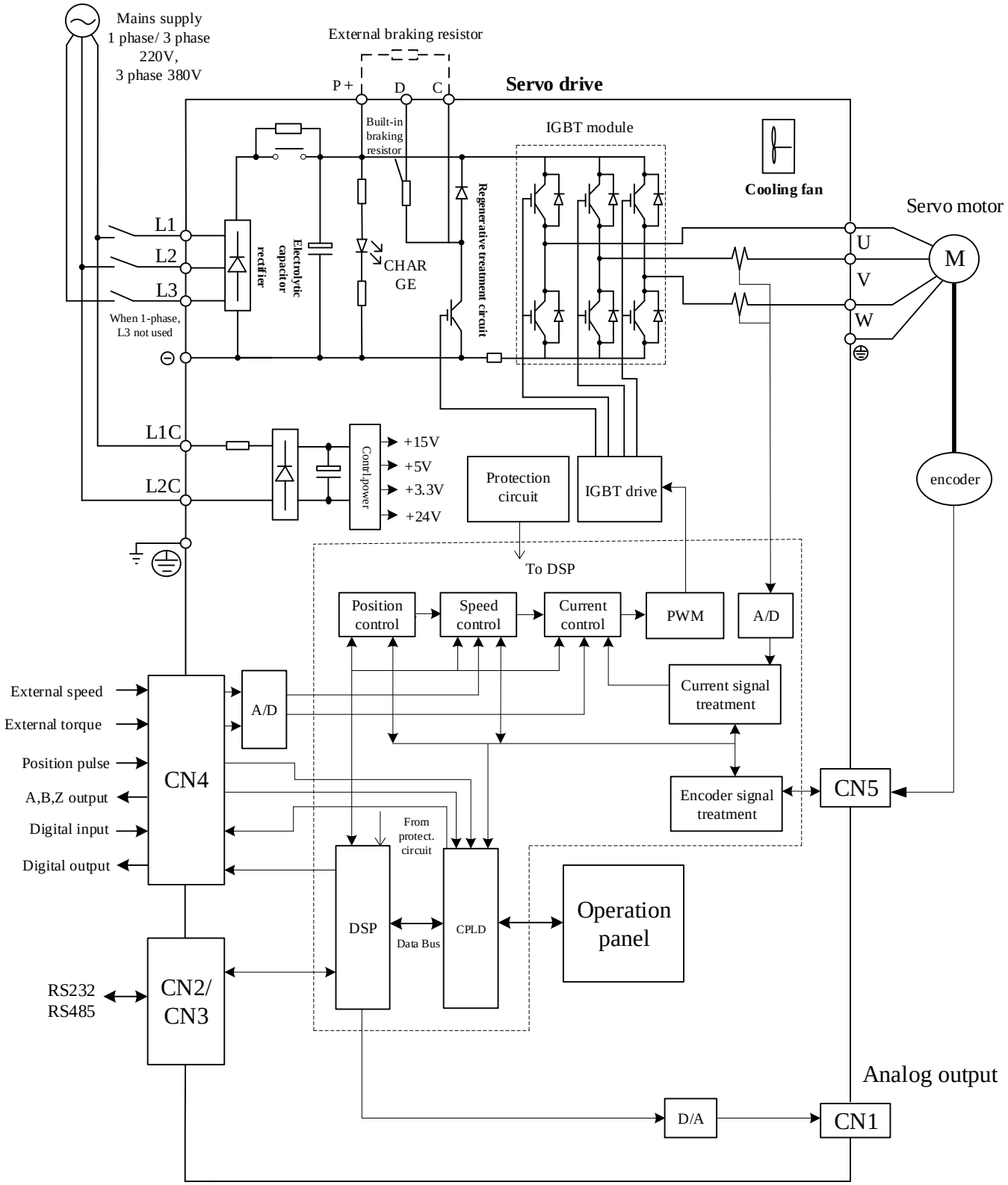
Note: 1):AC220V voltage class, 7.6A and below products, suitable for single-phase and three-phase AC220V power supply, so there is no special single-phase 220V products.
2): AC220V voltage class, 10A and above products, only to adapt to three-phase AC220V power supply varieties.

1.1.3 Servo drive part name

Display	5-bit 7-segment LED displays running state
Buttons	Parameters setting
L1C、L2C Control Circuit Supply	Refer to the nameplate
L1、L2、L3 Mains Supply	Refer to the nameplate
P+、 ⊖	DC bus voltage terminal,for DC bus sharing
P+、D、C External Braking Resistor	Defaulted short-cut between P+ and D, when using external braking resistor, remove the short-cut plate, open circuit in between P+ And D, connect external braking resistor in between P+ And C.
U、V、W Servo motor	To servo motor U、V、W
PE	Power and servo motor ground
CHARGE Bus volt.state	Show if the DC bus is in charging state, when the light is ON,even if the mains supply is cut, the capacitor inside the drive is electrified.
CN5 Encoder Port	Connected to the encoder of the servo motor
CN4 Control Terminal	Connected to upper computer
CN2、CN3 Communi.Port	Two in parallel connection, include RS232、RS485、CAN interface
CN1 Analog Monitoring Port	Two analog output



1.1.4 Block diagram of EA180 servo drive



1.2 Servo motor

1.2.1 Description of the nameplate

Motor type

Rated output power Rated input voltage Rated current

Rated torque Rated speed Insulation class

Motor code Protection grade

Barcode and Serial number

Note: The actual wording on the nameplate may be different from above picture

1.2.2 Model Description

SER ① 08 ② - 0R7 ③ - 30 ④ - 2 ⑤ A ⑥ A ⑦ Y ⑧ 1 ⑨ -XX ⑩

① product series	② Motor flange size	③ Rated motor output power
SER：standard servo motor SES：high performance servo motor	04：40mm 06：60mm 08：80mm 09：86mm 11: 110mm 13：130mm 18：180mm	0R1：100W 0R2：200W 0R4：400W 0R7：750W 1R0：1000W 1R5：1500W 2R0：2000W 3R0：3000W 4R5：4500W 5R6：5600W 7R5：7500W 011: 11000W
④ Rated motor speed	⑦ Inertia type	
10：1000rpm 15：1500rpm 20：2000rpm 25：2500rpm 30：3000rpm	A：Low inertia B：Medium inertia C：High inertia	
⑤ Voltage class		⑨ Optional
2：220V 3：380V	⑧ Shaft end	Null：No option 1：with brake（DC24V） 2：with oil seal 3：with brake and oil sea
⑥ Encoder type	X: shaft without keyway	
A：2500ppr B：17bit incremental C: 17 bit absolute F：23bit absolute	Y：Shaft with U-shaped slot and screw hole Z：Shaft with double-circle slot and screw hole	
		⑩ Special specifications

*: Some varieties may be double round keyway, but except the 130 flange motor, the width and height of the key are the same as those of the U keyway. See Chapter 10.

The above 10 types of servo motor elements are not optional, please refer to the selection guide or consult the company.

1.3 Confirm if the drive and motor matches with each other

1.3.1 Servo drive and motor matching table

Servo Drive			Servo Motor			
Drive Model	**Voltage**	**Size**	**Motor Model**	**Motor Power**	**Rated Speed**	**Rated Torque**
EA180-1R6-2□	Single phase or three phase AC220V	SIZEA	SES04-0R1-30-2□AY□	100W	3000rpm	0.32Nm
			SER06-0R2-30-2□AY□	200W	3000rpm	0.64Nm
EA180-2R8-2□			SER06-0R4-30-2□AY□	400W	3000rpm	1.28Nm
EA180-5R5-2□			SER08-0R7-30-2□AY□	750W	3000rpm	2.38Nm
			SER08-0R7-20-2□AY□	750W	2000rpm	3.58Nm
			SER08-1R0-30-2□AY□	1000W	3000rpm	3.18Nm
EA180-7R6-2□		SIZEB	SER13-1R0-10-2□BY□	1000W	1000rpm	9.55Nm
			SER13-1R0-20-2□BY□	1000W	2000rpm	4.77Nm
			SER13-1R0-30-2□BY□	1000W	3000rpm	3.18Nm
EA180-010-2□	Three phase AC220V		SER13-1R5-10-2□BY□	1500W	1000rpm	14.32Nm
			SER13-1R5-20-2□BY□	1500W	2000rpm	7.16Nm
			SER13-1R5-30-2□BY□	1500W	3000rpm	4.77Nm
EA180-8R4-3□	Three phase AC380V		SER13-1R5-10-3□BY□	1500W	1000rpm	14.32Nm
EA180-5R4-3□			SER13-1R5-20-3□BY□	1500W	2000rpm	7.16Nm
			SER13-1R5-30-3□BY□	1500W	3000rpm	4.77Nm
EA180-8R4-3□			SER13-2R0-20-3□BY□	2000W	2000rpm	9.55Nm
			SER13-2R0-30-3□BY□	2000W	3000rpm	6.37Nm
EA180-012-3□			SER13-3R0-20-3□BY□	3000W	2000rpm	14.32Nm
			SER13-3R0-30-3□BY□	3000W	3000rpm	9.55Nm
			SER18-3R0-15-3BBZ□	3000W	1500rpm	19.1Nm
			SER18-3R0-15-3BCZ□	3000W	1500rpm	19.1Nm
EA180-018-3B		SIZE C	SER18-4R5-15-3BBZ□	4500W	1500rpm	28.65Nm
EA180-021-3B			SER18-5R6-15-3BBZ□	5600W	1500rpm	35.65Nm
EA180-026-3B			SER18-7R5-15-3BBZ□	7500W	1500rpm	47.75Nm

Note that the type of encoder used by servo motors must be consistent with the type of encoder supported by the servo drive.

For more specifications of servo motors, please refer to our company.

1.3.2 Cables for encoders

Motor Flange Size	Encoder Type	Cable Model
40~80	2500ppr incremental encoder	A10-LP-A000-m*1
	17bit incremental encoder	A10-LS-A000-m
	17, 23bit absolute encoder	A10-LA-A000-m*2
110~180	2500ppr incremental encoder	A10-LP-H100-m
	17bit incremental encoder	A10-LS-H100-m
	17, 23bit absolute encoder	A10-LA-H100-m*2

Note *1:m indicates cable length, in meters

Note *2: battery for absolute encoder mounting on line cable. When the absolute encoder is used as incremental, use the 17bit incremental encoder cable.

1.3.3 Servo motor power cables / brake cables

Motor Flange Size	Motor Power Cable		Brake Cable (brake)
	Motor power cable	Motor with a brake,brake cable	
40~80	A10-LM-A010-m*1	-	A10-LZ-A005-m
110~130	A10-LM-H120-m	A10-LB-H120-m	-
180(3~4.5KW)	A10-LM-M220-m	-	Customer self-*2
180(5.6~7.5KW)	A10-LM-M240-m	-	Customer-made

Note *1:m indicates cable length, in meters

Note *2: When 17 bit absolute encoder is used as incremental encoder, then please use 17bit incremental cable.

Chapter 2 Installation

2.1 Selection of braking resistor

When the output torque of the motor is in reverse direction, the energy is transmitted back from the load to the drive. This energy will be injected into the capacitors of the bus bar, so that the voltage of the bus inside the drive rises, and the size of the recharging energy depends on the inertia of the rotor and the load of the motor. If the system inertia is small, possibly through capacitor to drive the internal recirculation of energy absorption, but if the system inertia is large, more than the capacity to absorb the energy, then the voltage value may rise too high, causing the drive stop or even damage, so when the voltage rises to a certain value, the recharge energy must be consumed by brake resistance.

The following table 2-1 lists the rotor inertia of the commonly used SER series servo motors and the capacity of the internal absorption of EA180 servo drive, as well as the formula for the calculation of the regenerative energy.

Table 2-1 Rotor inertia of commonly used SER series servo motors and capacitor absorbable regenerative energy

Drive Model	Motor	Rotor Inertia $J(\times 10^{-4} kg \cdot m^2)$	The regenerative energy from rated speed to 0 with no load Eo (Joule)	The maximum regenerative energy of capacitor Ec (Joule)
EA180-1R6-2□	SER04-0R1-30-2□AY	0.04	0.2	16
	SER04-0R2-30-2□AY	0.18	0.89	16
EA180-2R8-2□	SER06-0R4-30-2□AY	0.3	1.48	24
EA180-5R5-2□	SER08-0R7-30-2□AY	1.01	4.99	24
EA180-7R6-2□	SER13-1R0-10-2□BY	17.14	9.42	41
EA180-7R6-2□	SER13-1R0-20-2□BY	8.71	19.1	41
EA180-010-2□	SER13-1R5-20-2□BY	12.08	26.5	41
EA180-5R4-3□	SER13-1R5-20-3□BY	12.08	26.5	34
EA180-8R4-3□	SER13-2R0-20-3□BY	17.14	37.67	49.6
EA180-012-3□	SER13-3R0-20-3□BY	25.58	56.22	49.6
EA180-018-3B	SER13-4R5-15-3BBZ	45.51	56.26	61.2
EA180-021-3B	SER13-5R6-15-3BBZ	79.89	98.76	91.8
EA180-026-3B	SER13-7R5-15-3BBZ	102.36	126.54	91.8

- **Calculation formula of regenerative energy：**

$$Eo = \frac{J \times V^2}{182} \text{（Joule）}$$ V：rpm，motor's rated speed

The difference in rotor inertia between a servomotor with a brake and a servomotor without a brake is little, and can be considered the same.

2.2 Built in braking resistor

EA180 series drive starting from 5R5 contains a braking resistor that is suitable for general load inertia. Table 2-2 is the specifications for EA180 series built-in brake resistors.

Table 2-2 EA180 Built in brake resistance and Allowable minimum external resistance

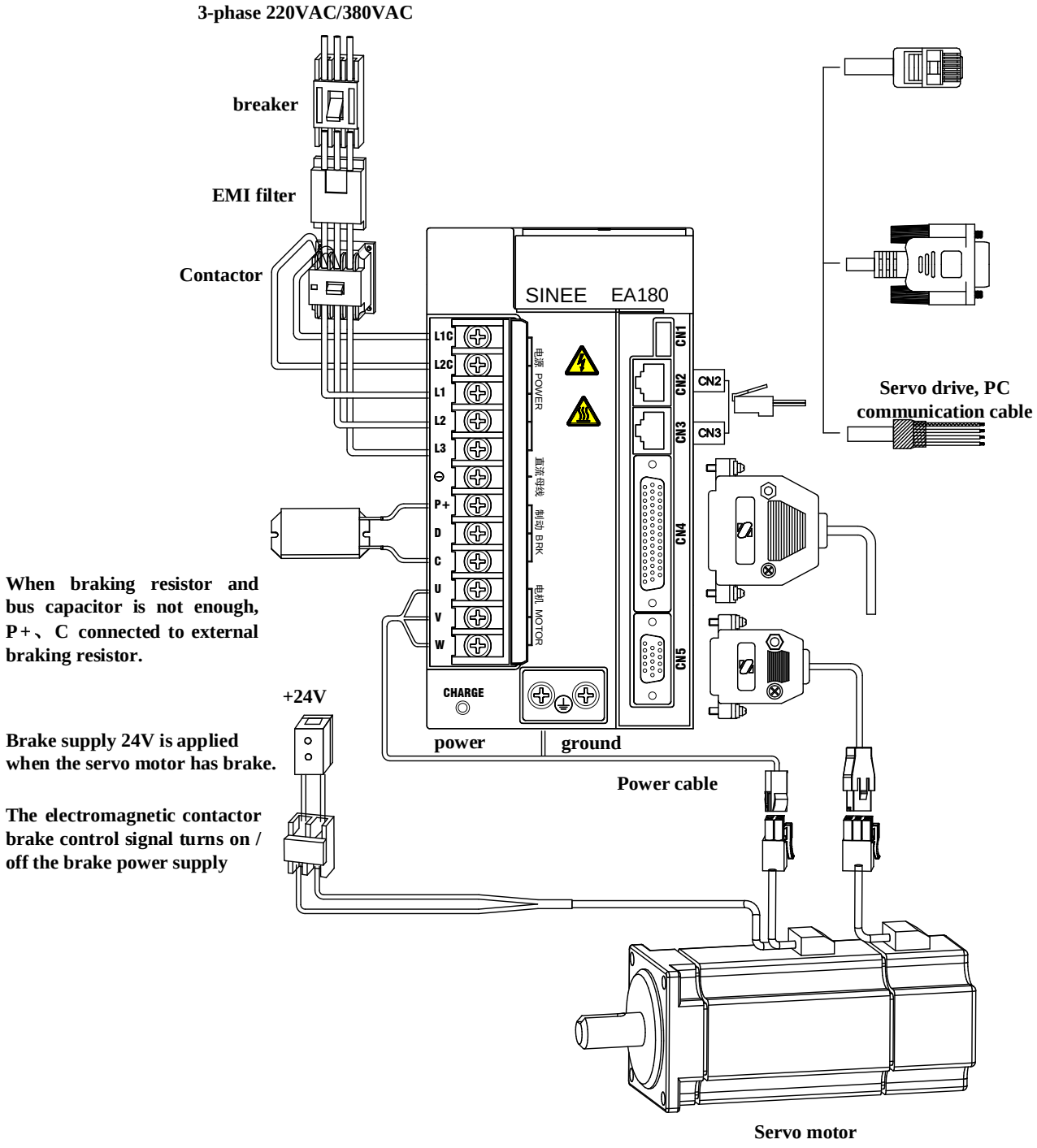
Servo drive model	Built in brake resistor specifications		Built in brake resistance, handling capacity	Allowable minimum external resistance
	Resistance (P8-10)	Capacity (P8-11)		
EA180-1R6-2□	N/A	N/A	N/A	50Ω
EA180-2R8-2□	N/A	N/A	N/A	50Ω
EA180-5R5-2□	50Ω	100W	50W	50Ω
EA180-7R6-2□	50Ω	100W	50W	40Ω
EA180-010-2□	50Ω	100W	50W	40Ω
EA180-5R4-3□	50Ω	100W	50W	50Ω
EA180-8R4-3□	50Ω	100W	50W	50Ω
EA180-012-3□	50Ω	100W	50W	45Ω
EA180-018-3B	40Ω	200W	90W	30Ω
EA180-021-3B	40Ω	200W	90W	30Ω
EA180-026-3B	40Ω	200W	90W	25Ω

2.2.1 External braking resistance capacity calculation formula

- When the regenerative capacity exceeds the handling capacity of the built in braking resistance, alarm Al017 occurs, should apply to external braking resistance.
- According to the calculation formula of the retrogradation of energy, assuming total load inertia is N times the inertia of the rotor of the motor, brake motor is braked from the rated speed to 0, regenerative energy is N *Eo, the action cycle is T(S), then, the power of brake resistance= 2[Nx Eo-Ec]/T

Chapter 3 Wiring

3.1 Peripherals connection



Precautions:

1) Servo drives are directly connected to industrial power supplies without the use of transformers. To prevent cross - electric shock in the servo system, use a fuse or wiring breaker on the input power supply.

2) No electromagnetic contactor is installed between the drive and the motor, which will cause the drive to be damaged.

3) External control power supply and 24V supply, please check the power supply capacity, especially when several drives or brake are supplied in the same time, if the power supply capacity is not enough, it will cause the current supply shortage, drive or brake damage.

4) Please note that the brake power supply is 24V DC, and its capacity shall comply with the power requirements of the brake. For braking power, refer to servo motors.

5) Confirm the servo motor output U, V, W terminals phase sequence connection is correct, wrong wiring may cause the motor does not turn or disorderly turn, and then alarm appears, and even lead to motor damage.

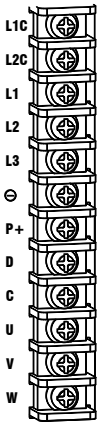
6) If the use of external resistor, the P+ and D terminals are in open circuit, external brake resistor is connected to terminal P+, C, if the use of internal braking resistance,terminals P+ and D are required to be short,and terminals P+, C are open (see Section 2.7).

7) in the single-phase 220V wiring, the main power supply terminals are L1, L2, the vacated terminal L3 should not be wiring.

8) CN2 and CN3 are two pins defined exactly the same communication interface, which can be used arbitrarily between the two.

3.2 Main circuit terminal connection

The main circuit (high voltage part) terminal arrangement and screw dimensions are as follows.



Drive size	Main circuit terminals	
	Screw size	Torque
SIZE A	M4	2.5N.m
SIZE B	M4	2.5N.m
SIZE C	M4	2.5N.m

Drive size	PE ground terminal	
	Screw size	Torque
SIZE A	M4	2.5N.m
SIZE B	M4	2.5N.m
SIZE C	M4	2.5N.m

3.2.2 The main circuit (high voltage part) terminal description

Table 3-1 Description of main circuit terminal of servo drive

Terminal mark	Name	Terminal function	
L1C、L2C	Control power input terminal	1-phase input voltage class is the same as the main circuit power	
L1、L2、L3	Main circuit AC power input terminal	EA180-1R6-2□ EA180-2R8-2□ EA180-5R5-2□ EA180-7R6-2□	L1、L2 1-phase 220V input Or L1、L2、L3 3-phase 220V input
		EA180-010-2□	L1、L2、L3 3-phase 220V input
		EA180-5R4-3□ EA180-□□□-3□ EA180-026-3□	3-phase 380V input
P+、D、C	External braking resistor connection terminal	The default connection between P+ and D is short wiring. When the braking capacity is insufficient, please open the circuit between P+ and D, and connect the external braking resistor between P+ and C.	
P+、⊖	Common DC bus terminal	The DC bus terminal of the servo drive can be connected in parallel when the multiple drives are in operation.	
U、V、W	Servo motor connection terminal	The connecting terminals of the servo motors are connected with U, V and W of the motor.	
PE	Ground	EA180-2R8-2□、EA180-5R5-2□ one ground terminal; connect with the two ground terminals of other power size, power supply and motor ground terminal.	

3.2.3 Power connection

Servo drive power supply wiring method is divided into single-phase and three-phase respectively, single-phase only suitable for the output current of 7.6A and below models.

- Single phase power supply wiring method (rated output current 7.6A and below applicable)

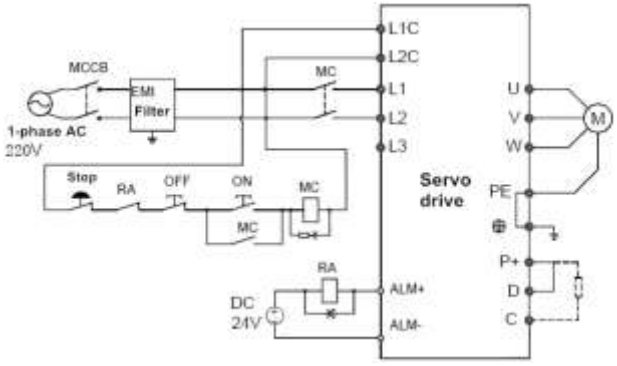
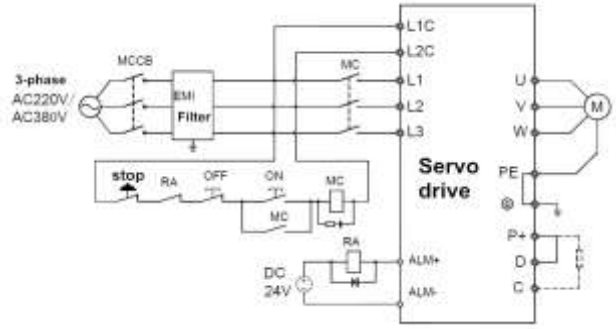


Figure 3-1 1-phase power supply connection

- Three phase power supply wiring method (all series are applicable)



3-phase power supply connection

Note☞	1.	**1. if you do not want to cut off the main loop power supply when a fault occurs, you do not need to use the RA relay.**
	2.	**2., L1C, L2C can also be not used with external power supply, but they are connected to P+ - - terminals (No need to distingh polarity).**

3.2.4 Power on timing sequence

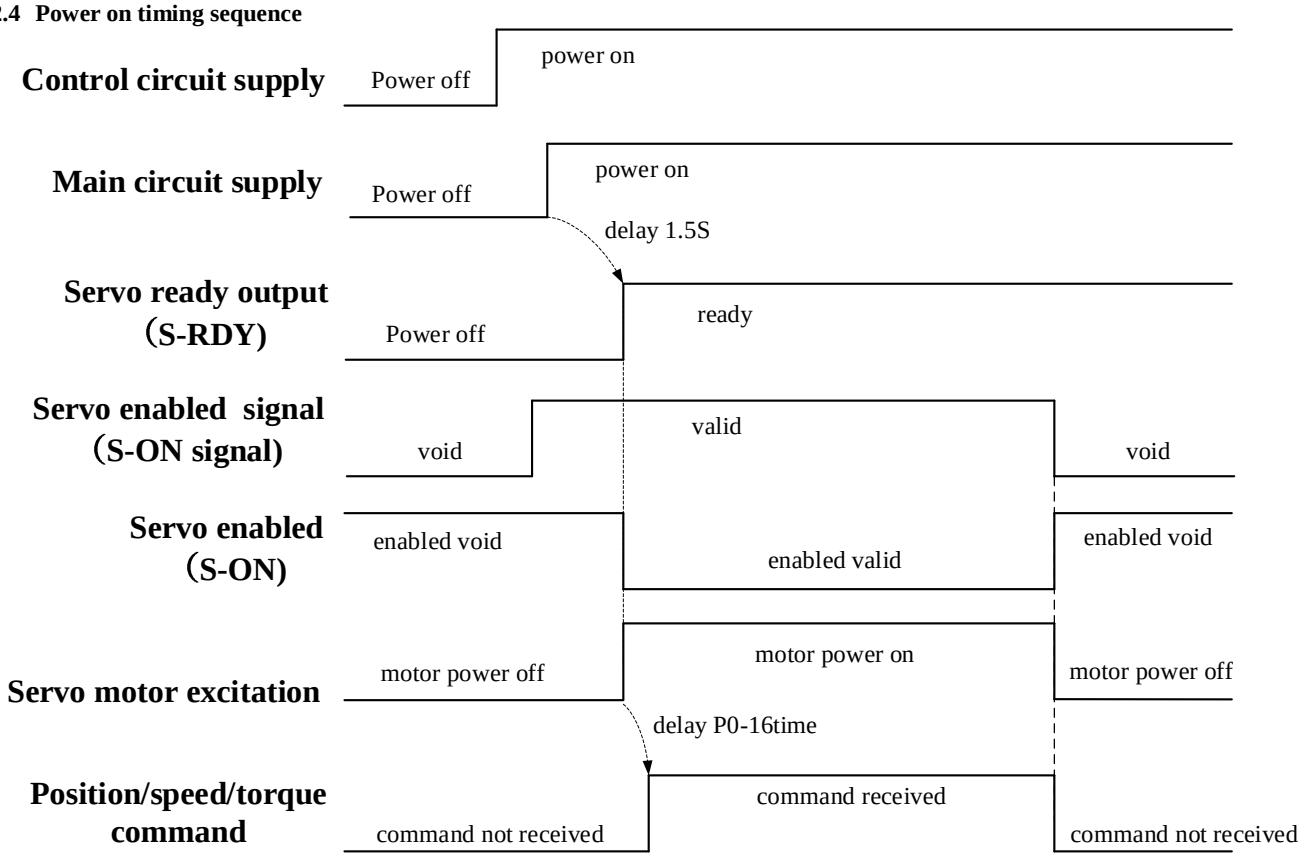


Figure 3-3 Power-on timing diagram

For power connections, refer to Figure s 3-1 and 3-2 and turn on the power supply in the following order:

1) the power supply L1C and L2C of the control circuit must be connected in the same time or before the main loop supply is connected. If the power of the control circuit is connected only, the servo ready signal (S-RDY) will not be effective.

2) the power supply is connected to the main circuit power input terminal (three-phase connected L1, L2, L3, single phase L1 and L2) by electromagnetic contactor.

3) when the main circuit is connected, the delay time is about 1.5 seconds, and the servo ready signal (SRDY) is effective and receive the servo enabled signal (S-ON) at this time. When the servo enable signal is detected, the motor is excited and in the running state. If the servo is disabled or has an alarm, the drive output is switched off and the motor is in a free state.

4) when the servo is switched on with the power supply, the motor is excited about 1.5 seconds later.

5) frequent switching on and off the main circuit power, may damage the soft start circuit and the energy consumption brake circuit, the frequency of switching on is best limited to 5 times per hour, 30 times a day below. If the drive unit or the motor is overheating, after the cause of the failure is ruled out, reconnect the power supply after 30 minutes of cooling.

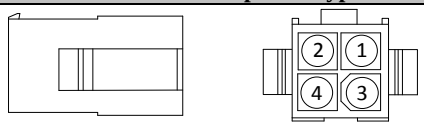
6) Do not connect the input power line to the output terminals U, V, and W, otherwise it will damage the servo drive.

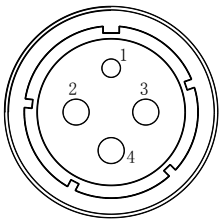
7) the braking resistance is absolutely prohibited from connecting between the DC bus P+ and the terminals, otherwise it may cause a fire.

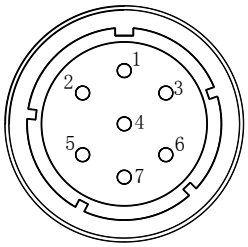
8) after the power is switched off, there may be residual voltage on the internal capacitor of the servo drive. Please confirm that the CHARGE indicator on the servo driver panel is extinguished before checking the operation.

Specification for connector of motor power cable

Table 3-2 Servo motor power cable and servo motor connecting terminal

<table>
<tr><th>Connector shape and type</th><th>Terminal pin distribution</th><th>Motor flange</th></tr>
<tr><td> 

Shell type：172159-1 TE MATE-N-LOCK
Insert spring type：794407-4 TE MATE-N-LOCK</td><td>4PINAmp plug (excluding brake）
<table><tr><th>Pin#</th><th>function</th></tr><tr><td>1</td><td>U</td></tr><tr><td>2</td><td>V</td></tr><tr><td>3</td><td>W</td></tr><tr><td>4</td><td>PE</td></tr></table></td><td>40
60
80
86</td></tr>
<tr><td> 

Model：YDA28K4TS</td><td>Air plug (excluding brake)
<table><tr><th>Pin#</th><th>function</th></tr><tr><td>1</td><td>PE</td></tr><tr><td>2</td><td>U</td></tr><tr><td>3</td><td>V</td></tr><tr><td>4</td><td>W</td></tr></table></td><td>110
130</td></tr>
<tr><td> 

Model：YDA28K7TS</td><td>Air plug (including brake）
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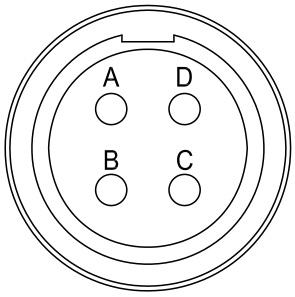
130</td></tr>
<tr><td> 

Model：MS3108F32-17S</td><td>Air plug
<table><tr><th>Pin#</th><th>function</th></tr><tr><td>A</td><td>U</td></tr><tr><td>B</td><td>V</td></tr><tr><td>C</td><td>W</td></tr><tr><td>D</td><td>PE</td></tr></table></td><td>180</td></tr>
</table>

Note ☛

1. For 40, 60, 80, 86 flange with brake, the brake power is independent 2P amp head, without distinguishing the polarity.
2. For 180 flange with brake, the brake power plug is used with MS3106A10SL-4S, without distinguishing the polarity.
3. The graph drawn in the table is the cable end。

3.2.5 Recommended specifications for main circuit connection cables

Drive model	L1C,L2C	L1,L2,L3	P+,C	U,V,W	PE
EA180-1R6-2□	0.5mm^2	0.5mm^2	0.5mm^2	0.5mm^2	1.0mm^2
EA180-2R8-2□		1.0mm^2	1.0mm^2	1.0mm^2	2.5mm^2 or above
EA180-5R5-2□					
EA180-7R6-2□		2.0mm^2	2.0mm^2	2.0mm^2	
EA180-010-2□					
EA180-5R4-3□		1.0mm^2	1.0mm^2	1.0mm^2	
EA180-8R4-3□		2.0mm^2	2.0mm^2	2.0mm^2	
EA180-012-3□					
EA180-018-3B		4.0mm^2	4.0mm^2	4.0mm^2	
EA180-021-3B					
EA180-026-3B		6.0mm^2	6.0mm^2	6.0mm^2	

3.3 CN5 Encoder signal terminal

3.3.1. CN5 is the encoder signal terminal, which is DB15 socket, and its position is shown in Figure 3-4：

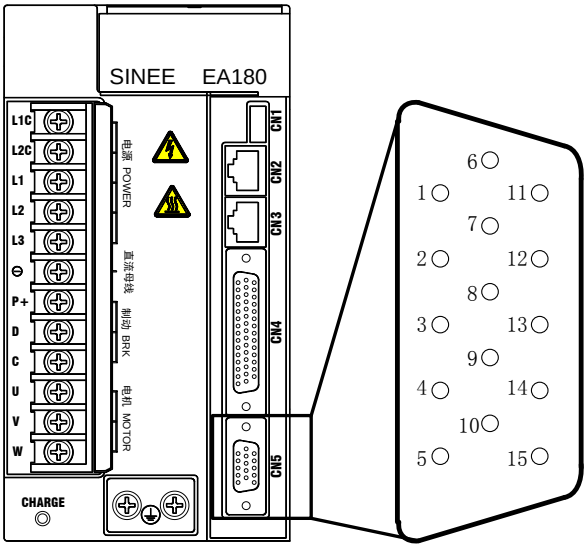


Figure 3-4 CN5 terminal location

3.3.2 Drive side encoder terminal definition

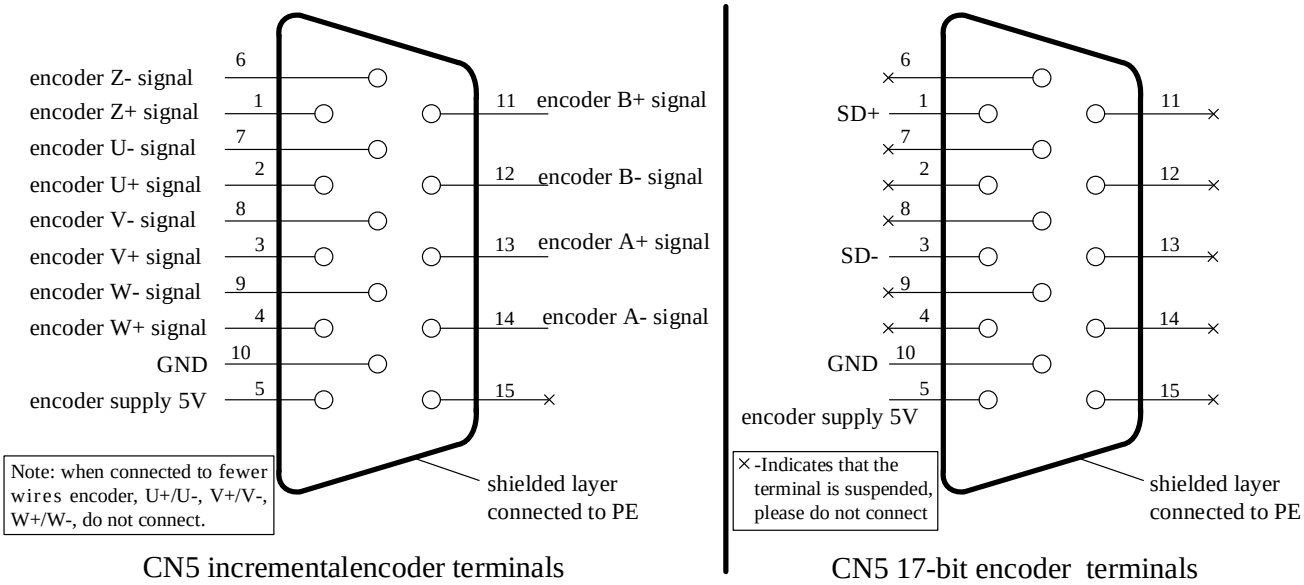


Figure 3-5 CN5 terminal pin distribution

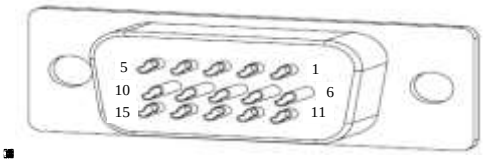
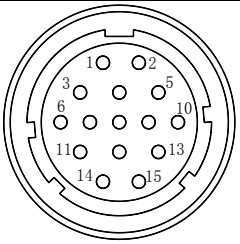
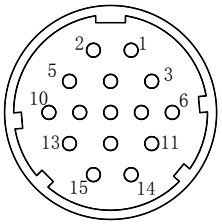


Figure 3-6 CN5 pins location

3.3.3 Servo motor side encoder terminal definition

The servo motor side has two types of encoder terminals

■ The aviation plug adapter: motor flange 110 and above is applicable, the pin definition is shown in table 3-4a and 4b

Cable end	Motor end
 Terminal model：YDA28K15TS	

***：For motors with flanges 110 and above, all encoders use the same plug, but pin definitions different only.**

■ The amp plug adapter: for motor flange 86 and below, pin definition refer to table 3-4a, 4b

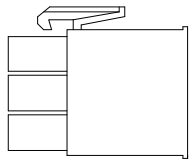
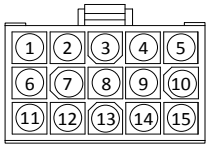
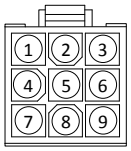
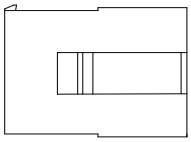
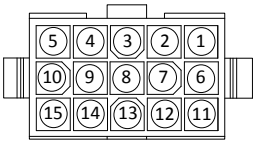
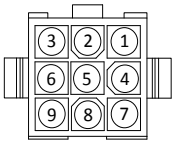
Motor-end connector		
Appearance	2500ppr incremental encoder	17-bit encoder
	 **Motor-end**	 **Motor-end**
Cable-end connector		
	 **Cable-end**	 **Cable-end**

Table 3-4a 17/23bit incremental/absolute encoder pin#

Function	**DB15 on drive side**		**Motor side**	
			AMP plug	**AIR plug**
	Signal code	**Pin #**	**Pin #**	**Pin #**
encoder power	+5V	5	1	2
encoder ground	GND	10	2	3
serial signal +	SD+	1	5	4
serial signal -	SD-	3	6	7
external battery +	VB+		7	14
external battery -	VB-		8	15
Shied PE	PE	Housing	2	3

*： The VB+ and VB- signals are used by absolute encoders only, the incremental encoder does not have the two signals and the corresponding pins.

Table 3-4b 2500ppr encoder pin#

Function	**DB15 on drive side**		**Motor side**	
			AMP plug	**AIR plug**
	Signal code	**Pin #**	**Pin #**	**Pin #**
Encoder Z+	Z+	1	7	6
Encoder U+	U+	2	6	10
Encoder V+	V+	3	10	11
Encoder W+	W+	4	11	12
Encoder power 5V	+5V	5	2	2
Encoder Z-	Z-	6	5	9
Encoder U-	U-	7	8	13
Encoder V-	V-	8	12	14
Encoder W-	W-	9	15	15
Encoder ground	GND	10	3	3
Encoder B+	B+	11	4	5
Encoder B-	B-	12	14	8
Encoder A+	A+	13	9	4
Encoder A-	A-	14	13	7
Shied PE	PE	Housing	1	3

Encoder wiring notes:

1) Make sure that the drive side and the motor side shield layer reliably grounding, otherwise it will cause a drive alarm.

2) Please pay special attention to the connection of GND and PE, and the combination of the two types of encoders and connectors, there are different ways of connection.

3) Please make sure that the differential signal corresponding to the two core wires in the connecting twisted pair. For example, A+ and A- are used as a set of differential signals, and a pair of twisted pairs should be used.

4) When using a 17/23bit encoder, if the wire length is below 5 meters, the wire cross-sectional area is 0.2mm2. If more than 5 meters, each increase of 1 meters, the core cross sectional area should be increased by 0.05mm2.

3.4 CN4 connector

3.4.1 The CN4 signal terminal provides the signal needed for connection with the upper controller. Here below is the DB44 plug, pin distribution and signal definition.

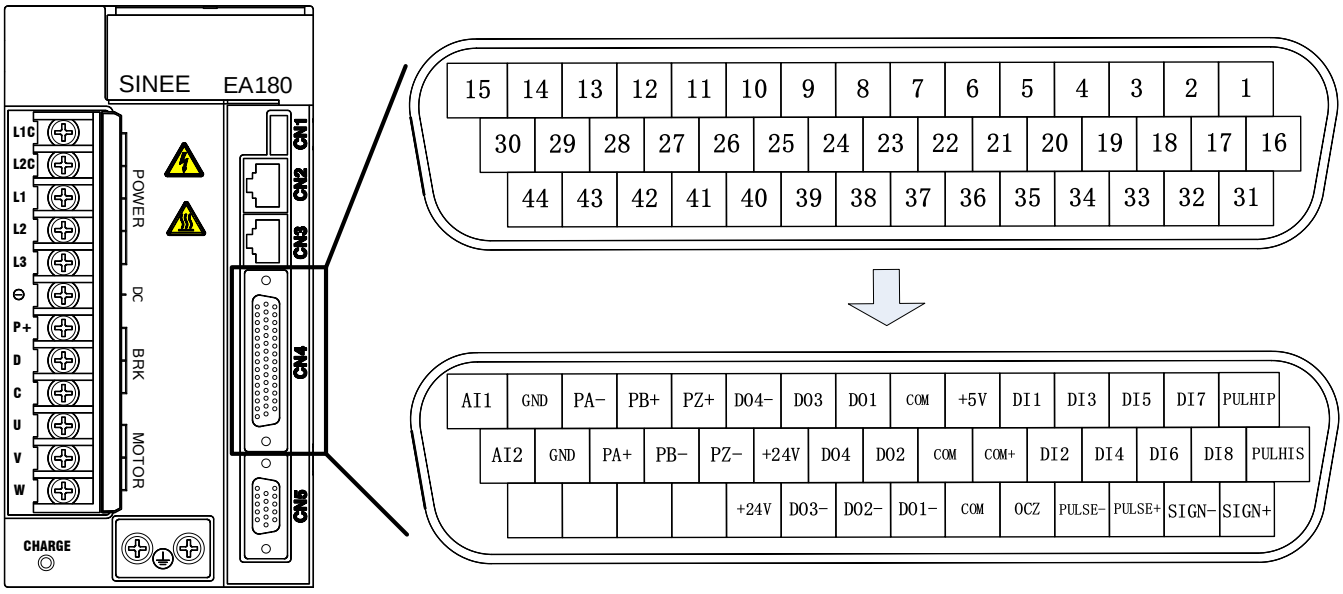


Figure 3-7 CN4 pins location and definition

3.4.2 CN4 pins location and definition

Signal		Pin #	Description
Digital input	DI1	5	Digital input, the default function number is 1
	DI2	20	Digital input, the default function number is 2
	DI3	4	Digital input, the default function number is 13
	DI4	19	Digital input, the default function number is 14
	DI5	3	Digital input, the default function number is 3
	DI6	18	Digital input, the default function number is 12
	DI7	2	Digital input, the default function number is 20
	DI8	17	Digital input, the default function number is 21
	COM+	21	Digital input common terminal (+)
Supply	+24V	25/40	Internal 24V power supply, voltage range +20V to 26V, maximum output current 200mA
	COM	7/22/36	Internal 24V power ground; digital input common ground
	+5V	6	+5V power supply with maximum output current of 50mA
	-	44	Reserved(for +10V or other purposes later)
	GND	29	+5V power ground
Digital output	DO1	8	Digital output, the default function number is 1
	DO1-	37	
	DO2	23	Digital output, the default function number is 2
	DO2-	38	
	DO3	9	Digital output, the default function number is 8
	DO3-	39	
	DO4	24	Digital output, fixed function number is 12
	DO4-	10	
	-	41	Not used
Position pulse input	PULHIP	1	the positive end when command pulse is used with 24V suply
	PULSE+	33	Position pulse command +
	PULSE-	34	Position pulse command +
	PULHIS	16	the positive end when command pulse is used with 24V suply
	SIGN+	31	Position direction instruction +

Signal		Pin #	Description
	SIGN-	32	Position direction instruction -
Freq. diverting output	PA+	28	A pulse differential frequency division output, maximum allowable current 20mA
	PA-	13	
	PB+	12	B pulse differential frequency division output, maximum allowable current 20mA
	PB-	27	
	PZ+	11	B pulse differential frequency division output, maximum allowable current 20mA
	PZ-	26	
	OCZ	35	Z pulse open collector output with maximum permissible current 40mA.
	GND	14	
Analog input	AI1	15	Analog input 1
	AI2	30	Analog input 2
	GND	29	Analog input signal ground

Note☞ All GND terminals are connected within the drive, and all COM terminals are connected within the drive

3.4.3（DI）Digial Input function

Value	Name	Function	Description		Triggering mode	Running mode
0	Disabled	Terminal invalid				
1	S-ON	Servo enabled	ON：enabled	OFF：disenabled	Level	P S T
2	ALM-RST	Alarm and fault reset	OFF→ON：resettable fault reset		Edge	P S T
3	P-CLR	Position error clear			Edge/Level	P
4	DIR-SEL	Speed direction selection	ON：negative speed command direction	OFF： the setting speed direction	Level	S
5	CMD0	Internal command bit0	In the multi preset position control mode, the signal is multi position switching function; In the multi preset speed control mode, the signal is a multi speed switching function;		Level	P S
6	CMD1	Internal command bit1			Level	P S
7	CMD2	Internal command bit2			Level	P S
8	CMD3	Internal command bit3			Level	P S
9	CTRG	Internal command trigger	multiple position trigger		Edge	P
10	MSEL	Control mode switched			Level	P S T
11	ZCLAMP	zero speed clamp enabled	ON：enabled	OFF：disenabled	Level	S
12	INHIBIT	Pulse inhibit	ON-inhibt	OFF：pulse input allowed	Level	P
13	P-OT	inhibit positive drive	ON-inhibit	OFF-allowed	Level	P S T
14	N-OT	Inhibit negative drive	ON-inhibit negative drive	OFF-allowed negative drive	Level	P S T
15	GAIN_SEL	Gain switched	ON：use second gain	OFF：use first gain	Level	P S T
16	J_SEL	Inertia switched	ON：use second inertia ratio P4-11 OFF：use first inertia ratioP4-10		Level	P S T
17	JOG_P	Positive jog	ON：postive jog	OFF：no function	Level	S
18	JOG_N	Negative jog	ON：negative inching operation	OFF：no function	Level	S
19	TDIR-SEL	Torque command direction selection	ON： negative torque command	OFF：the setting torque direction	Level	T
20	GNUM0	Electronic gear ratio numerator selection 0	GNUM1 / GNUM0 / Code: 0/0/P1-04; 0/1/P1-08; 1/0/P1-10; 1/1/P1-12		Level	P
21	GNUM1	Electronic gear ratio numerator selection 1			Level	P
22	ORGP	External detector input	Rising edge: external detector is valid Falling edge: external detector is invalid		Edge	P S T
23	SHOM	Homing	OFF→ON: Homing starts		Edge	P S T
24	TL2	External torque limiting	ON- External torque limiting enable OFF- External torque limiting is prohibited		Level	P S T
25	EMGS	Emergency stop	ON：emergency stop	OFF：no function	Level	P S T
33	TDIR-SEL	Position command direction selection	ON: negative position command direction	OFF: the setting command direction	Level	P

3.4.4 Digital output function definition(DO)

Value	Name	Function	Description	Running mode
0	Disable	Terminal invalid		
1	S-RDY	Servo ready	Effective- servo ready to receive S-ON command Invalid - the servo is not ready and does not receive the S-ON command	P S T
2	BK	Brake control	Effective-brake disengaged Invalid-brake engaged	P S T
3	TGON	Motor rotation	Effective - the motor is rotating (RPM is higher than the P0-04 setting) Invalid - motor stop rotating (speed below P0-04 setting)	P S T
4	ZER0	Motor 0 speed	Effective - motor speed is zero (speed lower than P0-03 setting) Invalid - motor speed is not zero (RPM is higher than P0-03 setting)	P S T
5	V-CLS	Speed close	Effective: when in speed control, the actual speed of the motor reaches or exceeds the setting value of the P2-08 (regardless of direction).	S
6	V-CMP	Speed comparison	Effective: When in speed control, the absolute difference between the actual speed and the speed of the motor is less than P2-09	S
7	PNEAR	Position near	Effective: In position control mode, the position deviation pulse is less than the setting value of the positioning approach width P1-23	P
8	COIN	Positioning finishes	Effective: In position control mode, the position deviation pulse is less than the positioning completion width, the P1-24 setting value, and the condition of the P1-22 definition is satisfied.	P
9	C-LT	Torque limiting	Effective: motor torque limited Invalid: motor torque is not limited	P S
10	V-LT	Speed limiting	Effective: motor speed is limited Invalid: motor speed is not limited	T
11	WARN	Warning output	Effective: warning happens	P S T
12	ALM	fault output	Effective: fault happens	P S T
13	Tcmp	Torque compliance	Effective: motor output torque reaches set point Invalid: motor output torque is not up to set point	T
14	Home	Homing	Effective: Homing finishes Invalid: Homing is in the process	P S T

3.4.5 Digital input terminal connection

The digital (DI) input terminal of the EA180 series servo drive uses a full bridge rectifier circuit. The current flowing through the terminals can be either positive (NPN mode) or negative (PNP mode).

Taking DI1 as an example, the interface circuit of DI1 ~ DI8 is identical.

1) When the upper device is the relay output：

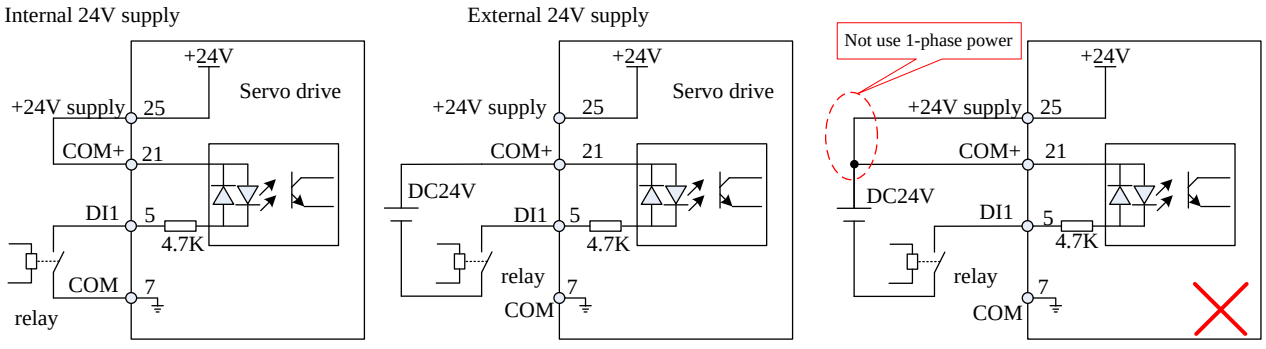


Figure 3-8 when the upper device is relay output, digital input terminals wiring

Note☛	**Defaulted setting:** The COM terminal used pin #7 , pin# 22/36 is also applicable. The GND terminal used pin #14, also pin# 29 is applicable. The servo internal +24V used pin# 25, also pin # 40 is applicable.

2) As for NPN open collector circuit output:

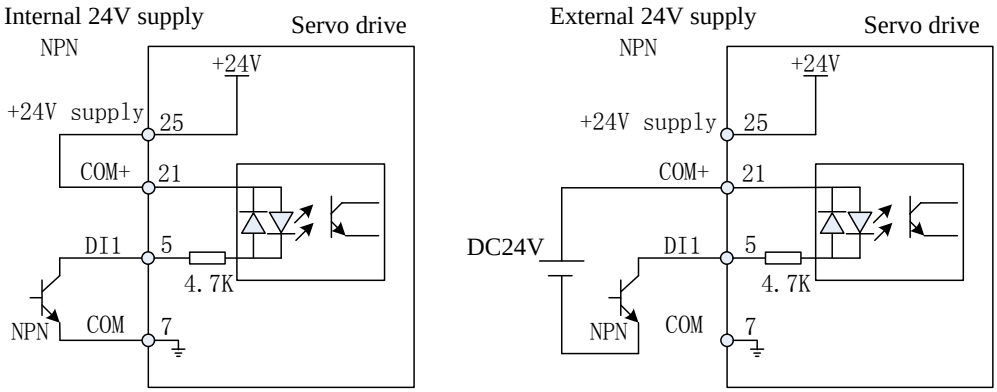


Figure 3-9(a) NPN open collector circuit output wiring diagram

3) As for PNP open collector circuit output:

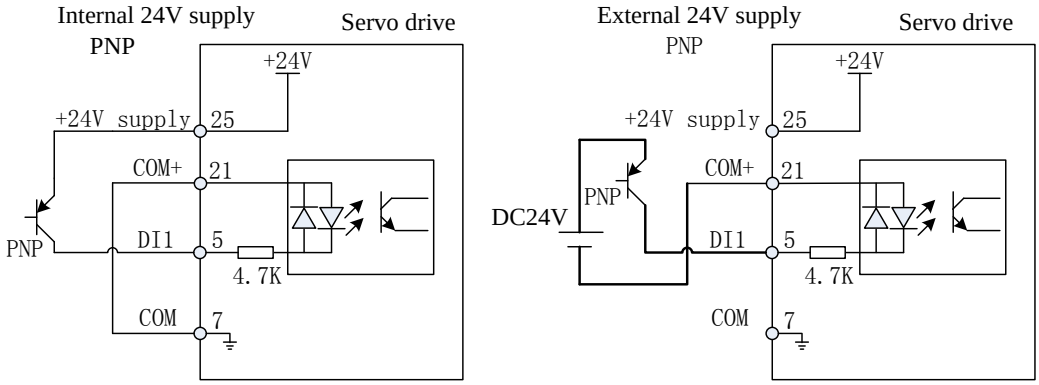


Figure 3-9(b) PNP open collector circuit output wiring diagram

Note☛	**1. When using external power supply, please make sure 24V and COM+ are in open circuit.** **2. Do not support PNP and NPN mixed input**

3.4.6 Digital output terminal connection

Taking DO1 as an example, the interface circuit of DO1 ~ DO4 is identical.

1) When the upper device is relay:

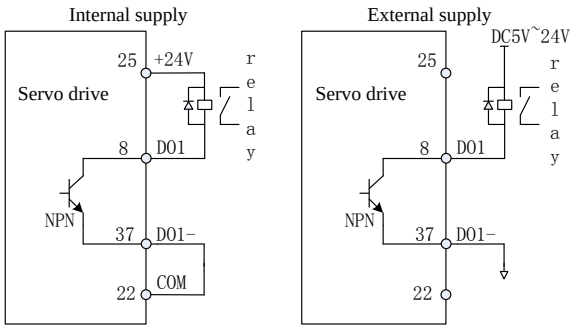


Figure 3-10(a) Relay input, the correct DO terminal wiring

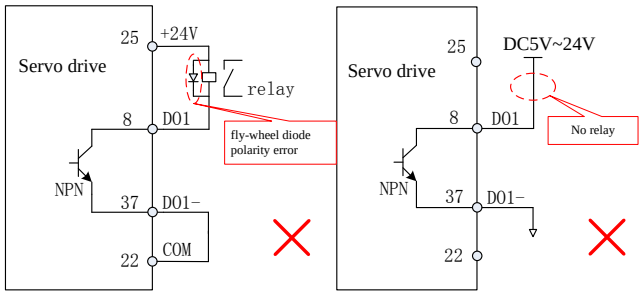


Figure 3-10(b) Relay input, the wrong DO wiring

Note☛	**When the upper device is a relay input, be sure to access the fry-wheel diode, otherwise it may damage the DO port**

2) When the uppder device is optocoupler input

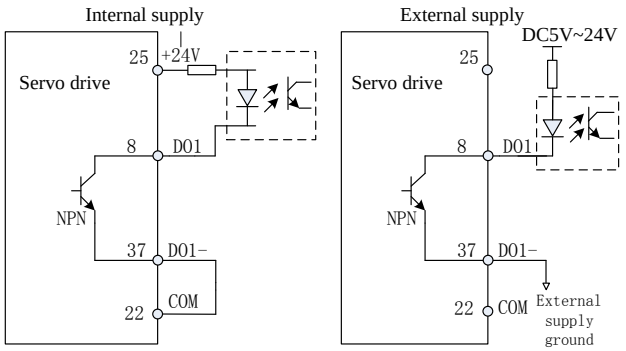


Figure 3-11（a） Optocoupler input, correct DO port wiring

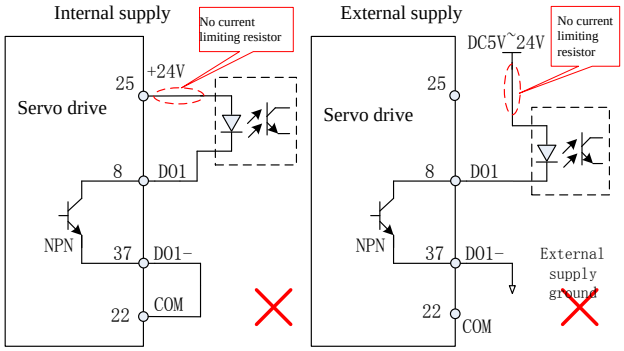


Figure 3-11（b） Optocoupler input, wrong DO port wiring

Note☛	Servo drive internal optocoupler output circuit, maximum allowable voltage and current capacity are as follows： ➢ voltage：DC30V(max.) ➢ current：DC50mA(max) ➢ As for inductive loads (e.g. relays and Contactors), should be equipped with surge absorption circuit; such as: RC absorption circuit (note the leakage current shall be less than that of the control contactor or relay current), varistors, or diode etc. (for DC magnetic circuit, must pay attention to the polarity when installing). The component of the absorption circuit is to be mounted near the coil of the relay or contactor.

3.4.7 CN4 analog input terminal wiring

Signal	Code	Pin #	Function	
Analog	AI1	15	Voltage analog input	Voltage input range: -10V to +10V, resolution 12 bits Maximum allowable voltage: ±12V Input impedance: 10K
	AI2	30		
	GND	29	Analog input ground	

AI1、AI2 is generally used for speed or torque analog signal input.

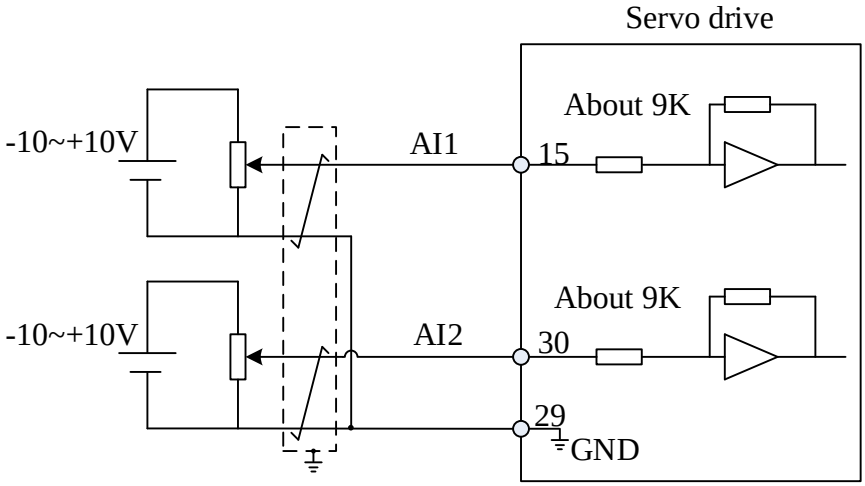


Figure 3-12 AI1、AI2 terminal wiring

3.4.8 CN4 position command input signal

The position command pulse input signal and the command symbol input signal terminal in CN4 terminal are described below.

Table 3-6 Position pulse input signal description

Signal		Pin #	Function	
Position command	PULSE+	33	Pulse command input mode: Differential input Open collector input	Input pulse mode: Direction + pulse A and B phase orthogonal pulses CW/CCW pulse
	PULSE-	34		
	SIGN+	31		
	SIGN-	32		
	PULHIP	1	Command pulse external power input interface	
	PULHIS	16		
	+24V	25/40	24V +	
	COM	36	24V ground	

The pulse command can be input by an open collector circuit or a differential mode. The maximum input pulse frequency of the differential input mode is 500Kpps, and the maximum input pulse frequency of the open collector circuit is 200Kpps.

The pulse input terminal needs to set a certain filtering time to prevent the interference signal from entering the servo drive, resulting in misoperation of the motor. For filtering time, see the description of P1-15 function parameters.

Different command input pulse patterns have different timing and time parameters

Table 3-7 Timing table for different command pulses

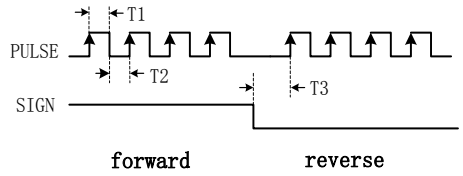
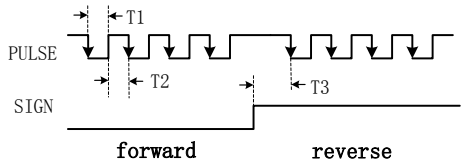
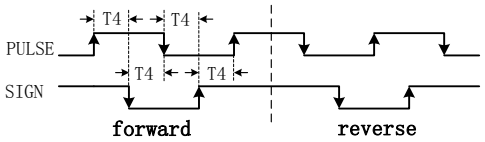
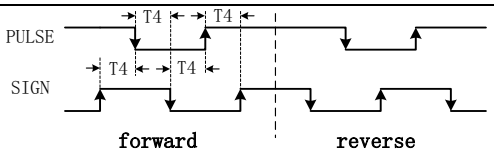
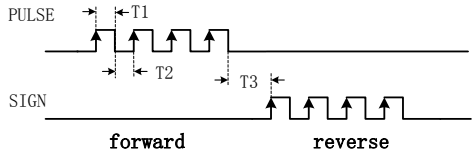
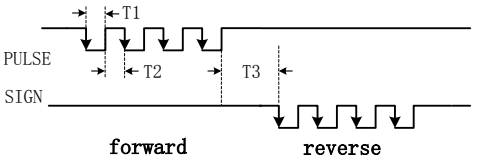
Pulse command mode	Logic state	Pulse waveform
Pulse + direction	P1-01=0 positive logic	
	P1-01=1 negative logic	
Two-phase orthogonal pulse (4 octave)	P1-01=2 positive logic	
	P1-01=3 negative logic	
CW + CCW pulse	P1-01=4 positive logic	
	P1-01=5 negative logic	

Table 3-8 Pulse input time parameter

Pulse mode	Maximum input frequency	The minimum allowable width				Voltage
		T1	T2	T3	T4	
Differential	500Kpps	1 s	1 s	2 s	0.5 s	5V
Open collector	200Kpps	2.5 s	2.5 s	5 s	1.25 s	24V(MAX)

3.4.8.1 Position command pulse differential input mode

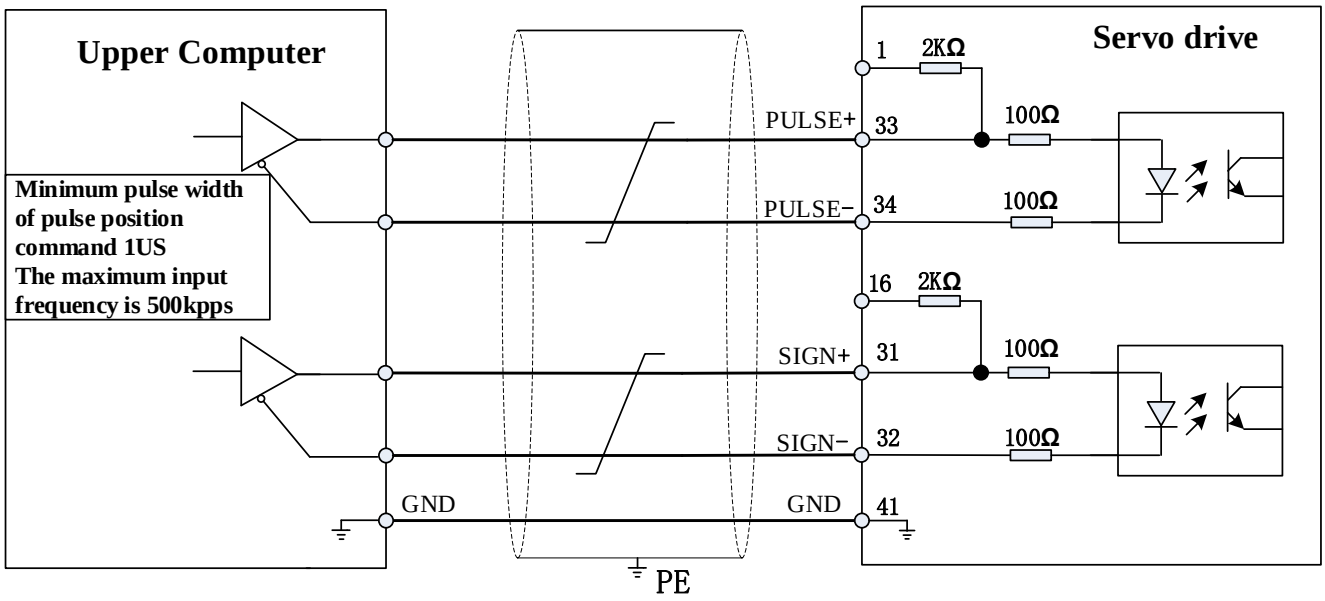


Figure 3-13 Differential mode input pulse command wiring diagram

Note **Please ensure "2.8V≤ (H level -L level) ≤3.7V", otherwise the servo drive input pulse will be unstable. It will result in the following situations:**

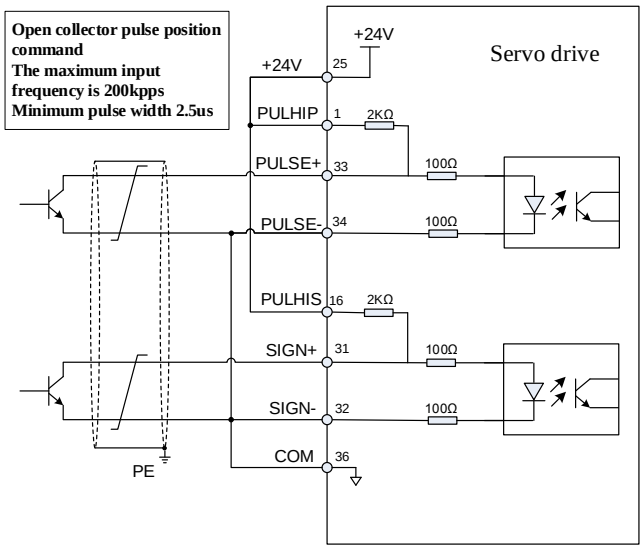
Pulse loss occurs when the instruction pulse is input.

Command reversal occurs when the command direction is input.

3.4.8.2 Position command pulse open collector input mode

- When using internal 24V power supply

Internal 24V supply NPN connection



Internal 24V supply PNP connection

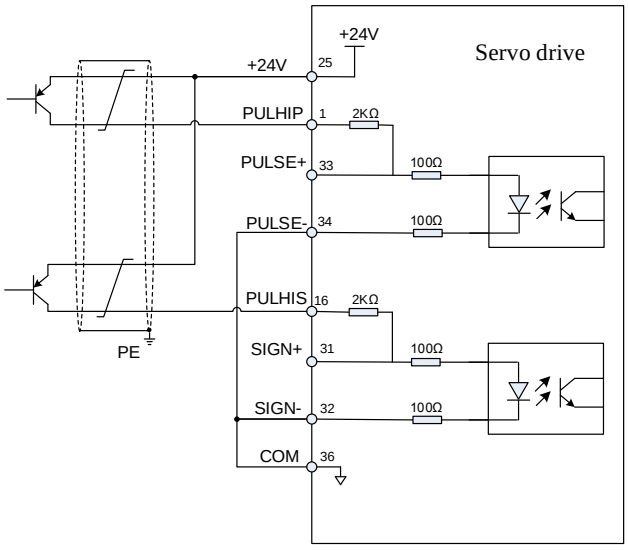
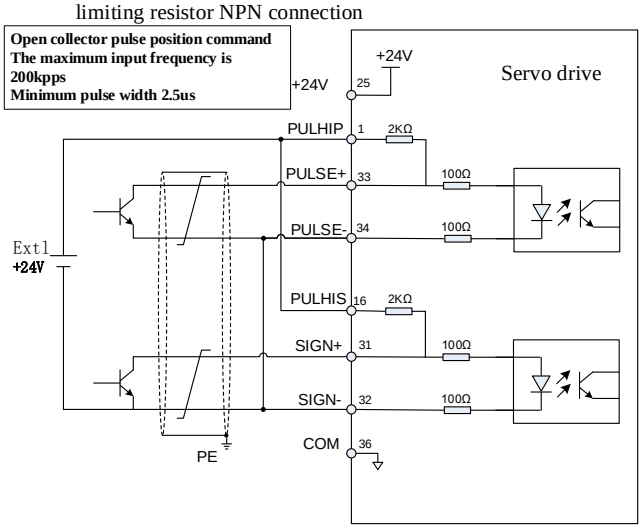


Figure 3-14 open collector pulse input command wiring diagram (using the servo internal 24V)

- When using the external 24V power supply and internal current limiting resistance

External 24V supply and internal current limiting resistor NPN connection



External 24V supply and internal current limiting resistor PNP connection

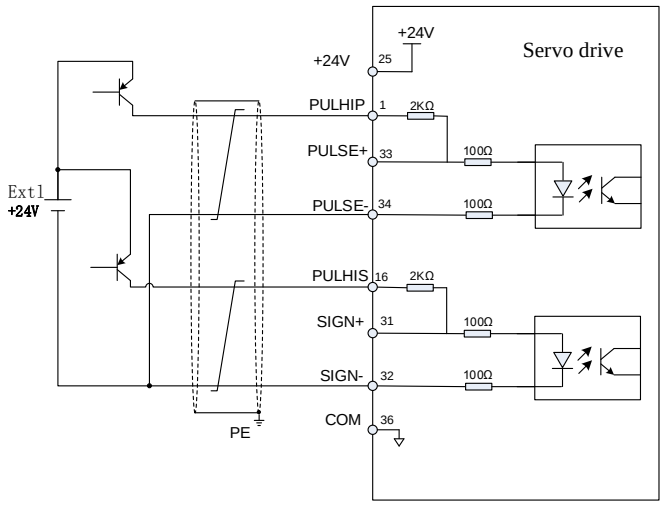
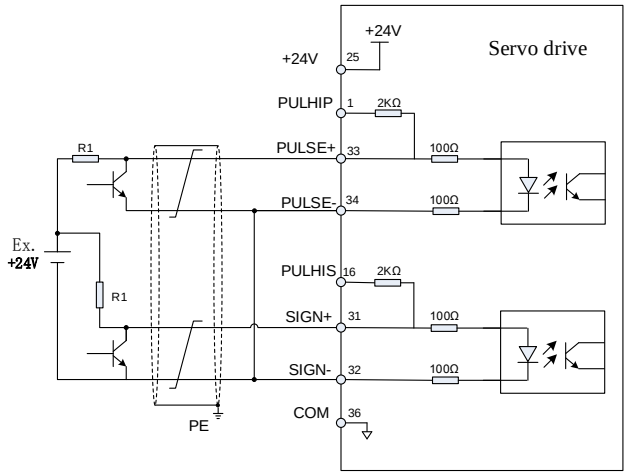


Figure 3-15(a) open collector pulse input command wiring diagram (using external power supply and external limiting resistor)

- Wiring method of external 24V power supply and external current limiting resistance

NPN wiring method



PNP wiring method

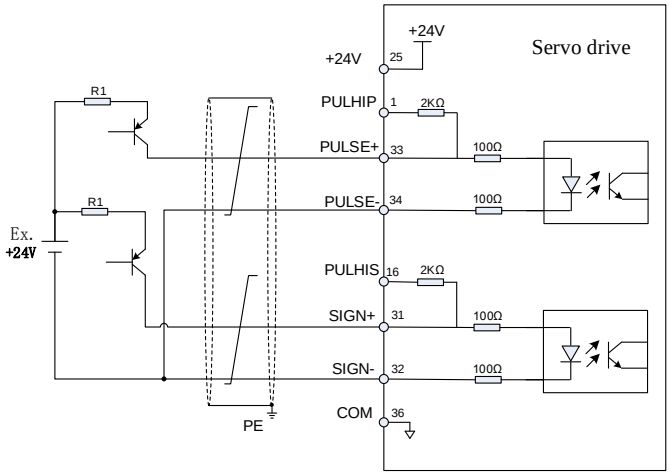


Figure 3-15(b) Open collector mode input pulse command wiring diagram（external 24V suppply）

Selection of current limiting resistance R1：

$$\text{R1：}\frac{V_{CC}-1.5}{R1+200}=10mA$$

R1 recommended resistance：

VCC voltage	R1 resistance	R1 power
24V	2.0K	0.5W
12V	0.8K	0.5W

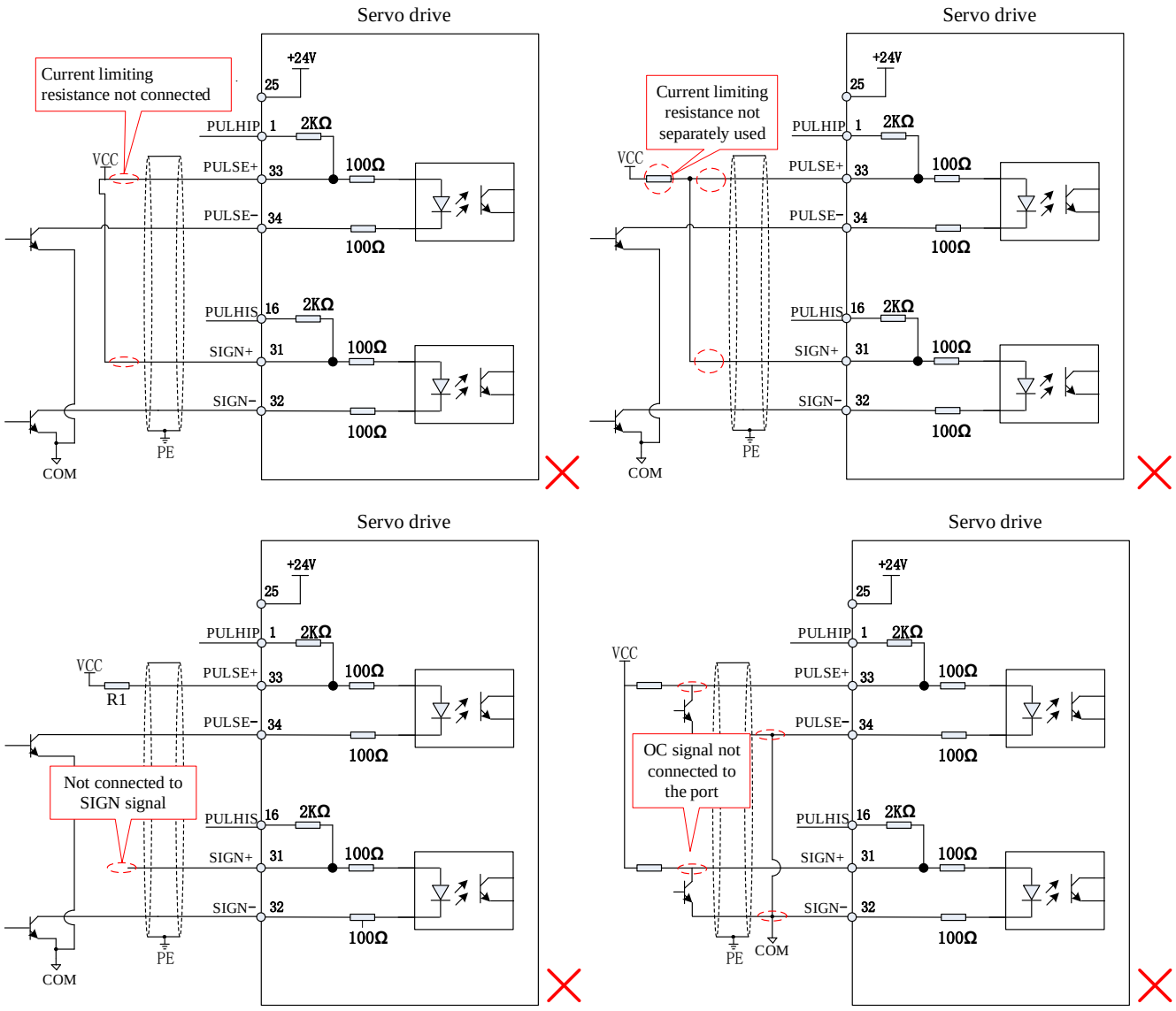
Note☞

1. a pair of differential signals, be sure to use a pair of twisted pairs.

2. pulse input signal cable must be separated from power cable, at least 30cm or more away from each other.

3. because the pulse input interface is not shielded from the input interface, in order to reduce noise interference, it is suggested that the output signal of the upper computer is connected to the signal ground of the drive

- Typical examples of mis-connection



3.4.9 **CN4 encoder output frequency division circuit**

Table 3-9 Encoder frequency division output signal description

Signal	Pin #	Function	
PA+	28	A Phase frequency division output signal	A,B orthogonal frequency pulse output signal
PA-	13		
PB+	12	B Phase frequency division output signal	
PB-	27		
PZ+	11	Z Phase frequency division output signal	Origin pulse output signal
PZ-	26		
OCZ	35	Z Phase frequency division output signal	Origin pulse open collector output signal
GND	14	Origin pulse open collector output signal ground	

Encoder frequency division circuit output differential signals by a differential drive. Generally, it will provide a feedback signal when the drive and the host device constituting the position control system. In the upper computer device, please use a differential or optocoupler receive as circuit receive. The maximum output current is 20mA.

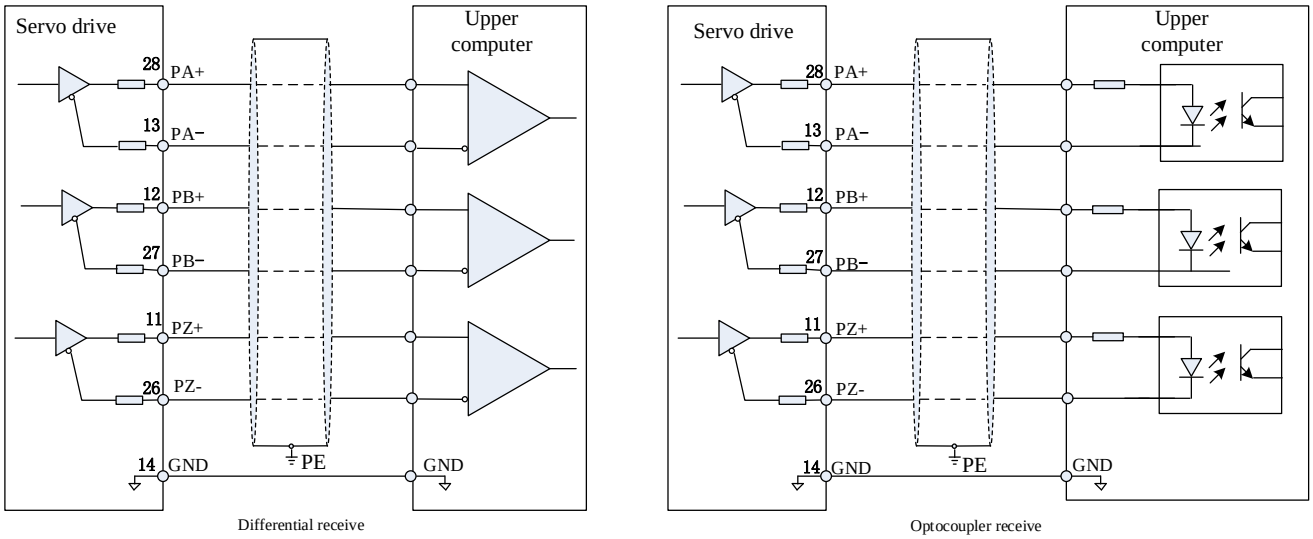


Figure 3-17 Frequency division output wiring diagram

Encoder Z-phase frequency division circuit can provide a feedback signal by open collector output signal when the drive and the host device constituting the position control system. In the upper computer device, please use a relay or optocoupler receive as circuit receive. The maximum output current is 40mA.

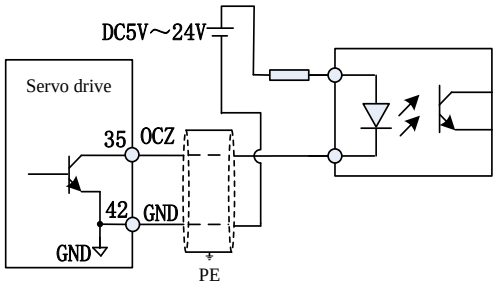


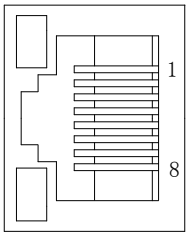
Figure 3-18 OCZ terminal circuit

Note☞ **Please be sure that the upper computer signal supply ground is connected to the drive GND, and using the twisted pair shielded cable to reduce noise interference.**
The maximum voltage of the internal triode is 30VDC, and the maximum allowable input current is 40mA.

3.5 CN2、CN3 communication terminal wiring

The drive is connected to the host computer by two same communication signalconnectors CN2 and CN3 connectors in parallel with each other. The user can use MODBUS communication to operate the drive, and the communication distance is about 15m.

Communication Connector Pin Description

Signal	Pin	Function	Terminal pinout
RS485+	1	RS485 Communication port	
RS485-	2		
GND	3	RS485,RS232 Communication Reference ground	
RS232-RXD	4	The sender of RS232 is connected with the receiver of upper computer	
RS232-TXD	5	The receiver of RS232 is connected with the sender of upper computer	
GND_ISO	6	CAN Communication Reference ground	
CANH	7	CAN Communication port	
CANL	8		

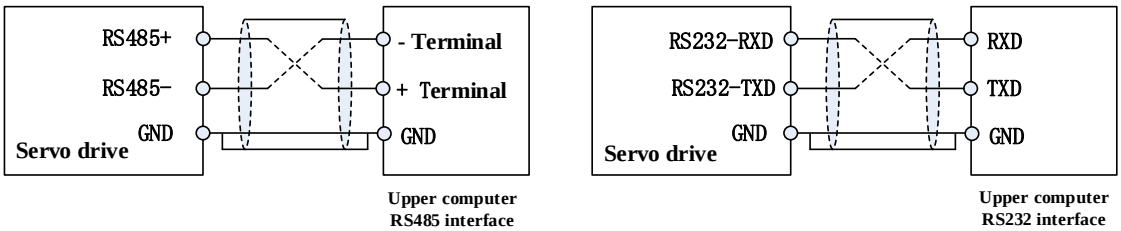


Figure 3-19 communication port diagram

3.6 CN1 analog monitoring output terminal

CN1 terminal has two shapes, the pin description is as follows:

Table 3-11 analog output

Signal	Pin #	Function		Pin location	Circuit diagram
AO1	1	Analog output 1, output voltage -10V～10V ，max.output current 1mA	can set by P6 group codes	④ ③ ② ① CN1 （front view）	Servo drive: 1 AO1, 2 AO2, 3 GND
AO2	2	Analog ouput 2, output voltage -10V～10V ，max.output current 1mA			
GND	3	analog signal common ground			
Not used	4	not connect with any signal cable			

Notes：

1) After control power is OFF, the analog monitoring output terminal may output 5V during the longest 10ms period.
2) The analog terminal has a maximum output current of 1mA, exceeding this value may lead to the damage to the drive. Please consider this fully when selecting the load.

3.7 Brake

When the motor is applied to the vertical shaft or the like, to prevent the movement due to the gravitiy or external force when power failure, need to choose the servo motor with brake.

Note☞	**1. The brake is used to keep the stop state of the servo motor, not used to stop motor from running.**
	2. The brake may give off clicking sound when the motor runs, but it does not affect its function.

The brake should be supplied by the external 24VDC, here below is the wiring method of brake signal and power.

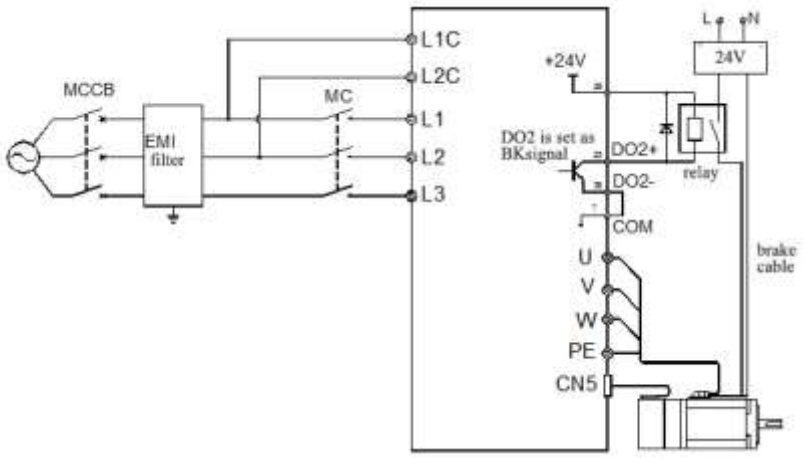


Figure 3-20 Brake signal and power cable

3.7.2 Brake cable notes：

1) The intermediate relay should be controlled by the terminal defined as 2 function (BK) signal terminals (pictured above is DO2+, DO2-), and switch on/off the brake power by the NO contact of the intermediate relay.

2) Be sure to use external power supply for the brake. The 24V DC supply for the intermediate relay coil can be applied from the servo drive itself, does not propose to share the same power with the brake when using an external power supply.

3) In the use of external power supply for relay coil, please note that the DO2+ terminal should be connected to the positive terminal, DO2- terminal connected to the negative terminal of the supply.

4) The brake operation voltage is at least 21.5V, so it is necessary to take full account of the pressure drop caused by the wire resistance to maintain the power supply of the brake. It is recommended that more than $0.5mm^2$ cables be used.

5) It is better not to share the power with other electrical appliances to prevent the brake from malfunction due to the reduction of voltage or current by other electrical appliances.

3.7.3 Brake sequence

3.7.3.1 Brake engaged and disengaged delay time refers to following Figure s

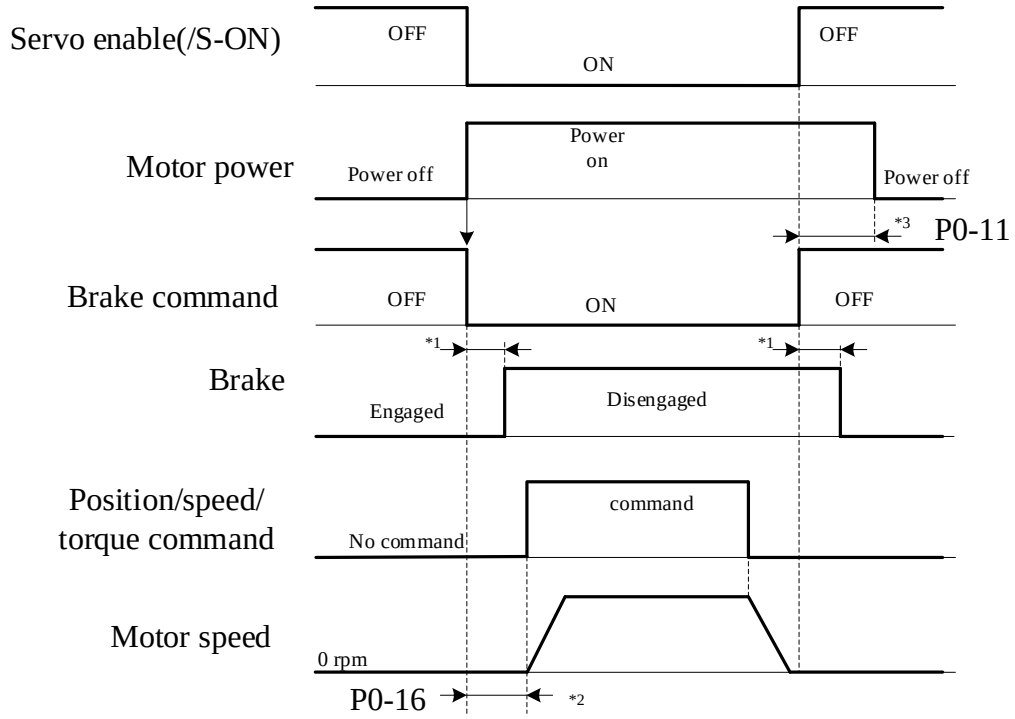


Figure 3-21 Brake engaged and disengaged delay time

1. The lag time of the brake is different due to the motor type.
2. P0-16 specifies the time from which the servo drive receives the enable (/S-ON) command, to the point where the position, speed, torque command can be received. This time must be greater than the time required to disengage the brake. When the upper device outputs the command to the servo drive, please wait for this time to output after the /S-ON-ON signal.
3. Please set the brake action and servo OFF time by P0-09, P0-10, and P0-11.

3.7.3.2 The braking signal (/BK) output time of the servo motor when it stops.

When applied to a vertical shaft, the dead weight or external force of the mechanical part movement may cause a slight movement of the machinery. By setting P0-11, the motor is left in the non energized state after the brake is enagaged so as to eliminate the slight movement of the machine.

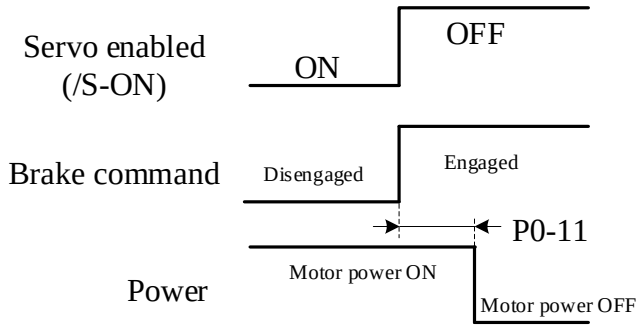


Figure 3-22 Servo enabled-off brake action sequence

Note☛ In any event when the alarm occurs, P0-11 is not valid, and the servo will immediately enter the non-energized state. At this point, the mechanical movement may move freely before the brakes act.

3.7.3.3 The output time of the brake signal (/BK) in the rotation of the servo motor

If the servo motor gives alarm or the enable is cancelled forcibly when the motor rotates, the servo motor will immediately enter the non energized state. At this point, the braking signal (/BK) output time can be adjusted by setting the braking command output speed value P0-10 and the servo OFF- brake command waiting time P0-09.

Operating conditions of the brake when the servo motor rotates

When any of the following conditions are established, the brake signal will act:

- When the motor enters the non energized state, the motor speed is lower than the setting value of P0-10.
- When the motor enters the non energized state, it goes through the setting time of P0-09.

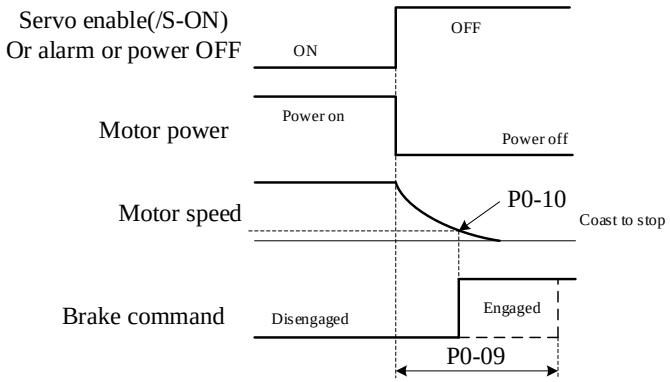


Figure 3-23 Brake actions when the servo motor is rotating

Note☛

1. Even if the value set in the P1-10 is more than the highest speed of the servo motor, it will be limited to the maximum speed of the servo motor.

2. Do not assign the motor rotation signal (TGON) and the brake signal (BK) to the same terminal. If assigned to the same terminal, due to the vertical axis of the falling speed, will make the TGON signal ON, the brake may not move.

3.8 Control circuit standard wiring diagram

3.8.1 position control mode standard wiring diagram

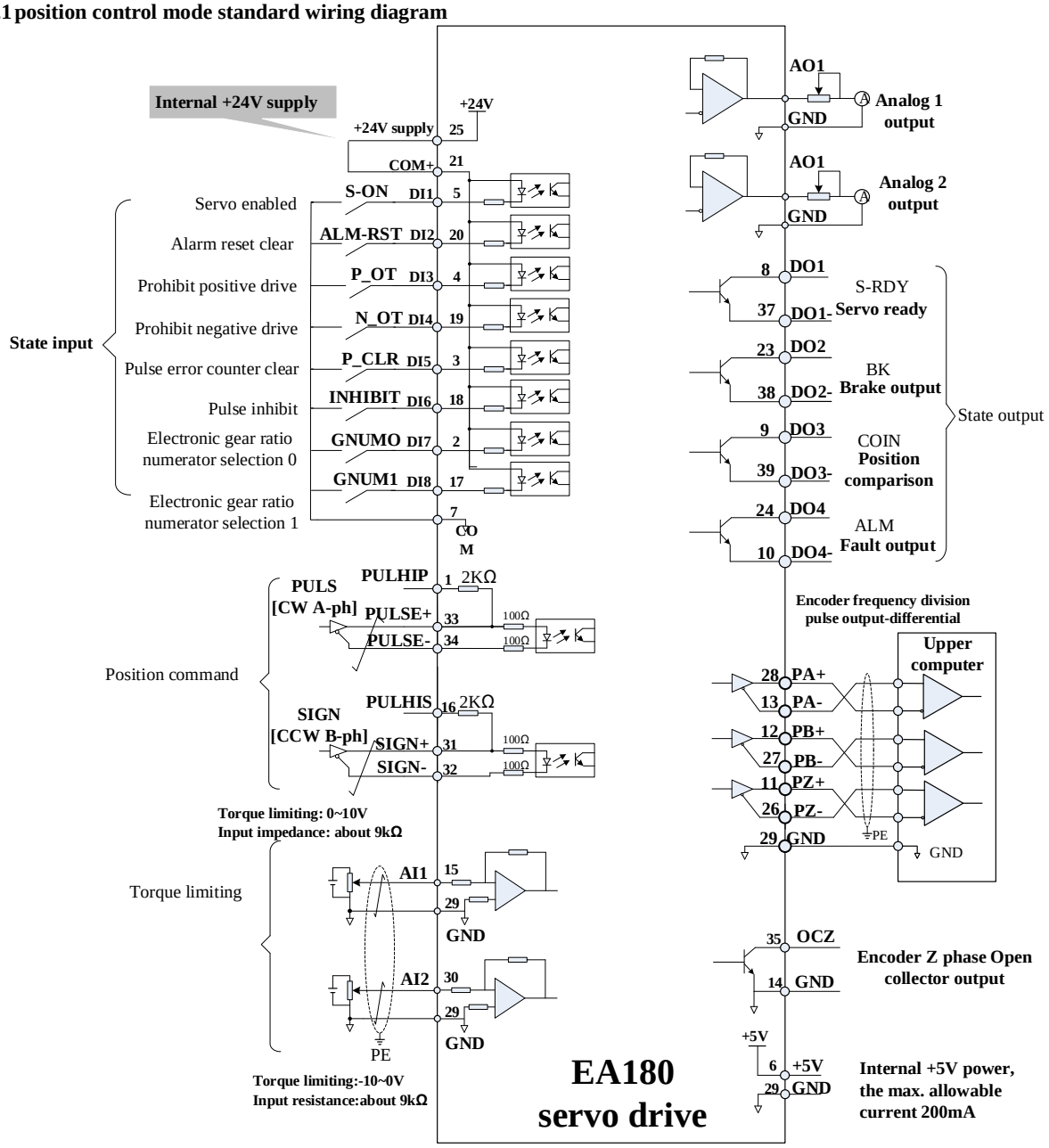


Figure 3-24 position control mode standard wiring diagram

3.8.2 Speed control mode standard wiring diagram

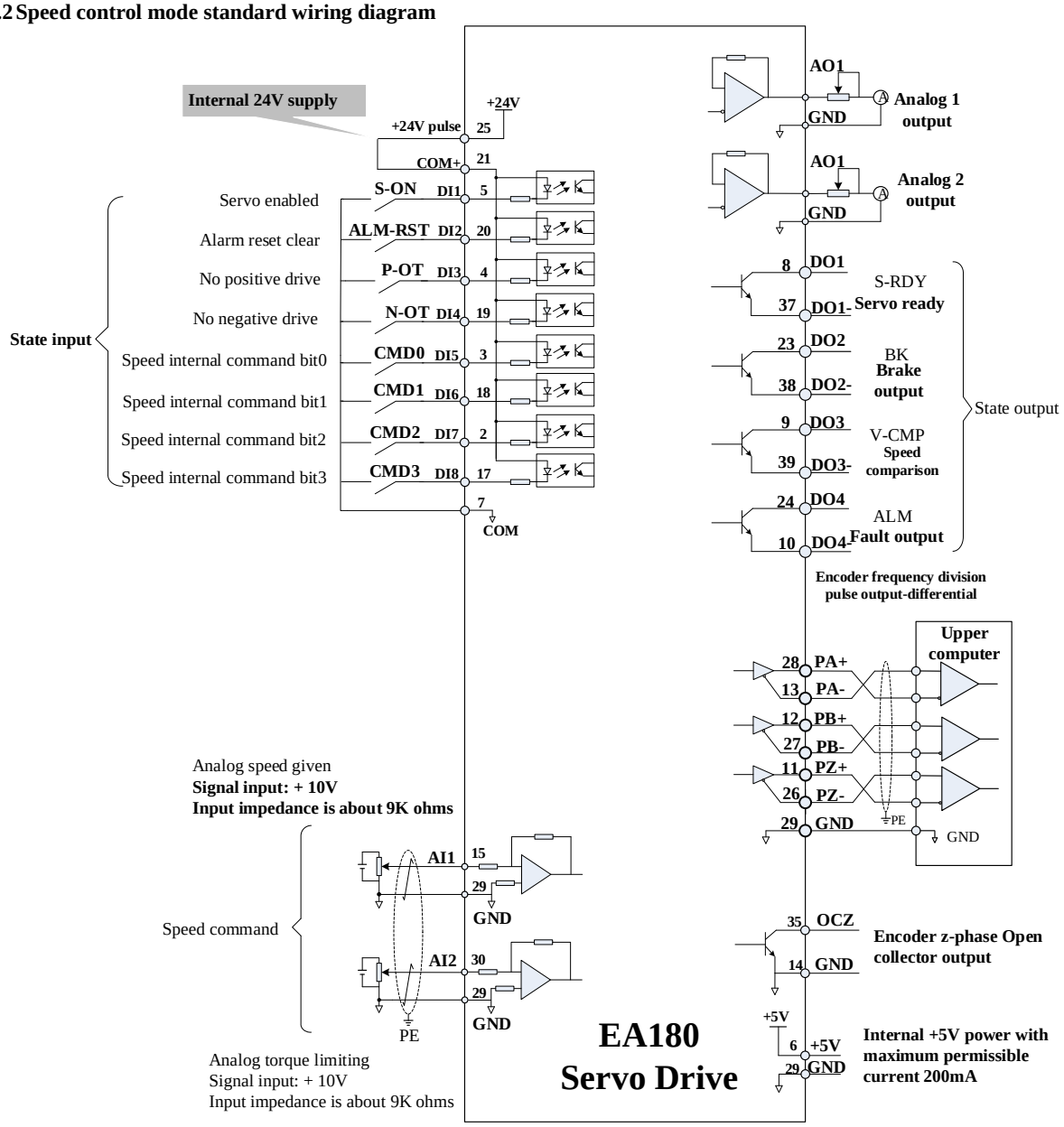


Figure 3-25 1.12.2speed control mode standard wiring diagram

3.8.3 Torque control mode standard wiring diagram

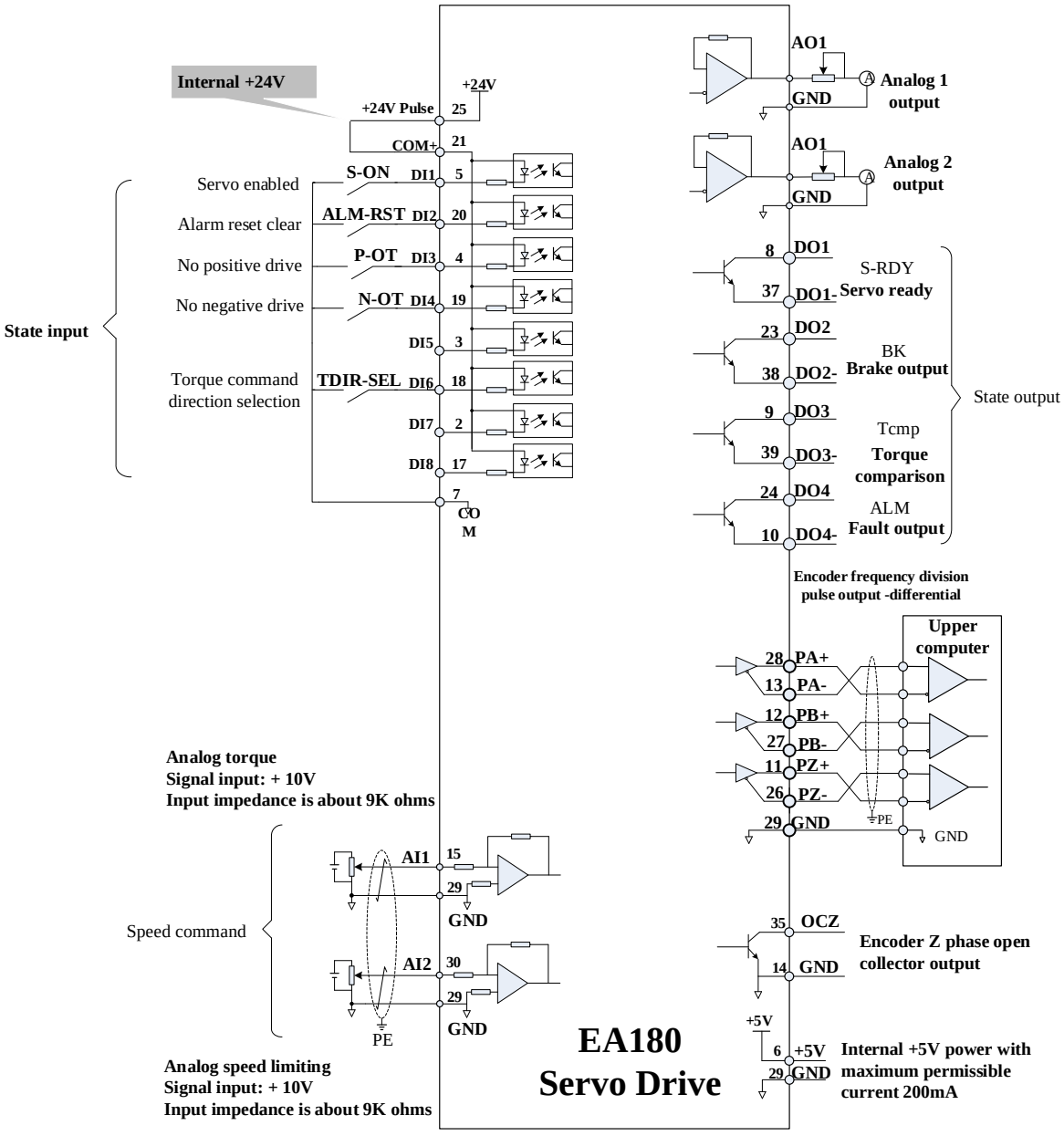


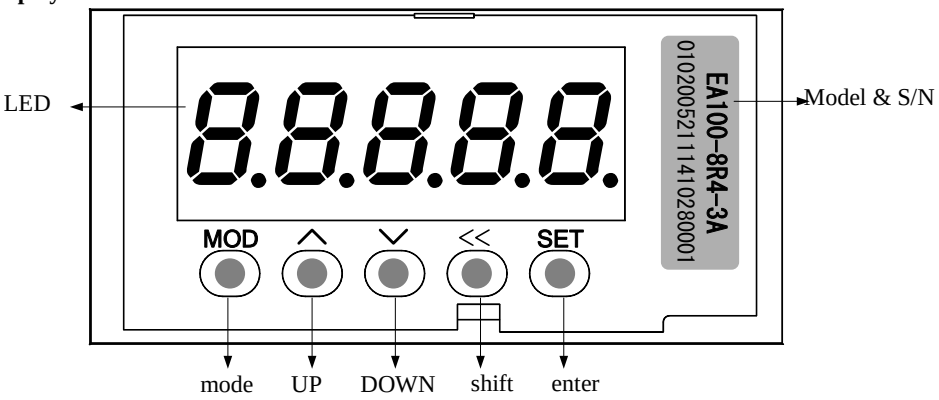
Figure 3-26 torque control mode standard wiring diagram

3.9 Control circuit wiring notes

- Control loop cables and power cables must be spaced separately at intervals of at least 30cm.
- If the control loop cable is too long to be connected, make sure that the shield is reliably connected to ensure a reliable shield and grounding;
- The servo drive +24V is referenced by COM, and +5V is referenced by GND. The load must not exceed the maximum allowable current, otherwise the drive will not work properly.
- Try to use the shortest command input and encoder cable.
- For ground cable, use more than 1.5mm2 cable.
- Must be single point grounding.

Chapter 4 Display and operation

4.1 Appearance of display and buttons



Buttons	Sign	Function description
Mode	MOD	◆ Switching between different operating modes ◆ Exit the current parameter / function operation ◆ Exit mode AL to normal operation mode
UP	∧	◆ The current cursor value increases ◆ When AF-02 auxiliary function is in second level, positive JOG ◆ When dS and CG mode are in second level, directly display the first level of next parameter ◆ AL mode, when it is faulty, switch downward to check the fault information ◆ St mode, AF-07 Parameter selection and drive state switching monitoring
DOWN	∨	◆ The current cursor value decreases ◆ When AF-02 auxiliary function is in second level, negative JOG ◆ In AL mode，when it is faulty, switch upward to check the fault information ◆ When dS and CG mode are in the 2nd level, display the first level of previous parameter
Shift	<< Or SHIFT *	◆ dS、Pr and AF mode, in the 1st level, the cursor moves rightward（>）; ◆ Pr and AF mode, in the 2nd level, the cursor moves leftward（<）; ◆ dS and CG mode, in the 2nd level, and the display is not big enough to show full parameter, switch to show.
Confirm	SET	Confirm about the present operation
Digital tube LED0 LED1 LED2 LED3 LED4	JI dt	◆ The information inside is the content shown on the LED.
	1.20.	◆ Up sign indicates that the corresponding digital tube flashes; ◆ Down sign indicates that the corresponding point at right bottom flashes.
	-. 11	◆ LED4 right bottom point“.”constantly ON indicates that the present data is the second display of the present information, can press SHIFT to switch the data of the two displays.
	-. 11 1.3.0 11	◆ LED4 sign “—”indicates that the present data is negative(the present display data bit≤4）; ◆ LED4 and LED3 right bottom point “..” constantly ON indicate that the present data is negative（the present display data bit=5）;
	1.3.0 11	◆ LED4 right bottom point“.” Flashes, and LED3 right bottom point“.”constantly ON，indicate that the present data is the 2nd display of the present information, can press SHIFT to switch the data in between the 2 displays, and the present data is negative.
	1.20.	◆ When digitally shown, LED3、LED2 and LED1 right bottom point“.” Indicates that the position of present parameter decimal point.

		◆ LED0 right bottom point“.”flashes，indicate that there is fault or alarm at present.

*：In the document, << and SHIFT are the keys for cursor movement with the same function.

4.2 Overview of drive operating modes

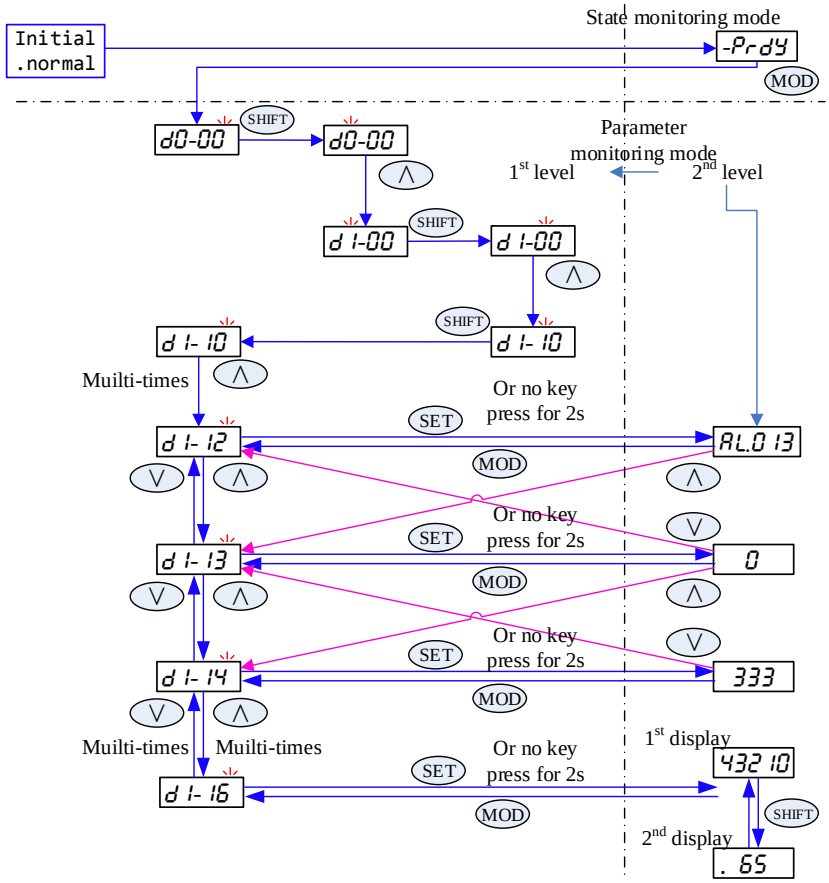
EA180 servo drive has 7 operating modes:

Operation mode		Function	Menu display level		
Name	Sign		1st level	2nd level	3rd level
Initialization mode	IE	Display drive model	-	EA 180	-
State monitoring mode	St	Display the current drive state	-	-Prdy	-
Parameter monitoring mode	d0	Select monitoring parameters and monitor their values	d0-00	- 100	-
Parameter setting mode	Pr	Select changing parameters and change their values	P0-00	1	-End-
Auxiliary function mode	AF	Select the auxiliary function, and conduct the corresponding operation	AF-05	JI dE	JI dE
Changed parameter mode (hidden by default)	CG	can see all the parameters that are different from the factory values (through the auxiliary function AF-08=1 ,achieve display view, still hidden after power on again)	P 1-00	0	-
Warning and alarm modes (display when abnormal)	AL	Display warning and alarm information	-	AL.E03	-

4.2.1 Parameters monitoring mode dS

When the system is initialized, it will automatically enter the status monitoring mode, press MOD, switch to parameter monitoring mode.

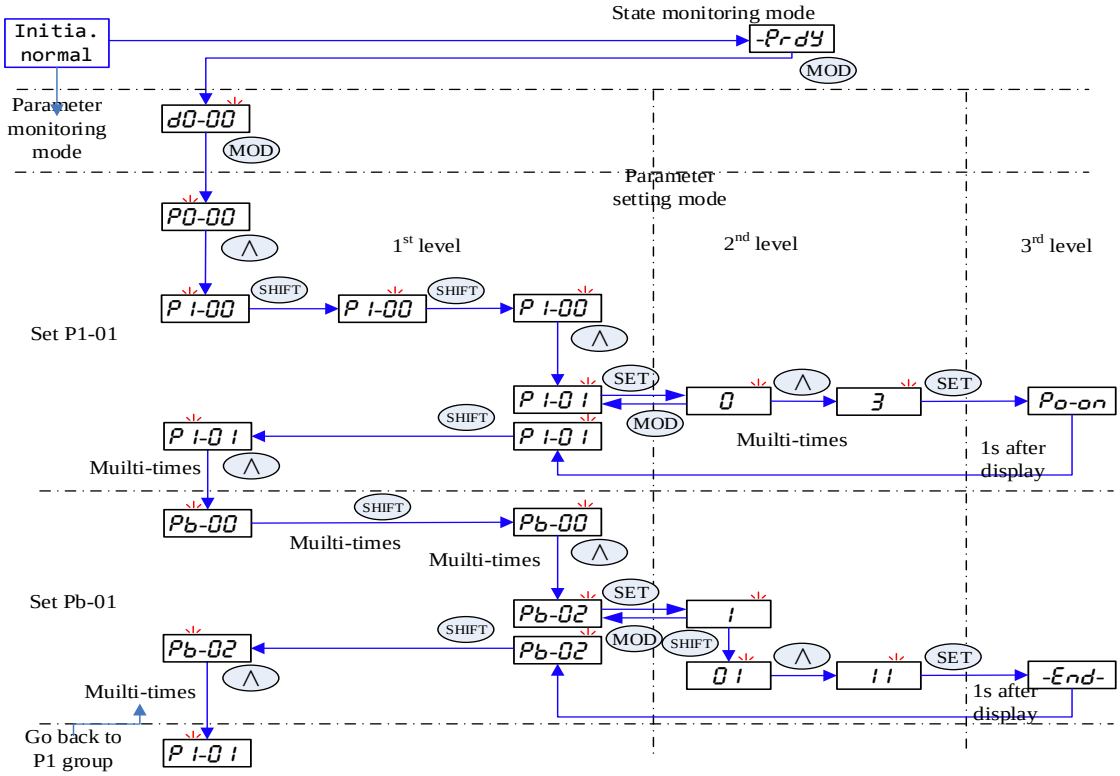
Take the previous fault information checking (d0-12 ~ d0-14 and d0-16) as an example, the following figure illustrates the parameter monitoring mode keyboard operation.



4.2.2. Parameter setting mode Pr

After system initialization, it enters status monitoring mode, press twice MOD, switch to parameter setting mode.

Here below is an example about setting the parameters, set P1-01=2，Pb-01=1，then go back to P1 group.



●

Attr	After SET	Description
○	-End-	set any time and effective immediately
●	Po-on	The value before and after change is different, set any time and effectively after power on again.

	-End-	The value before and after change is the same: the initial value is effective all the time
☆	HALt	The value before and after change is different: Set any time, effective 1 second after motor is static.
	-End-	The value before and after change is the same: initial value is effective all the time.
▲	-	Read only

4.2.3. Changed parameter mode CG

After control panel is powered on each time, the changed parameter patterns are hidden by default, after setting AF-08=1, press MOD to switch to this mode.

Here below is the description in two cases.

- No function codes, different from factory setting value: Enter changed parameter mode，LED reads nULL.

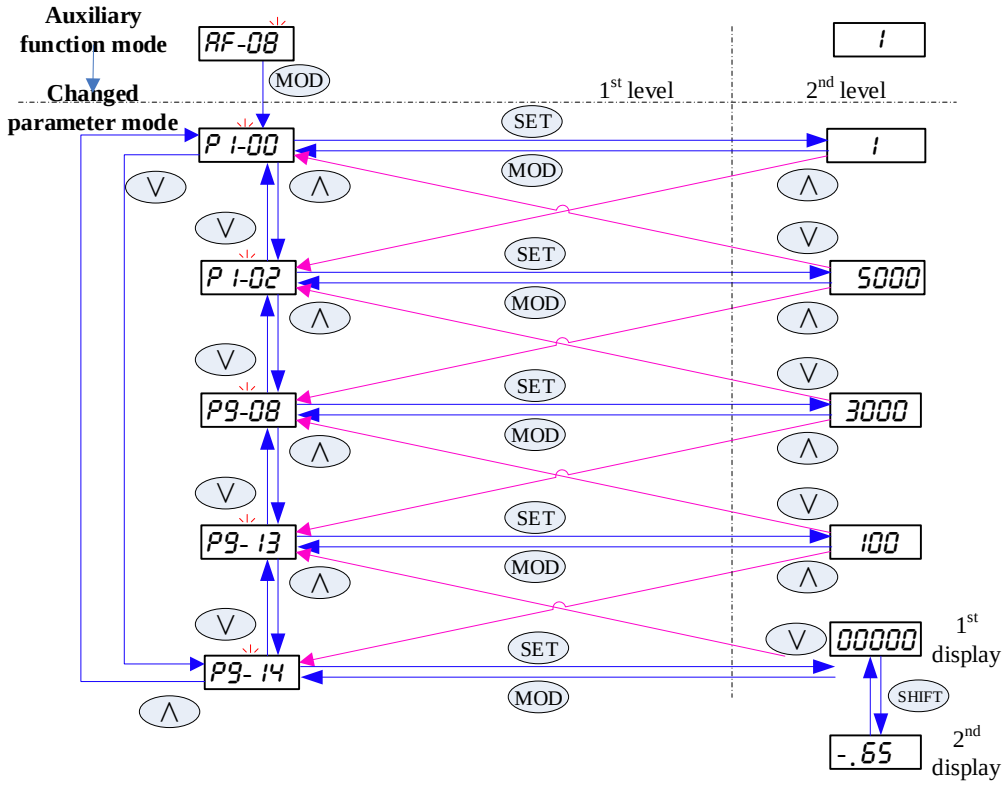
- Following function codes（P1-00/P1-02/P9-08/P9-13/P9-14）are different from factory setting.

A、 Different from normal function code display, in this mode, LED2 "-"flashes.

B、 By ∧ or ∨, check the changed function codes.

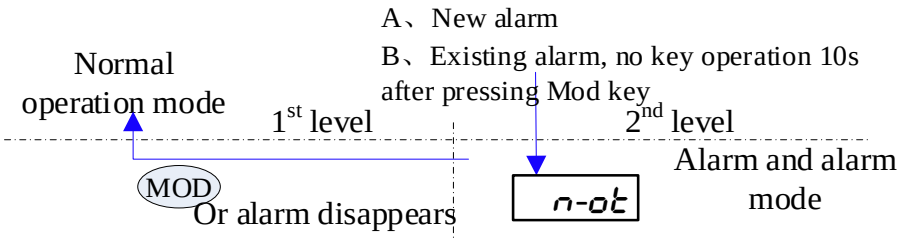
C、 In order to check the changed parameter more quickly, in this mode, if the second level is displayed currently, can switch to the first level of next parameter using ∧, equivalent to MOD + ∧); Press ∨, can directly switch to the first level of previous parameter (equivalent to MOD + ∨);

D、 Enter the second level, can check the changed value only and cannot modify the parameters in the current interface.

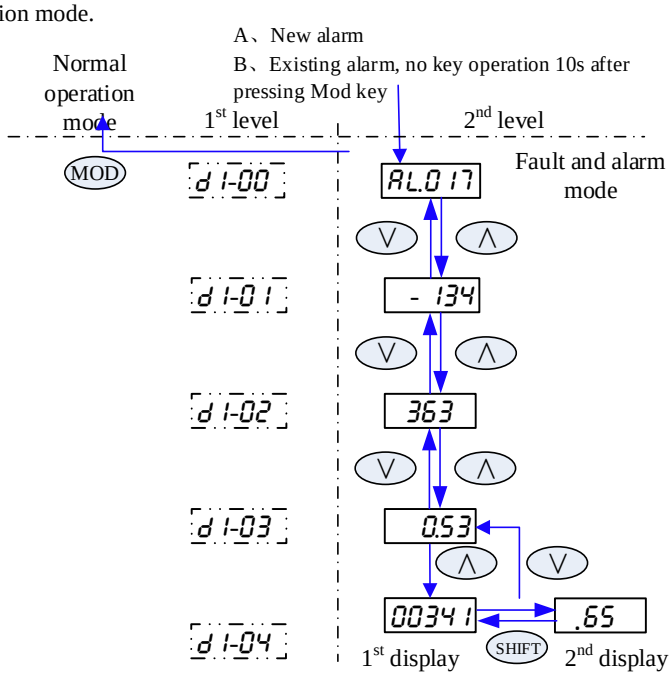


4.2.4 Alarm and alarm mode AL

In any mode, once alarm happens, directly enter alarm mode. At this time, can press MOD to switch to normal operation mode temporarily, LED0 right bottom flashes, if no key operation, go back to alarm mode 10 seconds later.



Here above is key operation when there is alarm, in alarm mode, it show alarm sign only（n-ot）, after alarm disappears, it will go back to normal operation mode.



Here above is keypad operation when alarm exists，in alarm mode, can press ∧ and ∨ to switch and check the alarm information（alarm code AL.017，RPM at alarm -134rpm、 bus voltage 363V、motor current 0.53A、elapsed operation time 6500341min）。

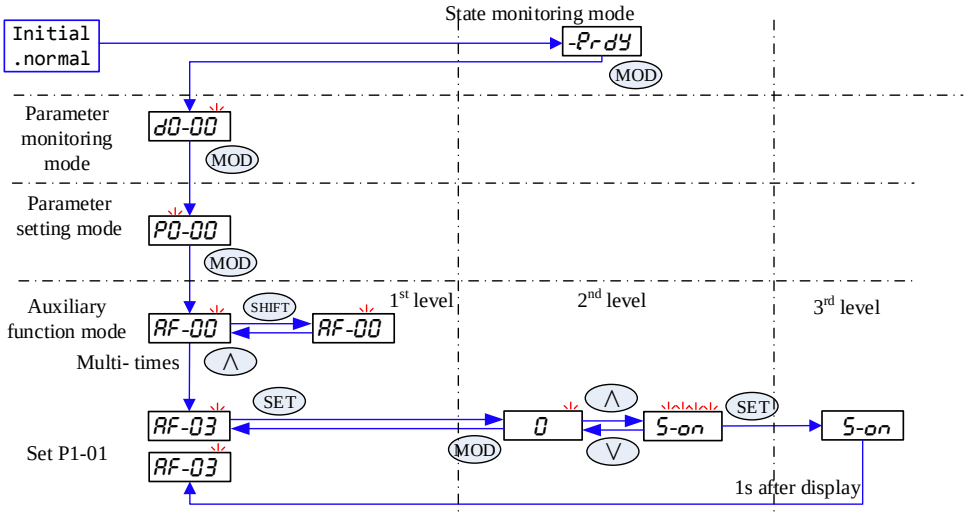
In case of alarm, clear the alarm source first, then alarm reset or control supply is power on again, the alarm can be cleared.

Display	Description
Al0nn	When the drive gives alarm, it shows alarm sign“Al0” and alarm number“nn” on the LED.
AlEnn	When the drive gives alarm, it shows alarm sign “AlE” and alarm number“nn”。 *：In case of positive over travel or negative over travel, it shows“-POT-”“-NOT-” directly.

4.2.5 Auxiliary function mode AF

When the system is initialized, it will automatically enter the status monitoring mode, press MOD for 3 times, switched to auxiliary function mode.

Taken AF-03（internal S-ON）auxiliary function as an example, the operation method for other function codes.



- When selecting auxiliary function AF-yz, as the parameters in this group are not many, can press ∧ and ∨ to select when the cursor at position z flashes, will automatically carry to or borrow from position y. Can also press SHIFT.
- In this mode, SHIFT is used to control the cursor in between position z and position y in the first level.
- When one parameter enters the second level, automatically show the present value, at this time, change this value by other channel. the display will not automatically refresh;
- After changing parameter by keypad, press MOD， go back to the first level, the parameter value is the one before change.
- After changing parameter by keypad, press SET, confirm the present operation, show the 3rd level for at least 1 second then go back to the 1st level.

Important:

The auxiliary function is the parameter for performing specific function operations, and the keyboard display is not the value of the internal register.

When the keyboard is operated, the display symbol is the standard. When communicating, write the register value at the corresponding address. If the value of the register is "-", it is indicated that the operation cannot be executed by communication

4.3 Auxiliary function operation

AF-00	Software reset		Data size	16bit	Communication address	3F00H
			Registervalue storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
	0	0	Press SET, it shows -End-, no operation			
	1	rESEt	Press SET, perform software resetX (equivalent to control power re-supply)			

AF-01	Alarm reset		Data size	16bit	Communication address	3F01H
			Register value storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
	0	0	Press SET, it shows -End-, no operation			
	1	AL.CLr	Press SET, execute alarm reset operation * it must be a resettable alarm, and the cause for the current alarm has been eliminated.			

	JOG		Data size	16bit	Communication address	3F02H
			Register value storage	-		
	Register value	Keypad display	Operation			
AF-02	-	-JoG	Press ∧, motor run forward, it shows JoG Press ∨, motor runs reverse, it shows JoG. Do not press the button, the motor is static, reads -JoG * The speed of inching(JOG) operation is determined by P8-00, and the acceleration and deceleration time is decided by P8-01.			

	Internal S_ON command		Data size	16bit	Communication address	3F03H
			Register value storage	Stored		
	Register value	Keypad display	Operation			
AF-03	0	0	Press SET, it shows -End-, if there is no other enabled input, enter Enabled OFF state.			
	1	S-on	If Enable meets the condition, press SET it shows S-on, enter Enabled ON state.			

* This parameter will be stored, can immediately enable ON next time when power ON. If you don't want to do this, please change the parameter to 0 before power off.

	FFT test		Data size	16bit	Communication address	3F04H
			Register value storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
AF-04	0	0	Press SET, it shows -End-, no operation.			
	1	EydFt	Press SET, it shows EydFt, With the host PC software identification system for speed bandwidth test, the test automatically quit after the completion, and upload data to the host computer for analysis and display. * The motor will be slightly dithered and accompanied by sound.			

	Off line inertia identification		Data size	16bit	Communication address	3F05H
			Register value storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
AF-05	0	0	Press SET, it shows -End-, no operation			
	1	JI dt	Press SET, it shows JI dt, the current system inertia is identified, and the inertia of the system (multiples of the inertia of the motor) is automatically stored in the P4-10 after successful identification.			

	AI channel self-check		Data size	16bit	Communication address	3F06H
			Register value storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
AF-06	0	0	Press SET, it shows -End-, no operation			
	1	AI 1	AI1 external voltage source is given 0V (the actual voltage may not be 0V). Press SET, it shows AI 1, conduct zero drift learning, after completion, the result is automatically stored in P6-33.			
	2	AI 2	AI2 external voltage source is given 0V (the actual voltage may not be 0V), Press SET, it shows AI 2, conduct zero drift learning, after completion, the result is automatically stored in P6-34.			

Note☛

1：When the zero drift is automatically corrected, it is necessary to ensure that the given command of the upper computer itself is 0V (the actual voltage may not be 0)
2：Zero drift automatic correction is only applicable to external supply -10~10V
3：If the correction is performed, the actual voltage of AI terminal is over±2V, alarm Al034 will occur.

AF-07	**Status power on defaulted display**		Data size	16bit	Communication address	3F07H
			Register value storage	Stored		
	Register value	Keypad display	Operation			
	0000H	0000	Press SET, it shows -End-, at this point, the status monitor mode displays the drive state only.			
	2001H (for example)	2001	Press SET, it shows -End-, if AF-07 is non-0 value, the defaulted display of status monitoring mode is function code values at the corresponding communication address(such as d0-01), can switch back and forth directly between the monitoring value and the drive state by ∧ button. Here below is an example, the parameter value corresponding to the address set by AF-07 is displayed first, can be switched back and forth in between the drive state by ∧ button. 0.0 ∧ -Prdy display the parameter values corresponding to AF-07 setting address Through UP key, the display can be switched to and fro the drive state			

Note☛

1：AF-07 is displayed in hexadecimal format, which represents the communication address. If the setting address does not correspond to function code, the display value is unknown.
2：If not enabled currently, LED3 will display position mode(P), once enabled, it displays the control mode of actual running.

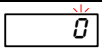
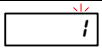
AF-08	**Non-factory setting value display**		Data size	16bit	Communication address	3F08H
			Register value storage	Automatically clear after power on		
	Register value	Keypad display	Operation			
	0	0	Press SET, it shows -End-, no operation			
	1	1	Press SET, it shows -End-, then press MOD, enter the changed parameter mode, different from the normal function code display, the middle"-"flashes. Press ∧ or ∨, can view the changed parameters in turn, press SET, can view the changed values.			

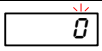
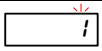
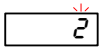
AF-09	**System parameter initialization**		Data size	16bit	Communication address	3F09H
			Register value storage	Automatically clear after power on		
	Register value	Keypad display	Operation			
	1	1	If AF-09≠65535, press SET, it shows Po-on, no operation			
	65535	65535	If AF-09=65535, press SET, it shows Po-on, restore function code to the factory setting status.			

Note☛

1：After using this function, the control supply must be power on again.
2：This operation does not restore motor parameters

AF-10	**Display motor parameters**		Data size	16bit	Communication address	3F0AH
			Register value storage	Automatically clear after power on		
	Register value	Keypad display	Operation			

	0		Press SET, it shows -End-, hide Pd group parameters
	1		Press SET, it shows -End-, display Pd group parameters.

AF-16	**Absolute encoder multi-turn data and fault handling**		Data size	16bit	Communication address	3F10H
			Register value storage	Automatically clear after completion		
	Register value	Keypad display	Operation			
	0		Press SET, it shows -End-, no operation.			
	1		Clear multi-turn encoder fault: Press SET, it shows -End- and acts.			
	2		Clear multi-turn encoder multi-turn data and fault: Press SET, it shows -End- and acts			
Important: This function must be operable in a non enabled state						

Chapter 5 Trial running

Before connecting the load, according to the instructions of this manual, the motor should run normally before the load of the servo motor is connected. Usually the drive can be put into use after following tests.

1) Wiring, inspection.
2) Drive power on, adjust parameters.
3) No-load operation.
4) Control function debugging.

Strong suggestion: please make servo motor work normally without load, and then connect the load to avoid unnecessary danger!

5.1 Drive power on

5.1.1. Inspection before power on

1) Check if the drive matches the motor in specifications.
2) L1、L2、L3 and U、V、W: absolutely cannot connect on the reverse, or loose joint.
3) Motor's U、V、W must be connected to drive's U、V、W one by one.
4) Whether the input voltage is consistent with the voltage level shown in the nameplate or panel of the drive.
5) Whether the encoder terminal is connected well.
6) Whether the servomotor and drive are in good grounding.

1.1.1 **Power on sequence**

1) Please refer to chapter 3.3.2，make sure the correct power on sequency。

5.2 Trial running

5.2.1 JOG running parameters setting

The following parameters are set in the servo non enabled state.

Parameter	Name
P8-00	JOG inching speed setting (usually can use factory value)
P8-01	JOG inching acceleration and deceleration time (usually can use factory value)

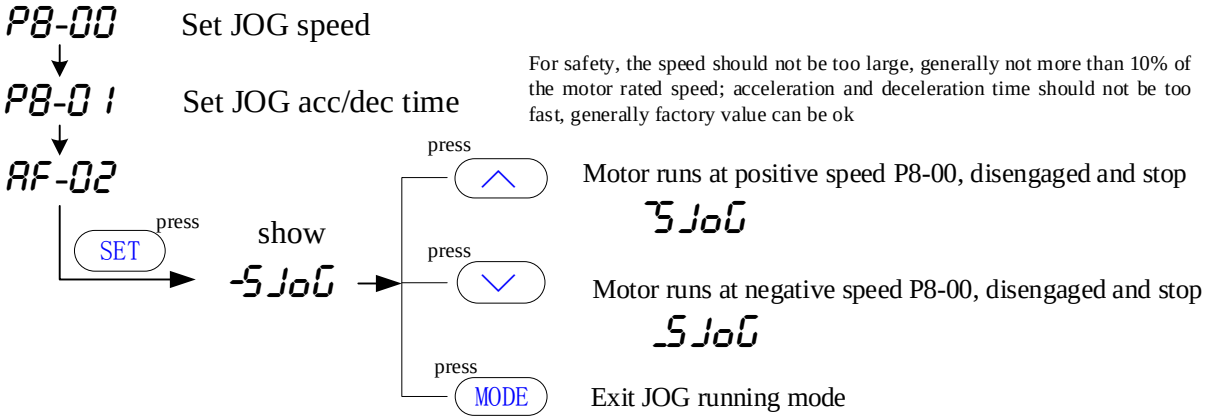
5.2.2 JOG operation

Operate as per following chart

P8-00: Set JOG inching running speed

P8-01: Set JOG inching acceleration and deceleration time

AF-02: Press key “SET”,then display –SJOG, and then Press key “



For safety, the speed should not be too large, generally not more than 10% of the motor rated speed; acceleration and deceleration time should not be too fast, generally factory value can be ok

If the motor runs normally at JOG, it indicates that the wiring and the basic functions of the drive and the motor are normal.

If the motor does not turn or is not running properly, please check first whether the wiring is correct, including whether motor power UVW sequence is correct and the contact is good, the encoder wiring is correct and is in a good contact, and then confirm if the motor CODE (d2-01) is consistent with the actual motor. Repeat the above steps, if still running abnormally, please contact our distributor partner.

5.3 **Servo enabled methods:**

1) After drive power on, set parameter AF-03=1, （S-on is shown on the keypad），drive is enabled ON right away（If AF-03 setting is not modified, power on again and it will be enabled ON immediately）.
2) If input terminal DI1 is used for servo enabled by default, set P6-01=00000001，make DI1 terminal negative logic, the drive is enabled ON (if P6-01 is not modified, then power on and it will be enabled right away).
3) According to standard wiring method, S_ON command is given by the DI terminal defined as S_ON function.

Chapter 6 Detailed description of function parameters

6.1 d0-xx universal monitoring parameters

Monitoring group parameters are to see the state of servo drive, can not be modified

d0-00	Motor speed				Initial value	0	Commu.addr.	2000H
					Unit	rpm	Type	Display
	Range	-6000~6000	Format	Decimal	Data size	16bit	Control mode	P S T

The actual speed of the servo motor is 1rpm. A negative number indicates that the rotation direction is in the opposite direction (defined by P0-01)

d0-01	Motor load ratio				Initial value	0.0	Commu.addr.	2001H
					Unit	%	Type	Display
	Range	-500.0~500.0	Format	Decimal	Data size	16bit	Control mode	P S T

The percentage of the actual load torque and the motor rated torque of the current motor. A negative number indicates the current torque, and the output direction is in the opposite direction.

$$Motor\ load\ rate = \frac{Actual\ motor\ load\ torque}{Motor\ rated\ torque} \times 100\%$$

d0-02	Total number of external pulses gathered				Initial value	0	Commu.addr.	2002H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P

In position mode, the total number of pulses sent to the servo by the host computer is only useful in the position control mode.
1: this value has not been processed by the multiple frequency of the electronic gear, which is the actual number of external pulses received.
2: this value may be greater than five bits. Please use the shift key to view high data.
3: continuous positive direction pulse, this value is positive increase, when the direction of the command changes to reverse, the value continues to decrease, after the zero, the negative increase.
4: if the received pulse exceeds the range above, it will start counting again from the maximum value in the opposite direction.
5: when servo enable OFF, this parameter is automatically cleared.

d0-04	Total number of pulse feedback(command pulse unit)				Initial value	0	Commu.addr.	2004H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P

The total pulse number of the servo motor based on the command pulse is displayed, which is useful only in the position control mode.
1: this value is the encoder feedback pulse, after the electronic gear ratio reverse processing, it obtains the position command pulse number.
2: this value may be greater than five bits. Please use the shift key to view high data.
3: the motor continues to rotate in a positive direction, this value is increasing, when the motor rotation direction becomes reverse, the value continues to decrease, up to zero, negative increase.
4: if the number of feedback pulses is greater than the range above, the count starts at the opposite direction.
5: when servo enabled is OFF, this parameter is automatically cleared.

d0-06	Total number of feedback pulses (encoder unit)				Initial value	0	Commu.addr.	2006H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P

The total pulse number of the servo motor based on the encoder resolution is shown and useful only in the position control mode.
1: this value is the actual number of pulse feedback encoder, please pay attention to the motor encoder resolution.
2: this value may be greater than five bits. Please use the shift key to view high data.
3: counting mode and over range processing is the same as d0-04.
4: when servo enabled is OFF, this parameter is automatically cleared.

d0-08	Received external pulse frequency				Initial value	0.00	Commu.addr.	2008H
					Unit	kHz	Type	Display
	Range	-10000.00~10000.00	Format	Decimal	Data size	32bit	Control mode	P

Display the currently acquired external pulse frequency, only useful in position control mode.

d0-10	Position deviation				Initial value	0	Commu.addr.	200AH
					Unit	pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P

Display the current position deviation, that is, the difference between the received command pulse and the feedback pulse. The default is based on the command pulse unit (P8-18, bit3=0).

Note☞: This parameter can be modified to the encoder unit by setting P8-18 bit3 to 1. Please see the detailed description of P8-18

d0-12	DI input terminal status				Initial value	00000000B	Commu.addr.	200CH
					Unit	-	Type	Display
	Range	00000000B~11111111B	Format	Binary	Data size	16bit	Control mode	P S T

The display state of the input terminal DI, a total display 8bit data, representing DI1 ~ DI8.

Panel display:	Change by « Key switch 	It indicates that DI1、DI3、DI6、DI8 are in effective state. （DI terminal is active in high level or low level, dependent on the setting of the parameter P6-01）

d0-13	DO output terminal status				Initial value	0000B	Commu.addr.	200DH
					Unit	-	Type	Display
	Range	0000B~1111B	Format	Binary	Data size	16bit	Control mode	P S T

Displays the status of the DO output terminal, which displays 4bit data, representing DO1~DO4.

Panel display:		Note that DO1 and DO3 are in a valid output state. (DO terminal output is conduction / open effective, related to the setting of the parameter P6-11)

d0-14	AI1 command voltage value (after system processing)				Initial value	0	Commu.addr.	200EH
					Unit	mV	Type	Display
	Range	-10000~10000	Format	Decimal	Data size	16bit	Control mode	P S T

Display analog input channel AI1 acquisition voltage, after filtering, offset, hysteresis, dead band and zero drift treatment.

d0-15	AI2 command voltage (after system processing)				Initial value	0	Commu.addr.	200FH
					Unit	mV	Type	Display
	Range	-10000~10000	Format	Decimal	Data size	16bit	Control mode	P S T

Display analog input channel AI2 acquisition voltage, after filtering, offset, hysteresis, dead band and zero drift treatment.

d0-16	Bus voltage				Initial value	0	Commu.addr.	2010H
					Unit	V	Type	Display
	Range	0~1000	Format	Decimal	Data size	16bit	Control mode	P S T

Show the actual value of the DC bus voltage inside the drive

d0-17	Motor current rms				Initial value	0.00	Commu.addr.	2011H
					Unit	A	Type	Display
	Range	0.00~655.35	Format	Decimal	Data size	16bit	Control mode	P S T

Display the current motor current value.

Motor current effective value $I = \sqrt{\frac{2}{3}(I_U^2 + I_V^2 + I_W^2)}$

d0-18	Speed corresponding to pulse command				Initial value	0	Commu.addr.	2012H
					Unit	rpm	Type	Display
	Range	-6000~6000	Format	Decimal	Data size	16bit	Control mode	P

Display the speed command value corresponding to the current command pulse.

d0-19	Speed command value				Initial value	0	Commu.addr.	2013H
					Unit	rpm	Type	Display
	Range	-6000~6000	Format	Decimal	Data size	16bit	Control mode	P S T

Display the current speed command value.

d0-20	Torque command value				Initial value	0	Commu.addr.	2014H
					Unit	%	Type	Display
	Range	-500.0~500.0	Format	Decimal	Data size	16bit	Control mode	P S T

Show the current torque command value, the benchmark is motor rated torque

d0-21	Maximum instantaneous load rate of the motor				Initial value	0	Commu.addr.	2015H
					Unit	%	Type	Display
	Range	-500.0~500.0	Format	Decimal	Data size	16bit	Control mode	P S T

This shows the actual maximum output torque of the motor and percentage of the rated torque of the motor during the whole process

from enabled ON to enabled OFF.

d0-22	IGBT module temperature				Initial value	0	Commu.addr.	2016H
					Unit	℃	Type	Display
	Range	0~150	Format	Decimal	Data size	16bit	Control mode	P S T

Internal temperature of IGBT module

This drive has a perfect over temperature protection mechanism. Because of the temperature detection position, the temperature may be 100 degrees or higher, which is normal.

d0-24	Total elapsed time of the system				Initial value	0	Commu.addr.	2018H
					Unit	Min	Type	Display
	Range	0~2147483647	Format	Decimal	Data size	32bit	Control mode	P S T

Display the elapsed running time in enabled ON state (to prevent EEPROM damage, this parameter is saved every 10 minutes)

d0-26	Brake load rate				Initial value	0.0	Commu.addr.	201AH
					Unit	%	Type	Display
	Range	0.0~400.0	Format	Decimal	Data size	16bit	Control mode	P S T

When the motor is in a braking state, the load rate of the current braking resistance is displayed.

$$\textbf{Braking load rate} = \frac{\boldsymbol{The\ power\ actually\ applied\ to\ the\ braking\ resistor}}{\textbf{The rated power of braking resistor}} \times \mathbf{100\%}$$

d0-27	Current motor electrical angle				Initial value	By motor	Commu.addr.	201BH
					Unit	°	Type	Display
	Range	0.0~359.9	Format	Decimal	Data size	16bit	Control mode	P S T

Show the current angle of the motor rotor.

Electrical angle = motor mechanical angle * motor pole count

d0-28	Incremental encoder sector number				Initial value	0	Commu.addr.	201CH
					Unit	-	Type	Display
	Range	0~7	Format	Decimal	Data size	16bit	Control mode	P S T

Display the current sector code of the incremental encoder. 0 or 7 indicates that the encoder is out of order

If the motor is used with a 2500ppr incremental encoder, the sector number means the UVW combination of the encoder feedback, and generally when rotating counterclockwise, it jumps according to 1- > 5- > 4- > 6- > 2- > 3-.

d0-29	Revolutions number of absolute encoder				Initial value	0	Commu.addr.	201DH
					Unit	Rev	Type	Display
	Range	-32768~+32767	Format	Decimal	Data size	16bit	Control mode	P S T

Display the multi-circle value of absolute encoder, - sign means the opposite direction(the actual motor direction defined by P0-01)

d0-30	Serial encoder current turn position value				Initial value	0	Commu.addr.	201EH
					Unit	Pulse	Type	Display
	Range	0~8388608	Format	Decimal	Data size	32bit	Control mode	P S T

Display the current single-circle position value of the serial encoder feedback.

d0-32	The total number of external pulses gathered				Initial value	0	Commu.addr.	2020H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P

In position mode, the total number of pulses sent to the servo drive by the host computer, useful only in the position control mode.

1: this value has not been processed by the frequency doubling of the electronic gear, which is the actual number of external pulses received.

2: this value may be greater than five bits. Please use the shift key to view high data.

3: continuous positive direction pulse, this value is positive increase, when the direction of the command changes to reverse, the value continues to decrease, after zero, negative increase.

4: if the received pulse exceeds the range above, it will start counting again from the maximum value in the opposite direction.

5: the value of this parameter starts when the servo drive is powered on, and automatically reset when the drive is powered down.

d0-34	Servo motor current position (command pulse unit)				Initial value	0	Commu.addr.	2022H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P S T

The total pulse number of the servo motor based on the command pulse is shown, valid in any mode.

1: this value is the encoder feedback pulse, it obtains the corresponding command pulse number after the electronic gear ratio reverse processing.

2: this value may be greater than five bits. Please use the shift key to view high data.

3: the motor continues to rotate in a positive direction, this value is increasing, and when the rotation direction of the motor becomes reverse, the value will continue to decrease, and it will increase negatively after zero.

4: if the number of feedback pulses is greater than the range above, the count starts at the opposite direction.

5: the value of this parameter starts with the servo power on (the incremental system starts at 0, the absolute value system starts at the encoder location that is now received, and starts from Pb-07 after the origin returns).

d0-36	Servo motor current position (encoder unit)				Initial value	0	Commu.addr.	2024H
					Unit	Pulse	Type	Display
	Range	-2147483647~2147483647	Format	Decimal	Data size	32bit	Control mode	P S T

Displays the total number of pulses of servo motor rotation based on the encoder resolution, effective in any mode.

1: this value is the actual number of pulse feedback encoder, please pay attention to motor encoder resolution.

2: this value may be greater than five bits. Please use the shift key to view high data.

3: numerical changes and over range processing ibid.

4: the value of this parameter starts with the servo power on (the incremental system starts at 0, the absolute value system starts at the encoder location that is now received, and starts from Pb-07 after the origin returns).

d0-38	Positioning status				Initial value	0	Commu.addr.	2026H
					Unit	-	Type	Display
	Range	0~1	Format	Decimal	Data size	16bit	Control mode	P S T

Display positioning status

0: positioning in progress

1: positioning completed

d0-39	Multi-speed current execution segment				Initial value	0	Commu.addr.	2027H
					Unit	-	Type	Display
	Range	0~16	Format	Decimal	Data size	16bit	Control mode	P S T

When using a multiple preset speed model, show which segment is currently executing. If the current one is not currently executing, the last execution segment is displayed.

d0-40	Multi- position current execution segment				Initial value	0	Commu.addr.	2028H
					Unit	-	Type	Display
	Range	0~16	Format	Decimal	Data size	16bit	Control mode	P S T

When using a multiple preset position mode, display what segment is currently executing. If the current one is not currently executing, the last execution segment is displayed.

d0-41	AI1 physical voltage (actual value)				Initial value	0	Commu.addr.	2029H
					Unit	mV	Type	Display
	Range	-10000~10000	Format	Decimal	Data size	16bit	Control mode	P S T

Display the actual value of the voltage obtained from the analog input channel AI1

d0-42	AI2 Physical voltage (actual value)				Initial value	0	Commu.addr.	202AH
					Unit	mV	Type	Display
	Range	-10000~10000	Format	Decimal	Data size	16bit	Control mode	P S T

Display the actual value of the voltage obtained from the analog input channel AI2.

6.2 d1-xx fault query parameters

Check the current and previous 3 fault records.

d1-00	The fault code				Initial value	0	Commu.addr.	2100H
					Unit	Pulse	Type	Display
	Range	00~FF	Format	Hexadecimal	Data size	16bit	Control mode	P S T

Show the code that breaks down this time. Please refer to the ninth chapter for the meaning of the fault code and the Countermeasures

d1-01	The speed of this failure				Initial value	0	Commu.addr.	2101H
					Unit	rpm	Type	Display
	Range	-6000~6000	Format	Decimal	Data size	16bit	Control mode	P S T

Show the motor RPM at time of fault, - sign means that the rotation direction is the opposite(defined by P0-01)

d1-02	The bus voltage at this time of failure				Initial value	0	Commu.addr.	2102H
					Unit	V	Type	Display
	Range	0~1000	Format	Decimal	Data size	16bit	Control mode	P S T

Display the bus voltage value of the servo drive at time of fault.

d1-03	The current value at the current fault				Initial value	0.00	Commu.addr.	2103H
					Unit	A	Type	Display
	Range	0.00~655.35	Format	Decimal	Data size	32bit	Control mode	P S T

Display the motor current value at time of fault.

d1-04	The run time at this failure				Initial value	0	Commu.addr.	2104H
					Unit	min	Type	Display
	Range	0~2147483647	Format	Decimal	Data size	32bit	Control mode	P S T

Display the elapsed running time of the servo drive. (since ex-factory)

6.3 d2-xx Product Information query parameters

d2-00	Servo drive type				Initial value	0	Commu.addr.	2200H
					Unit	-	Type	Display
	Range	10~31	Format	Decimal	Data size	16bit	Control mode	P S T

Show the type of servo drive.

d2-00 Ten's place	d2-00 One's place	command type	Encoder type
1	0	Analog pulse	2500ppr incremental encoder
	1		17 / 23bit encoder serial communication
2	0	EtherCAT bus *	-
	1		17 / 23bit encoder serial communication
3	0	CANOpen bus	2500ppr incremental encoder
	1		17 / 23bit encoder serial communication

*: The EtherCAT bus type drive does not support the 2500ppr encoder.

d2-01	Current motor CODE				Initial value	0	Commu.addr.	2201H
					Unit	-	Type	Display
	Range	0~999	Format	Decimal	Data size	16bit	Control mode	P S T
d2-02	CPUA software serial number 1				Initial value	100.00	Commu.addr.	2202H
					Unit	-	Type	Display
	Range	0.00~600.00	Format	Decimal	Data size	16bit	Control mode	P S T

Other parameters in this group are no longer detailed.

6.4 P0-xx Basic control parameters

P0-00	Control mode selection	Initial value	1	Commu.addr.	0000H
		Unit	-	Valid time	Power on again

Parameter function: select the servo system control mode

P0-00=0: speed control mode

The servo drive works in speed control mode, and determines the speed of the motor by means of communication, parameter setting, analog and multiple preset speed.

The default functions for the DI and DO terminals are automatically changed. See the commands for the P6 group.

P0-00=1: position control mode

The servo drive operates in position control mode where the position of the motor can be determined by external position pulses, and the internal multi segment position setting, and the motor speed can be adjusted by the pulse frequency.

The default functions for the DI and DO terminals are automatically changed. See the commands for the P6 group.

P0-00=2: torque control mode

The servo drive works in torque control mode, and the output torque of the motor can be determined by communication, parameter setting and analog.

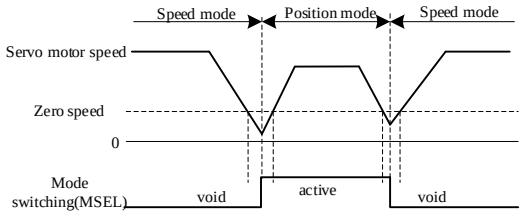
The default functions for the DI and DO terminals are automatically changed. See the commands for the P6 group.

P0-00=3：Speed- position switching mode (zero speed)

The drive works in speed position switching mode and switches only at zero speed.

Mode switching via DI terminals defined as MSEL functions.

When the motor is at zero speed, by switching the state of the MSEL terminal, the drive can switch between two modes of speed and position.



- Switched from a position control mode to speed control mode, the stranded pulse will be cleared.
- Zero speed is the set value of P0-03.
- If zero speed condition is not met, even if MSEL signal ON/OFF switching,is changed for the mode
- Control mode switch cannot be carried out even if zero speed condition is met later on.
- When MSEL terminal is not valid, work in speed control mode.

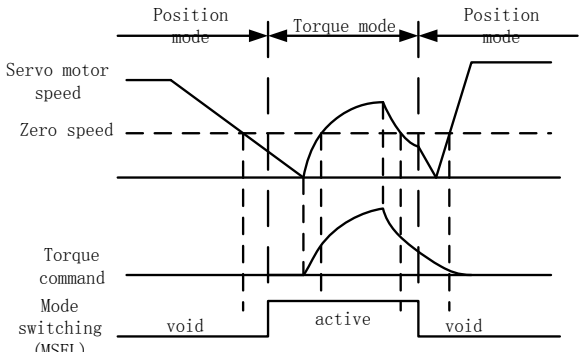
P0-00=5：Position -torque switching mode (zero speed)

The drive operates in the position torque switching mode and switches only at zero speed.

Mode switching via DI terminals defined as MSEL functions.

When the motor is at zero speed, by switching the state of the MSEL terminal, the drive can switch between the two control modes of position and torque.

- When switching from position control mode to torque control mode, the holding pulse will be cleared.
- Zero speed is set by P0-03.
- If zero speed condition is not met, even if MSEL signal ON/OFF switching,is changed for the mode, control mode switch cannot be carried out even if zero speed condition is met later on.
- When MSEL terminal is not valid, work in position control mode.



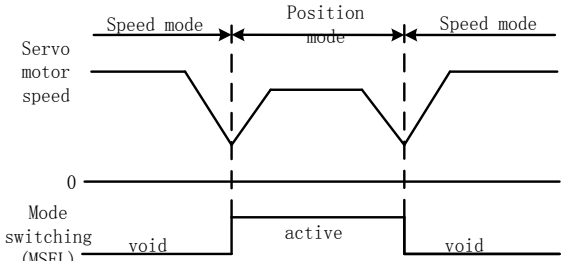
P0-00=6：Speed - position switch mode (immediately)

The drive works in speed position switching mode, switching at any time.

Mode switching via DI terminals defined as MSEL functions.

Regardless of whether the motor is rotated, by switching the MSEL terminal state, the drive will immediately switch between two control modes of speed and position.

- Switched from a position control mode to speed control mode, the stranded pulse will be cleared.
- When MSEL terminal is not valid, it works in speed control mode.



Note☞ In this mode, either with mechanical shock or drive alarm may occur in the process of switching.

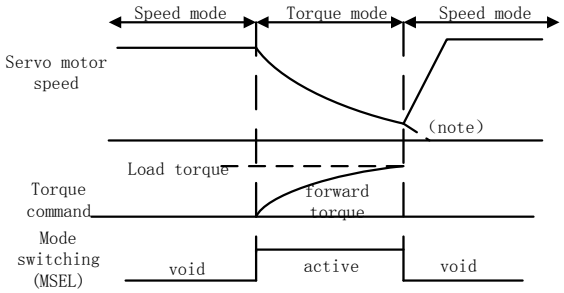
P0-00=7：Torque - Speed mode switching (immediately)

The drive operates at the torque speed switching mode, switching at any time.

Mode switching via DI terminals defined as MSEL functions.

Regardless of whether the motor is rotating, the drive will switch between the two control modes, torque and speed, by switching the status of the MSEL terminal.

- When the MSEL terminal is not valid, work in the torque control mode.



Note☞ If the speed command value is 0 when switching to the speed control mode, the servo motor slows down at the time of P2-05.

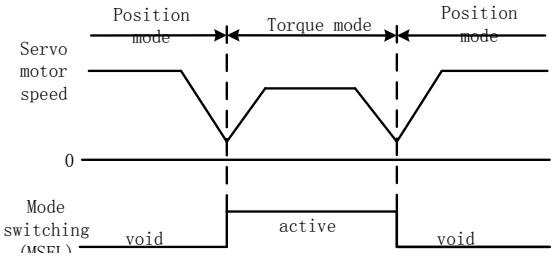
P0-00=8：position - torque switching mode (immediately)

The drive operates in the position torque switching mode, switching at any time.

Mode switching via DI terminals defined as MSEL functions.

Regardless of whether the motor is rotated, by switching the status of the MSEL terminal, the drive will immediately switch between the two control modes of position and torque.

- Switched from a position control mode to the torque control mode, the pulse stranded will be cleared.
- When MSEL terminal is invalid, work in position control mode.



Note☞ In this mode, either with mechanical shock or drive alarm may occur in the process of switching.

P0-01	Rotation direction		Initial value	0	Commu.addr.	0001H
			Unit	-	Valid time	When motor is still
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: set the direction of the servo motor rotation.

P0-01=0: when the direction is directed, the motor turns counter clockwise (CCW)

P0-01=1: when the direction is directed, the motor turns counter clockwise (CW)

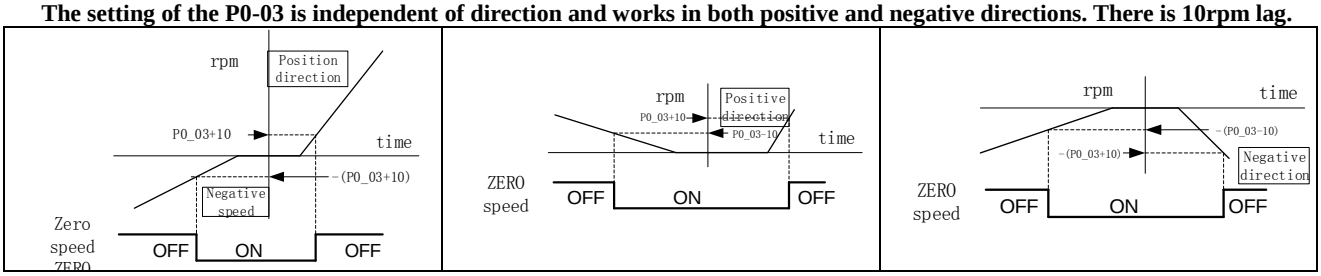
P0-02	Maximum speed setting		Initial value	3000	Commu.addr.	0002H
			Unit	rpm	Valid time	Power on again
	Range	0~10000*	Data size	16bit	Control mode	P S T

Parameter function: set the maximum speed of servo motor allowed. System speed shall not be higher than 1.1 times this set value, and if the motor speed is higher than the set value, the overspeed alarm will occur.

Note☞ Even if a higher value is set, the overspeed alarm will still occur if the speed exceeds the maximum speed allowed by the motor itself.
The actual speed setting is limited by the actual motor parameters, and (later) the function code specification is no longer restated.

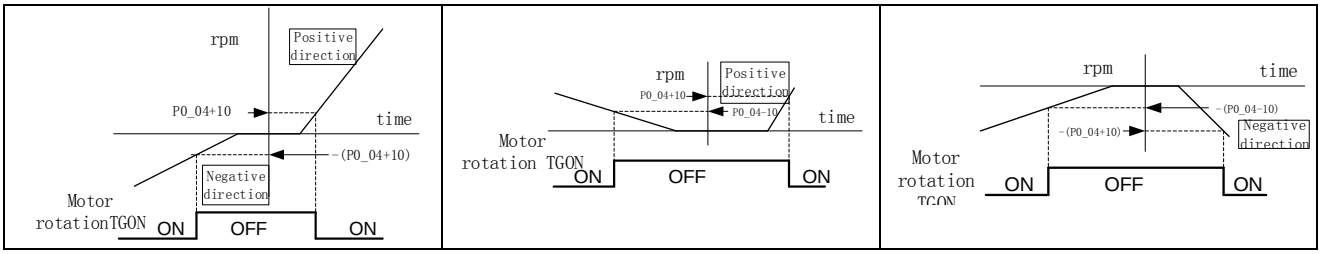
P0-03	Zero speed signal output value		Initial value	10	Commu.addr.	0003H
			Unit	rpm	Valid time	Immediately
	Range	10~1000	Data size	16bit	Control mode	P S T

Parameter function: set the standard of zero speed detection, and the timing of ZERO (motor zero speed) signal output.
The setting of the P0-03 is independent of direction and works in both positive and negative directions. There is 10rpm lag.



P0-04	Rotation signal output value		Initial value	20	Commu.addr.	0004H
			Unit	rpm	Valid time	Immediately
	Range	10~1000	Data size	16bit	Control mode	P S T

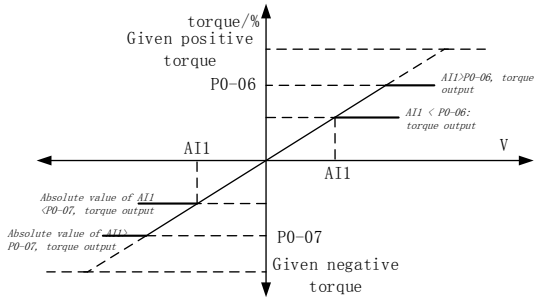
Parameter function: set the motor rotation status test standard, and TGON (motor rotation) signal output timing.
The setting of the P0-04 is independent of direction and works in both positive and negative direction. There is 10rpm lag.



P0-05	The first torque limit source selection		Initial value	0	Commu.addr.	0005H
			Unit	-	Valid time	Immediately
	Range	0~8	Data size	16bit	Control mode	P S T

Parameter function: select the source that limits the output torque of the motor
P0-05=0:P0-06 limits positive torque and P0-07 limits negative torque;
P0-05=1:AI1 limits positive and negative torque;
P0-05=2:AI2 limits positive and negative torque;
The P0-05=3:AI1 limits the positive torque, and the P0-07 limits the negative torque;
The P0-05=4:AI2 limits the positive torque, and the P0-07 limits the negative torque;
The P0-05=5:P0-06 limits the positive torque, and the AI1 limits the negative torque;
The P0-05=6:P0-06 limits the positive torque, and the AI2 limits the negative torque;
The P0-05=7:AI1 limits the positive torque, and the AI2 limits the negative torque;
The P0-05=8:AI1 limits negative torque, and the AI2 limits the positive torque;

In the case of P0-05=1, see the diagram below for the meaning of the torque limitation.



Positive toruque limiting value=AI1/10V *P0-06

Negative torque limiting value=AI1/10V*P0-07

Note☛ By defining the terminals of the TL2 function, the torque limit can be switched to an external torque limit at any time. See the commands in P8-25~29.

P0-06	the first torque limit-forward maximum		Initial value	300.0	Commu.addr.	0006H
			Unit	%	Valid time	Immediately
	Range	0.0~350.0*	Data size	16bit	Control mode	P S T
P0-07	the first torque limit-reverse maximum		Initial value	300.0	Commu.addr.	0007H
			Unit	%	Valid time	Immediately
	Range	0.0~350.0	Data size	16bit	Control mode	P S T

Parameter function: setting the limit value of torque in the corresponding direction. The reference is motor rated torque.
☞The minimum value is always used when torque limits are limited by analog or other parameters.

Note☛ If the setting of these two parameters is larger than the factory value, over current alarm may easily occur, and it is usually recommended to modify to smaller values only.
The actual maximum torque limit is limited by the model, and (later) the parameter description is no longer restated.

P0-08	Stop mode selection		Initial value	200H	Commu.addr.	0008H
			Unit	-	Valid time	Immediately
	Range	000H~311H	Data size	16bit	Control mode	P S T

Parameter function: set stop mode. The number end H indicates that the parameter is 16 decimal numbers. Please pay attention to the communication.

P0-08=0H: servo enabled OFF, coast to stop, after stop, the motor is in a free state.**

P0-08=1H: servo enabled OFF, press P0-17 setting time to slow down and stop, after stop, the motor is in a free state.**

P0-08=*0*H: Coast to stop when stage 2 alarm occurs. The motor is in free state after stop.

P0-08=*1*H: when stage 2 alarm occurs, press P0-17 setting time to slow down and stop. The motor is in free state after stop.

P0-08=0H: treatment methods when the overshoot occurs. After the stop, the motor is in a free state (when the servo enabled is effective, the brake will not be enagaged).**

P0-08=1H: when the overshoot occurs, press P0-18 setting time to slow down and stop at zero speed. After the stop, the motor is in a free state (when the servo enable signal is valid, the brake will not be engaged).**

P0-08=2H: when the overshoot occurs, press P0-18 setting time to slow down and stop at zero speed. The motor stays in position after the stop. (servo must be in enabled state)**

P0-08=3H: no overshoot judgment and treatment.**

P0-09	Enabled OFF-brake command dismissed delay time		Initial value	500	Commu.addr.	0009H
			Unit	ms	Valid time	Immediately
	Range	1~65535	Data size	16bit	Control mode	P S T

Parameter function: when the motor rotates, if the servo enabled is OFF or fails, wait for this time, then turn off the brake control terminal BK, see the commands in section 3.7.2.

P0-10	Brake command dismissed speed value		Initial value	20	Commu.addr.	000AH
			Unit	rpm	Valid time	Immediately
	Range	1~1000	Data size	16bit	Control mode	P S T

Parameter function: when the motor rotates, if the servo enabled is off or fail, when the motor speed drops below this setting and below, close the brake control terminal BK, see section 3.7.2 for commands.

P0-11	Brake command dismissed-motor power off delay time		Initial value	200	Commu.addr.	000BH
			Unit	ms	Valid time	Immediately
	Range	0~500	Data size	16bit	Control mode	P S T

Parameter Function: When the motor is in the stationary state, if the servo enable is turned off, the brake control terminal BK will be turned off immediately, and the motor will continue to be energized (only for zero speed stop), and the motor will be switched off after delaying this parameter setting time The See section 3.7.2.

P0-12	Re-enabled condition for each kind of stop mode		Initial value	0	Commu.addr.	000CH
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: when two different stop modes are selected, the processing mode when the enabled ON command is received again.
P0-12=0: coast to stop, press P0-13 settings to enable ON; zero speed stop, immediately enable ON.
P0-12=1: no matter if it is coast to stop or zero speed stop, P0-13 is set to enabled ON.

P0-13	Servo enabled ON condition		Initial value	3	Commu.addr.	000DH
			Unit	-	Valid time	Immediately
	Range	0~3	Data size	16bit	Control mode	P S T

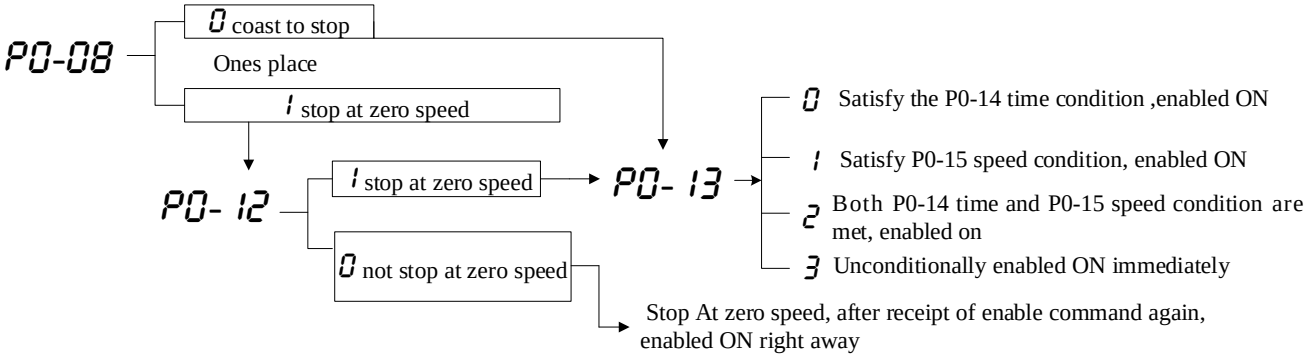
Parameter function: setting the enabling condition when receiving the enable command.
P0-13=0: satisfy the P0-14 condition, enabled ON.
P0-13=1: satisfy the P0-15 condition, enabled ON.
P0-13=2: to satisfy both P0-14 and P0-15 conditions, enabled ON.
P0-13=3: immediately enabled ON.

P0-14	Interval for ON again after enabled OFF		Initial value	500	Commu.addr.	000EH
			Unit	ms	Valid time	Immediately
	Range	1~30000	Data size	16bit	Control mode	P S T

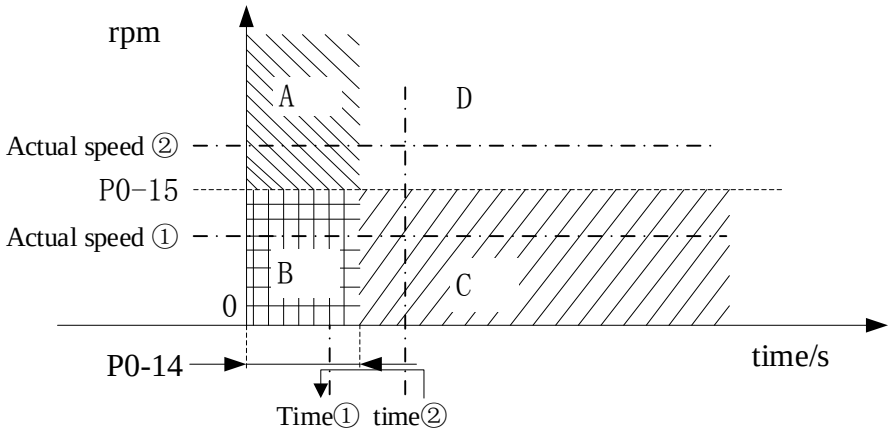
Parameter function: sets the time required from enabled OFF to ON again when P0-13=0 or 2.

P0-15	Enabled ON speed upper limit setting		Initial value	20	Commu.addr.	000FH
			Unit	rpm	Valid time	Immediately
	Range	20~Motor rated speed	Data size	16bit	Control mode	P S T

Parameter function: sets the enabled-ON motor speed limit when P0-13=1 and 3 are set. If the motor speed is higher than this parameter setting, the servo can not be enabled ON.
When the servo enabled is OFF and then ON again, first set the stop mode of P0-08, select the enabled-on condition by P0-12 for zero speed stop (coast to stop must be in line with this condition), and then set the specific condition for enabled-ON



As shown below, for different position, the enabled ON zone is different, the setting of P0-13 is different.



P0-13=0	Only in the C and D areas, can be enabled ON, that is, the time interval is greater than P0-14, such as time ②. In the figure, ① can not be enabled ON.
P0-13=1	Only in the B and C area, can be enabled ON, that is, the motor speed is within P0-15, such as the actual speed ①. The actual speed of the motor in the figure can not be enabled ON in the ②.
P0-13=2	Only in the C area, S-ON can be enabled ON, that is not only the time interval is greater than P0-14, but the actual speed should be less than P0-15.

P0-16	**Enable ON-command receiving delay time**		Initial value	200	Commu.addr.	0010H
			Unit	ms	Valid time	Immediately
	Range	0~500	Data size	16bit	Control mode	P S T

Parameter function: servo enabled ON can receive position, speed and torque command after this time.

Note☞ For the applications with vertical shafts or external force, as the motor has a holding brake, the servo motor is energized first after the servo enabled, and then the brake control terminal is opened so that the brake is disengaged. Because the relay, intermediate relay, holding brake all need some time to act, so this time should be set reasonably, so as to avoid holding brakes not really released, and the motor has started running and then according to the command of occurrence of various abnormal situation.

P0-17	**Zero speed stop deceleration time**		Initial value	200	Commu.addr.	0011H
			Unit	ms	Valid time	Power on again
	Range	1~65535	Data size	16bit	Control mode	P S T

Parameter function: when the stop mode is set to zero speed stop (P0-08 setting), this parameter is used for enable shutdown command or deceleration time after stage 2 alarm.

P0-18	**Overshoot protection deceleration time**		Initial value	200	Commu.addr.	0012H
			Unit	ms	Valid time	Power on again
	Range	1~65535	Data size	16bit	Control mode	P S T

Parameter function: when an over travel warning (P-OT, N-OT) occurs and the P0-08 is set to over travel zero speed stop, the time for motor slow down to stop.

P0-19	**Emergency stop deceleration time**		Initial value	50	Commu.addr.	0013H
			Unit	ms	Valid time	Power on again
	Range	1~65535	Data size	16bit	Control mode	P S T

Parameter function: when the emergency stop terminal (EMGS) is effective, the motor slow down to stop time.

Note☞ The above deceleration time is set too short, easy to alarm, and then lead to the motor in a free state. So please set it carefully according to the actual situation.

P0-20	Pulse output setting definition		Initial value	0	Commu.addr.	0014H
			Unit	-	Valid time	Power on again
	Range	0~1	Data size	16bit	Control mode	P S T

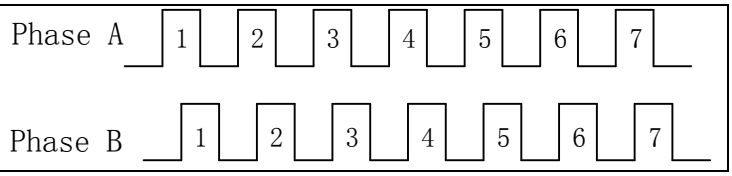
Parameter function: sets the meaning of the P0-21 parameter.

P0-20=0：The setting value of P0-21 is before 4 frequency doubled, e.g. the pulse number of phase A or phase B (2500ppr encoder has this option only)

P0-20=1：P0-21 the set value is after 4 frequency doubled, e.g. the total number of the edges of phase A phase and phase B phase.

P0-21	The pulse number for every 1 turn of the motor		Initial value	2500	Commu.addr.	0015H
			Unit	Pulse	Valid time	Power on again
	Range	2500ppr：165~2500 17~23bit：265~8192（P0-20=0） 17~23bit：1060~16382（P0-20=1）	Data size	16bit	Control mode	P S T

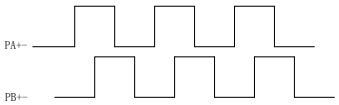
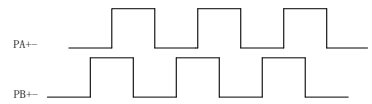
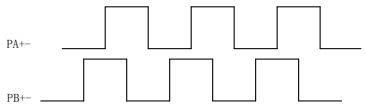
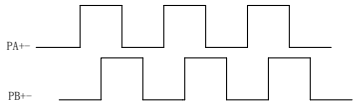
Take right figure for example，for every turn of the motor, phase A,B output 7 pulses. If P0-20=0，then P0-21 is set to7；if P0-20=1，then P0-21 is set to 28.



P0-22	Pulse output logic selection		Initial value	0	Commu.addr.	0016H
			Unit	-	Valid time	Power on again
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: setting the phase relation between the output pulse A phase and the B phase when the motor rotation direction is invariable. See table below

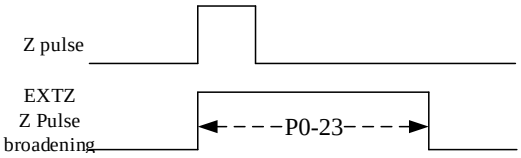
Table 5-4 Output pulse phase order

	Forward	Reverse
P0-22=0	 Phase A advances 90 ℃ompared to phase B	 Phase B advances 90 ℃ompared to phase A
P0-22=1	 Phase A advances 90 ℃ompared to phase B	 Phase A advances 90 ℃ompared to phase B

P0-23	Z pulse width		Initial value	0	Commu.addr.	0017H
			Unit	ms	Valid time	Power on again
	Range	0~3	Data size	16bit	Control mode	P S T

Parameter function: broaden the Z pulse. When the upper device can not capture the narrow Z pulse, it can be widened.

The width of the Z pulse decreases with the increase of the speed of the motor, so that the Z pulse width can be adjusted according to the actual situation for the convenience of matching with various host computers. Set to 0, the Z pulse is represented as the original width of the encoder Z signal.



6.5 P1-xx Position control parameters

P1-00	Position command source selection		Initial value	0	Commu.addr.	0100H
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P

Parameter function: select the source of the position command

P1-00=0: external pulse command (PT)

The position command is derived from the number of pulses externally input, and the frequency of the external pulses determines the speed at which the motor operates.

P1-00=1: multiple preset position command (Pr)

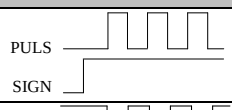
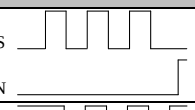
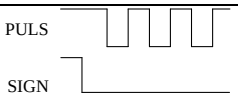
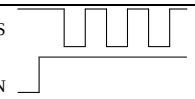
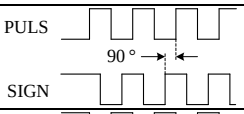
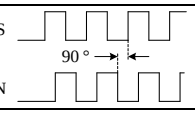
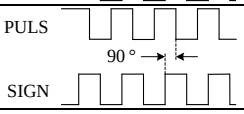
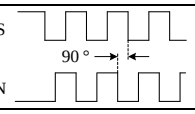
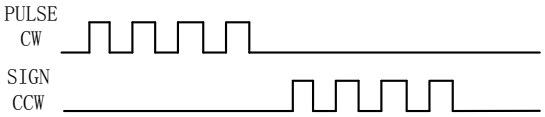
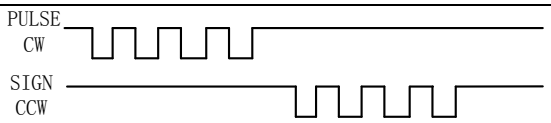
The positiona command is derived from the multiple preset position command set by the P9 group.

See the detailed description of P9 group.

P1-01	External pulse command input mode		Initial value	0	Commu.addr.	0101H
			Unit	-	Valid time	Effectively after power on again
	Range	0~5	Data size	16bit	Control mode	P

Parameter function: how to select external pulse command.

It is important toNote that the forward turn of the rotation refers to the clockwise or counter clockwise direction of the motor shaft, determined by P0-01.

Parameters	Pulse form	Logical state	Rotation direction	
			Forward	Reverse
P1-01=0	Pulse + direction	Positive logic		
P1-01=1	Pulse + direction	Negative logic		
P1-01=2	Two-phase orthogonal pulse (4x frequency doubled)	Positive logic		
P1-01=3	Two-phase orthogonal pulse (4x frequency doubled)	Negative logic		
P1-01=4	CW + CCW pulse	Positive logic		
P1-01=5	CW + CCW pulse	Negative logic		

P1-02	Command pulse number for 1 turn of the motor		Initial value	10000	Commu.addr.	0102H
			Unit	-	Valid time	Immediately
	Range	0~8388608	Data size	32bit	Control mode	P

Parameter function: sets the pulse number of command required to rotate the motor at 1 turn (360 degrees).

The command pulse number can come from an external pulse command or from a multiple preset position command.

When this parameter is set to 0, the parameter is invalid, and the relationship between the command pulse number and the turn number of the motor is set by the electronic gear ratio.

P1-04	Electronic gear ratio numerator 1		Initial value	0	Commu.addr.	0104H
			Unit	-	Valid time	Immediately
	Range	$0\sim2^{30}$	Data size	32bit	Control mode	P
P1-06	Electronic gear ratio denominator		Initial value	10000	Commu.addr.	0106H
			Unit	-	Valid time	Immediately
	Range	$0\sim2^{30}$	Data size	32bit	Control mode	P
P1-08	Electronic gear ratio numerator 2		Initial value	1	Commu.addr.	0108H
			Unit	-	Valid time	Immediately
	Range	$0\sim2^{30}$	Data size	32bit	Control mode	P
P1-10	Electronic gear ratio numerator 3		Initial value	1	Commu.addr.	010AH
			Unit	-	Valid time	Immediately
	Range	$0\sim2^{30}$	Data size	32bit	Control mode	P
P1-12	Electronic gear ratio numerator 4		Initial value	1	Commu.addr.	010CH
			Unit	-	Valid time	Immediately
	Range	$0\sim2^{30}$	Data size	32bit	Control mode	P

Parameter function: P1-04~P1-12 is used to set the electronic gear ratio and is valid at P1-02=0.

The 3 parameters, P1-08, P1-10, and P1-12, are useful only if they require electronic gear ratio switching.

The relationship between P1-02, P1-04, and P1-06, the function of (P1-08, P1-10, P1-12) is similar to that of P1-04.

P1-02	P1-04	P1-06	Command input and motor output
1~8388608	- Not affected	- Not affected	Refer to (1)
0	0	1~1073741824	Refer to (2)
	1~1073741824	1~1073741824	Refer to (3)

(1) Command pulse input x $\frac{Encoder\ resolution}{P1-02\ setting\ value}$ -→Position command

(2) Command pulse input x $\frac{Encoder\ resolution}{P1-06\ setting\ value}$ -→Position command

(3) Command pulse input x $\frac{P1-04\ setting\ value}{P1-06\ setting\ value}$ -→Position command

When a variety of different electronic gear ratios are required in use:

- Use communication to modify P1-04 and P1-06 online (pay attention to using RAM address, otherwise it will damage the storage device of drive);
- by setting two DI terminals as 20 (GNUM0) and 21 (GNUM1)function, and then switch through the external DI input,at this time, the numerator of the electronic gear ratio corresponding to the DI terminal state is shown as follows (0 terminal invalid, 1 effective):

GNUM0	GNUM1	Effective electronic gear ratio numerator
0	0	P1-04
0	1	P1-08
1	0	P1-10
1	1	P1-12

When using an external terminal to switch the electronic gear ratio, the electronic gear denominator is a fixed value, so in this manner, be careful to select the appropriate value for P1-06.

Note☛
1. **P1-02 and the electronic gear ratio are effective for both the external pulse command and the internal multiple preset position command.**
2. **the electronic gear ratio can be set to: 1/1000~64000/1. Beyond the Range, the drive will give Al032 alarm.**

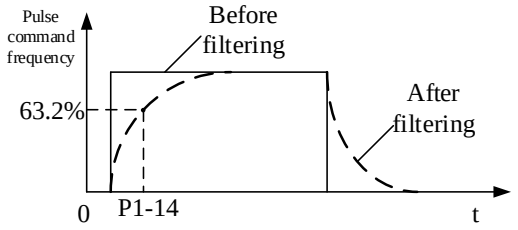
P1-14	External pulse command smooth filtering time		Initial value	0	Commu.addr.	010EH
			Unit	ms	Valid time	Power on again
	Range	0~30000	Data size	16bit	Control mode	P

Parameter function: the time constant of smoothing filtering of the external pulse command signal, does not work when set to 0.

The function of this parameter is to smooth the input pulse command, but there is a delay in command.

Generally used for:

- Upper computer has no acceleration and deceleration function;
- The electronic gear ratio is relatively large;
- The low frequency of command;
- Step jump, unstable phenomenon appears when the motor is running etc..



Note☛ **In order to reduce the vibration caused by the abrupt change of the command pulse frequency, there is also the position FIR filter (P5-23) function that can be used.**

P1-15	External pulse input high frequency filtering time		Initial value	3	Commu.addr.	010FH
			Unit	-	Valid time	Power on again
	Range	0~255	Data size	16bit	Control mode	P

Parameter function: setting the time constant of the external pulse command input for high frequency filtering

When a pulse is given at a given position, a high frequency interference may occur for various reasons, resulting in an error in the number of pulses received by the servo drive. Proper setting of this parameter can avoid high frequency interference.

If the pulse input filter time constant is Tf, the minimum width of the input signal is Tmin, then the input signal and filtered signal are shown in the following figure. The filtered signal will delay Tf than the input signal.

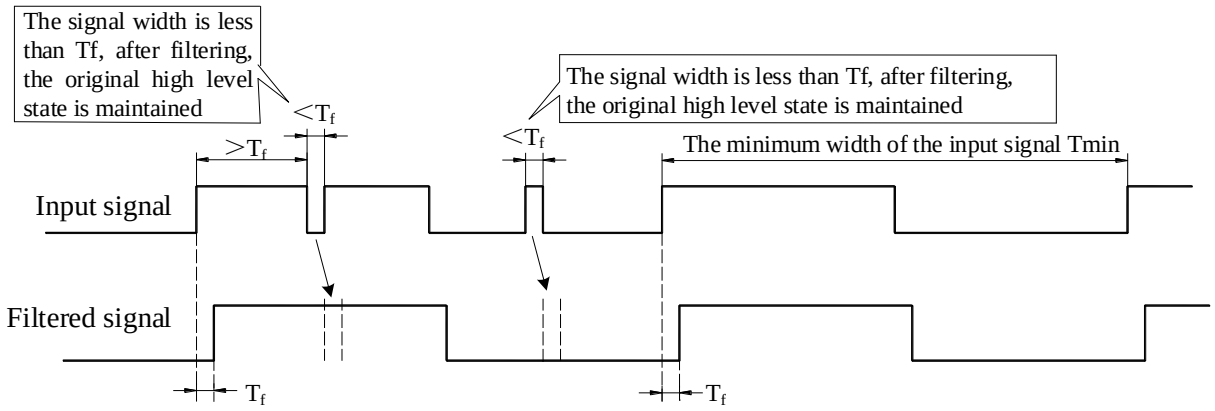


Figure 5-8 Example of pulse input signal filtering

Pulse input filter time constant Tf should meet: Tf = (20%~25%) Tmin
The maximum frequency (or minimum pulse width) of a given input pulse signal. The recommended filtering time parameters are shown in the table below:

Maximum frequency of input pulse	Recommended parameters for P1-15	Actual filter time
＜167K	12	960ns
167K~250K	6	480ns
250K~500K	3	240ns

P1-16	Position deviation clear external DI signal action		Initial value	0	Commu.addr.	0110H
			Unit	-	Valid time	Immediately
	Range	0~3	Data size	16bit	Control mode	P

Parameter function: select what kind of external DI signal to clear the deviation.

P1-16=0: cleared by rising edge of P-CLR
P1-16=1: clear through P-CLR low level
P1-16=2: clear by P-CLR high level
P1-16=3: cleared by falling edge of P-CLR

Note☞ The position deviation will be automatically cleared when the servo is enabled to turn off or alarm occurs.

P1-18	Position following deviation threshold alarm		Initial value	80000	Commu.addr.	0112H
			Unit	ppr	Valid time	Immediately
	Range	0~1073741824	Data size	32bit	Control mode	P

Parameter function: set the position follow deviation warning threshold.

When the position deviation reaches and is greater than the set point, output warning against too large position following deviation warning signal too large.

The motor continues, and the LED monitor displays AlE05, defined as the valid output of the DO terminal of the WARN. Once the position deviation is less than the set point, the warning is cancelled automatically.

P1-20	Position following deviation alarm threshold		Initial value	100000	Commu.addr.	0114H
			Unit	ppr	Valid time	Immediately
	Range	0~1073741824	Data size	32bit	Control mode	P

Parameter function: set position following error alarm threshold.

When the position deviation reaches and is larger than the corresponding setting value, output warning against too large position deviation.

When the motor stops, LED display reads Al013，defined as DO terminal of ALM effective.

Note☞

1. when P1-18=0, the position following deviation warning is blocked. When P1-20=0, the position deviation is too large and the alarm is blocked.
2. the setting unit at the factory is the command unit, but can be changed to the encoder unit through the P8-18 bit3. When using the encoder unit, please set the appropriate value according to the resolution of the encoder to avoid frequent alarms due to the small set value.

P1-22	Positioning completion output setting		Initial value	1	Commu.addr.	0116H
			Unit	-	Valid time	Immediately
	Range	0~6	Data size	16bit	Control mode	P

Parameter function: select the output effective condition for the positioning completion signal (defined as the DO terminal of the COIN) to output valid conditions.

P1-22=0: the absolute value of position deviation is less than P1-24.

P1-22=1: the absolute value of position deviation is less than P1-24 and the position command is 0.

P1-22=2: the absolute value of the position deviation is less than P1-24, and the position command is 0, and the motor zero speed.

P1-22=3: the absolute value of the position deviation is less than P1-24, and the position command is 0. The two conditions are satisfied simultaneously, and the duration is INP, and the holding time is P1-25.

When one of the above 3 conditions is not satisfied, the COIN output is invalid immediately. Whether it is effective again needs to be rejudged.

P1-22=4: the absolute value of the position deviation is less than P1-24, and the position command is 0, and the motor zero speed, the three conditions are satisfied simultaneously and the duration is up to INP Time P1-25.

When the above 4 conditions are not satisfied, the COIN output is invalid immediately. Once again, the validity will be re judged.

P1-22=5: when the position command is 0, the COIN output is valid if the absolute value of the position deviation is less than P1-24. After the duration of the P1-25, the COIN output is valid / invalid depending on the position deviation at this point and the P1-24. Once the position command is not zero, the COIN output is invalid immediately.

P1-22=6: when the position command is 0, the COIN output is valid if the absolute value of the position deviation is less than P1-24 and the motor is at zero speed. After the duration of P1-25, the COIN output is valid / invalid depending on relation between the position deviation at this point and P1-24 and if the motor is at zero speed. Once the position command is not 0, the COIN output is invalid immediately.

Note☞ This parameter is only for DO output that is set to COIN. The DO output for position proximity (PNEAR) is invalid.

P1-23	**Positioning proximity width**		Initial value	20	Commu.addr.	0117H
			Unit	ppr	Valid time	Immediately
	Range	1~65535	Data size	16bit	Control mode	P
P1-24	**Positioning completion width**		Initial value	10	Commu.addr.	0118H
			Unit	ppr	Valid time	Immediately
	Range	1~65535	Data size	16bit	Control mode	P

Parameter function: Positioning proximity and completion criteria.

When the position deviation count is less than the P1-23 setting, the DO terminal, which is set to position proximity (PNEAR), will be output valid.

When the position deviation count is less than the P1-24 setting and meets the conditions selected by P1-22, the positioning completion (COIN) DO terminal will be output valid.

Note☞
1. **the setting unit at the factory is the command unit, but can be changed to the encoder unit via P8-18bit3.**
2. **when choosing an encoder unit, the appropriate value must be set according to the resolution of the encoder, otherwise the time required for the completion of the encoder may be longer.**

P1-25	**INP maintaining time**		Initial value	10	Commu.addr.	0119H
			Unit	ms	Valid time	Immediately
	Range	0~3000	Data size	16bit	Control mode	P

Parameter function: sets the duration of P1-22=3, 4, 5, and 6.

P1-26	**Positive limit position**		Initial value	2147483647	Commu.addr.	011AH
			Unit	ppr	Valid time	Immediately
	Range	-2147483647~2147483647	Data size	32bit	Control mode	P S T
P1-28	**Negative limit position**		Initial value	-2147483647	Commu.addr.	011CH
			Unit	ppr	Valid time	Immediately
	Range	-2147483647~2147483647	Data size	32bit	Control mode	P S T

Parameter function: set the positive and negative soft limit positions respectively.

When the setting value of the two parameters is the maximum, that is, the setting value is +2147483647 or -2147482647, the corresponding position detection is invalid.

Once the drive is power on, the pulse is calculated, and the result is the value of d0-34 (command unit) /d0-36 (encoder unit). When the value is greater than or equal to P1-26 or less than or equal to the setting value of P1-28, the motor is considered to exceed the limit and the servo drive gives off over-range warning. The DO terminal, defined as WARN, is valid for output，LED

display reads P-oT or n-oT，The motor stops as per the P0-08 setting.

Note☞ The setting unit at the factory is the command unit and can be changed to the encoder unit via the P8-18 bit3 (at this time, please set the appropriate value according to resolution).

6.6 P2-xx Speed control parameters

P2-00	**Speed command source selection**		Initial value	0	Commu.addr.	0200H
			Unit	-	Valid time	Immediately
	Range	0~3	Data size	16bit	Control mode	S

Parameter function: select the speed command source:

P2-00=0: digital speed given (P2-01 given);
P2-00=1:AI1 given;
P2-00=2:AI2 given;
P2-00=3: multiple preset speed switching (see commands in group P9);

Note： when P2-00=1：Speed command=$\frac{AI1}{10V}$ X $[P2-01]$ /
When P2-00=2：Speed command=$\frac{AI2}{10V}$ X $[P2-01]$

Note☞
1. analog AI1 and AI2 are + 10V input, P2-01 set value has positive and negative sign, the sign of speed command depends on the times result of these two (for instance: - * - = +).
2. if there is only +10V analog input, there are a variety of ways to change the direction of the motor rotation:
   Adjust by adjusting the status of the DI terminal defined as DIR-SEL
   Adjust by modifying the plus and minus of the P2-01
   Adjust by modifying P0-01
   Adjust by modifying P8-18 bit4.

P2-01	**Digital speed setting**		Initial value	3000	Commu.addr.	0201H
			Unit	rpm	Valid time	Immediately
	Range	-30000~30000	Data size	16bit	Control mode	S

Parameter function: when setting the speed control mode, set the target speed and direction of the motor. The positive is rotated in the positive direction.

When analog input is used as the speed command source, this parameter can be interpreted as a gain of analog, i.e., the speed command value when the analog amount is 10V.

For example: P2-00=1, P2-01=1000, then when AI1 is 5V, the speed command is positive 500rpm, and when AI1 is -10V, the speed command is in the opposite direction 1000rpm

Note☞ The actual rotation direction of the motor is controlled by the P0-01 parameter.

P2-04	**Speed S-type acceleration time T_{SACC}**		Initial value	200	Commu.addr.	0204H
			Unit	ms	Valid time	Power on again
	Range	1~65535	Data size	16bit	Control mode	S
P2-05	**Speed S-type deceleration time T_{SDEC}**		Initial value	200	Commu.addr.	0205H
			Unit	ms	Valid time	Power on again
	Range	1~65525	Data size	16bit	Control mode	S
P2-06	**Speed S-type acc/dec smoothing timeT_{SL}**		Initial value	50	Commu.addr.	0206H
			Unit	ms	Valid time	Power on again
	Range	0~10000	Data size	16bit	Control mode	S

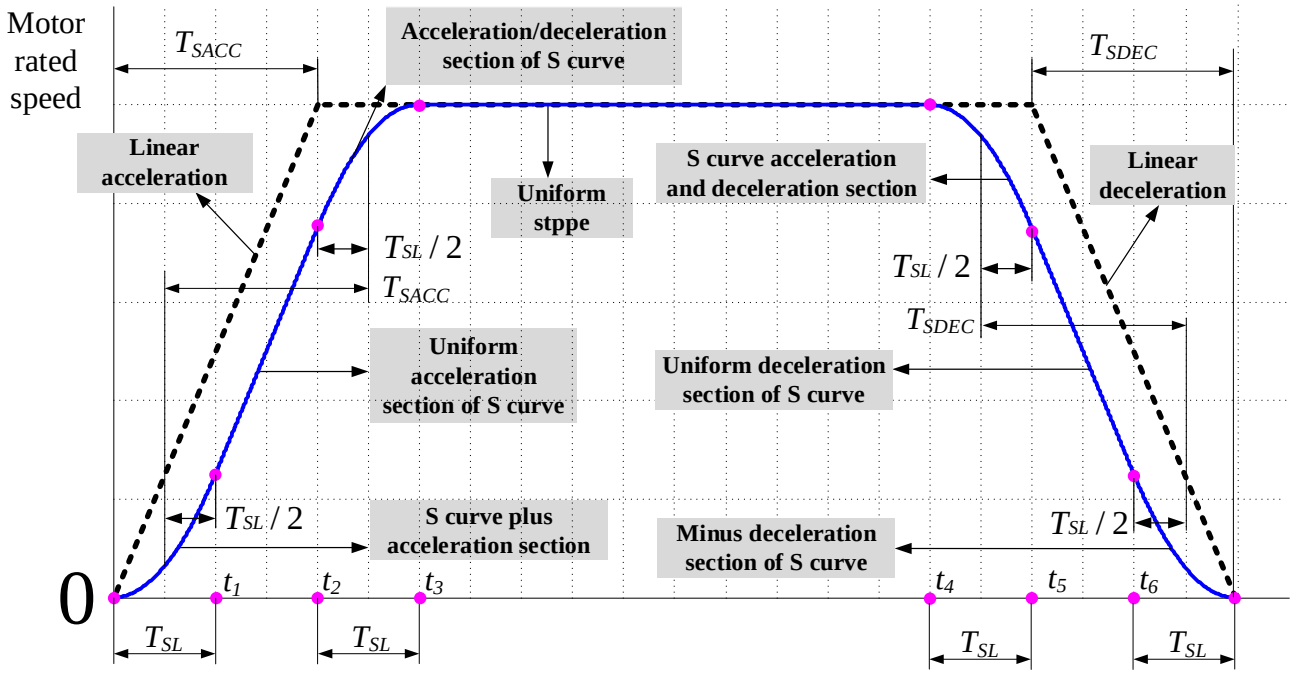
Parameter function: when the servo drive runs in the speed mode, these three parameters are used to set the acceleration and deceleration time of the motor.

P2-04: set the motor speed from 0 rpm to the rated speed of the motor.

P2-05: set the motor speed down from the motor speed to 0 speed.

P2-06: set the S curve smoothing time in process of the acceleration and deceleration.

If the S curve (i.e., P2-06 is not 0) is used, in the process of acceleration or deceleration, the drives are programmed using three stage acceleration curve to smooth the motion commands. The acceleration generated at this point is continuous, avoiding excessive jumps (acceleration differential) due to a sharp change in the input command, thereby stimulating the vibration and noise of the mechanical structure. The user can use P2-04 to adjust the slope of the speed change in the process of acceleration; use P2-05 to adjust the slope of the speed change in the process of deceleration; use P2-06 to smooth the start and stop of the motor.



Note☛

1. P2-04, P2-05 refers to the acceleration and deceleration time required when motor speed is changed to motor rated speed. If the change in target speed is not motor rated speed, the required time varies according to the ratio of the motor speed to the rated speed.
   For example, the motor target speed is 1500rpm, the motor rated speed is 3000rpm, P2-04=200ms, P2-05=300ms, the motor speed changes from 0 to 1500rpm, then the required time is 100ms; slow down from 1500rpm to 0 speed, the required time is 150ms.
2. speed S acceleration deceleration time TSL is only valid in speed mode, and it is invalid in inching operation, emergency stop, over travel stop, alarm and enabled- OFF stop

P2-07	Speed command zero position fixing threshold		Initial value	10	Commu.addr.	0207H
			Unit	rpm	Valid time	Immediately
	Range	0~300	Data size	16bit	Control mode	S

Parameter function: analog speed command zero position fixed value setting, e.g. zero clamping.

When the servo is set to the speed mode, if the speed command is given by the external analog, even if the analog voltage is 0, due to external electromagnetic interference or zero drift and other causes, the motor may not be static. If the external analog input voltage is near 0V, the motor must remain stationary, this function can be used.

Two conditions are required to be met for this feature enabled as follows:

Analog input voltage corresponding to the absolute value of speed command, after treatment of dead zone, hysteresis and filtering, is less than P2-07;

DI terminal defined as zero position fixed signal ZCLAMP is effective.

When the above conditions are satisfied, the drive automatically switched from speed mode to position mode, the motor is locked in the position whose range is specified by P1-24 within, even under the action of external force, will return to the locked position.

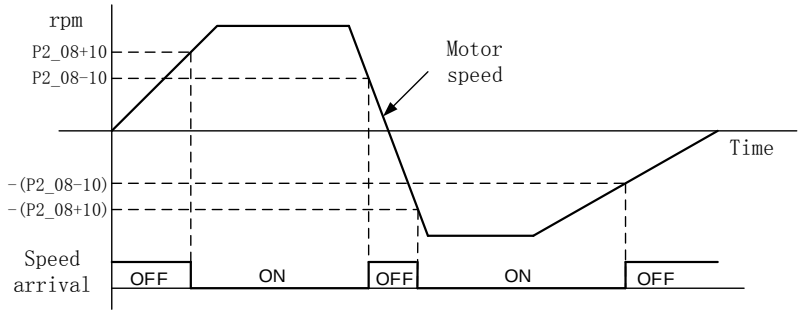
Once the speed command is greater than P2-07, regardless of the status of the ZCLAMP terminal, the speed mode is immediately returned and run as per the command.

Note☛

1. speed mode, this function is valid.
2. When the position is locked, if an external force compels the motor shaft to rotate, then when the external force is equal to or greater than the rated torque of the motor and continues, the drive will have overload or overcurrent fault.

P2-08	Arrival speed		Initial value	1000	Commu.addr.	0208H
			Unit	rpm	Valid time	Immediately
	Range	20~6000	Data size	16bit	Control mode	S

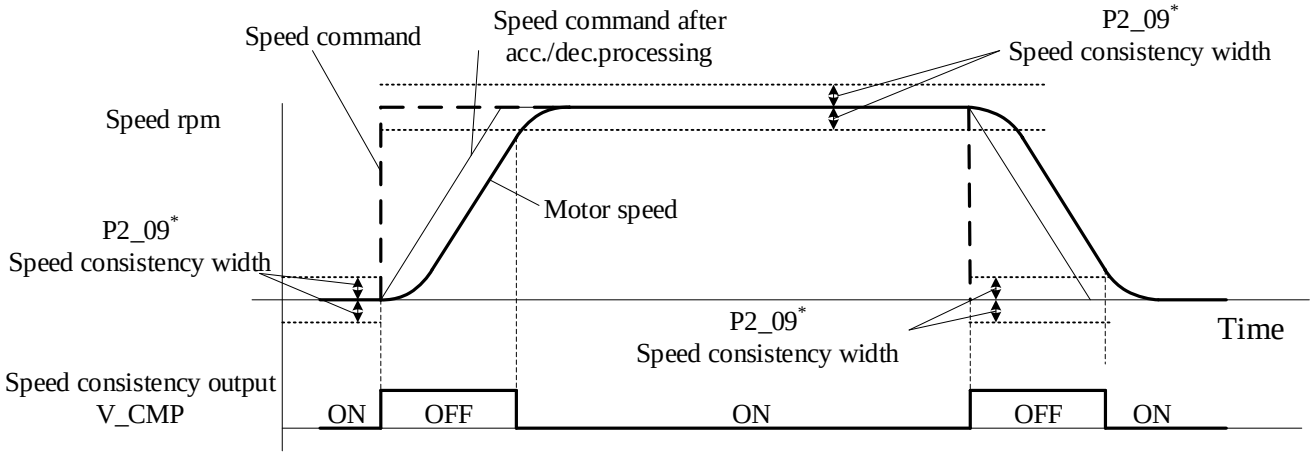
Parameter function: the setting exceeds the threshold of the signal output. When the motor speed reaches and exceeds this setting, the DO terminal, defined as V_CLS, is output valid.



Note **Because of the 10rpm hysteresis, the actual value of speed arrival signal is:**
The speed arrival output OFF→ON:P2_08+10rpm, ON-→OFF:P2.08-10rpm

P2-09	Speed consistency threshold		Initial value	10	Commu.addr.	0209H
			Unit	rpm	Valid time	Immediately
	Range	10~100	Data size	16bit	Control mode	S

Parameter function: when the given speed - the current speed < = P2-09, the DO terminal defined as V-CMP is output effective.



Note **Due to the 10rpm hysteresis, the actual detection width of speed uniformity**
Speed uniformity output OFF→ON：P2_09-10rpm ON→OFF：P2_09+10rpm

Important:
In the torque control mode, the reverse direction is defined as: the motor rotation direction is opposite to the torque direction. This may happen when an external force is pulling back

6.7 P3-xx Torque control parameter

P3-00	Torque given command source selection		Initial value	0	Commu.addr.	0300H
			Unit	-	Valid time	Immediately
	Range	0~9	Data size	16bit	Control mode	T

Parameter function: select the source of the torque command:
P3-00=0: torque P3-01 given, positive and negative symmetry;
P3-00=1: the torque P3-01 is given and the reverse direction is limited by P3-02;
P3-00=2: the torque P3-01 is given and the reverse direction is limited by AI1;
P3-00=3: the torque P3-01 is given and the reverse direction is limited by AI2;
P3-00=4: torque AI1 given, positive and negative symmetry;
P3-00=5: the torque AI1 is given and the reverse direction is limited by P3-02;
P3-00=6: the torque AI1 is given and the reverse direction is limited by AI2;
P3-00=7: torque AI2 given, positive and negative symmetry;
P3-00=8: the torque AI2 is given and the reverse direction is limited by P3-02;
P3-00=9: the torque AI2 is given and the reverse direction is limited by AI1;

Note Analog AI1、AI2 can be ±10V input, the setting value of P3-01 can be positive or negative, so the torque command direction depends on the multiplication of both.
There are many ways to change the motor torque output direction if there is only +10V analog input:

- Adjust by adjusting the status of the DI terminal defined as TDIR-SEL
- Adjust by modifying the plus and minus code of P3-01
- Adjust by modifying P0-01

P3-01	Digital torque setting		Initial value	100.0	Commu.addr.	0301H
			Unit	%	Valid time	Immediately
	Range	-350.0~350.0	Data size	16bit	Control mode	T

Parameter function: when in torque control mode, set the motor target torque size and direction, the reference is motor rated torque.

When analog input is used as torque given command source, this parameter can be understood as analog gain.

For example: P3-00=4, P3-01=200.0, then, when AI1 is 5V, the torque command is the 100% motor rated torque in the forward direction of the motor, AI1 is -10V, the torque command is the 200% motor rated torqu in the reverse direction of the motor.

P3-02	Opposite direction torque limit		Initial value	300.0	Commu.addr.	0302H
			Unit	%	Valid time	Immediately
	Range	0.0~350.0	Data size	16bit	Control mode	T

Parameter function: when torque control mode is set, the motor torque limit is set in the reverse direction.

When analog input is used as a reverse direction torque limit source, this parameter can be understood as analog gain.

Note☞ The reverse direction means that the direction of the motor rotation is opposite to the direction of the torque command.

P3-04	Torque command direction speed limit source		Initial value	0	Commu.addr.	0304H
			Unit	-	Valid time	Immediately
	Range	0~2	Data size	16bit	Control mode	T

Parameter function: in torque control mode, select the command source that limits the rotation speed of the motor

P3-04=0: limit by P3-05;
P3-04=1: limit speed by AI1;
P3-04=2: limit speed by AI2.

Note☞ When the speed limiting command is given by AI1\AI2，Speed limiting command $= \frac{AI1\backslash AI2}{10V} X\ P3-05$

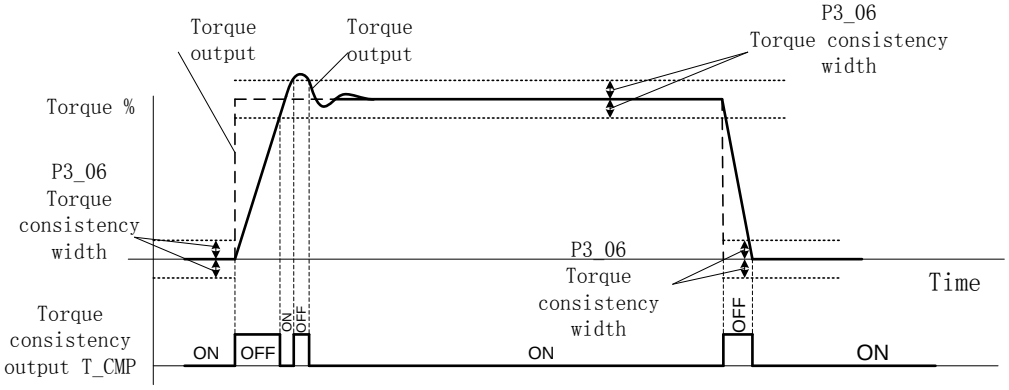
P3-05	In torque control mode, torque command direction speed limit value		Initial value	100	Commu.addr.	0305H
			Unit	rpm	Valid time	Immediately
	Range	0~10,000	Data size	16bit	Control mode	T

Parameter function: in torque control mode, set the speed limit in the direction of the torque command. When P3-04=1 and 2, this parameter can be considered as the analog gain.

Note☞ In torque mode, when the P0-05 (first torque limit source selection) is set to use AI1\AI2 to limit the torque and P3-04 (torque speed limit command source selection) set to use AI1\AI2 to limit the running speed of the motor, and select the same analog source (such as all AI1), then the analog speed limits not only speed but torque.

P3-06	Torque consistency threshold		Initial value	5.0	Commu.addr.	0306H
			Unit	%	Valid time	Immediately
	Range	3.0~100.0	Data size	16bit	Control mode	T

Parameters function: when [given torque - actual torque] is less than or equal to P3-06, DO terminal defined as the torque consistency (T_CMP) is valid.



Note☞ There is a hysteresis of 3%, hence, the actual detection width of the torque consistency:
Consistency output OFF→ON：P3_06-3%　　ON→OFF：P3_06+3%

6.8 P4-xx Gain parameters

P4-00	Gain adjustment mode		Initial value	1	Commu.addr.	0400H
			Unit	-	Valid time	Immediately
	Range	0~4	Data size	16bit	Control mode	P S T

Parameter function: select the mode of gain adjustment. The end number H indicates that the parameter is 16 decimal numbers. Please pay attention to the communication

P4-00=0: manual mode

The position loop and speed loop gain related parameters and load inertia ratio are set by the user.

When this mode is used, the control loop coefficient P4-14 is invalid.

When switching from automatic mode to manual mode, the gain parameter will maintain the value calculated in the original automatic mode.

• gain switching is valid only in this mode.

P4-00=1: semi-automatic adjustment mode (rigid table)

Suitable for occasions where the load inertia ratio is basically constant. Using this model, off-line inertia should be identified through AF-05 first, identification result will be automatically written to the P4-10 parameter and saved after it is successfully identified (if not convenient to carry out inertia identification, please fill in P4-10 the value basically consistent with the mechanical value).

Users need to select appropriate rigid value (P4-01) according to the mechanical situation, based on this value and the value of P4-10, the system will calculate the corresponding gain value of P4-10, P4-02, P4-03, P4-05, P4-29, these parameters are read only.

P4-00=2: auto tuning mode 1

suitable for frequently variable load inertia ratio (inertia ratio variables from a minimum to a maximum is tens seconds and above), using this model, load inertia variables are monitored by servo on real time, and every 30 minutes, the identification result will be written to P4-10 parameter.

Users need to select appropriate rigid value (P4-01) according to the mechanical situation, the system will automatically calculate the corresponding gain value of P4-02, P4-03, P4-05, P4-29 according to online identified inertia value each time, these parameters are read only.

P4-00=3: auto tuning mode 2

The same as the auto tuning mode 1, but it is suitable when the load inertia ratio variable is in seconds.

P4-00=4: auto tune mode 3

The same as the automatic adjustment mode 1, but it is suitable when the load inertia ratio variable is in milliseconds.

Please use manual mode in the following situations:

- While using the automatic mode, the effect is poor.
- The mechanical parts are not joint firmly, such as reverse clearance, and the mechanical rigidity is very low.
- The load inertia ratio is too large (over 20 times), or too small (less than 3 times), and the fluctuation of load inertia.
- There is a continuous low speed (less than 100RPM) operation, and not less than 100RPM and the acceleration time for not less than 2000rpm/s did not last for at least 50ms.
- The deceleration time is less than 2000rpm/s, and the deceleration torque is smaller than friction torque.

P4-01	Rigidity		Initial value	11*	Commu.addr.	0401H
			Unit	-	Valid time	Immediately
	Range	0~31	Data size	16bit	Control mode	P S T

Parameter function: select rigidity level.

The following table shows the relationship between the stiffness setting and the gain parameter. The higher the stiffness is, the faster the servo response is, but too large a oscillation may occur.

P4-01	P4-02	P4-03	P4-05	P4-29
	Position loop proportional gain 1/s	Speed loop proportional gain Hz	Speed loop integral time constant ms	Torque command low pass smoothing constant ms
0	2.0	1.5	370.00	15.00
1	2.5	2.0	280.00	11.00
2	3.0	2.5	220.00	9.00
3	4.0	3.0	190.00	8.00
4	4.5	3.5	160.00	6.00
5	5.5	4.5	120.00	5.00
6	7.5	6.0	90.00	4.00
7	9.5	7.5	70.00	3.00
8	11.5	9.0	60.00	3.00
9	14.0	11.0	50.00	2.00

P4-01	P4-02	P4-03	P4-05	P4-29
	Position loop proportional gain 1/s	Speed loop proportional gain Hz	Speed loop integral time constant ms	Torque command low pass smoothing constant ms
10	17.5	14.0	40.00	2.00
11	32.0	18.0	31.00	1.26
12	39.0	22.0	25.00	1.03
13	48.0	27.0	21.0	0.84
14	63.0	35.0	16.0	0.65
15	72.0	40.0	14.0	0.57
16	90.0	50.0	12.0	0.45
17	108.0	60.0	11.0	0.38
18	135.0	75.0	9.0	0.30
19	162.0	90.0	8.0	0.25
20	206.0	115.0	7.0	0.20
21	251.0	140.0	6.0	0.16
22	305.0	170.0	5.0	0.13
23	377.0	210.0	4.0	0.11
24	449.0	250.0	4.0	0.09
25	500.0	280.0	3.5	0.08
26	560.0	310.0	3.0	0.07
27	610.0	340.0	3.0	0.07
28	660.0	370.0	2.5	0.06
29	720.0	400.0	2.5	0.06
30	810.0	450.0	2.0	0.05
31	900.0	500.0	2.0	0.05

*：EA180-7R6-□□ and below model， the factory setting value is 13, above that ,11.

P4-02	Position loop gain		Initial value	48.0	Commu.addr.	0402H
			Unit	1/s	Valid time	Immediately
	Range	1.0~2000.0	Data size	16bit	Control mode	P

Parameter function: sett the gain of the position regulator APR_P, determine the response of the position control system.

The higher the APR_P set value is, the higher the position response is, the better the alignment of the position command is, and the smaller the position error is, the shorter the positioning setting time is. However, pleaseNote that the big value may cause vibration.

P4-03	Speed loop gain		Initial value	27.0	Commu.addr.	0403H
			Unit	Hz	Valid time	Immediately
	Range	0.1~5000.0	Data size	16bit	Control mode	P S

Parameter function: set the gain of the speed regulator ASR-P, determine the response of the speed control loop.

The greater ASR_P set value is, the higher speed loop response is, the better the speed command following. In order to improve the response performance of the servo system, it is necessary to increase the setting value of the speed loop gain. However, pleaseNote that set values may cause vibration.

The response of the speed loop must be 4~6 times higher than that of the position loop, otherwise it will cause vibration.

Position loop response frequency fp=APR_P/2л Speed loop response frequency fv=ASR_P x (P4_10)

P4-05	Speed loop integral time constant		Initial value	21.0	Commu.addr.	0405H
			Unit	ms	Valid time	Immediately
	Range	0.1~3000.0	Data size	16bit	Control mode	P

Parameter function: set the speed loop integral time constant. When the setting value is 3000, no integral action will be taken.

The smaller the set point, more near to 0 the deviation is when stop. However, setting too small can cause vibration.

In general, the larger the load inertia, the greater the integral time constant of the speed loop.

If the load inertia ratio P4-10 setting is in line with the actual situation, the speed loop integral time constant ASR_Ti can be

obtained by using the following formula: $ASR\_Ti \geq 5000 / 2\pi fv$

P4-06	Speed feedforward gain		Initial value	30.0	Commu.addr.	0406H
			Unit	%	Valid time	Immediately
	Range	0.0~100.0	Data size	16bit	Control mode	P

Parameter function: set speed, feed forward gain.

A speed command that comes out from the position command calculation; multiplied by the ratio of the parameter, the value is added to the speed command of position loop output.

When the position control command changes smoothly, increasing the gain can reduce the position following error and improve the position following.

When the position control command does not change smoothly, the mechanical vibration may happen and can be reduced by reducing this gain.

P4-07	Speed feedforward filtering time constant		Initial value	5	Commu.addr.	0407H
			Unit	ms	Valid time	Immediately
	Range	0~100	Data size	16bit	Control mode	P

Parameter function: set the first order inertial filtering time constant of the speed feed forward gain.

When the position control command changes smoothly, the position following deviations are fewer by reducing the filtering time.

When the position control commands do not change smoothly, increasing the filtering time can reduce the vibration of the mechanism, but the position following error will increase.

P4-08	Speed feedback low-pass filtering time constant		Initial value	0.00	Commu.addr.	0408H
			Unit	ms	Valid time	Immediately
	Range	0.00~20.00	Data size	16bit	Control mode	P S

Parameter function: set the time constant for the first order filtering of the speed feedback.

The motor rotating speed is obtained by differential calculation on the encoder feedback of position, the speed has resonance and high frequency interference signals, through this parameter, can eliminate the noise, but also will cause the delay, resulting in the slow response of the loop.

P4-10	The first negative inertia ratio		Initial value	2.50	Commu.addr.	040AH
			Unit	-	Valid time	Immediately
	Range	1.00~120.0	Data size	16bit	Control mode	P S T

Parameter function: set the ratio between the first total inertia and the rotor inertia of the motor.

JT: total inertia, that is, load inertia + electronic rotor inertia, JM: motor rotor inertia

When the inertia self identification function can be used, this parameter can be obtained by self identification of inertia. When setting, make sure that the set value is in line with the actual situation.

When manually setting the gain, the user needs to adjust the speed loop gain value automatically according to the operation of the machine. Therefore, if the accurate data is not known, the factory value can be used and ignore the adjustment of the parameter.

Note☞ If there is no more accurate load inertia ratio, vibration, abnormal sound or alarm, the following functions are turned on.
Acceleration feedback (P4-22, bit0)
Speed observer (P4-22, bit3)
Torque feedforward (P4-24, P4-25)
External disturbance resistance (P4-28)

P4-11	The second negative inertia ratio		Initial value	1.00	Commu.addr.	040BH
			Unit	-	Valid time	Immediately
	Range	1.00~120.0	Data size	16bit	Control mode	P S T

Parameter function: set the ratio between the motor second inertia and the rotor inertia of the motor.

You can switch the system to P4-11 using the function terminal J_SEL to switch immediately using the second load inertia ratio.

J_SELvalid	Use second load inertia ratioP4-11
J_SEL void	Use first load inertia ratio P4-10

When this function is invalid, the gain is adjusted automatically, i.e., P4-00=2, 3, and 4.

When switching to the second load inertia ratio:

If the P4-00=0, the drive will continue to use P4-02, P4-03, P4-05 and other gain parameters;

If P4-00=1, the drive will automatically calculate the new gain parameters based on the second inertia ratio and rigidity。

Note☞
1. **be sure to switch inertia when the servo motor is stopped, switch during the motor movement, vibration and oscillation will occur;**
2. **when the difference between the first and second inertia is greater, even in the case of motor stop, oscillation may occur, etc., please be sure to confirm the absence of vibration according to the actual situation, and then use this function.**

P4-12	PDFF control coefficient	Initial value	100	Commu.addr.	040CH

			Unit	%	Valid time	Immediately
	Range	0~100	Data size	16bit	Control mode	P

Parameter function: set 0 for IP controller, 100 for PI controller, 1~99 for PDFF controller.

When using the IP controller, the motor speed does not overshoot or overshoot is small, but the response will be slower.

When using the PI controller, the motor speed will overshoot, but the response is rapid.

The PDFF controller is a combination of IP and PI controllers to reduce overshoot and speed up system response. The closer the parameter is to 0, the stronger the effect of IP, and vice versa.

P4-13	**Low frequency rigidity adjustment coefficient**		Initial value	0.5	Commu.addr.	040DH
			Unit	-	Valid time	Immediately
	Range	0.5~1.0	Data size	16bit	Control mode	P S

Parameter function: this parameter is effective only when P4-00≠0, e.g. in the automatic gain adjustment mode is 1, 2, 3, 4. Used to increase speed loop gain when P4-01 cannot set non-higher. Its meaning is

$$\textbf{\textit{Speed loop gai}} = \frac{P4-03}{P4-13}$$

In the automatic adjustment mode, the increase of the setting value can increase the servo response in the low rigidity situation. However, the assembly has been set up to cause vibration.

P4-14	**Control loop coefficient**		Initial value	75	Commu.addr.	040EH
			Unit	-	Valid time	Immediately
	Range	10~100	Data size	16bit	Control mode	P S T

Parameter function: this parameter is valid only at P4-00=1 and 2, i.e., gain auto tuning modes 1 and 2. Used to determine the relationship between speed bandwidth and position bandwidth.

This parameter is based on the automatic control theory, that is, the speed bandwidth should be at least 4 times of the position bandwidth. Generally, do not need to adjust.

P4-15	**Gain switching condition**		Initial value	00H	Commu.addr.	040FH
			Unit	-	Valid time	Immediately
	Range	00H~18H	Data size	16bit	Control mode	P S T

Parameter function:

When P4-00=0, that is, the gain adjustment mode is manual mode, select the gain switching condition.

When P4-00≠ 0, the automatic gain adjustment mode, the function is invalid.

The number end H indicates that the parameter is hexadecimal numbers. Please pay attention to the communication.

P4-15 =0*H: only the position loop gain and the speed loop gain are switched;
P4-15 =00H: turn off the gain switch function;
P4-15 =01H: when DI terminal that is set for (GAIN_SEL) is changed OFF→ON;
P4-15 =02H: in position control mode, the position deviation is greater than the setting value of parameter P4-18 (with 100 ppr command unit lag);
P4-15 =03H: in position control mode, when the speed command is greater than the setting value of parameter P4-18 (there is 10rpm lag);
P4-15 =04H: the servo motor rotates at a speed greater than the setting value of P4-18 (with a 10rpm lag);
P4-15 =05H: the DI terminal defined as gain switching (GAIN_SEL) ON - OFF is invalid;
P4-15 =06H: in position control mode, the position deviation is less than the setting value of parameter P4-18 (with 100ppr command unit lag);
P4-15 =07H: in position control mode, when the speed command is less than the setting value of parameter P4-18 (there is 10rpm lag);
P4-15 =08H: servo motor rotation speed is less than the setting value of parameter P4-18 (with 10rpm lag);
P4-15 =1*H: only switch the speed loop integral, PI--->P, that is, the speed loop integral action is eliminated
P4-15 =10H: switch off the integral switching function, the speed loop integral is always valid;
P4-15 =11H: DI terminal is defined as gain switching (GAIN_SEL), OFF-→ON;
P4-15 =12H: in position control mode, the position deviation is greater than the setting value of parameter P4-18 (with 100ppr command unit lag);
P4-15 =13H: in position control mode, when the speed command is greater than the setting value of parameter P4-18 (there is 10rpm lag);
P4-15 =14H: the servo motor rotates at a speed greater than the setting value of the parameter P4-18 (with 10rpm lag);
P4-15 =15H: the DI terminal defined as gain switching (GAIN_SEL) ON - OFF is invalid.
P4-15 =16H: in position control mode, the position deviation is less than the setting value of parameter P4-18 (with 100ppr command unit lag);
P4-15 =17H: in position control mode, when the speed command is less than the setting value of parameter P4-18 (there is 10rpm lag)
P4-15 =18H: servo motor rotation speed is less than the setting value of parameter P4-18 (with 10rpm lag).

Note☛
1. **see the commands in section 6.9.4**
2. **with a lag, the actual value: when condition is met: P4_18+ lag value; the condition not satisfied: P4_18 - lag value**

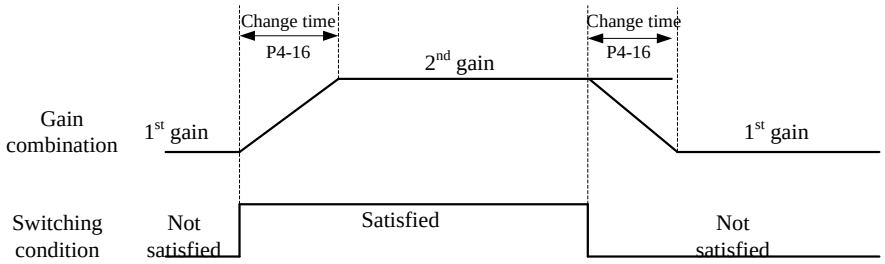
P4-16	**Gain switching change time**	Initial value	5	Commu.addr.	0410H
		Unit	ms	Valid time	Immediately

Parameter function: when the gain switching condition is satisfied, the gain varies linearly over time to the target gain (0: turn off this function). Refer to Figure 5-15.

P4-18	Gain switching threshold		Initial value	100	Commu.addr.	0412H
			Unit	Pulse\Kpps\rpm	Valid time	Immediately
	Range	0~32767	Data size	16bit	Control mode	P S

Parameter function: set the threshold for gain switching, based on the P4-15 setting

- When the motor stops, switch to low gain to suppress vibration and sharp noise
- When the motor stops, switch to higher gain in order to increase the rigidity of servo.
- When the motor is running, switch to higher gain to obtain better command following performance and smaller positioning time.
- According to the load equipment operation, switch different gain to obtain the optimal control.



When the switching condition is satisfied, the gain is switched to the second gain. If the switching condition is not satisfied during the second gain operation, the gain is switched to a first gain.

When switching, the current gain combination is linearly smoothed to the target gain combination according to the setting time of the parameter P4-16, and each parameter in the combination changes simultaneously to avoid sudden change of parameters and cause mechanical impact. Once the switch is started, the handover is completed even after the switching condition is changed and the switching condition is re determined after completion of the handover.

P4-19	Second position loop gain change coefficient		Initial value	50	Commu.addr.	0413H
			Unit	%	Valid time	Immediately
	Range	10~500	Data size	16bit	Control mode	P

Parameter function: when the gain switching condition is satisfied, the proportional gain of the target position adjuster is proportional to the gain.

Target position regulator proportional gain APR_P1=APR_R x (P4_19) x 100%

P4-20	Second speed loop gain change coefficient		Initial value	50	Commu.addr.	0414H
			Unit	%	Valid time	Immediately
	Range	10~500	Data size	16bit	Control mode	P S

Parameter function: the variable ratio of the target speed regulator proportional gain when the gain switching condition is satisfied.

Target speed regulator proportional gain ASR_P1=ASR_P X (P4-20) X 100%

P4-22	Inhibit performance expansion 1		Initial value	000000B	Commu.addr.	0416H
			Unit	-	Valid time	Immediately
	Range	000000B~111111B	Data size	16bit	Control mode	P S

Parameter function: Advanced inhibit function switch.

bitX=0：function closed
bitX=1：function opened

Bit0: acceleration feedback function

The acceleration feedback function is to use the motor speed feedback signal by differential operation to obtain the acceleration, then multiply the acceleration feedback gain to compensate the torque command function. Use it to suppress the shock of the speed loop.

This function can make the servo system stable when the motor and the mechanical system are connected elastically and the load inertia is much greater than the system of motor inertia. When the vibration of the 50~150Hz occurs.

When in the use of automatic gain mode (P4-00≠ 0), torque control mode, the function is invalid.

Bit1: reserved

Bit2: reserved
Bit3: reserved.
Bit4: speed obverse function
Bit5: low noise mode
With this function, the gain of the current loop is reduced and noise can be improved

P4-23	Speed observer cutoff level		Initial value	13	Commu.addr.	0417H
			Unit	-	Valid time	Immediately
	Range	0~13	Data size	16bit	Control mode	P S

Parameter function: sets the cut-off level of the built-in speed observer.
The higher the set value, the higher the cut-off frequency of the speed observer, the wider the range of vibration suppression, but the suppression intensity will be reduced.

P4-24	Torque feedforward gain		Initial value	0.0	Commu.addr.	0418H
			Unit	%	Valid time	Immediately
	Range	0.0~200.0	Data size	16bit	Control mode	P S

Parameter function: set the acceleration feedforward gain value.
The acceleration torque is obtained by differentiating the speed command, multiplying the parameter and then adding it to the torque command of the speed regulator by The response of the motor can be accelerated.
The reference is rated torque.
When in the use of automatic gain mode (P4-00 ≠ 0), torque control mode, the function is invalid.

P4-25	Torque feedforward filter time constant		Initial value	5	Commu.addr.	0419H
			Unit	ms	Valid time	Immediately
	Range	0~100	Data size	16bit	Control mode	P S

Parameter function: the time constant of the first-order low-pass filtering of the acceleration torque,
the acceleration torque obtain by differential speed command contains a large number of higher harmonics. When it is superimposed on the torque command, it will cause high frequency vibration of the motor torque. After the low pass filtering of the acceleration torque, and multiplying it to the torque command, the high frequency harmonic can be eliminated and the vibration can be reduced.

P4-28	External disturbance resistance gain		Initial value	0.0	Commu.addr.	041C
			Unit	%	Valid time	Immediately
	Range	-100.0~100.0	Data size	16bit	Control mode	P S

Parameter function: disturbance compensation after the external disturbance. Used to reduce the speed variations against the load disturbances. Its meaning is:
The torque after compensation = the torque before compensation + the observed disturbance *P4-28
When the disturbance disappears, the compensated torque will be withdrawn immediately.
When in the the use of automatic gain mode (P4-00 ≠ 0), torque control mode, the function is invalid.

P4-29	Torque command low pass smoothing constant		Initial value	1.26	Commu.addr.	0410
			Unit	ms	Valid time	Immediately
	Range	0.00~100.00	Data size	16bit	Control mode	P S T

Parameter function: set the time constant of the first-order low-pass filter for the torque command output by the speed regulator.
The torque command output by the speed regulator may contain higher harmonic components, which in turn leads to vibration of the motor. Low pass filtering can eliminate high harmonics, but cause phase delay and slow down the motor response.

P4-30	Friction compensation smoothing time constant		Initial value	50	Commu.addr.	041E
			Unit	ms	Valid time	Immediately
	Range	10~1000	Data size	16bit	Control mode	P S

Parameter function: First order filtering is applied to the friction compensation value, avoid the abrupt change of compensation value to cause mechanical vibration.
The friction compensation value includes the values set by the three parameters of P4-31, P4-32, P4-33 and P4-34.

P4-31	Viscous friction compensation gain		Initial value	0	Commu.addr.	041F
			Unit	0.1%/1000rpm	Valid time	Immediately
	Range	0~1000	Data size	16bit	Control mode	P S

Parameter function：Setting torque compensation value of viscous friction load.
The greater the speed, the greater the viscous friction, early superposition of viscous friction loads brings about higher response. The setting value means that the torque command value required for the increase of motor speed by each 1000rpm.,
Please see P4-34

P4-32	Torque command added value		Initial value	0.0	Commu.addr.	0420H
			Unit	%	Valid time	Immediately
	Range	-100.0~100.0	Data size	16bit	Control mode	P S T

Parameter function: for vertical axis occasions，there is always gravity, you can convert this value to a given torque and add it to the torque command set. Please refer toP4-34

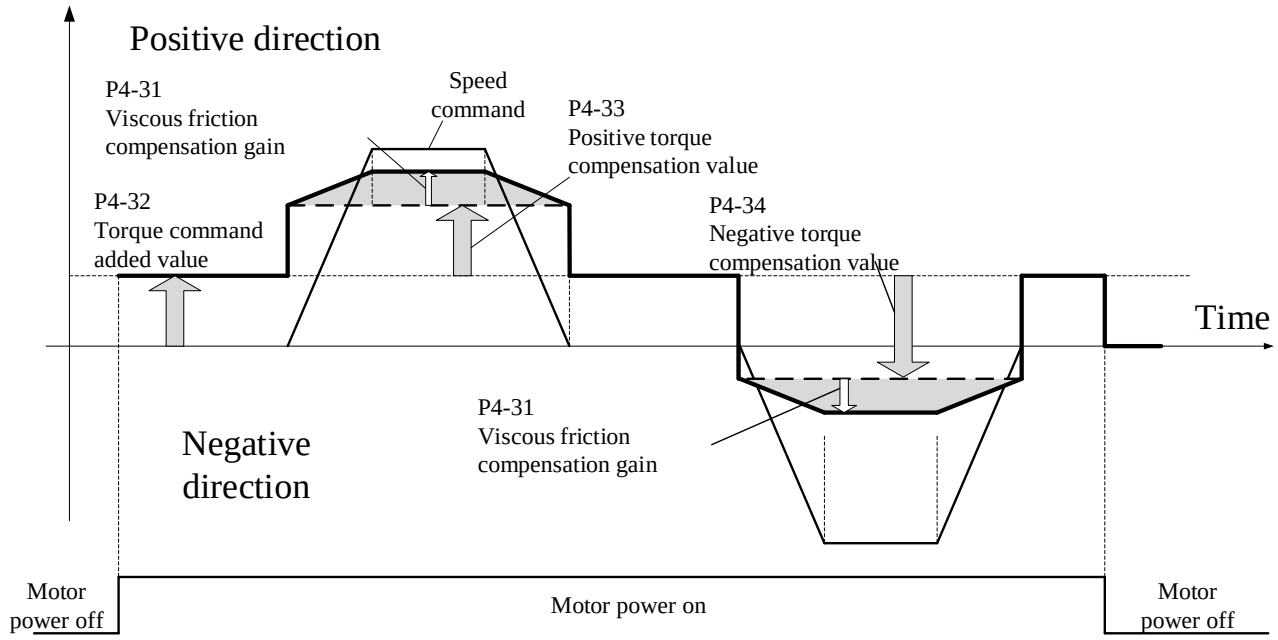
P4-33	Forward torque compensation		Initial value	0.0	Commu.addr.	0421H
			Unit	%	Valid time	Immediately
	Range	-100.0~100.0	Data size	16bit	Control mode	P S T

Parameter function: the sliding friction compensation value of the motor when it rotates forward

Please see P4-34

P4-34	Reverse torque compensation		Initial value	0.0	Commu.addr.	0422H
			Unit	%	Valid time	Immediately
	Range	-100.0~100.0	Data size	16bit	Control mode	P S T

Parameter function: the friction compensation value of the motor in reverse rotation



6.9 P5-xx Vibration suppression parameter

P5-00	Adaptive filter mode setting		Initial value	0	Commu.addr.	0500H
			Unit	-	Valid time	Power on again
	Range	0~2	Data size	16bit	Control mode	P S T

Parameter function: select the mode of adaptive filter.

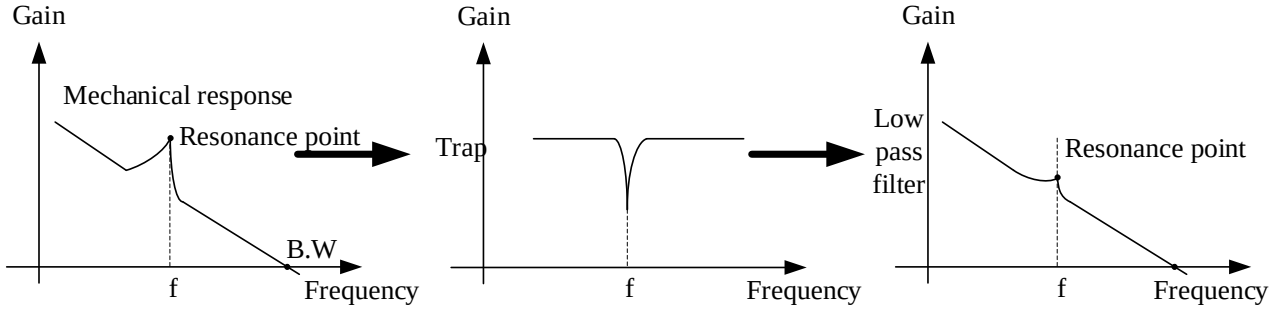
P5-00=0: manually set 4 trap devices

P5-00=1: trap 3 and trap 4, automatically adjust the depth on the line, width manually set

P5-00=2: clear trap 3 and trap 4

If the resonance occurs in the operation of the mechanical system, it is possible that the servo system has big rigidity and the response is too fast. The reduction of the gain may be improved, but the response speed of the system will be reduced. To suppress mechanical resonances without changing the gain, EA180 servo drive provides two solutions for low-pass filtering of the command pulse (P1-15 setting) and trap.

The principle of vibration suppression is to use the notch filter to restrain the resonance peak of mechanical response:



P5-01	Automatic vibration suppression, detection, quasi sensitivity		Initial value	100	Commu.addr.	0501H
			Unit	-	Valid time	Immediately
	Range	10~30000	Data size	16bit	Control mode	P S T

Parameter function: sets the amplitude of the speed error. When the resonance occurs, the velocity will oscillate. At the resonance point, the oscillation frequency approaches the normal distribution. If the oscillation width is greater than the parameter setting, it can be considered as a resonance point.

P5-02	1st notch frequency		Initial value	5000	Commu.addr.	0502H
			Unit	Hz	Valid time	Power on again
	Range	50~5000	Data size	16bit	Control mode	P S T

Parameter function: setting the center frequency of the first notch filter to 5000, the notch filter is invalid.

P5-03	1st notch width		Initial value	2	Commu.addr.	0503H
			Unit	-	Valid time	Power on again
	Range	0~20	Data size	16bit	Control mode	P S T

Parameter function: first notch width, the greater the value, the greater the center frequency is suppressed.

P5-04	1st notch depth		Initial value	0	Commu.addr.	0504H
			Unit	dB	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: 1st notch depth, the smaller the value, the greater the point is suppressed.

P5-05	2nd notch frequency		Initial value	5000	Commu.addr.	0505H
			Unit	Hz	Valid time	Power on again
	Range	50~5000	Data size	16bit	Control mode	P S T
P5-06	2nd notch width		Initial value	2	Commu.addr.	0506H
			Unit	-	Valid time	Power on again
	Range	0~20	Data size	16bit	Control mode	P S T
P5-07	2nd notch depth		Initial value	0	Commu.addr.	0507H
			Unit	dB	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: Set second trap.

P5-08	**3rd notch frequency**		Initial value	5000	Commu.addr.	0508H
			Unit	Hz	Valid time	Power on again
	Range	50~5000	Data size	16bit	Control mode	P S T
P5-09	**3rd notch width**		Initial value	2	Commu.addr.	0509H
			Unit	-	Valid time	Power on again
	Range	0~20	Data size	16bit	Control mode	P S T
P5-10	**3rd notch depth**		Initial value	0	Commu.addr.	050AH
			Unit	dB	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: Set the 3rd trap

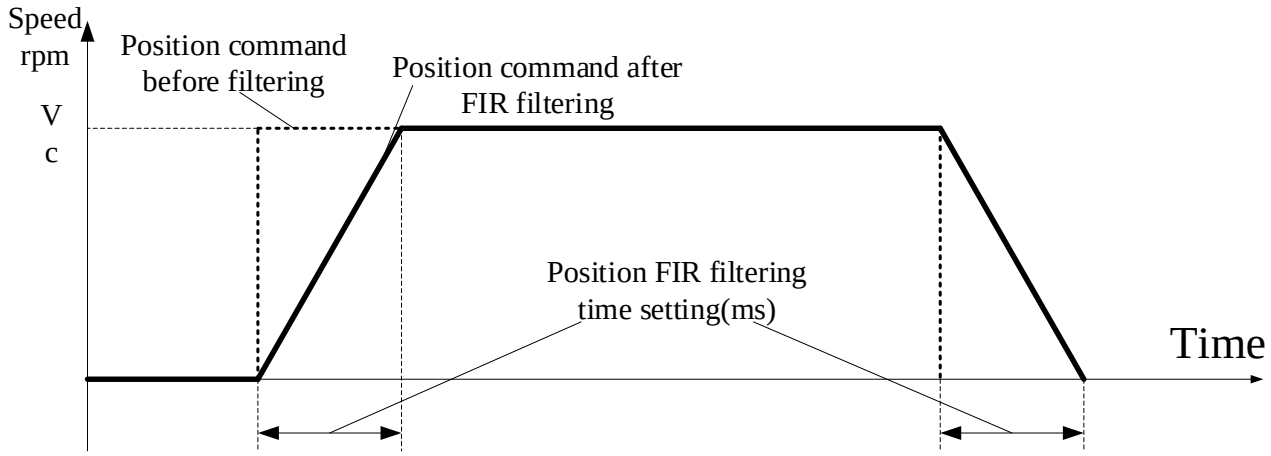
P5-11	**4th notch frequency**		Initial value	5000	Commu.addr.	050BH
			Unit	Hz	Valid time	Power on again
	Range	50~5000	Data size	16bit	Control mode	P S T
P5-12	**4th notch width**		Initial value	2	Commu.addr.	050CH
			Unit	-	Valid time	Power on again
	Range	0~20	Data size	16bit	Control mode	P S T
P5-13	**4th notch depth**		Initial value	0	Commu.addr.	050DH
			Unit	dB	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: Set the 4th trap

P5-23	**Position FIR filter**		Initial value	0.0	Commu.addr.	0517
			Unit	ms	Valid time	Immediately
	Range	0.0~128.0	Data size	16bit	Control mode	P S T

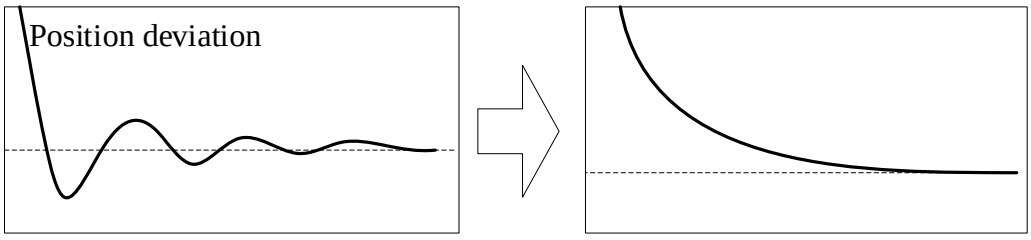
Parameter function: set the time constant of position FIR filter.

The square wave position command corresponding to the target speed is Vc, and the setting value of the position FIR filter can be understood as the arrival time of Vc.



The device can use the position FIR filter to suppress vibration during the whole movement, especially when the vibration occurs at time of the deceleration stop.

The following diagram shows the effect of using the FIR filter.



Usage method：

Determine the vibration waveform, calculate the vibration cycle and turn to MS units, enter P5-23.

6.10 P6-xx I / O parameters

P6-00	**DI filter time**		Initial value	2	Commu.addr.	0600H
			Unit	ms	Valid time	Immediately
	Range	0~20	Data size	16bit	Control mode	P S T

Parameter function: set the filtering time of DI terminal.

When the external interference is strong, the filter time can be set for the DI terminal in order to prevent external interference. Its meaning is that the signal of the DI terminal must be maintained over the time set by the P6-00 so that the drive can confirm if the the state of DI changes (OFF -→ON or ON -→ OFF).

For example, when P6-00 is set to 2, then the signal of the DI terminal must last until 2ms before it is recognized as a state change by the drive. For edge trigger, it means that if a pulse signal is used, then the pulse width must be at least greater than 2ms. See figure P6-01

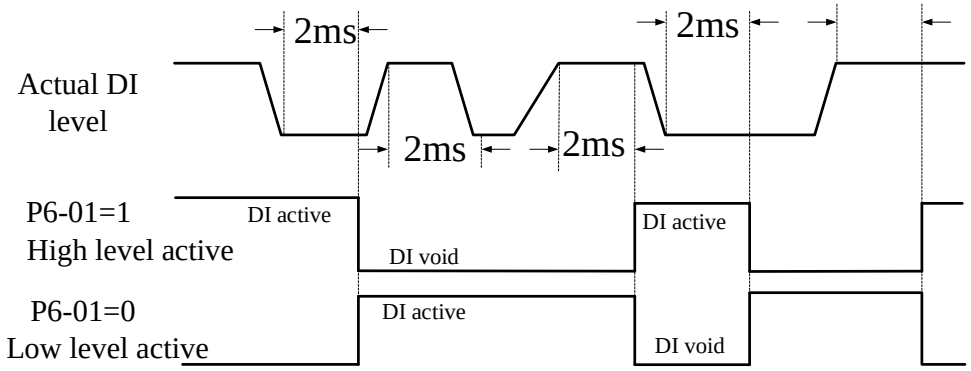
P6-01	**DI level logic**		Initial value	00000000B	Commu.addr.	0601H
			Unit		Valid time	Immediately
	Range	00000000B~11111111B*	Data size	16bit	Control mode	P S T

Parameter function: setting the level logic of each DI terminal in a stop state, effective when power on again.

0 0 0 0 0 0 0 0

DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1

8 ways of DI can be set separately, for one bit, bitX=0, the external input low level is valid; if bitX=1, the external input high level is valid.



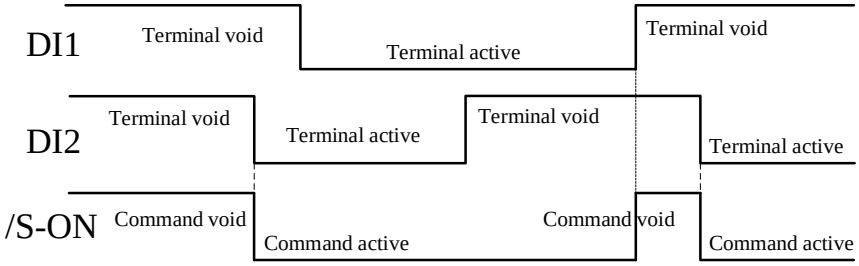
*: The number end B indicates that the parameter is binary. Please pay attention to the communication.

Note☞ **If you want to enable the corresponding terminals by communication, use the P6-10 parameter. (using this parameter may cause drive memory corruption)**

P6-02	**DI1 function selection**		Initial value	1*	Commu.addr.	0602H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-03	**DI2 function selection**		Initial value	2*	Commu.addr.	0603H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-04	**DI3 function selection**		Initial value	13*	Commu.addr.	0604H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-05	**DI4 function selection**		Initial value	14*	Commu.addr.	0605H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-06	**DI5 function selection**		Initial value	3*	Commu.addr.	0606H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-07	**DI6 function selection**		Initial value	12*	Commu.addr.	0607H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-08	**DI7 function selection**		Initial value	20*	Commu.addr.	0608H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-09	**DI8 function selection**		Initial value	21*	Commu.addr.	0609H
			Unit		Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: setting the function of DI1~DI8 terminal, see Table 5-5. 8 DI corresponding function settings, you can set the range of 0~99, but the current part is reserved.

Different DI can set the same function number, the corresponding logical relationship is OR, e.g. when the D1 or D2 is valid, the corresponding function will happen. For example, P6-02=1, P6-03=1, when one of DI1 and DI2 is valid, servo ON; when two are invalid, servo OFF.



*：When the servo drive is first set to a different operating mode, i.e., when the P0-00 parameter setting value changes, the initial value of the DI terminal selection parameter changes.

The following table shows the default terminal function for different P0-00 setting:

Function parameter	P0-00 = 0	Function parameter	P0-00 = 0
P6-02（DI1）	1	1	1
P6-03（DI2）	2	2	2
P6-04（DI3）	13	13	13
P6-05（DI4）	14	14	14
P6-06（DI5）	5	3	0
P6-07（DI6）	6	12	19
P6-08（DI7）	7	20	0
P6-09（DI8）	8	21	0

Note☛ When the servo drive is set to a mixed operation mode, i.e., the P0-00 parameters are 3, 5, 6, 7, 8, and even the initial setting, the setting function of the DI terminal is not changed.

Table 5-5 digital input (DI) function definition table

Setting value	Name	Function code	Description		Trigger mode	Running mode
0	Disabled	Terminal invalid				
1	S-ON	Servo enabled	ON: servo enable	OFF: Servo enable canceled	Level	P S T
2	ALM-RST	Alarm and Fault Reset	OFF → ON: fault reset			P S T
3	P-CLR	Position deviation counter cleared	See the definition of trigger P1-16			P
4	DIR-SEL	Speed command direction selection	ON: Reverse speed command	Level trigger	Level	S
5	CMD0	Internal command bit0	When multi-position control mode, the signal is a multi-position switching function; When the multi-speed control mode, the signal is a multi-speed switching function;		Level	P S
6	CMD1	Internal command bit1			Level	P S
7	CMD2	Internal command bit2			Level	P S
8	CMD3	Internal command bit3			Level	P S
9	CTRG	Internal command trigger	Multi-position trigger			P
10	MSEL	Control mode switch	Control mode switching, meaning of ON / OFF refers to description of P0-00			P S T
11	ZCLAMP	Speed command zero fixed enable	ON: Zero fixing function is enabled	OFF: Function invalid	Level	S
12	INHIBIT	Pulse is forbidden	ON-Prohibit command pulse input	OFF: allow pulse input	Level	P
13	P-OT	Prohibit forward drive	ON-Prohibit forward drive	OFF- allow forward drive	Level	P S T
14	N-OT	Prohibit reverse drive	ON- prohibit reverse drive	OFF- allow reverse drive	Level	P S T
15	GAIN_SEL	Gain switching	ON: Use the second gain	OFF: using the first gain	Level	P S T
16	J_SEL	Inertia switch	ON: The second inertia ratio P4-11			P S T
17	JOG_P	Positive jogging	OFF: using a first inertia ratio P4-10		Level	S

Setting value	Name	Function code	Description	Trigger mode	Running mode
18	JOG_N	Negative jogging	ON: Jog forward / OFF: No function	Level	S
19	TDIR-SEL	Torque command direction selection	ON: reverse jog operation / OFF: No function	Level	T
20	GNUM0	Electronic Gear Ratio Selection 0	GNUM1=0, GNUM0=0, CODE=P1-04	Level	Level
21	GNUM1	Electronic gear ratio numerator selection 1	GNUM1=0, GNUM0=1, CODE=P1-08 GNUM1=1, GNUM0=0, CODE=P1-10 GNUM1=1, GNUM0=1, CODE=P1-12	Level	P
22	ORGP	External detector input	Rising edge: The external detector is active Falling edge: External detector is invalid	Edge	P S T
23	SHOM	Homing return	OFF→ON：Start homing function	Edge	P S T
24	TL2	External torque limit	ON- External torque limit is enabled OFF- external torque limit prohibit	Level	P S T
25	EMGS	Emergency stop	ON：Emergency stop / OFF: No function	Level	P S T
33	PDIR_SEL	Position command direction selection		Level	P

P6-10	DIThe input is forcibly valid		Initial value	00000000B	Commu.addr.	060AH
			Unit	-	Valid time	Immediately
	Range	00000000B~11111111B	Data size	16bit	Control mode	P S T

Parameter function: make the DI terminal forcibly valid

*: at the end of the numer B, stands for binary. Please pay attention to it when communicating.

When bitX=1, the DI terminal corresponding to the bit is valid, and the function corresponding to the DI terminal is enabled.

Note☛

1. **When using communication to control the drive, if you want to simulate the DI terminal switch, please rewrite this parameter to proceed.**
2. **When the servo power is restarted, the parameter content is automatically cleared.**

P6-11	DO On-off logic		Initial value	0000B	Commu.addr.	060BH
			Unit	-	Valid time	Immediately
	Range	0000B~1111B	Data size	16bit	Control mode	P S T

Parameter function: setting the logic of the 4 DO output terminal in a stop state, effective after power on again.

0 0 0 0

DO4 DO3 DO2 DO1

BitX=0: this bit corresponds to the DO terminal, conductive when the event is valid

BitX=1: this bit corresponds to the DO terminal, cut off when the event is valid.

P6-12	DO1 function selection		Initial value	1	Commu.addr.	060CH
			Unit	-	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-13	DO2 function selection		Initial value	2	Commu.addr.	060DH
			Unit	-	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-14	DO3 function selection		Initial value	8	Commu.addr.	060EH
			Unit	-	Valid time	Power on again
	Range	0~99	Data size	16bit	Control mode	P S T
P6-15	DO4 function selection		Initial value	12	Commu.addr.	060FH
			Unit	-	Valid time	不可修改
	Range	0~99	Data size	16bit	Control mode	P S T

Parameter function: sets the event corresponding to each way of DO, as shown in Table 5-6.

When the corresponding event occurs, the DO output terminal corresponding to the event is valid.

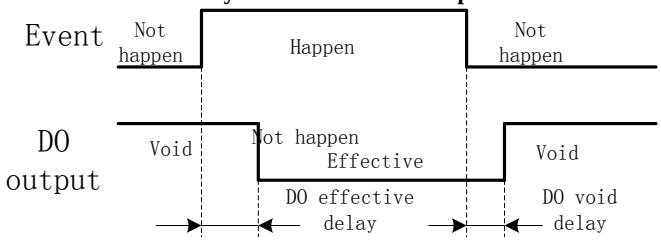
If P6-12=1, if the servo is ready, the DO1 terminal output is valid (P6-11, bit0=0, DO1 terminal conductive, P6-11 bit0=1,DO1 terminal cut off).

Table 5-6 digital output (DO) function definition table

Setting	Code	Name	Description	Running mode
0	Disable	Terminal void		
1	S-RDY	Servo ready	Effective - servo ready, the S-ON command can be received Invalid - servo is not ready, the S-ON command can not be received	P S T
2	BK	Brake Control	Effective - releasing the holding brake (brake power on) Invalid - closing the holding brake (brake power off)	P S T
3	TGON	Motor rotation	Effective - the motor is rotating Invalid - motor stops rotating	P S T
4	ZER0	Motor zero speed	Effective - the motor speed is zero Invalid - motor speed is not zero	P S T
5	V-CLS	Speed arrival	Effective: speed control, the actual motor speed at or above the set value of P2-08.	S
6	V-CMP	The same speed	Effective: speed control, the absolute value of the difference between the actual speed and the motor speed command value is less than Set value of P2-09	S
7	PNEAR	Position near	Effective: position control, the position deviation pulse number is smaller than the setting value of P1-23 position near.	P
8	COIN	Positioning is completed	Effective: position control, the position deviation pulse number is smaller than the setting value of P1-24 and should satisfy the condition of P1-22	P
9	C-LT	Torque limit	Effective - the motor torque is limited Invalid - the motor torque is not limited	P S
10	V-LT	Speed limit	Effective - motor speed is limited Invalid - motor speed is not limited	T
11	WARN	Warning output	Effective: warning event occurs Invalid: No warning event	P S T
12	ALM	Alarm output	Effective: the occurrence of an alarm event Invalid: No alarm event	P S T
13	Tcmp	The same torque	Effective: the output torque of the motor reaches at a given value Invalid: the motor output torque is less than a given value	T
14	Home	Homing completed	Effective: Homing is finished Invalid: Homing has not yet been finished	P S T

P6-16	**DO1 effective delay**		Initial value	0	Commu.addr.	0610H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-17	**DO1 invalid delay**		Initial value	0	Commu.addr.	0611H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-18	**DO2 effective delay**		Initial value	0	Commu.addr.	0612H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-19	**DO2 invalid delay**		Initial value	0	Commu.addr.	0613H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-20	**DO3 effective delay**		Initial value	0	Commu.addr.	0614H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-21	**DO3 invalid delay**		Initial value	0	Commu.addr.	0615H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-22	**DO4 effective delay**		Initial value	0	Commu.addr.	0616H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T
P6-23	**DO4 invalid delay**		Initial value	0	Commu.addr.	0617H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P S T

Parameter function: set the effective and invalid delay time for each DO output.



P6-24	DO Forced output		Initial value	0000B	Commu.addr.	0618H
			Unit	-	Valid time	Immediately
	Range	0000B~1111B*	Data size	16bit	Control mode	P S T

Parameter function:
0: depends on the function state; 1: forcibly valid.

0 0 0 0
DO4 DO3 DO2 DO1

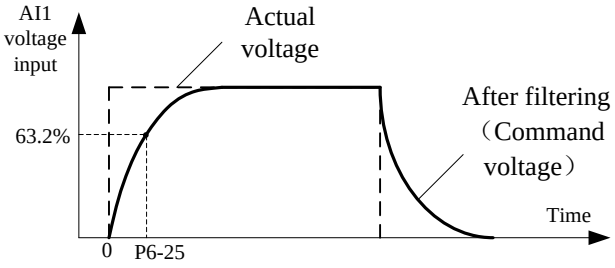
*: at the end of the numer B, this parameter is binary. Please pay attention when communicating.
BitX=1, the output of the DO terminal corresponding to this bit is valid。

Note☞
1. this function can test whether the connection between the DO output of the drive and the external device is intact when the servo is not enabled.
2. when the servo power is restarted, the parameter content is automatically cleared.

P6-25	AI1 filter time		Initial value	10	Commu.addr.	0619H
			Unit	ms	Valid time	Immediately
	Range	0~10000	Data size	16bit	Control mode	P S T
P6-26	AI2 filter time		Initial value	10	Commu.addr.	061AH
			Unit	ms	Valid time	Immediately
	Range	0~10000	Data size	16bit	Control mode	P S T

Parameter function: set the first-order low-pass filter time constant of AI1 and AI2 analog input respectively.

First order low-pass filtering for AI1 and AI2 input analog can reduce the analog fluctuation caused by external electromagnetic interference and delay the vibration caused by analog mutation. But with too much adjustment, the system will slow down.



P6-27	AI1 hysteresis		Initial value	2	Commu.addr.	061BH
			Unit	-	Valid time	Immediately
	Range	0~300	Data size	16bit	Control mode	P S T
P6-28	AI2 hysteresis		Initial value	2	Commu.addr.	061CH
			Unit	-	Valid time	Immediately
	Range	0~300	Data size	16bit	Control mode	P S T

Parameter function: set the hysteresis level of AI1 and AI2 analog input respectively.

When using analog to regulate speed or torque, even if the analog input remains unchanged, due to electromagnetic interference and internal sampling circuit, analog actually detected by the drive may fluctuate, therefore cannot obtain the stable speed or torque. This situation can be improved by tuning this parameter.

Usage method:

When externally given a constant analog signal (non-zero, suggest more than 1V), monitor the value of d0-14 (AI1 channel) and d0-15 (AI2 channel), if there is not acceptable fluctuation, can increase the value of P6-27 (AI1 channel) and P6-28 (AI2 channel), to make the monitoring value no longer fluctuating.

Note☞
The greater the hysteresis, it means that the speed or torque command will show greater step, that may not be adjusted to a specific value of the speed or torque by analog.
For example, when the hysteresis coefficient is 4, it is possible to adjust the speed command to 100RPM or 102rpm, while the intermediate 101rpm is not available.

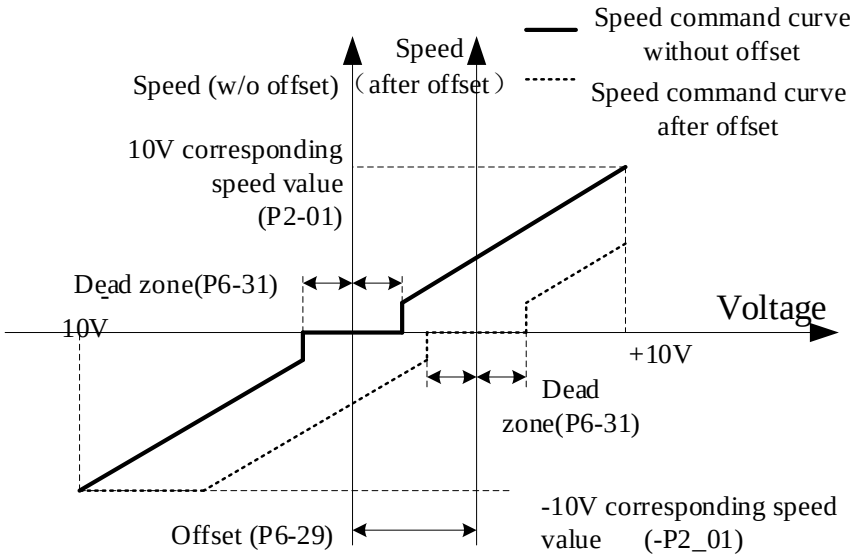
P6-29	AI1 offset		Initial value	0	Commu.addr.	061DH
			Unit	mV	Valid time	Immediately
	Range	-3000~3000	Data size	16bit	Control mode	P S T
P6-30	AI2 offset		Initial value	0	Commu.addr.	061EH
			Unit	mV	Valid time	Immediately
	Range	-3000~3000	Data size	16bit	Control mode	P S T

Parameter function: set the bias voltage of AI1 and AI2 analog input respectively.

Because of the circuit, the external analog may have a certain DC bias voltage. For example, when the external given is 5V, it is possible that the display voltage of the drive is 5.2V. This can be corrected by this parameter.

Usage method:

Measure the actual voltage given by AI1, AI2, and then check the values shown by d0-14 and d0-15. The difference is XmV, and the deviation can be cleared by setting P6-29 and P6-30 as X.



P6-31	AI1 dead zone		Initial value	10	Commu.addr.	061FH
			Unit	mV	Valid time	Immediately
	Range	0~3000	Data size	16bit	Control mode	P S T
P6-32	AI2 dead zone		Initial value	10	Commu.addr.	0620H
			Unit	mV	Valid time	Immediately
	Range	0~3000	Data size	16bit	Control mode	P S T

Parameter function: set dead zone range of AI1, AI2 analog input,

Because of the circuit and the environment, there is a zero drift in the analog quantities. This parameter is used to set the loop width and will be handled by 0V as the external analog gives the actual value within this range.

For example, when the P6-31 is set to 50, then the actual analog voltage passed through the AI1 is in the range -50mV to +50mV, and will be handled by 0V.

P6-33	AI1 zero drift		Initial value	0	Commu.addr.	0621H
			Unit	mV	Valid time	Immediately
	Range	-2000~2000	Data size	16bit	Control mode	P S T
P6-34	AI2 zero drift		Initial value	0	Commu.addr.	0622H
			Unit	mV	Valid time	Immediately
	Range	-2000~2000	Data size	16bit	Control mode	P S T

Parameter function: without setting, automatic correction by AF-06 function, set by the drive itself.

P6-35	AO1 function selection		Initial value	0	Commu.addr.	0623H
			Unit	-	Valid time	Immediately
	Range	0~20	Data size	16bit	Control mode	P S T
P6-36	AO2 function selection		Initial value	1	Commu.addr.	0624H
			Unit	-	Valid time	Immediately
	Range	0~20	Data size	16bit	Control mode	P S T

Parameter function: set the meaning of AO terminal output

When the output of the AO terminal is 10V, it means that the amount it represents reaches at the maximum value

Setting	AO output	Setting	AO output
0	The actual motor speed: 1V corresponds to 1000rpm	9	Write P6-42 direct output: -10000 ~10000mV
1	Speed command: 1V corresponds to 1000rpm	10	AI1 input: -10V ~ 10V corresponds to -10V ~ 10V
2	Torque command: 1V corresponds to 100.0% of rated torque	11	AI2 input: -10V ~ 10V corresponds to -10V ~ 10V
3	Position deviation: 1mV corresponds to the deviation of 1 command unit	12	Speed feedforward value: 1Vcorresponds to 1000rpm
4	Position deviation: 1mV corresponds to deviation of 1 encoder unit	13	Torque feedforward value: 1Vcorresponds to 100.0% of rated torque
5	The speed corresponding to the pulse command: 1V corresponds to 1000rpm	14	Effective Gain: 0V first gain, 5V second gain
6	The actual torque output: 1V corresponds to 100.0% of rated torque	15	Position command transmission end: 5V completed, 0V unfinished
7	Positioning completion: 5V completed, 0V unfinished	16	Bus voltage: 1V corresponds to 100V
8	Write P6-41 direct output: -10000 ~10000mV		

P6-37	**AO1 gain**		Initial value	1.00	Commu.addr.	0625
			Unit	-	Valid time	Immediately
	Range	-10.00~10.00	Data size	16bit	Control mode	P S T
P6-38	**AO2 gain**		Initial value	1.00	Commu.addr.	0626
			Unit	-	Valid time	Immediately
	Range	-10.00~10.00	Data size	16bit	Control mode	P S T

P6-39	**AO1 offset**		Initial value	0	Commu.addr.	0627
			Unit	mV	Valid time	Immediately
	Range	-10000~10000	Data size	16bit	Control mode	P S T
P6-40	**AO2 offset**		Initial value	0	Commu.addr.	0628
			Unit	mV	Valid time	Immediately
	Range	-10000~10000	Data size	16bit	Control mode	P S T

Parameter function: adjust the gain and bias of analog output terminals AO1 and AO2.

Analog output voltage = selected output * analog gain + analog bias. Note that these are signed numbers, so consider the operational relation.

For example, "P6-35=0" and "AO1" represent motor speed:

The P6-37 gain is set to 1.00, and the P6-39 bias is set to 0, then the analog output is 3V, corresponding to the forward 3000rpm, and the -3V corresponds to the reverse 3000rpm.

The P6-37 gain is set to 2.00, and the P6-39 bias is set to -5000, then the analog output 0V corresponds to the forward 2500rpm, the -5V corresponds to the 0 speed, and the -10V corresponds to the reverse 2500rpm.

The P6-37 gain is set to 3.33, and the P6-39 bias is set to 5000, then the analog output is 0V, corresponding to the reverse 1500rpm, the 5V corresponds to the 0 speed, and the 10V corresponds to the forward 1500rpm.

P6-41	**AO direct output 1**		Initial value	0	Commu.addr.	0629
			Unit	mV	Valid time	Immediately
	Range	-10000~10000	Data size	16bit	Control mode	P S T
P6-42	**AO direct output 2**		Initial value	0	Commu.addr.	062A
			Unit	mV	Valid time	Immediately
	Range	-10000~10000	Data size	16bit	Control mode	P S T

Parameter function: the desired voltage value that you want the AO terminal to output.

When P6-35, P6-36 set to 8 or 9, written by communication or keyboard input, P6-41 (corresponding to 8), P6-42 (corresponding to 9), the corresponding AO terminal output the corresponding voltage to test if the drive output, circuit and upper computer are in good order.

For example: P6-35 is set to 8, and P6-41 is set to 5000 by keyboard or by communication. Then the AO1 terminal should output 5V.

Note When the servo power is restarted, the contents of the two parameters will be automatically cleared.

6.11 P7-xx Communication parameters

P7-00	**Modbus Communication address setting**		Initial value	1	Commu.addr.	-
			Unit	-	Valid time	Immediately
	Range	1~254	Data size	16bit	Control mode	P S T

Parameter function: This machine is the slave address.

P7-01	Modbus Communication baud rate		Initial value	1	Commu.addr.	-
			Unit	-	Valid time	Immediately
	Range	0~5	Data size	16bit	Control mode	P S T

Parameter function: set baud rate of local communication

P7-01=0：4800 bps
P7-01=1：9600 bps
P7-02=2：19200 bps
P7-03=3：38400 bps
P7-04=4：57600 bps
P7-04=5：115200 bps

P7-02	Modbus Communication data format		Initial value	0	Commu.addr.	-
			Unit	-	Valid time	Immediately
	Range	0~5	Data size	16bit	Control mode	P S T

Parameter function: set up the communication data format of this machine

P7-02=0: no check 1+8+N+1
P7-02=1: odd check 1+8+O+1
P7-02=2: even check 1+8+E+1
P7-02=3: no check 1+8+N+2
P7-02=4: odd check 1+8+O+2
P7-02=5: even check 1+8+E+2

P7-03	Modbus Communication response delay		Initial value	2	Commu.addr.	-
			Unit	ms	Valid time	Immediately
	Range	1~20	Data size	16bit	Control mode	P S T

Parameter function: set communication response delay time

Response after this time delay when the drive receives a communication command from the host computer.

P7-04	Modbus Parameter storage options for communication		Initial value	0	Commu.addr.	-
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function:

P7-04=0: the data sent to the drive via the MODBUS communication, whether the data is saved is determined by the P7-05 setting.

P7-04=1: data sent to the drive via the MOUBUS communication will not be saved.

P7-05	Modbus Address definition selection for communication		Initial value	1	Commu.addr.	-
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function:

P7-05=0:

if the communication address uses the address in this manual, the parameter is written to the drive RAM register, and is determined whether it is effective immediately according to the parameter attribute, after power failure, it will not be saved; if the communication address uses + 8000H in this manual, this parameter is written to the drive EEPROM and strored immediately saved, whether it will take effect immediately depends on the property of the parameter.

P7-05=1:

if the address of the communication uses the address +8000H in this manual, the parameter is written to the RAM register of the drive, and whether it will take effect immediately depends on the parameter attribute, it will not be saved after power failure; if the address of the communication uses the address in this manual, the parameter is written to the drive EEPROM and is immediately saved, whether it will take effect immediately depends on the attribute of the parameter.

The impact of P7-04 and P7-05 settings on communication addresses and storage

Parameters		MODBUSCommu.addr.	
P7-04	P7-05	0000H~3FxxH	(0000H~3FxxH)+8000H
0	1	Write EEPROM, memory	Write RAM, not stored
0	0	Write RAM, not stored	Write EEPROM, stored
1	1	Write RAM, not stored	Write RAM, not stored
1	0	Write RAM, not stored	Write RAM, not stored

P7-06	Reserved							
P7-07	Reserved							
P7-08	Reserved							
P7-09	In Modbus communication,	0：Read and write: low 16-bit first, then high 16-bit	U16	0	-	PST	○	0709H

	the high and low bit setting of 32-bit function code	1：Read: high 16-bit first,then low 16-bit 2：Read: low 16-bit first, then high 16-bit; Write: on the contrary 3：Read: high 16-bit first, then low 16-bit; Write: on the contrary						

6.12 P8-xx Extended function parameters

P8-00	**JOG speed**	Initial value	100	Commu.addr.	0800H
		Unit	rpm	Valid time	Immediately
	Range: 0~6000	Data size	16bit	Control mode	P S T
P8-01	**JOG acc/dec speed**	Initial value	200	Commu.addr.	0801H
		Unit	ms	Valid time	Power on again
	Range: 1~65535	Data size	16bit	Control mode	P S T

Parameter function:

Set the motor speed and acceleration and deceleration time of the JOG, the acceleration and deceleration time reference is the motor speed time from 0 to the rated speed or vice versa. The drive can carry out inching through the function parameter AF-02 when the servo is enabled OFF, or by the DI terminal set to JOG-P and JOG-N when the servo is enabled ON or OFF.

Jogging command execution:

Original state	JOG terminal OFF→ON and on	JOG terminal ON→OFF
The motor is still	The speed at which to run from P8-01 to P8-00, and continuously running	Slow down to zero speed at the speed of P8-01, restore to original control mode
Position mode of pulse command	Clear droop pulses, starting at the current speed, run from P8-01 to P8-00, and run continuously.	Resume position mode the moment when JOG command inactive, start receiving the command pulse.
Multi-stage position mode	Clear droop pulses, starting at the current speed, run from P8-01 to P8-00, and run continuously.	Restore the multi-stage position mode, run the remaining pulse command, (the cleared stranded pulse is no longer executed)
Speed mode	The speed at which to run from P8-01 to P8-00, and continuously running	Accelerate by P2-04 or decelerate by P2-05 to the specific speed of current speed command.
Torque mode	Starting from current speed, run from P8-01 to P8-00, and continuously running.	Resume torque mode, and run according to the current torque command

P8-02	**Auto tuning torque identified by offline inertia**	Initial value	50	Commu.addr.	0802H
		Unit	%	Valid time	Immediately
	Range: 10~200	Data size	16bit	Control mode	P S T

Parameter function:

When the load inertia ratio is offline, the percentage of the torque relative to the motor's rated torque is the output torque of the motor.

The greater the setpoint, the greater the possible mechanical impact, but the shorter the identification time and the number of turns required by the motor, please set the appropriate value according to the machine.

P8-03	**The maximum number of turns identified by offline inertia**	Initial value	10	Commu.addr.	0803H
		Unit	rev	Valid time	Immediately
	Range: 1~20	Data size	16bit	Control mode	P S T

Parameter function：Sets the maximum number of cycles allowed for off-line inertia identification

If the motor runs in this loop, the system inertia is not recognized successfully, or, in the course of inertia identification, the motor cannot run to this circle, then Al028 alarm occurs.

Note☛ When the system inertia can not be recognized, and the mechanical condition allows the motor to rotate more turns, please increase the set value of this parameter.
When the system inertia can not be recognized, and the mechanical condition does not allow the motor to rotate more turns, please add the set value of P8-02.
See section 6.6 for reference.

P8-05	**Absolute encoder maximum number of revolutions**	Initial value	32767	Commu.addr.	0805H
		Unit	rev	Valid time	Immediately
	Range: 1~32767	Data size	16bit	Control mode	P S T

Parameter Function: Set the upper limit of the turns of absolute encoder

If the number of revolutions of the absolute encoder is positive and its value exceeds the set value and the current command direction is positive, the forward overtravel is processed. LED display p-ot, WARN terminal output is valid; if the number of

revolutions is negative, the value exceeds the set value, and the current command direction is negative, then reverse overrun processing, LED display n-ot, WARN terminal output effective.

P8-06	Absolute encoder use method selection		Initial value	0	Commu.addr.	0806H
			Unit	-	Valid time	Power on again
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: select the use of absolute encoder

P8-06=0: used as an incremental encoder

P8-06=1: used as an absolute encoder

P8-07	Fan control		Initial value	0	Commu.addr.	0807H
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: controls the operation of the cooling fan of the drive

P8-07=0: servo enable ON and alarm / alarm

P8-07=1: after the power on

P8-08	Drive overload warning threshold		Initial value	80	Commu.addr.	0808H
			Unit	%	Valid time	Immediately
	Range	20~100	Data size	16bit	Control mode	P S T

Parameter function: sets the warning threshold for drive overload, based on the rated output current of the drive.

The drive has an overload protection function that generates an overload curve as per 100% of the rated current of the drive, but in this case, it goes directly to the alarm. This parameter sets the threshold of the drive overload warning. Once the drive overload is detected greater than this setting, the drive overload warning AlE04 is issued, but it does not stop running.

P8-09	Motor overload warning threshold		Initial value	80	Commu.addr.	0809H
			Unit	%	Valid time	Immediately
	Range	20~100	Data size	16bit	Control mode	P S T

Parameter function: set the warning threshold of servo motor overload, the reference is the rated current of servo motor.

The drive has a motor overload protection function that generates an overload curve based on 100% of the rated load of the servo motor, but in this case, it goes directly to the alarm state. This parameter can set the motor overload warning threshold, once detected that the motor overload is greater than the set value, that is, the motor overload warning AlE03, but will not stop running.

P8-10	Braking resistor resistance setting		Initial value	50	Commu.addr.	080AH
			Unit	**Ω**	Valid time	Immediately
	Range	20~700	Data size	16bit	Control mode	P S T

Parameter function: set the resistance value of brake resistor. Do not modify when using internal brake resistor.

P8-11	Braking resistor power setting		Initial value	100	Commu.addr.	080BH
			Unit	W	Valid time	Immediately
	Range	20~30000	Data size	16bit	Control mode	P S T

Parameter function: set the power of braking resistor, do not modify when using internal brake resistor.

P8-12	Brake duty cycle		Initial value	100	Commu.addr.	080CH
			Unit	%	Valid time	Immediately
	Range	0~100	Data size	16bit	Control mode	P S T

Parameter function: when braking, the duty ratio of the brake IGBT

When the P8-12 is set to 100, the brake duty ratio is 100%, that is, during the braking process, the brake IGBT is fully opened;

When the P8-12 is set to 0, the brake duty ratio is 0%, that is, during the braking process, the brake IGBT is completely closed (without the use of braking resistors).

P8-13	Braking resistor derating percentage		Initial value	40	Commu.addr.	080DH
			Unit	%	Valid time	Power on again
	Range	1~100	Data size	16bit	Control mode	P S T

Parameter function: set the derating of brake resistance. Do not modify when using internal brake resistor.

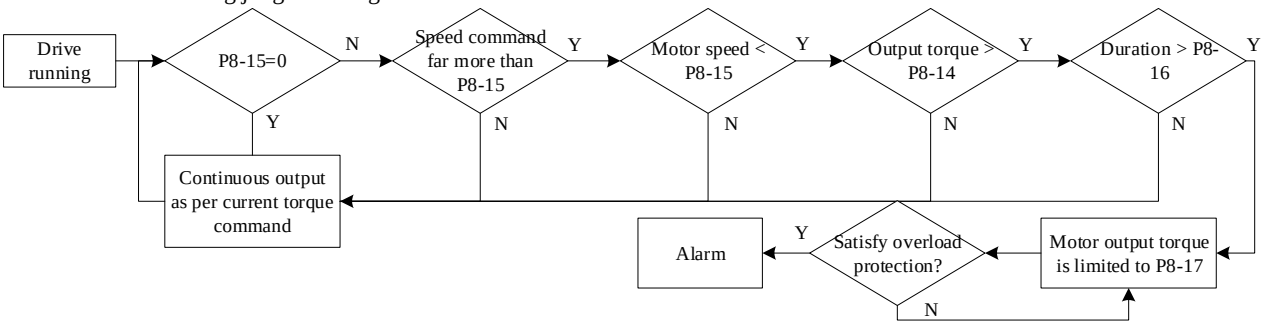
P8-14	The minimum load of motor stall judgment		Initial value	150.0	Commu.addr.	080EH
			Unit	%	Valid time	Immediately
	Range	10.0~250.0	Data size	16bit	Control mode	P S T

Parameter function: set the minimum output torque to judge if the motor rotor is blocked.

When the motor is blocked due to mechanical reasons, as the motor speed does not reach at the command value, the motor will continue to output according to the P1-06 and P1-07 settings. But because the motor does not rotate, the drive and motor will cause a sudden heat and damage.

The drive has motor blocking protection to cope with the obstruction.

Motor blocking judgement logic:



P8-15	The speed of motor stall judgment		Initial value	50	Commu.addr.	080FH
			Unit	rpm	Valid time	Immediately
	Range	0~500(0: turn off stall judgement)	Data size	16bit	Control mode	P S T

Parameter function: when opening the motor block protection, set the maximum motor speed at which to determine whether the motor is in a locked state.

P8-16	The time of motor stall judgment		Initial value	100	Commu.addr.	0810H
			Unit	ms	Valid time	Immediately
	Range	50~2000	Data size	16bit	Control mode	P S T

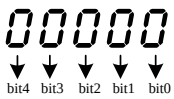
Parameter function: when the motor block protection is started, a duration is set to judge at which whether the motor is locked.

P8-17	Motor Stall Restriction Torque		Initial value	100.0	Commu.addr.	0811H
			Unit	%	Valid time	Immediately
	Range	0.0~150.0	Data size	16bit	Control mode	P S T

Parameter function: when the motor block protection is started, the maximum torque is set to judge if the motor is blocked.

P8-18	Function switch 1		Initial value	00100B	Commu.addr.	0812H
			Unit	-	Valid time	Immediately
	Range	00000B~11111B	Data size	16bit	Control mode	P S T

Parameter function

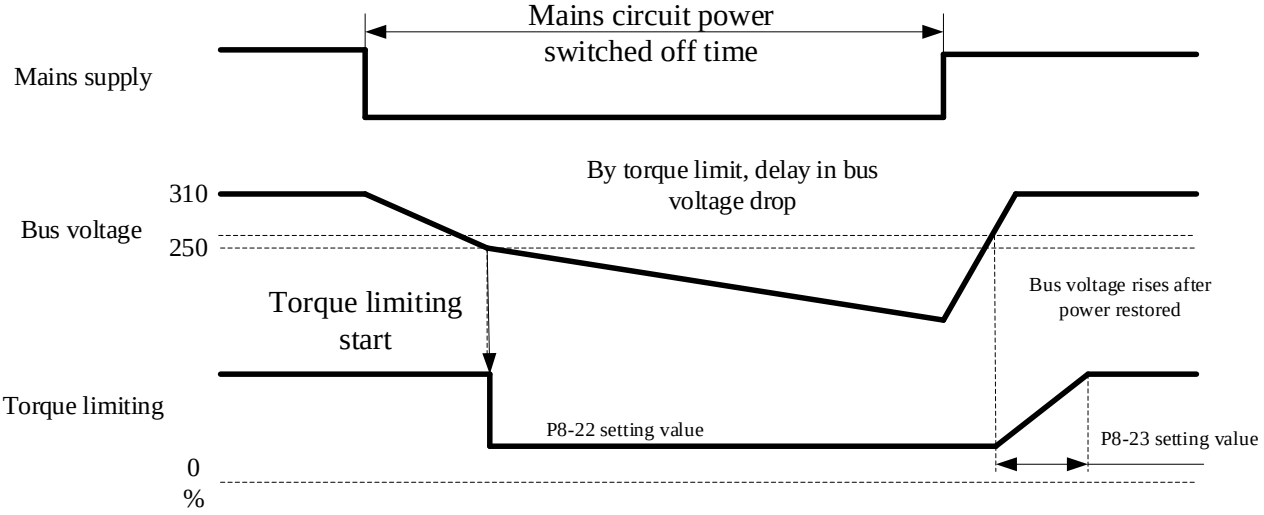


bitX=0：function closed
bitX=1：function opened

P8-18 bit0: torque limiting function when the main circuit voltage drops

bit0=0: turn off the torque limit function when the main circuit voltage drops, P8-22 and P8-23 are invalid

bit0=1: turn on the torque limit function when the main circuit voltage drops. When the bus voltage is detected to be less than 80% of the rated value, the motor output torque will be limited to the value set by P8-22. This function is combined with the instantaneous power outage function to continue operation when the supply voltage is low, so as to avoid shutdown due to an alarm.



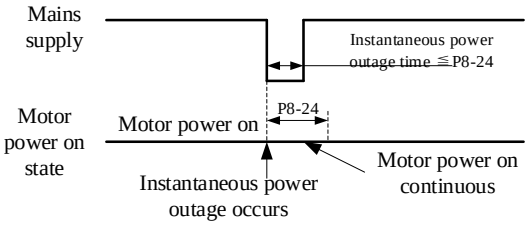
P8-18 bit1: instantaneous power outage maintenance function

bit1=0: turn off the instantaneous power outage maintenance function

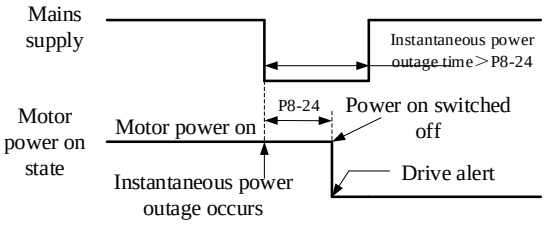
bit1=1: open the instantaneous power outage maintenance function, which will turn on the power down detection function by default and block the Al01D alarm within P8-24 time.

When this function is opened, the motor can continue to power on (servo ON) according to the time set by P8-24, even if the main circuit of the drive is in instantaneous power failure.

When the instantaneous interruption time is less than the P8-24 setting value, the motor will continue to power on, and the motor is no longer powered on when the setting value is greater than the set value, and the drive will cause alarms such as Al01d or Al00A.



P8-24 Setting≥Instanteneous power outage time



P8-24 Setting＜Instanteneous power outage time

Note☛

1: In vertical axis applications, do not recommend the use of this function, there may be the possibility of falling. (when the DO terminal is set to the BK function, if open the function, control power to electricity Al005 alarm)

2: when opening this function, it is recommended to open the torque limit function when the main circuit voltage drops, and set the appropriate value for P8-22.

3: servo control circuit power retention time is about 80ms. If the power supply of the control circuit can not continue to supply power when the instantaneous power failure occurs, then the same processing is performed with the usual power cut-off, and the setting of P8-24 is invalid.

The duration of the instantaneous outage can vary depending on the output of the servo pack. The servo motor load is large and the Al00A alarm occurs in the instantaneous power failure, then the function is invalid.

P8-18 bit2: power down detection function (associated with Bit1)

bit2=0 and bit0=0: turn off the power down detection function, the main loop power failure is no longer detected.

When the vertical shaft is applied, be sure to turn on the power down test function. Otherwise, the main circuit will not be switched off immediately and the holding brake will not be closed

bit2=1: turn on the power down test function.

If there is no instantaneous power outage at the same time, when the main circuit is switched off, the Al01D alarm will happen immediately.

P8-18 bit3: position judgment relative command unit is switched to encoder unit

bit3=0: position judgment based on command units.

The command unit is a unit of 1 pulse input from the upper device (including the P9 group, multi segment position) as 1.

bit3=1: position judgment based on encoder units.

The encoder unit is a unit of 1 pulse fed from the motor encoder as 1. Encoder unit = command unit * electronic gear ratio

For example, the factory status when using an adaptive 17bit encoder motor:

Since the electronic gear is smaller than the =131072/10000, the encoder unit = command unit * 131072/10000

Note☛

The setting of these four parameters is affected by this function: P1-18 position deviation following warning, P1-20 position deviation following alarm, P1-23 position approximity width, P1-24 positioning completed width, and d0-10 position deviation.

P8-18 bit4: speed command reverse (speed mode)

bit4=0: the motor rotates forward (forward is defined by P0-01) when the positive speed command is applied.

bit4=1: when the negative speed command is applied, the motor rotates forward (forward is defined by P0-01).

P8-22	**The torque limit value when the main circuit voltage drops**		Initial value	50.0	Commu.addr.	0816
			Unit	ms	Valid time	Immediately
	Range	1.0~100.0	Data size	16bit	Control mode	P S T

Parameter function: set the limit value of motor output torque when the drive DC bus voltage is below 80%.
Please see the commands of P8-18 bit0.

P8-23	**The torque limit release time when the main circuit voltage drops**		Initial value	100	Commu.addr.	0817
			Unit	ms	Valid time	Immediately
	Range	10~1000	Data size	16bit	Control mode	P S T

Parameters Function: when the mains loop voltage is resumed to 90% rated, the torque goes back to the original value from this time.
Please see the commands of P8-18 bit0.

P8-24	**Instantaneous power outage maintaining time**		Initial value	100	Commu.addr.	0818
			Unit	ms	Valid time	Immediately
	Range	10~1000	Data size	16bit	Control mode	P S T

Parameter function: when the instantaneous power failure occurs in the main circuit power supply, the time to keep the motor power on continuously.

Please see the commands of P8-18 bit1.

P8-25	Internal torque limiting		Initial value	100.0	Commu.addr.	0019
			Unit	%	Valid time	Immediately
	Range	0.0~500.0	Data size	16bit	Control mode	P S T

P8-26	External torque limit switching rate 1		Initial value	300.0	Commu.addr.	081A
			Unit	%/ms	Valid time	Immediately
	Range	0.1~500.0	Data size	16bit	Control mode	P S T

Parameter function: when the TL2 terminal is valid, the motor output torque limit value changes to the setting value of P8-25 according to this slope.

The unit is the percentage of torque limit value per millisecond relative to the rated torque of the motor.

P8-27	External torque limit switching rate 2		Initial value	300.0	Commu.addr.	081B
			Unit	%/ms	Valid time	Immediately
	Range	0.1~500.0	Data size	16bit	Control mode	P S T

Parameter function: when the TL2 terminal is not valid, the motor output torque limit varies to the value defined by the P0-05 by this slope.

The unit is the percentage of torque limit value per millisecond relative to the rated torque of the motor.

P8-28	When the external torque limit is active, the position deviation alarm detection block		Initial value	0	Commu.addr.	081C
			Unit	-	Valid time	Immediately
	Range	0~1	Data size	16bit	Control mode	P S T

Parameter function: when the TL2 terminal is valid and the motor output torque is limited to the setting value of P4-06, select whether or not to pause the excessive position deviation detection.

P8-28=0：P8-28=0: TL2 terminal is still undergoing excessive position deviation detection during the effective period;

P8-28=1： TL2 terminal pauses large position deviation detection during the effective period.

P8-29	After the external torque limit is invalid, alarm blocking invalid delay		Initial value	10000	Commu.addr.	081D
			Unit	ms	Valid time	Immediately
	Range	1~10000	Data size	16bit	Control mode	P S T

Parameter function: when setting P8-28=1, and TL2 terminal is changed from invalid to valid, how long is the delay in the recovery of position deviation check.

If P1-20 is set smaller, when TL2 terminal is in effect, if the motor is in stall condition, the drive continues to receive position command pulses, when TL2 terminal becomes invalid, the position deviation is detected immediately, and alarm occurs. Setting this parameter can delay a certain period of time, to make motor run and reduce position deviation, avoid immediate position deviation warning.

6.13 P9-xx Multistage position parameter

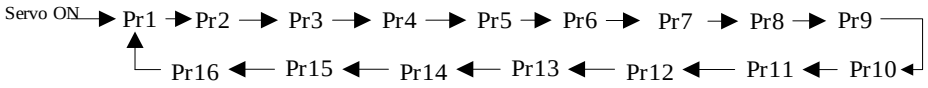
This function is enabled when the servo drive is currently in position mode (P0-00=1) and the position command source is a multi - segment position command (P1-00=1).

The P9-xx group consists of 54 functional code, the definition of multi position from P9-06 to divided into 16 groups, corresponding to multi position command Pr1 to Pr16, each of the 3 function codes is set to stop for a period of time relative to the target position, the uniform speed at which the target position is reached, and the stopping time after the completion of the position.

P9-00	Multi-position execution mode		Initial value	0	Commu.addr.	0900H
			Unit	-	Valid time	Immediately
	Range	0~7	Data size	16bit	Control mode	P

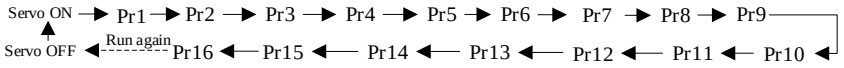
Parameter function: when P0-00 is set to 1 and P1-00 is 1, that is, when using multi segment position control, this parameter is used to select the mode of multi segment position execution.

P9-00=0: according to the 16 segments of position command, start the continuous cycle operation from Pr1, servo enabled ON, automatically star



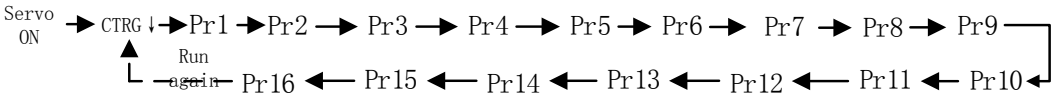
Note☛
1. enable OFF, re-enable ON to start execution from Pr1.
2. the stopping time parameter for each segment is valid.

P9-00=1： According to the 16 position commands, start a single cycle from Pr1, servo enabled ON and automatically start. After the operation of Pr16 segment is completed, it stops, and it needs to be re enabled before running again.



Note☛
1. After enabled OFF, re-enabled ON to start execution from Pr1.
2. the stopping time parameter for each segment is valid.

P9-00=2： According to the 16 position commands, start from Pr1with a single cycle operation, servo enable ON, after receiving the falling edge from DI terminal defined as CTRG function, it begins to run, after the completion of the Pr16 section, the motor stopped. To run again, you need to re-apply the CTRG falling edge.



P9-00=3： From the external DI input, select the segment that you want to execute by Table 5-2, and then use the CTRG falling edge to trigger the execution. After the execution, the motor is stationary.

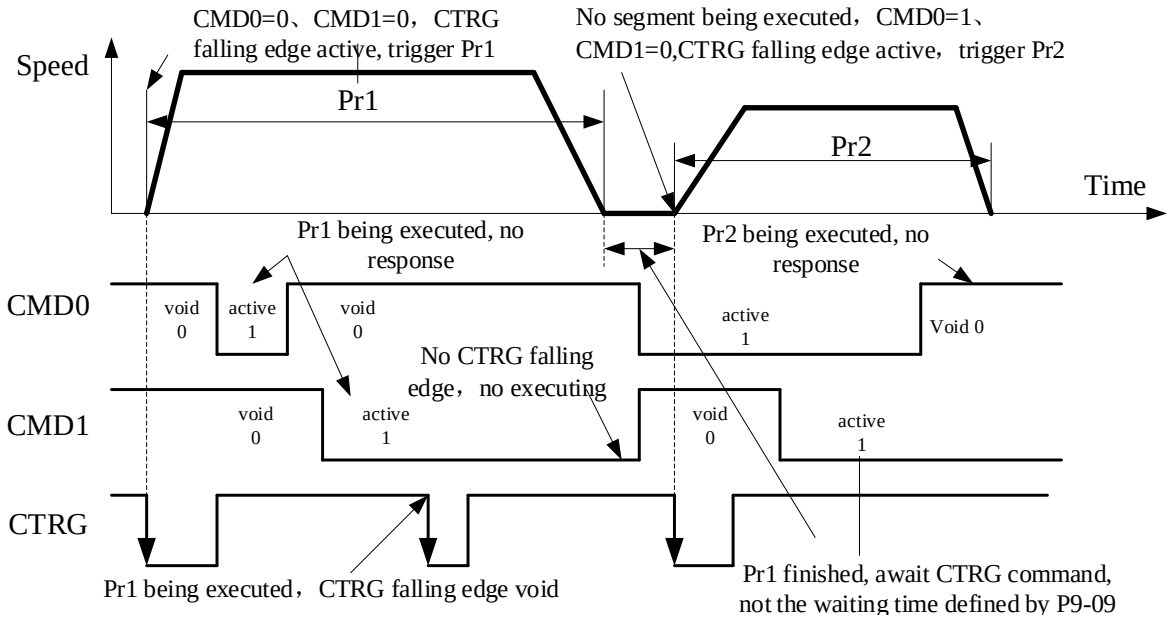


Table 5-2 DI terminal status corresponding to multi segment position command

Pr command	CMD3	CMD2	CMD1	CMD0	CTRG	Running pulse numbers	Allowable speed	Stop time
Pr1	0	0	0	0	↓	P9-06	P9-08	P9-09
Pr2	0	0	0	1	↓	P9-10	P9-12	P9-13
Pr3	0	0	1	0	↓	P9-14	P9-16	P9-17
Pr4	0	0	1	1	↓	P9-18	P9-20	P9-21
Pr5	0	1	0	0	↓	P9-22	P9-24	P9-25
Pr6	0	1	0	1	↓	P9-26	P9-28	P9-29
Pr7	0	1	1	0	↓	P9-30	P9-32	P9-33
Pr8	0	1	1	1	↓	P9-34	P9-36	P9-37
Pr9	1	0	0	0	↓	P9-38	P9-40	P9-41
Pr10	1	0	0	1	↓	P9-42	P9-44	P9-45
Pr11	1	0	1	0	↓	P9-46	P9-48	P9-49
Pr12	1	0	1	1	↓	P9-50	P9-52	P9-53
Pr13	1	1	0	0	↓	P9-54	P9-56	P9-57

Pr command	CMD3	CMD2	CMD1	CMD0	CTRG	Running pulse numbers	Allowable speed	Stop time
Pr14	1	1	0	1	↓	P9-58	P9-60	P9-61
Pr15	1	1	1	0	↓	P9-62	P9-64	P9-65
Pr16	1	1	1	1	↓	P9-66	P9-68	P9-69

Note: 0/1 in the table simply indicates that the DI terminal is invalid / valid and does not indicate the actual level.

Note☛
1. the DI terminal, which is required to set as a CTRG function, and the DI terminal of the CMDX function can be set as required.
2. during execution of a position command, the execution of the current segment position command will not be aborted due to changes in the CMDX and CTRG terminal status.
3. in this mode, the stop time parameter for each segment is invalid. After the execution of the current position command, the motor is in a quiescent state until the CTRG falling edge is received, executed the position command at the corresponding segment according to the current DI terminal state.

P9-00=4： By the terminal defined as CTRG, execute from Pr1 to Pr16 in stepping method.
When the servo enabled ON, the first CTRG falling edge will trigger the execution of Pr1, after completion, the motor is in a stationary state. The Pr2 is triggered until the second falling edge of the CTRG is received, after completion, the motor is in a stationary state, and so on. When Pr16 is completed, the Pr1 execution is triggered when the CTRG falling edge is received again.

Note☛
1：Does not respond to the falling edge of the CTRG during the current segment position command execution.
2：In this mode, the stop time parameter for each segment is invalid.
3：At any time when the homing command is received, after performing the homing action, receipt of the falling edge of the CTRG once more will trigger the execution of Pr1.

P9-00=5： same as P9-00=4，but after performing Pr16, when the CTRG valid edge is received again, it will only trigger the execution of Pr16 once more.

Note☛
1: do not respond to the falling edge of the CTRG during the execution of current section command.
2: in this mode, the stop time parameter for each segment is invalid.
3: any time when received the homing command, after performing the homing action, the receipt of the CTRG falling edge again will trigger the execution of Pr1.

P9-00=6： execute as per the setting of P9-01, trigger the operation.
After servo enabled ON, the falling edge of CTRG will trigger the segment of P9-01 to be executed. After the execution of the motor, the motor is stationary and P9-01 is automatically cleared, waiting for the next command.

Note☛
1：During the current segment position command execution, do not respond to the revision of P9-01.
2： In this mode, the stop time parameter for each segment is invalid.

P9-00=7： exeute as per the setting segment of P9-01.
After servo enable ON, execute the P9-01 specified section, after the execution, the motor is stationary, the P9-01 is automatically cleared, waiting for the next command.

Note☛
1: do not respond to changes to P9-01 during the execution of current segment command.
2: in this mode, the stop time parameter for each segment is invalid.

Note☛
1: modify the parameters of the current running section, which will not take effect until the segment is executed next time.
2: if enabled OFF or power is lost during operation, the segments that have been executed are cleared.
3: if you need to use CTRG terminals to trigger the implementation, please be sure to set the DI input terminal define as CTRG function of, low level active.

P9-01	**Multi-position execution segment selection**	Initial value	0	Commu.addr.	0901H
		Unit	-	Valid time	Immediately

Parameter function:

0: in the state of waiting for the command:

1~16: when P9-00 is set to 6 or 7, this parameter is used to select the segments to be executed.
When the set value is nonzero and there is no more than one current position in execution, execute the specified section based on the P9-00 condition. When the execution is completed, the parameter is automatically cleared and waiting for next command.

For example, when the motor is stationary, the parameter is changed to 8, and the Pr8 segment defined by the two parameters of P9-33 and P9-34 is immediately executed (P9-35 is not executed). After the execution is completed, the parameter is automatically restored to 0, and the motor is stationary.

P9-02	**Multi-position command reference setting**	Initial value	0	Commu.addr.	0902H
		Unit	-	Valid time	Immediately

	Range	0~1	Data size	16bit	Control mode	P

Parameter function：When a multi - segment position is set, the commands are executed in relative or absolute positions.

P9-02=0： Based on the current position, executed in incremental position.

The number of pulses defined for each segment of the command at the multi segment position, are calculated from the static position of the current motor.

<For instance>:

P9-06 is set to 12000, P9-10 is set to -10000, and when Pr1 is executed, then Pr2 is executed.

When the Pr1 segment is executed, the motor is rotating 12000 command pulses from the current stationary position. Then, when the Pr2 segment is executed, the motor reverses the 10000 command pulses, eventually, the motor stops at the position of 2000 forward command pulses from the original position.

P9-02=1： Based on the current position, executed in absolute position, only for absolute value system

The number of pulses defined for each segment is absolute position, calculate starting from the current position (d0-34) of the motor.

<For instance>:

P9-06 is set to 12000, P9-10 is set to -10000, and when Pr1 is executed, then Pr2 is executed. Before Pr1 starts, the motor is stationary and the value of d0-34 is 65300.

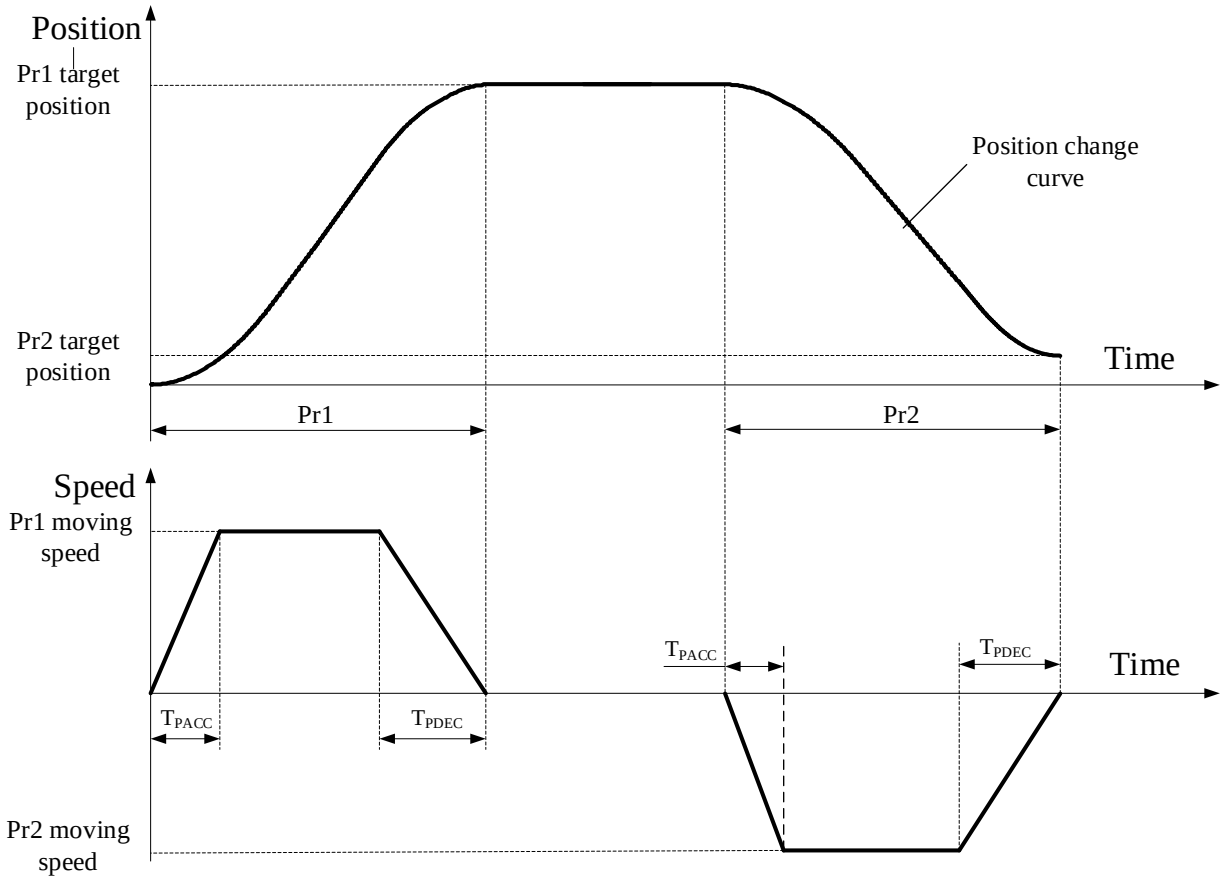
When the Pr1 segment is executed, the motor reverses by (65300-12000=43300) command pulses from the current position and reaches at the position of d0-34=12000. Then, when executing the Pr2 segment, the motor reverses by (12000- (-10000) =22000) pulses, and eventually stops at the position d0-34=-10000.

P9-03	**Multi-position acceleration time T_{PACC}**		Initial value	100	Commu.addr.	0903H
			Unit	ms	Valid time	Power on again
	Range	1~10000	Data size	16bit	Control mode	P
P9-04	**Multi-position deceleration time T_{PDEC}**		Initial value	100	Commu.addr.	0904H
			Unit	ms	Valid time	Power on again
	Range	1~10000	Data size	16bit	Control mode	P

Parameter function: When using the multi position position control mode, it is used to set the acceleration and deceleration time of the motor speed when the position command makes the motor speed up and down. These two arguments are invalid when using an external pulse for a given position command.

P9-03: set the acceleration time of the motor when it is accelerating.

P9-04: set the deceleration time of the motor when it slows down.



Note☞	1. using this method, the motion commands can be smoothed and the vibration and abnormal sound of the mechanical structure can be avoided because of the sharp change of the position commands. 2. P9-03, P9-04 indicate that the motor speed variables are acceleration and deceleration time for motor rated speed. If the change in target speed is not motor rated speed, the required time varies according to the ratio of the motor to the rated speed. For example, the motor target speed is 1500rpm, the motor rated speed is 3000rpm, P9-03=200ms, P9-04=300ms, then the motor speed from 0 to 1500rpm, the required time is 100ms, from 1500rpm to 0 speed reduction, the required time is 150ms.

Here below are description of the three parameters P9-06~P9-08 related to the first segment Pr1, other 15 segments are the same without detailed explanation.

P9-06	The number of pulses of the multi-position command Pr1		Initial value	100000	Commu.addr.	0906H
			Unit	Pulse	Valid time	Immediately
	Range	-2147483647~2147483647	Data size	32bit	Control mode	P

Parameter function: set the number of target pulses to move in first segments.

This parameter is a signed number, the positive number indicates that the motor is rotating in the forward direction specified by P0-01, whereas the negative number is the reverse.

Note☞	**The set pulses number corresponds to the command pulse unit.**

P9-08	Multi-position command Pr1 Movement speed		Initial value	100	Commu.addr.	0908H
			Unit	rpm	Valid time	Immediately
	Range	1~10000	Data size	16bit	Control mode	P

Parameter function:set the speed at which the first segment moves at uniform speed.

Note☞	**If the position pulse is less, the motor may not actually reach this speed when it is actually running. Therefore, the meaning of the parameter is understood as the upper limit of the motor speed during the execution of the Pr1 segment position.**

P9-09	Pr1 stop time		Initial value	0	Commu.addr.	0909H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P

Parameter function: when the cycle operation (P9-00=0, 1, 2) is selected, the pulse number of this section is completed, and after waiting for this time, the next segment of the position command is executed.

Note☞	This parameter is invalid when P9-00=3, 4, 5, 6, and 7

P9-10	Pulse no. of Multi-position command Pr2	-2147483647～2147483647	I32	-100000	Pulse	P	○	090AH
P9-12	Travel rate of Multi-position command Pr2	1～10000	U16	100	rpm	P	○	090CH
P9-13	Pr2 stop time	0～65535	U16	0	ms	P	○	090DH
P9-14	Pulse no. of Multi-position command Pr3	-2147483647～2147483647	I32	0	Pulse	P	○	090EH
P9-16	Travel rate of Multi-position command Pr3	1～10000	U16	100	rpm	P	○	0910H
P9-17	Pr3 stop time	0～65535	U16	0	ms	P	○	0911H
P9-18	Pulse no. of Multi-position command Pr4	-2147483647～2147483647	I32	0	Pulse	P	○	0912H
P9-20	Travel rate of Multi-position command Pr4	1～10000	U16	100	rpm	P	○	0914H
P9-21	Pr4 stop time	0～65535	U16	0	ms	P	○	0915H
P9-22	Pulse no. of Multi-position command Pr5	-2147483647～2147483647	I32	0	Pulse	P	○	0916H
P9-24	Travel rate of Multi-position command Pr5	1～10000	U16	100	rpm	P	○	0918H
P9-25	Pr5 stop time	0～65535	U16	0	ms	P	○	0919H
P9-26	Pulse no. of Multi-position command Pr6	-2147483647～2147483647	I32	0	Pulse	P	○	091AH
P9-28	Travel rate of Multi-position command Pr6	1～10000	U16	100	rpm	P	○	091CH
P9-29	Pr6 stop time	0～65535	U16	0	ms	P	○	091DH
P9-30	Pulse no. of Multi-position command Pr7	-2147483647～2147483647	I32	0	Pulse	P	○	091EH
P9-32	Travel rate of Multi-position command Pr7	1～10000	U16	100	rpm	P	○	0920H
P9-33	Pr7 stop time	0～65535	U16	0	ms	P	○	0921H

P9-34	Pulse no. of Multi-position command Pr8	-2147483647～2147483647	I32	0	Pulse	P	○	0922H
P9-36	Travel rate of Multi-position command Pr8	1～10000	U16	100	rpm	P	○	0924H
P9-37	Pr8 stop time	0～65535	U16	0	ms	P	○	0925H
P9-38	Pulse no. of Multi-position command Pr9	-2147483647～2147483647	I32	0	Pulse	P	○	0926H
P9-40	Travel rate of Multi-position command Pr9	1～10000	U16	100	rpm	P	○	0928H
P9-41	Pr9 stop time	0～65535	U16	0	ms	P	○	0929H
P9-42	Pulse no. of Multi-position command Pr10	-2147483647～2147483647	I32	0	Pulse	P	○	092AH
P9-44	Travel rate of Multi-position command Pr10	1～10000	U16	100	rpm	P	○	092CH
P9-45	Pr10 stop time	0～65535	U16	0	ms	P	○	092DH
P9-46	Pulse no. of Multi-position command Pr11	-2147483647～2147483647	I32	0	Pulse	P	○	092EH
P9-48	Travel rate of Multi-position command Pr11	1～10000	U16	100	rpm	P	○	0930H
P9-49	Pr11 stop time	0～65535	U16	0	ms	P	○	0931H
P9-50	Pulse no. of Multi-position command Pr12	-2147483647～2147483647	I32	0	Pulse	P	○	0932H
P9-52	Travel rate of Multi-position command Pr12	1～10000	U16	100	rpm	P	○	0934H
P9-53	Pr12 stop time	0～65535	U16	0	ms	P	○	0935H
P9-54	Pulse no. of Multi-position command Pr13	-2147483647～2147483647	I32	0	Pulse	P	○	0936H
P9-56	Travel rate of Multi-position command Pr13	1～10000	U16	100	rpm	P	○	0938H
P9-57	Pr13 stop time	0～65535	U16	0	ms	P	○	0939H
P9-58	Pulse no. of Multi-position command Pr14	-2147483647～2147483647	I32	0	Pulse	P	○	093AH
P9-60	Travel rate of Multi-position command Pr14	1～10000	U16	100	rpm	P	○	093CH
P9-61	Pr14 stop time	0～65535	U16	0	ms	P	○	093DH
P9-62	Pulse no. of Multi-position command Pr15	-2147483647～2147483647	I32	0	Pulse	P	○	093EH
P9-64	Travel rate of Multi-position command Pr15	1～10000	U16	100	rpm	P	○	0940H
P9-65	Pr15 stop time	0～65535	U16	0	ms	P	○	0941H
P9-66	Pulse no. of Multi-position command Pr16	-2147483647～2147483647	I32	0	Pulse	P	○	0942H
P9-68	Travel rate of Multi-position command Pr16	1～10000	U16	100	rpm	P	○	0944H
P9-69	Pr16 stop time	0～65535	U16	0	ms	P	○	0945H

6.14 PA-xx Multi - speed parameters

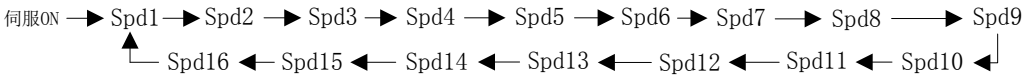
If the servo drive is currently in the speed mode (P0-00=0), and the speed command source is a multi-speed command (P2-00=1), this set of functions can be enabled.

PA-xx group has 34 function codes, from PA-02, divided into 16 groups, corresponding to the multi-stage position commands Pr1 to Pr16, each of the 2 function codes set a running speed and time.

PA-00	**Multi-speed command execution mode**		Initial value	0	Commu.addr.	0A00H
			Unit	-	Valid time	Immediately
	Range	0~4	Data size	16bit	Control mode	S

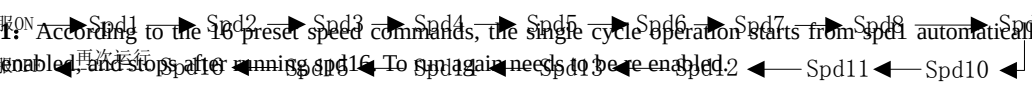
Parameter function: when P0-00=1 and P2-00=1, multi-stage speed operation mode is selected.

PA-00=0: according to the 16 preset speed commands, the spd1 starts running continuously, and the servo enable starts automatically**.**



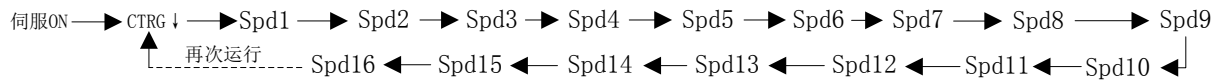
Note Enabled OFF, re-enabled ON, execute from Pr1.

PA-00=1: According to the 16 preset speed commands, the single cycle operation starts from spd1 automatically once the servo drive is enabled, and stops after running spd16. To run again needs to be re-enabled.



PA-00=2： The 16 preset speed commands start running from the spd1 in single cycle mode once the servo is enabled, and CTRG starts running after receipt of the falling edge and stops after running spd16. To run again, you need to receive the CTRG falling

edge again.



PA-00=3： By external DI input, according to Table 5-3, select the desired segment for execution, then keep running until the command is changed.

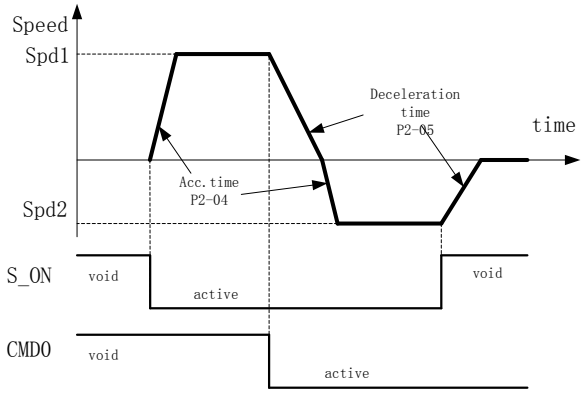


Table 5-3 DI state and corresponding multi speed command

Multi-speed command	CMD3	CMD2	CMD1	CMD0	Running speed	Running time
Spd1	0	0	0	0	PA-02	PA-03
Spd2	0	0	0	1	PA-04	PA-05
Spd3	0	0	1	0	PA-06	PA-07
Spd4	0	0	1	1	PA-08	PA-09
Spd5	0	1	0	0	PA-10	PA-11
Spd6	0	1	0	1	PA-12	PA-13
Spd7	0	1	1	0	PA-14	PA-15
Spd8	0	1	1	1	PA-16	PA-17
Spd9	1	0	0	0	PA-18	PA-19
Spd10	1	0	0	1	PA-20	PA-21
Spd11	1	0	1	0	PA-22	PA-23
Spd12	1	0	1	1	PA-24	PA-25
Spd13	1	1	0	0	PA-26	PA-27
Spd14	1	1	0	1	PA-28	PA-29
Spd15	1	1	1	0	PA-30	PA-31
Spd16	1	1	1	1	PA-32	PA-33

Note: 0/1 in the table simply indicates that the DI terminal is invalid / valid and does not indicate the actual level.

Note☛

1. set the DI terminal as CMD0, CMD1, CMD2 and CMD3 according to the requirement.
2. The terminal status changes and the segments being executed change immediately, as per the setting of P2-04、P2-05, accelerate or decelerate to the set target speed.

PA-00=4： Execute as the setting of PA-01.
Execute the specified segment of PA-01, keep running and stop when PA-01=0.

Note☛

1. Use intermal multiple preset speed, and run as per the command sequency order (e.g. PA-00=0,1,2), if revised the parameter of current segment, then the revised parameter will not be effective until next execution of this segment.
2. when the DI terminal is used to switch the multi segment speed, i.e. PA-00=3, the running time parameter is invalid, and the servo motor runs at the corresponding speed according to the state of the external terminal. At the same time, the speed value of the current segment is immediately executed as soon as it is modified.
3. if enabled OFF or power is lost during operation, the segments that have been executed are cleared.
4. For the trigger required for CTRG terminals, please be sure to set the DI input terminal define as CTRG function, low level active.

PA-01	Multi-speed execution number selection	Initial value	0	Commu.addr.	0A01H

			Unit	-	Valid time	Immediately
	Range	0, 1~16	Data size	16bit	Control mode	S

Parameter function: when PA-00=4 , this parameter is used to select the segments to be executed.

When this parameter is set to nonzero, the specified segment speed is executed immediately. For example, when the parameter is changed to 8, then run right away at speed PA-17 of segment , when this parameter is 0, stop and waiting for next command.

Here below is description of two parameters in association with spd1, parameters in other groups follow to the same.

PA-02	**Multi-speed command spd1 running speed**		Initial value	100	Commu.addr.	0A02H
			Unit	rpm	Valid time	Immediately
	Range	-10000~10000	Data size	16bit	Control mode	S

Parameter function: first segment speed of multi preset speed.

PA-03	**Multi-step speed command spd1 running time**		Initial value	1.0	Commu.addr.	0A03H
			Unit	s	Valid time	Immediately
	Range	0~6553.5	Data size	16bit	Control mode	S

Parameter function: when selecting cyclic operation (PA-00=0, 1, 2), the running time for the first preset speed operation.

Note☞ This parameter is invalid when PA-00=3 or 4.

PA-04	Multi-speed command Spd2	-10000～10000	I16	-100	rpm	S	○	0A04H
PA-05	Running time of multi-speed command Spd2	0～6553.5	U16	1.0	s	S	○	0A05H
PA-06	Multi-speed command Spd3	-10000～10000	I16	0	rpm	S	○	0A06H
PA-07	Running time of multi-speed command Spd3	0～6553.5	U16	0.0	s	S	○	0A07H
PA-08	Multi-speed command Spd4	-10000～10000	I16	0	rpm	S	○	0A08H
PA-09	Running time of multi-speed command Spd4	0～6553.5	U16	0.0	s	S	○	0A09H
PA-10	Multi-speed command Spd5	-10000～10000	I16	0	rpm	S	○	0A0AH
PA-11	Running time of multi-speed command Spd5	0～6553.5	U16	0.0	s	S	○	0A0BH
PA-12	Multi-speed command Spd6	-10000～10000	I16	0	rpm	S	○	0A0CH
PA-13	Running time of multi-speed command Spd6	0～6553.5	U16	0.0	s	S	○	0A0DH
PA-14	Multi-speed command Spd7	-10000～10000	I16	0	rpm	S	○	0A0EH
PA-15	Running time of multi-speed command Spd7	0～6553.5	U16	0.0	s	S	○	0A0FH
PA-16	Multi-speed command Spd8	-10000～10000	I16	0	rpm	S	○	0A10H
PA-17	Running time of multi-speed command Spd8	0～6553.5	U16	0.0	s	S	○	0A11H
PA-18	Multi-speed command Spd9	-10000～10000	I16	0	rpm	S	○	0A12H
PA-19	Running time of multi-speed command Spd9	0～6553.5	U16	0.0	s	S	○	0A13H
PA-20	Multi-speed command Spd10	-10000～10000	I16	0	rpm	S	○	0A14H
PA-21	Running time of multi-speed command Spd10	0～6553.5	U16	0.0	s	S	○	0A15H
PA-22	Multi-speed command Spd11	-10000～10000	I16	0	rpm	S	○	0A16H
PA-23	Running time of multi-speed command Spd11	0～6553.5	U16	0.0	s	S	○	0A17H
PA-24	Multi-speed command Spd12	-10000～10000	I16	0	rpm	S	○	0A18H
PA-25	Running time of multi-speed command Spd12	0～6553.5	U16	0.0	s	S	○	0A19H
PA-26	Multi-speed command Spd13	-10000～10000	I16	0	rpm	S	○	0A1AH
PA-27	Running time of multi-speed command Spd13	0～6553.5	U16	0.0	s	S	○	0A1BH
PA-28	Multi-speed command Spd14	-10000～10000	I16	0	rpm	S	○	0A1CH
PA-29	Running time of multi-speed command Spd14	0～6553.5	U16	0.0	s	S	○	0A1DH
PA-30	Multi-speed command Spd15	-10000～10000	I16	0	rpm	S	○	0A1EH
PA-31	Running time of multi-speed command Spd15	0～6553.5	U16	0.0	s	S	○	0A1FH
PA-32	Multi-speed command Spd16	-10000～10000	I16	0	rpm	S	○	0A20H
PA-33	Running time of multi-speed command Spd16	0～6553.5	U16	0.0	s	S	○	0A21H

6.15 Pb-xx Homing parameters

Pb-00	Zero return failure alarm time		Initial value	0	Commu.addr.	0A00H
			Unit	ms	Valid time	Immediately
	Range	0~65535	Data size	16bit	Control mode	P

Parameter function: starting homing command, if you cannot locate the origin after the parameter setting time, the drive display Al01C alarm and the ALM terminal acts.

When the parameter is set to 0, the homing monitor is switched off, even if the homing fails, the alarm will not occur.

Note☛ **Please set the appropriate time for Pb-00 according to the actual situation, so as to avoid false alarm when the execution time is longer**

Pb-01	The homing starting mode		Initial value	0	Commu.addr.	0A00H
			Unit	-	Valid time	Immediately
	Range	0~2	Data size	16bit	Control mode	P

Parameter function: select the homing start mode

Pb-01=0: turn off the origin regression function.

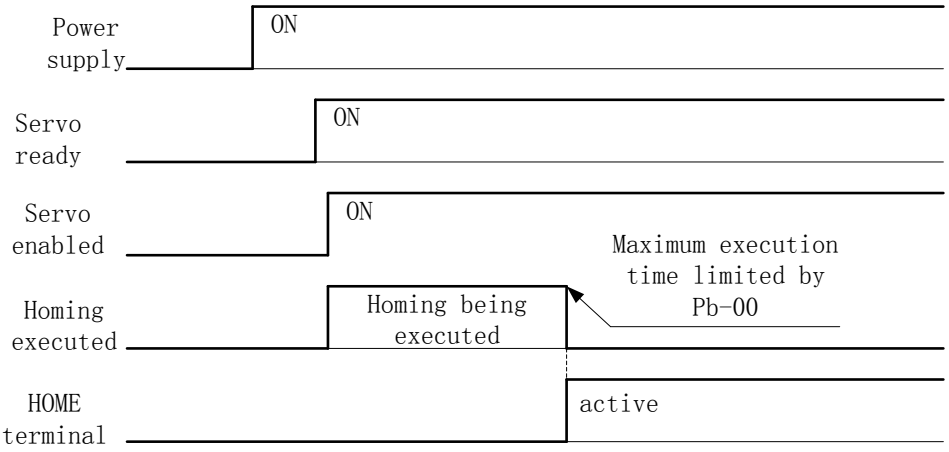
Pb-01=1: when the servo drive is powered on first, once the servo enabled (S-ON) is performed, the origin return is automatically performed immediately.

Pb-01=2: the origin return is started immediately after the DI terminal (function number 23) that is defined as "SHOM", that is, the origin regression enable. Even in unfinished

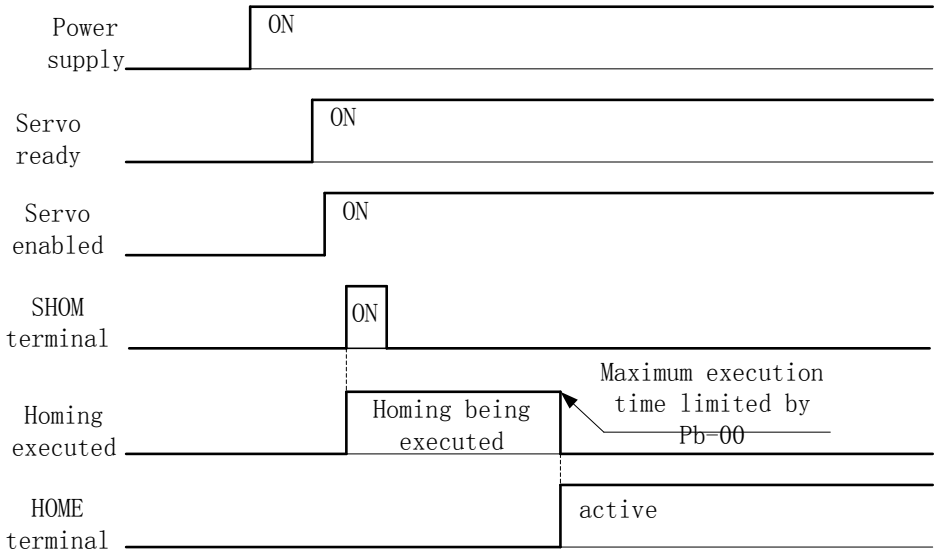
The SHOM terminal is invalid, and the execution of the origin return cannot be aborted.

Timing diagram of homing trigger

1: Power on, servo enabled, execute homing(Pb-01=1)



2: The homing (Pb-01=2) is triggered by the SHOM function terminal (function number 23)



After the homing is defined, the output terminal, defined as HOME (function number 14), outputs the valid signal. If the servo enabled is cancelled or the alarm occurs during the homing, the homing function will be stopped and the HOME terminal will not output an effective signal.

Note☛ **The SHOM terminal is level triggered. If the terminal is still valid after the homing is completed, the homing is performed again.**

Pb-02	Homing mode		Initial value	1	Commu.addr.	0A00H
			Unit	-	Valid time	Immediately
	Range	1~35	Data size	16bit	Control mode	P S

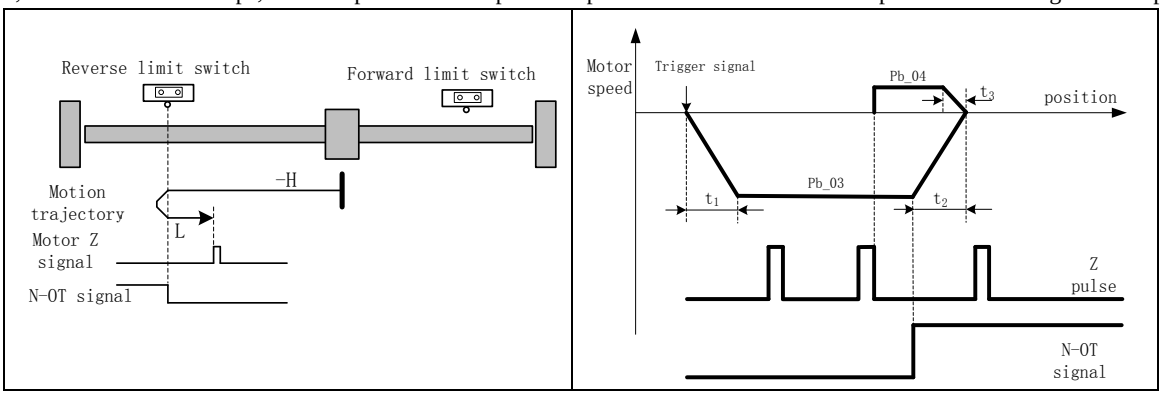
Parameter function: sets the short distance movement mode near the origin:

Pb-02=1：

Target Zero position: the first motor Z signal after the negative limit switch N-OT falling edge.

Deceleration point: negative limit switch (N-OT)

- If the N-OT signal is invalid when the return to zero starts, run at the negative speed of Pb-03. After receiving the rising edge of N-OT, it slows down and stops, then run positive at the positive speed of Pb-04 to find the zero position of the target and stops.



Note☛

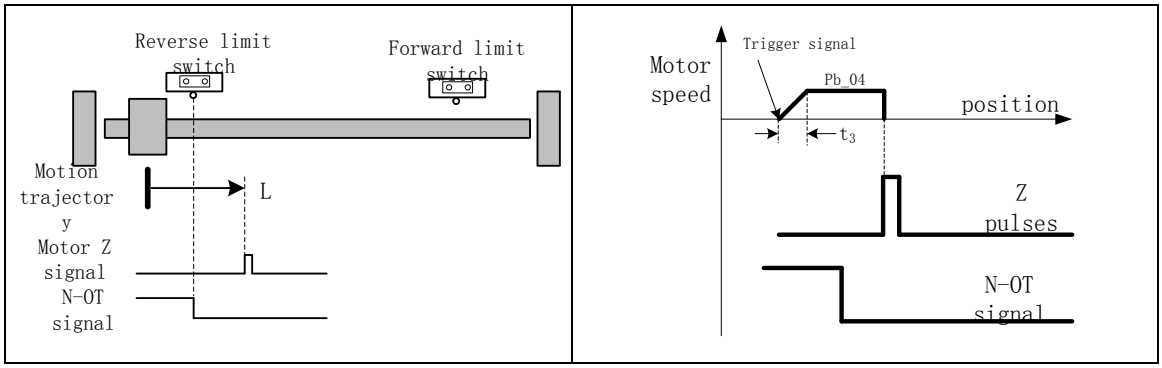
H：Positive Pb-03 speed　　-H：Negative Pb-03 speed

L：Positive Pb-04 speed　　-L: Negative Pb-04 speed

$$t1 = \frac{Pb-03}{\text{Motor rated speed}}\ x\ Pb-05 \quad t2 = \frac{Pb-03}{Motor\ rated\ speed}\ x\ Pb-06 \quad t3 = \frac{Pb-04}{\text{Motor rated speed}}\ x\ Pb-05$$

Here below is the same

- if the N-OT signal is valid when returning to zero, the Pb-05 is then directed forward to the target zero position and then stopped.

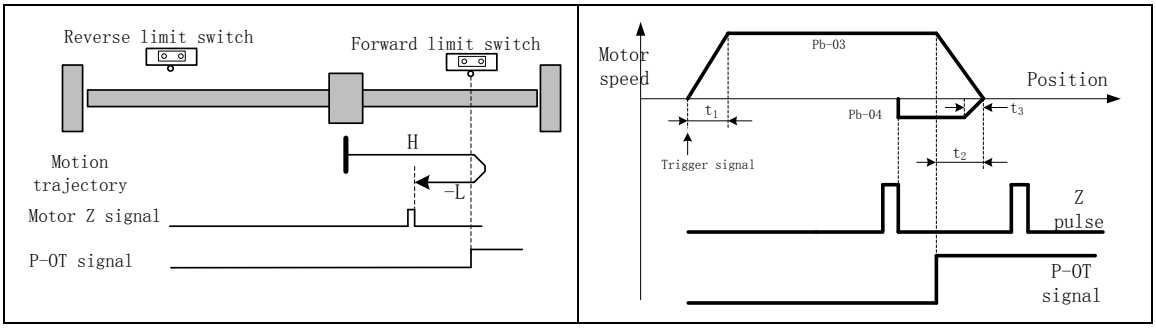


Pb-02=2：

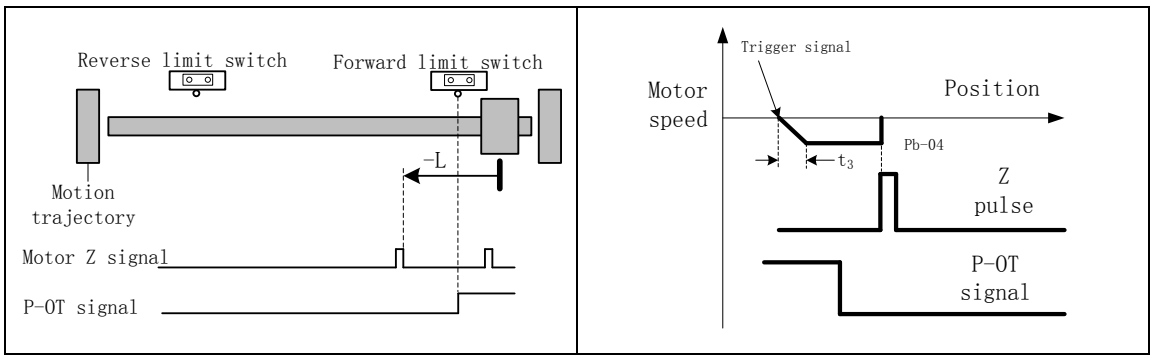
Target Zero position: the first motor encoder Z signal after positive limit switch P-OT falling edge.

Deceleration point: positive limit switch (P-OT)

- If the P-OT signal is invalid when the return to zero starts, it is running at the speed of Pb-03. After receiving the rising edge of P-OT, it slows down and stops, then run at the negative speed of Pb-04 to find the zero position of the target and then stops.

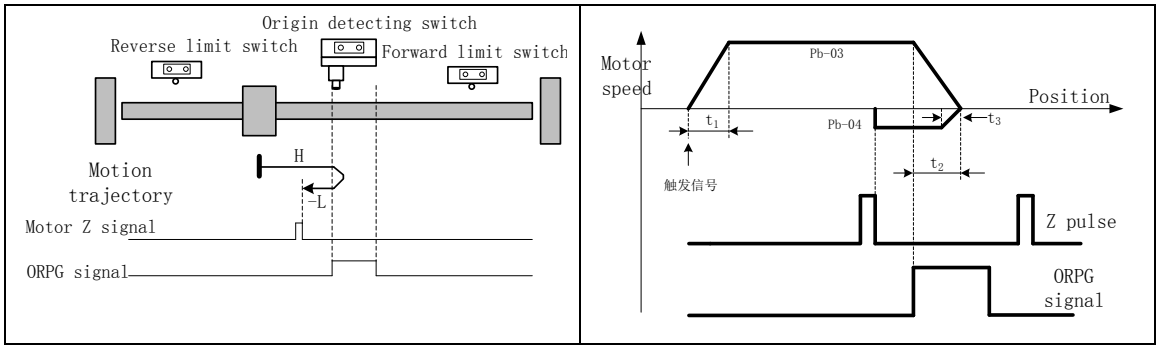


- If the P-OT signal is valid when returning to zero, it will reverse the speed of Pb-04 to find the zero of the target and then stop.

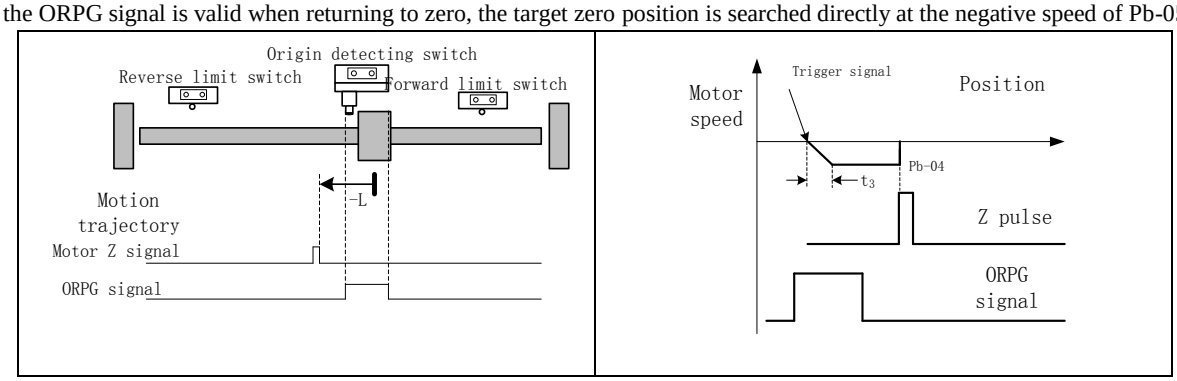


Pb-02=3：

- Target Zero position: the first motor Z pulse following ORPG falling edge
- Deceleration point: origin switch (ORPG)
- If the ORPG signal is invalid when the return to zero starts, it is running at the speed of Pb-03. When it meets the rising edge of ORPG, it slows down and stops, then run at the negative speed of Pb-04 to find the zero position of the target and then stops.



- If the ORPG signal is valid when returning to zero, the target zero position is searched directly at the negative speed of Pb-05.

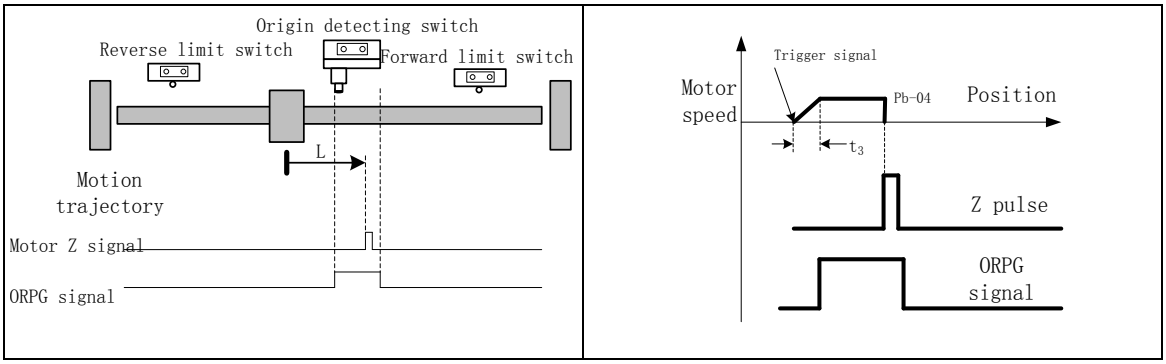


Pb-02=4：

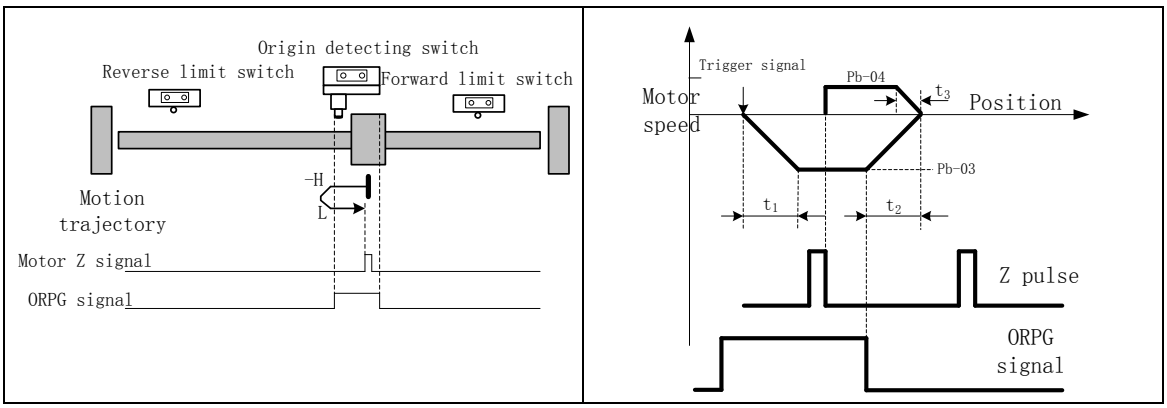
Target Zero position: the first Z pulse after the rising edge of the ORPG

Deceleration point: origin switch (ORPG)

If the ORPG signal is not valid when it returns to zero position, the target zero position is directly searched at the positive speed of Pb-04.



- If the ORPG signal is valid when returning to zero, run reverse at Pb-03, slow down after the falling edge of the ORPG, and then look for the target zero position at the positive speed of Pb-04.

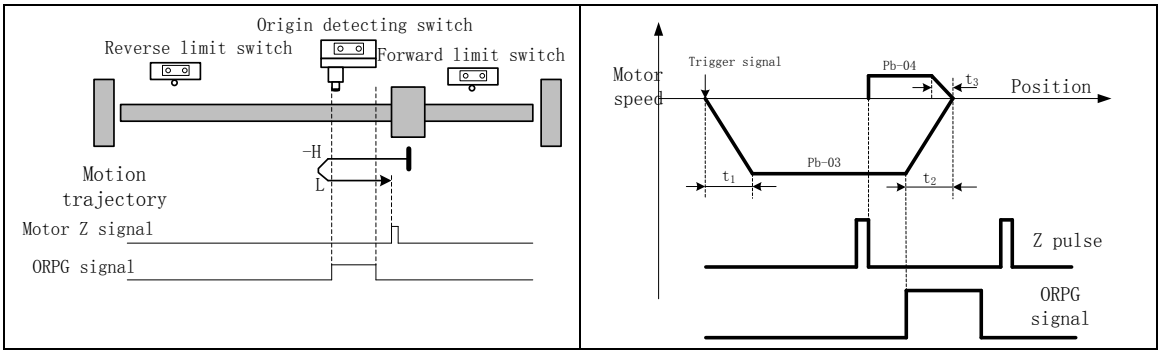


Pb-02=5:

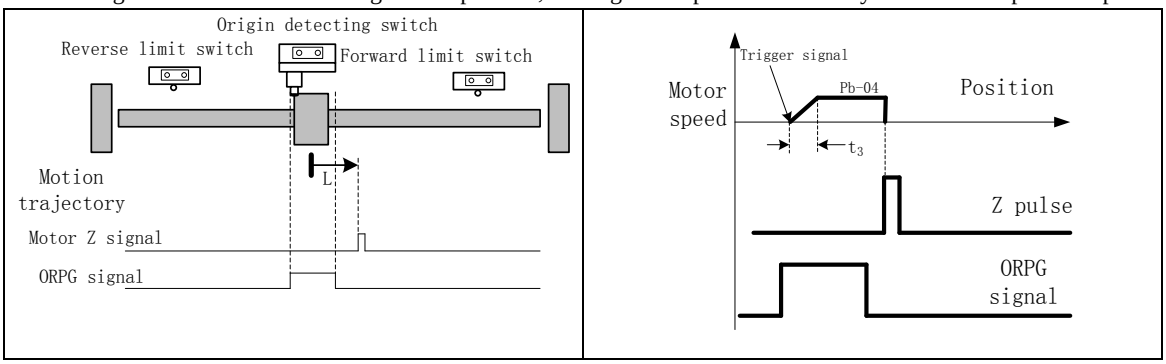
Target Zero position: the first Z pulse after the falling edge of the ORPG

Deceleration point: origin switch (ORPG)

If the ORPG signal is invalid when zero position return starts, the reverse will run at Pb-03, slow down after the rising edge of the ORPG, and then look for the target zero at the positive speed of Pb-04.



- If the ORPG signal is valid when returning to zero position, the target zero position is directly located at the positive speed of Pb-04.

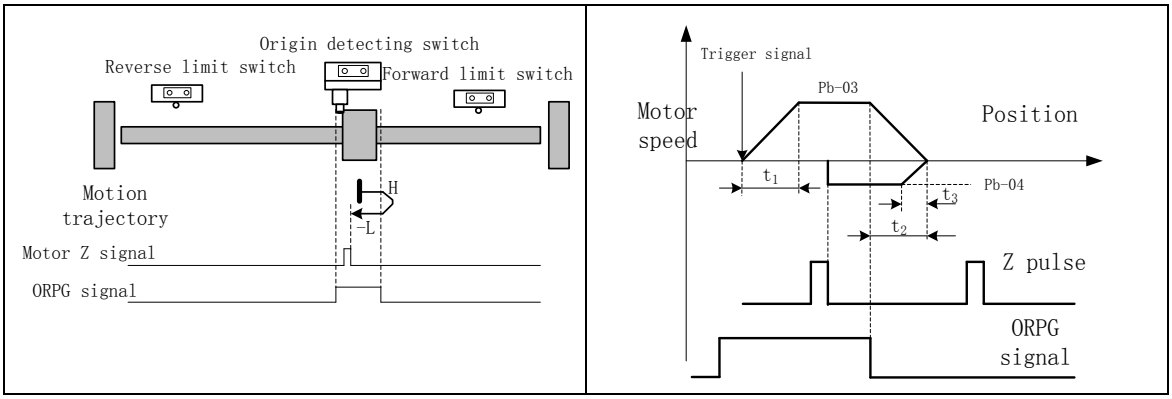


Pb-02=6:

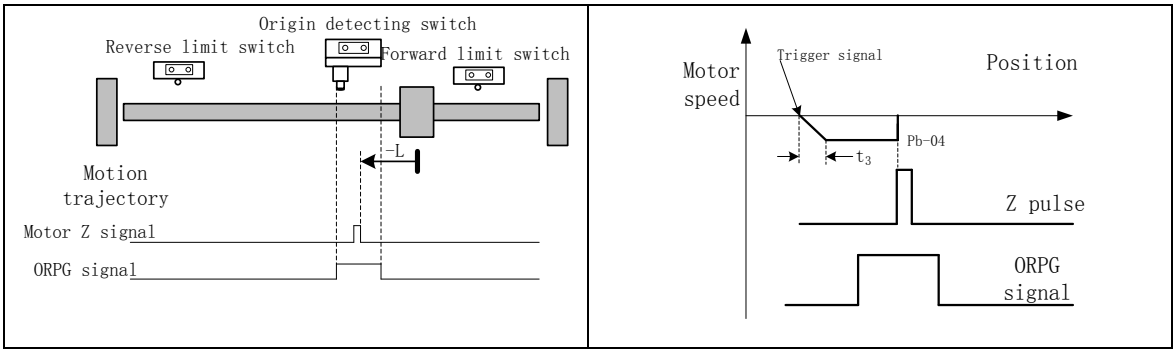
Target Zero position: the first Z pulse after the rising edge of the ORPG

Deceleration point: origin switch (ORPG)

If the ORPG signal is valid when zero position return starts, it is running at the speed of Pb-03, slowing down after the falling edge of the ORPG, and then looking for the target zero position at the negative speed of Pb-04.



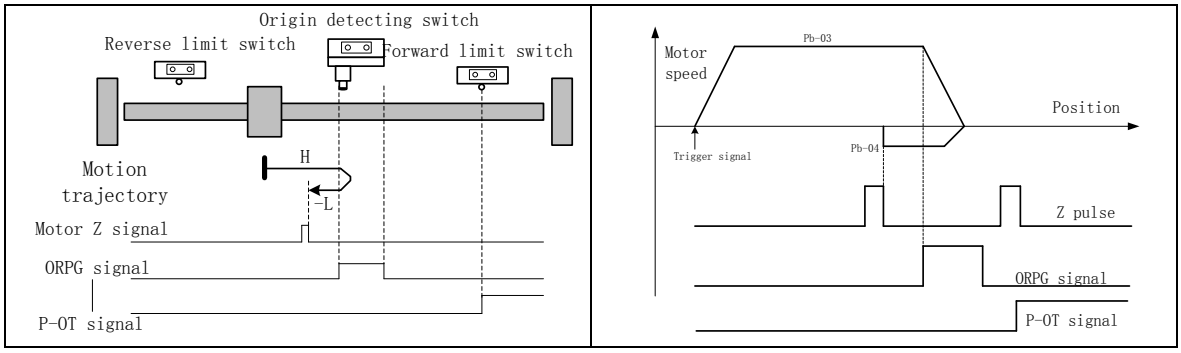
- If the ORPG signal is not valid, the target zero position is searched directly at the speed of Pb-04.



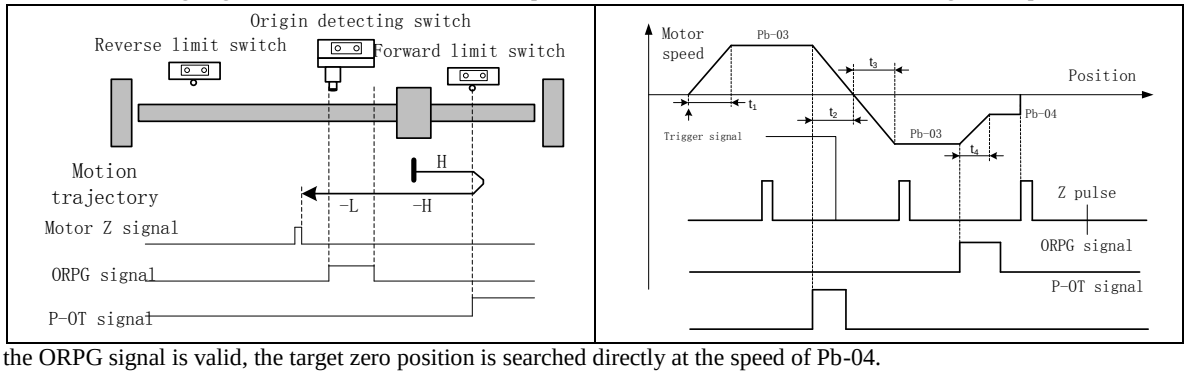
Pb-02=7：

Target Zero positon: the first Z pulse after the falling edge of the ORPG

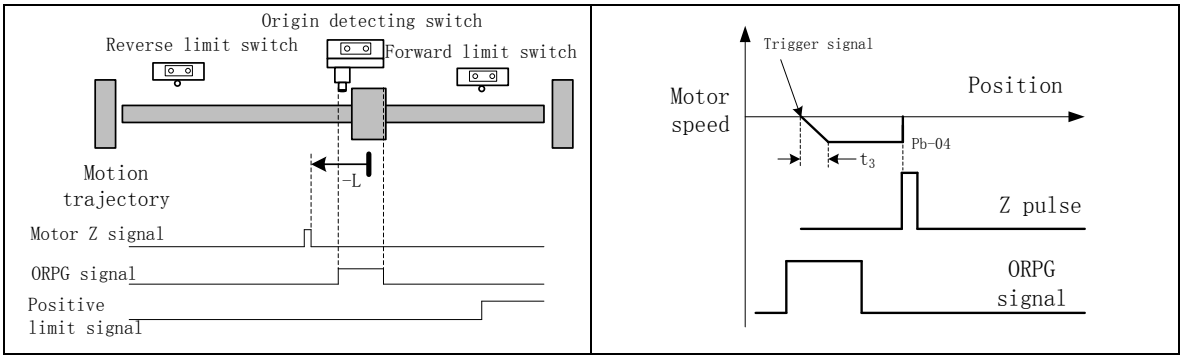
- Deceleration point: origin switch (ORPG)
- When the ORPG signal is not valid, running at Pb-03 positive speed:
- - if not encountered positive limit switch P-OT signal, after the rising edge of ORPG, decelerate to stop, then reverse to Pb-04 speed to look for target zero position.



- Upon the encounter of positive limit switch P-OT signal, automatic reverse operation at a speed of Pb-03, on meeting the rising edge of OPRG, slow down to the speed of Pb-04, and continue to run until target zero position is met.



- If the ORPG signal is valid, the target zero position is searched directly at the speed of Pb-04.

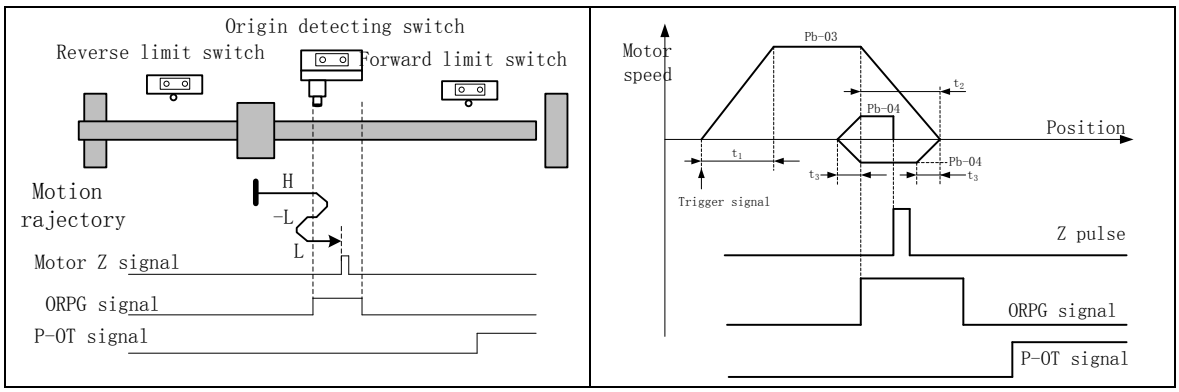


Pb-02=8：

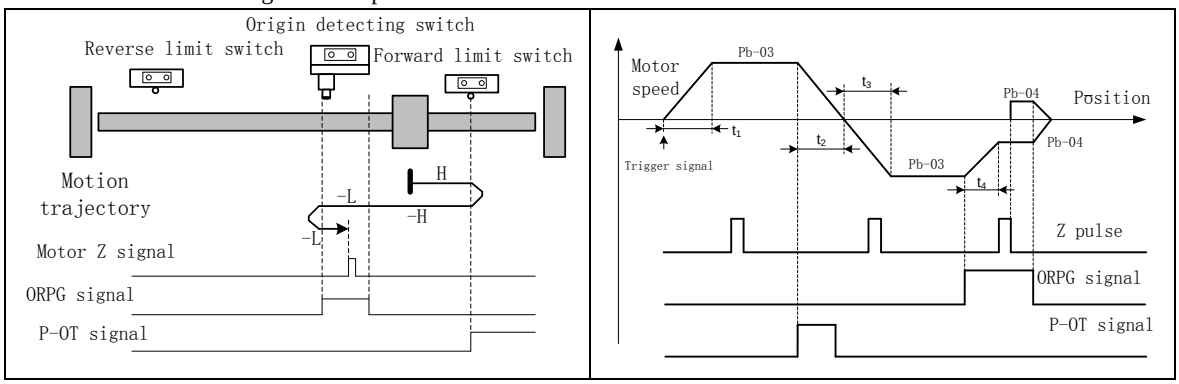
Target Zero position: the first Z pulse after the rising edge of the ORPG

Deceleration point: origin switch (ORPG)

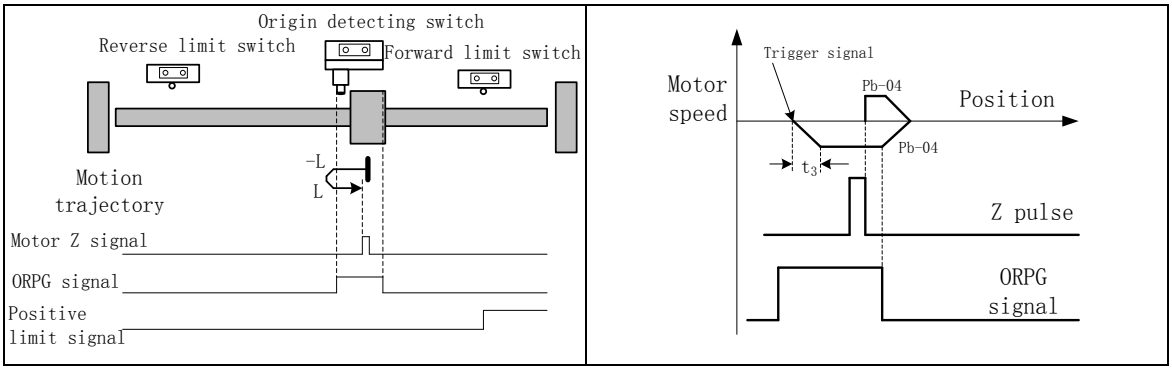
- When the ORPG signal is not valid, running at Pb-03 positive speed:
- if not encountered positive limit switch P-OT signal, after meeting the rising edge of ORPG, slow down to stop, then run at Pb-04 negative speed, meet the falling edge of ORPG, and then to run positive to find the target zero position.



- If encountered positive limit switch P-OT signal, automatically run at a negative speed of Pb-03, meet the rising edge of OPRG, slow down to the speed of Pb-04, continue to run until the falling edge of ORPG is met, reverse and run at a speed of Pb-04 until the target zero stop is found.



- If the ORPG signal is valid when zero position return starts, it will start to return to zero position directly at the negative speed of Pb-04. After meeting the falling edge of ORPG, slow down to stop and then search for the target zero position at the negative speed of Pb-04.

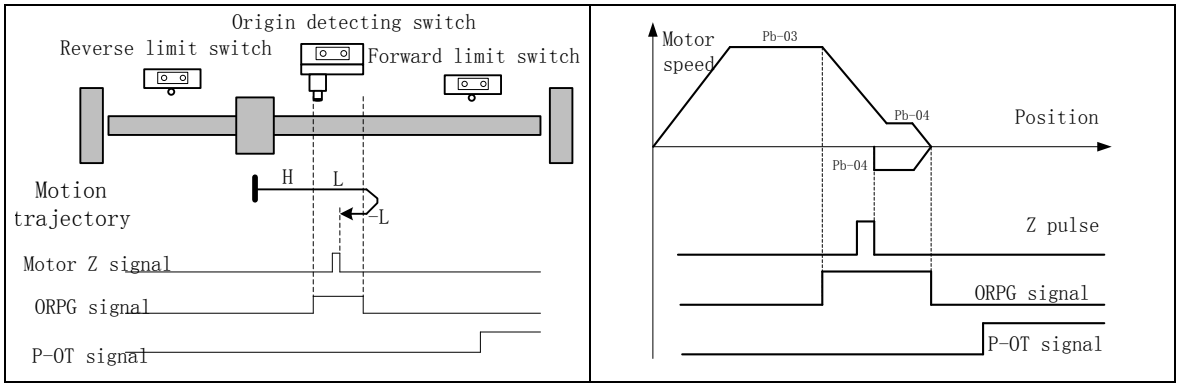


Pb-02=9：

Target Zero position: the first Z pulse after the rising edge of the ORPG

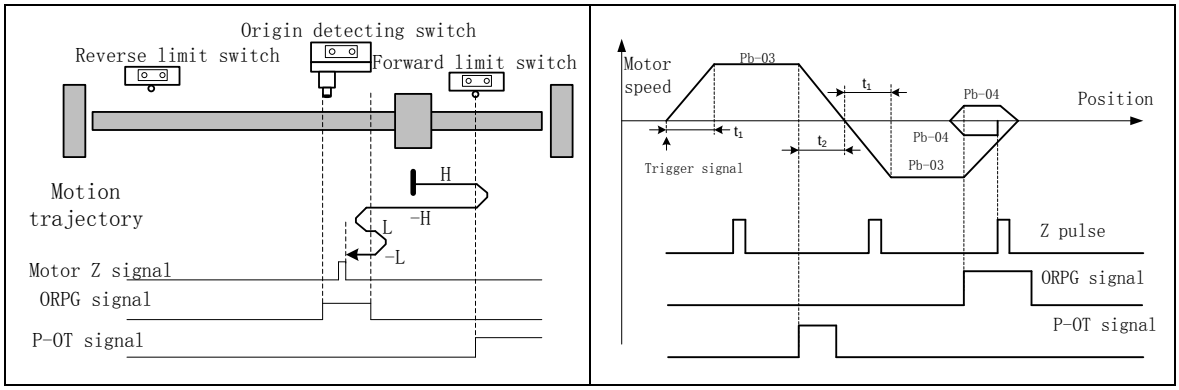
Deceleration point: origin switch (ORPG)

- When the ORPG signal is not valid when returning to zero position, run forward at Pb-03 speed:
- - if not encountered positive limit switch P-OT signal, when meeting the rising edge of ORPG, slow down to Pb-04 speed and continue to run forward, meeting the falling edge of ORPG, slow down to stop, then reverse to find the target zero position at Pb-04 speed.

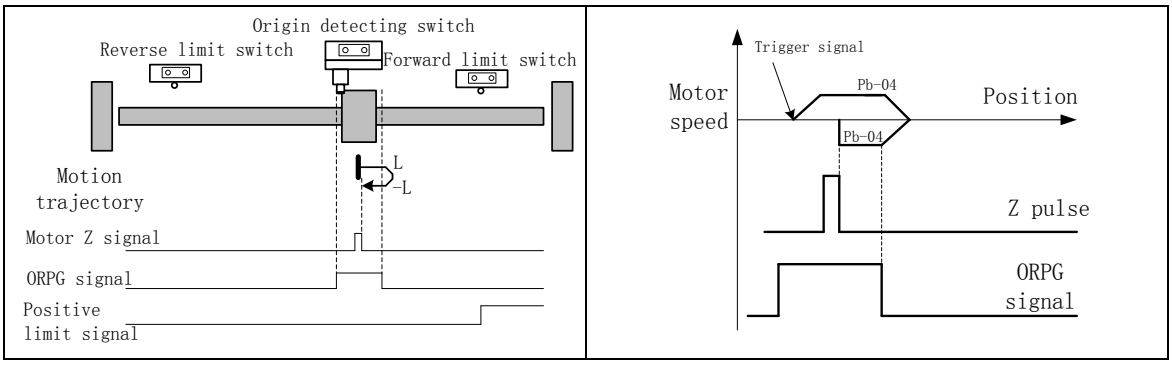


- If meeting positive limit switch P-OT signal, automatically reverse at a speed of Pb-03, meeting the rising edge of

OPRG, slow down to stop, and then reverse at Pb-04 speed until target zero position is found.



- If the ORPG signal is valid when returning to zero position, it will start forward to zero position at the speed of Pb-04 directly. When the falling edge of ORPG is encountered, slow down to stop, and then the target position will be searched at the speed of Pb-04.

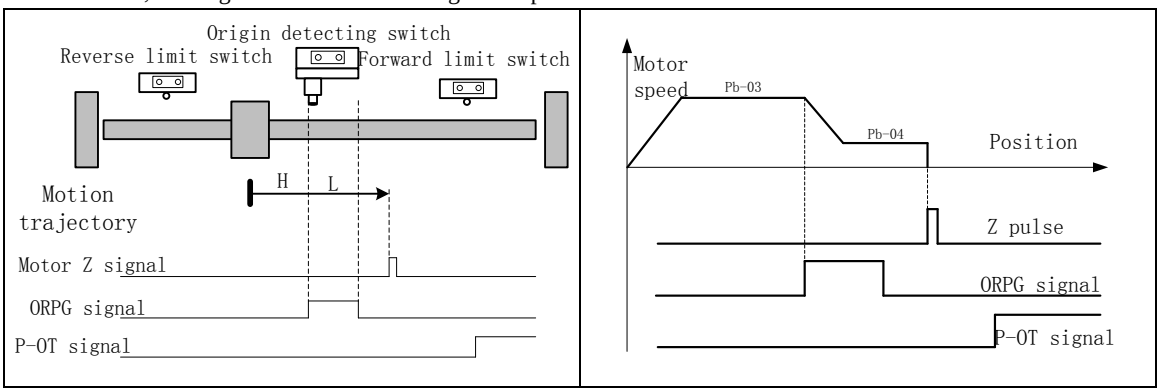


Pb-02=10：

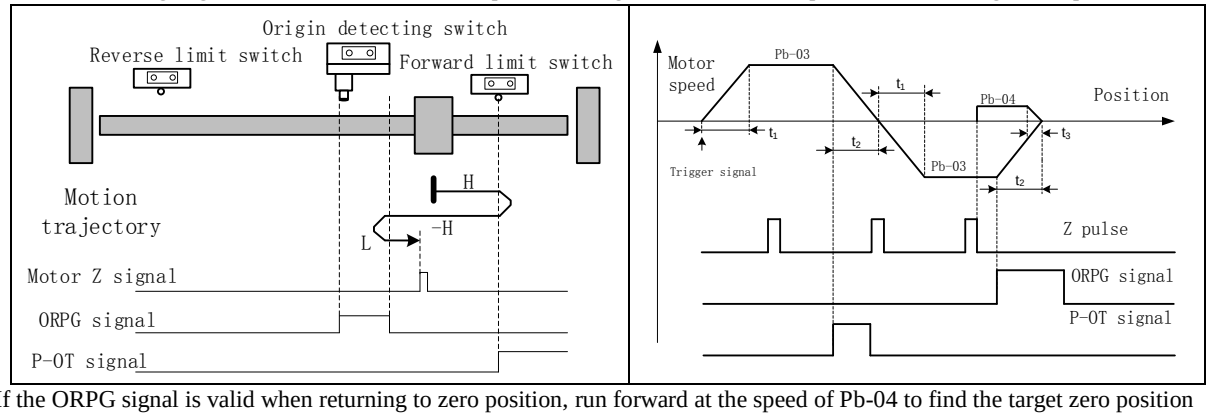
Target Zero position: the first Z pulse after the falling edge of the ORPG

Deceleration point: origin switch (ORPG)

- When the ORPG signal is not valid when returning to zero position, run forward at Pb-03 speed:
- if not encountered positive limit switch P-OT signal, meeting the rising edge of ORPG, slow down to the speed of Pb-04, running forward to find the target zero position.

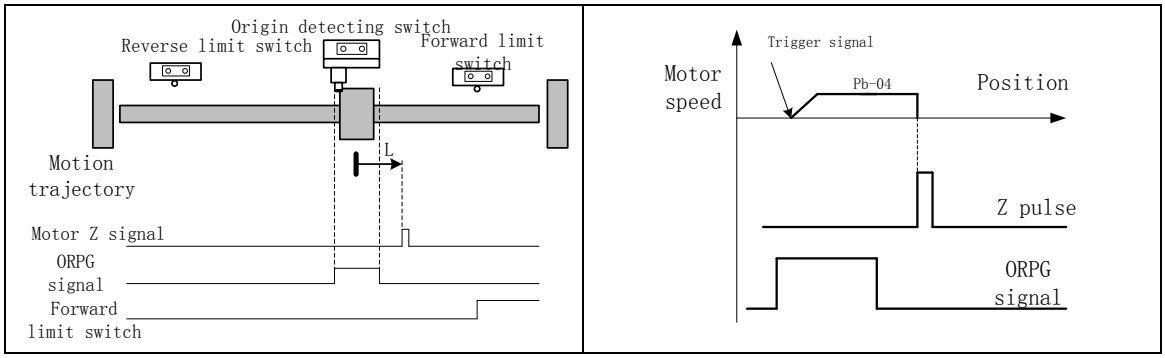


- If the positive limit switch P-OT signal is encountered, automatically run reverse at a speed of Pb-03, on meeting the rising edge of OPRG, slow down to stop and running forward at Pb-04 speed to find the target zero position.



- If the ORPG signal is valid when returning to zero position, run forward at the speed of Pb-04 to find the target zero position

directly.



Pb-02=11、12、13、14：

Similar to Pb-02=7~10, only the initial direction is opposite.

Pb-02=17 至 30： Same as with the Pb-02=1~14 motion curve, only the last step of finding the Z signal is omitted. The signal is stopped immediately upon meeting the origin signal.

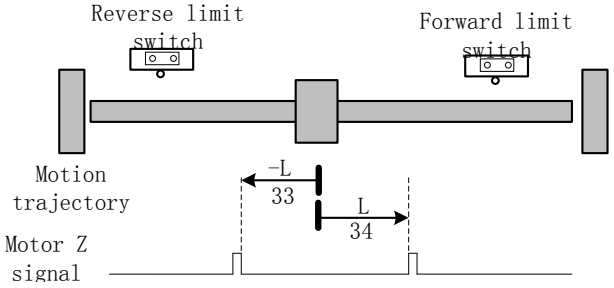
Pb-02=	Origin signal		Pb-02=	Origin signal
17	N-OT falling edge		24	ORPG rising edge
18	P-OT falling edge		25	ORPG rising edge
19	ORPG falling edge		26	ORPG falling edge
20	ORPG rising edge		27	ORPG falling edge
21	ORPG falling edge		28	ORPG rising edge
22	ORPG rising edge		29	ORPG rising edge
23	ORPG falling edge		30	ORPG falling edge

Pb-02=31、32： Reserve

Pb-02=33、34：

- Origin signal: Z pulse
- Deceleration point: no
- Zero return mode 33: run reverse at the speed of Pb-04, on meeting the first Z pulse, stop.

Zero return mode 34: run forward at the speed of Pb-04, on meeting the first Z pulse, stop.



Pb-02=35：

Take the current position as the mechanical origin. When the origin is returned to zero, the current position is the origin and the origin return signal is completed.

Pb-03	**Zero return 1st high speed setting**		Initial value	500	Commu.addr.	0B03H
			Unit	rpm	Valid time	Immediately
	Range	0~10000	Data size	16bit	Control mode	P

Parameter function: the motor speed at which the homing function is performed before reaching the reference point.

Pb-04	**Zero return 2nd low speed setting**		Initial value	50	Commu.addr.	0B04H
			Unit	rpm	Valid time	Immediately
	Range	0~10000	Data size	16bit	Control mode	P

Parameter function: when performing the homing function, the motor speed of finally positioned at the origin after reaching the reference point.

This speed should not be set too high, otherwise, when the load inertia is large, it may cause overshoot.

Pb-05	**Homing acceleration time**		Initial value	100	Commu.addr.	0B05H
			Unit	ms	Valid time	Immediately
	Range	1~65535	Data size	16bit	Control mode	P
Pb-06	**Homing deceleration time**		Initial value	100	Commu.addr.	0B06H

			Unit	ms	Valid time	Immediately
	Range	1~65535	Data size	16bit	Control mode	P

Parameter function: set the acceleration and deceleration time in the process of homing.

Acceleration time is the time from the 0 speed to the motor's rated speed.

Deceleration time is the speed from the motor speed down to 0 speed.

Pb-07	Reserve							
Pb-08	Homing offset pulse number	-2147483647～2147483647	I32	0	Pulse	P	○	0B08H
Pb-10	Postioning after homing	-2147483647～2147483647	I32	0	Pulse	P	○	0B0AH

5-16. Motor parameters

Code	Function	Intial value	Unit	Attr	Commu.address
Pd-00	Reserve				
Pd-01	Motor code	Corresponding mode code	-	●	0D01H
Pd-02	Motor rated power	Determined by motor code	kW	●	0D02H
Pd-03	Motor rated current	Determined by motor code	A	●	0D03H
Pd-04	Motor rated torque	Determined by motor code	Nm	●	0D04H
Pd-05	Motor rated voltage	Determined by motor code	V	●	0D05H
Pd-06	Motor rated speed	Determined by motor code	rpm	●	0D06H
Pd-07	Motor maximum speed	Determined by motor code	rpm	●	0D07H
Pd-08	Motor pole pair number	Determined by motor code	-	●	0D08H
Pd-09	Q xis inductance	Determined by motor code	mH	●	0D09H
Pd-10	D axis inductance	Determined by motor code	mH	●	0D0AH
Pd-11	Line resistance	Determined by motor code	Ω	●	0D0BH
Pd-12	Torque constant	Determined by motor code	N/A	●	0D0CH
Pd-13	BEMF	Determined by motor code	V	●	0D0DH
Pd-14	Rotor inertia	Determined by motor code	$kg.cm^2$	●	0D0EH
Pd-15	Encoder type 0：encoder with standard cable no. + logic 1：encoder with standard cable no. - logic 2：encoder with less cable no. + logic 3：encoder with less cable no. - logic 4：serial encoder + logic 5：serial encoder - logic	Determined by motor code		●	0D0FH
Pd-16	Encoder cable number	Determined by motor code	Pulse	●	0D10H
Pd-18	Encoder origin electric angle	Determined by motor code	°	●	0D12H
Pd-19	Encoder U phase　rise edge electric angle	Determined by motor code	°	●	0D13H
Pd-20	Reserve				
Pd-21	Reserve				
Pd-22	Incremental encoder AB phase order 0：A　advances B: CCW 1：A　advances B: CW	0	-	●	0D16H
Pd-23	Current adjustor Q axis proportion gain	Determined by motor code	-	●	0D17H
Pd-24	Current adjustor D axis proportion gain	Determined by motor code	-	●	0D18H
Pd-25	Current adjustor Q axis integral gain	Determined by motor code	-	●	0D19H
Pd-26	Current adjustor D axis integral gain	Determined by motor code	-	●	0D1AH
Pd-27	Current loop proportion tuning	100	%	●	0D1BH

Code	Function	Intial value	Unit	Attr	Commu.address
Pd-28	Current loop gain tuning	100	%	●	0D1CH
Pd-29	Motor flange size	Determined by motor code	mm	●	0D1DH

Chapter 7 Warning and troubleshooting

7.1 Alarm diagnosis and treatment measures

A servo drive alarm occurs, the operation will fail on the digital display Al The motor will coast to stop or zero speed stop (according to P0-08 setting, but zero speed stop only for two alarms). The drive will record the last four alarm messages which can be viewed by d1 group. Display and alarm. The measures are as follows:

AL 001: short-circuit

AL 002: Hardware Overcurrent

AL 00C: Software Overcurrent

Alert cause	Check	Treatment
Motor wiring error	Check the phase sequence between the motor and the drive	Re-wire according to the commands on the manual
Control parameter setting exception	Check if the set value is much larger than the factory value	Resume to the default value, and then gradually revised
Command changes are too dramatic	Check whether the control input command changes too violently	Correct the input command change rate or turn on the filter function
The drive output short circuit	1: Check the drive and motor connection status or if there is a short cut 2: Check if the motor is damaged	1: exclude short-circuited state, and to prevent the metal conductor being exposed. 2: replace damaged motor
External braking resistor resistance is too small or short circuit	Check if the external braking resistor is in compliance	Braking resistor specification refers to the manual, and the correctly set P8-10, P8-11 and P8-13 parameters
Drive hardware failure	Alerts still occur when all of the above questions are excluded	Send to our dealer

AL 003: AD Initializing Alarm

Alert cause	Check	Treatment
Drive hardware failure	Power off and restart, whether this failure still occurs	Send to our dealer

AL 004: abnormality memory alarm

Alert cause	Check	Treatment
Parameter data write abnormal	Power off and restart, whether this failure still occurs	Replace the drive
Storage is too frequent	Check upper PC program, if the drive EEPROM was written frequently	Revise upper PC program, parameters that need to be written frequently use the RAM address, the address can be adjusted by P7 group.

AL 005: System Parameters abnormal

Alert cause	Check	Treatment
There is a conflict with the set parameters	Check the parameters set before the alarm	Fix the wrong parameters

AL 006: AD sampling alert

Alert cause	Check	Treatment

The external analog sample deviation is too large or the conversion time out	Power off and restart, whether this alarm still occurs	Send to our dealer

AL 007: encoder error 1

Alert cause	Check	Treatment
The encoder is loose	check CN5 connector and encoder connector	re-install
Encoder wiring error	Make sure that the wiring of the encoder follows the recommended wiring in the manual	Correct wiring
Poor encoder wiring	Check the wiring between CN5 and encoder terminal on both ends, including the shield layer	Reconnect wiring
The encoder is damaged	Exclude the wiring problems and this alarm still occurs	Replace the motor

AL 008: encoder error 2

Alert cause	Check	Treatment
Incremental encoder AB signal abnormal	Refer to AL 007	Refer to AL 007
Absolute Encoder CRC check errors		

AL 009: encoder error 3

Alert cause	Check	Treatment
Incremental encoder Z signal abnormal	Refer to AL 007	Refer to AL 007
Absolute encoder communication error		

AL 00A: Undervoltage

Alert cause	Check	Treatment
The main circuit input voltage is below the allowable value	Check the main circuit input voltage and wiring is normal	Re-confirm the power supply wiring
No input voltage for main circuit	Check if the main circuit voltage is normal	Re-confirm the power switch
Power supply error	Check if the power supply matches the specification	Use the correct power supply

AL 00b: Overvoltage

Alert cause	Check	Treatment
The main circuit input voltage exceeds the allowable value	Check whether the main circuit voltage is within the allowable range	Use the correct power supply
Power input error	Check that the power supply matches the specification	Use the correct power supply
The motor slows down too fast	Check that the system inertia is too large and slow down too fast	Extend the deceleration time, or use a suitable external braking resistor
Drive hardware failure	This alarm is still present when the main circuit voltage measured is in the allowable range and the motor is not running	Send to our dealer

AL 00C: Software Overcurrent

See the description of AL 002

AL 00d / AL 00E: Motor overload / drive overloading

Alert cause	Check	Treatment
More than the rated load for continuous operation	1: monitor whether d0-01 lasts more than 100% 2: monitor whether d0-21 lasts over the rated value	1: increase motor capacity or decrease the load 2: increase drive capacity or decrease the load
Motor, encoder wiring error	Check the U, V, W and the encoder wiring	Correct wiring

Incorrect control parameter setting	1: whether there are mechanical shocks, motor abnormal sound 2: rapid acceleration or deceleration setting	1: adjust the position, speed gain value 2: slow down the acceleration and deceleration time
Drive or motor failure	Exclude the above questions	Send to our dealer

AL 010: drive is overheated

Alert cause	Check	Treatment
Ambient temperature is too high	Check whether the ambient temperature and humidity are within the allowable range	Improve the installation environment
The drive cooling fan is damaged	Check if the cooling fan is running during operation	Replace the fan that does not operate
The cooling of the servo drive is affected	1: Check the drive installation meets the requirements 2: Check the drive sink is clogged	1: Drive properly installed according to the requirements of chapter II 2: blockage clean

AL 012: overspeed

Alert cause	Check	Treatment
UVW phase sequence error	View UVW phase sequence is correct	Wiring in the correct phase sequence
Over speed judgment parameter is set incorrectly	Check if the speed setting parameter is too small	The speed parameter value is set correctly
The speed input command has changed	Check whether the input analog voltage signal is abnormal	Adjust the input signal rate of change or adjust the filter
The encoder is disturbed	Cable arrangement is appropriate, the system has no grounding	Adjust the cable layout, the system reliable grounding

AL 013: position error

Alert cause	Check	Treatment
The position following error alarm value is too small	Confirm whether the parameterP1-20 is appropriate	Increase the setting value of P1-20
The pulse command frequency is higher than the specification	Detect the frequency of the pulse command	Adjust the pulse frequency so that it is not higher than the specification
The gain value is set too low	Confirm if the set value is appropriate	Set the gain value correctly
Torque limit is too low	Check the torque limit value	Correctly adjust the torque limit value
Load inertia is too large	Calculate the ratio of load inertia to motor rotor inertia	Reduce the load inertia or re-evaluate the motor capacity

AL 014: Input phase loss

Alert cause	Check	Treatment
Main circuit power is abnormal	Check if L1, L2, L3 power cord is loose or only a single-phase input	Access to the normal three-phase power supply, still unusual, send to our dealer.
Drive parameter setting error	The single-phase power supply is set to three-phase power supply	Set parameters correctly

AL 017: the braking resistor overload

Alert cause	Check	Treatment
Braking resistor is not connected or the capacity is too small	1: Check the braking resistor is connected 2: calculated braking resistance value	1: Reconnect braking resistor 2: Use the appropriate braking resistor
Braking IGBT failure	Check the braking IGBT is not damaged	Send to our dealer
Parameter setting error	Check the setting value of brake resistor (P8-10), the brake resistor capacity (P8-11), and the braking resistance derated percentage(P8-13)	Set parameters correctly

AL 018: Encoder overheat

Alert cause	Check	Treatment
Absolute encoder is overheated	Check if the motor operating ambient temperature is too high	Reduce the ambient temperature or apply forced air cooling for the motor

AL 019: absolute encoder low battery voltage warning

Alert cause	Check	Treatment
The battery voltage of absolute encoder is below 3.1V	Measure the battery voltage	Replace the battery (Please keep the encoder and the drive CN5 terminal in good condition and replace the battery when the drive is powered on. If the encoder does not have power, replace the battery, the alert A l 01A will occur after power on.

AL 0 1A: absolute encoder battery voltage low

Alert cause	Check	Treatment
Absolute encoder battery voltage is below 2.5V, the multiturn location information is missing	Measure the battery voltage	Replace the battery and then manually remove the multiturn fault information by AF-16, and then power on again.

AL 0 1b: motor drive mismatch

Alert cause	Check	Treatment
The drive does not match the motor	1: motor and drive voltage level are consistent 2: code within the motor drive is consistent with the motor nameplate	1: correctly match drives and motors 2: motor code entered correctly

AL 0 1C: Homing failure

Alert cause	Check	Treatment
Pb-00 parameter setting value is too small	Check the value of Pb-00 is appropriate	Increase the value of Pb-00
External detector, limit switch failure	Check the external detector, limit switches, and wires	Troubleshooting

AL 0 1d: main power failure

Alert cause	Check	Treatment
The main circuit power is cut off	Check that the power supply logic is correct	Adjust the power supply logic

AL 0 1F: a system reboot

Alert cause	Check	Treatment
After some operations are complete, the drive needs to be restarted	none	Turn off the drive and then power on again

AL 027: UVW to ground short circuit alert

Alert cause	Check	Treatment
Motor wire UVW wire is shorted to ground	Check the motor wires and connectors	Handle the insulation problem
The motor has an internal line insulation damage	Check the insulation of the motor windings	Send to our dealer

AL 028: Inertia identification fails

Alert cause	Check	Treatment
Load inertia is too large	Whether the load inertia is too large	Try to reduce the load inertia or replace a motor with larger inertia
There is an abnormal connection between the load and the motor	The connection of the load to the motor is correct	Exclude mechanical problems
The number of turns the motor can rotate is too small	Whether the number of turns of the motor is greater than a set value P8-03	Adjust parameters P8-03 Appropriately increasing the set value of P8-02
P8-03 is set too small	Whether the motor can rotate more turns	

AL 032: electronic gear ratio setting range error

Alert cause	Check	Treatment
The electronic gear ratio setting is unreasonable	Check that the setting of the electronic gear ratio is appropriate	Adjustment parameters

AL 033: input pulse frequency is too high

Alert cause	Check	Treatment
The input pulse frequency	Whether the input pulse frequency is too	Adjust the upper computer output

exceeds 1MHz	high	
	Whether there is serious interference	Use a qualified twisted shielded wire to transmit the pulse signal

AL 034: Analog zero drift error correction

Alert cause	Check	Treatment
For zero drift self-learning, the collected external voltage exceeds 2V	When performing the autotuning of zero drift, whether the upper computer command is set to 0	The commands from the upper computer is set to 0, and then auto tune the zero drift again.
	Upper PC command is 0, the output voltage exceeds 2V	Modify the upper computer output

Warning diagnosis and handling measures
When the servo drive has a warning, a warning will be displayed "AlE on the numeric keypad. " warning occurance indicates that the system detects an abnormality, but the motor does not stop running, please check the causes and eliminate the problem of warning. Warning display and handle measures are as follows:

AlE02: Drive overheating warning

Alert cause	Check	Treatment
Ambient temperature is too high	Check whether the ambient temperature and humidity are within the allowable range	Improve the cooling conditions of the servo drive, and reduce the ambient temperature
The drive cooling fan is damaged	Check if the drive cooling fan is running	Replace the fan that does not operate
The installation direction of the servo drive or the cooling fan inlet and outlet are blocked	1: Check the drive installation meets the requirements 2: Check the drive sink is clogged	1: installing a drive in accordance with chapter 2. 2: blockage cleansed
The servo drive is faulty	Power off for a period of time before restart	If the fault is still reported, replace the servo drive

AlE03: Motor overload warning

Alert cause	Check	Treatment
motor load reaches at the motor overload warning threshold set by P8-09	1: Refer to **AL 00d** and **AL 00E** 2: P8-09 parameter setting is too small	1: Refer to **AL 00d** and **AL 00E** 2: Appropriate increase in P8-09 set value

AlE04: drive overload warning

Alert cause	Check	Treatment
drive load reaches at the drive overload warning threshold set by P8-08	1: Refer to **AL 00d** and **AL 00E** 2: P8-08 parameter setting is too small	1: Refer to **AL 00d** and **AL 00E** 2: Appropriate increase in P8-08 setting value

AlE05: Excessive position deviation warning

Alert cause	Check	Treatment
The position following error alarm threshold is too small	Confirm whether the parameter of P1-18 is appropriate	Increase the setting value of P1-18
The pulse command frequency is higher than the specification	Detect the frequency of the pulse command	Adjust the pulse frequency so that it is not higher than the specification
The gain value is set too low	Determine if the set value is appropriate	Set the gain value correctly
Torque limit is too low	Confirm the torque limit value	Correctly adjust the torque limit value
Load inertia is too large	Calculate the ratio of load inertia to motor rotor inertia	Reduce the load inertia or re-evaluate the motor capacity

AlE06: braking overload warning

Alert cause	Check	Treatment
Braking resistor is not connected or the capacity is too small	1: Check the braking resistor is connected 2: calculate the braking resistance value	1: Reconnect braking resistor 2: Use the appropriate braking resistor resistance
Load inertia is too large	Calculate if the total load / rotor inertia ratio is appropriate	Reduce the load inertia or change the motor with larger inertia
Incorrect parameter setting	Check brake resistor set value (P8-10) and capacity parameter (P8-11)	Correctly set P8-10 and P8-11 parameters

	Ensure if brake resistor derating percentage (P8-13) is appropriate	When applied an external braking resistor, if the power is sufficient, increase the set value of P8-13
	Make sure the deceleration time is too short	Extended deceleration time

AL E09: Communication parameters written and storage times in EEPROM are too many

Alert cause	Check	Treatment
Modification times by the host computer are too many	Check if the parameters modification is used with the corresponding RAM address	Existing address+8000H

AL E0A: Requied to power on again

Alert cause	Check	Treatment
The parameter for ‘ effective after power on again’ is changed	-	Power on again after setting the parameters.

– Pot –: Positive over travel warnings

Alert cause	Check	Treatment
P-OT terminal is valid and the command command is positive	Confirm the position of the positive limit switch	1: Release positive limit switch 2: Give negative command
Run over the position limit position	Confirmed the current motor position and the value of P1-26	Modify command and the set value of P1-26 P1-26 is set to a maximum value, the feature closed
The absolute value of the system is running in the positive direction beyond the allowable turns and the command is positive	The set value of P8-05 is proper	Adjust P8-05 Give negative commands
Servo system stability is not enough	Confirm the setting control parameters and load inertia	Re-modify the control parameters or re-evaluate the motor capacity

– not –: Negative over travel warnings

Alert cause	Check	Treatment
N-OT terminal is valid and the command is a negative command	1: Confirm the state of the negative limit switch	1: Release negative limit switch 2: Give positive command
Run more than the negative limit position	Confirm the current motor position and the value of P1-28	Modify command and the set value P1-28 The P1-28 is set to maximum value, the feature closed
The absolute value of the system runs in the negative direction over the allowable turns and the command is negative	The set value of P8-05 is proper	Adjust P8-05 Give a positive command
Servo system stability is not enough	Confirm the setting control parameters and load inertia	Re-modify the control parameters or re-evaluate the motor capacity

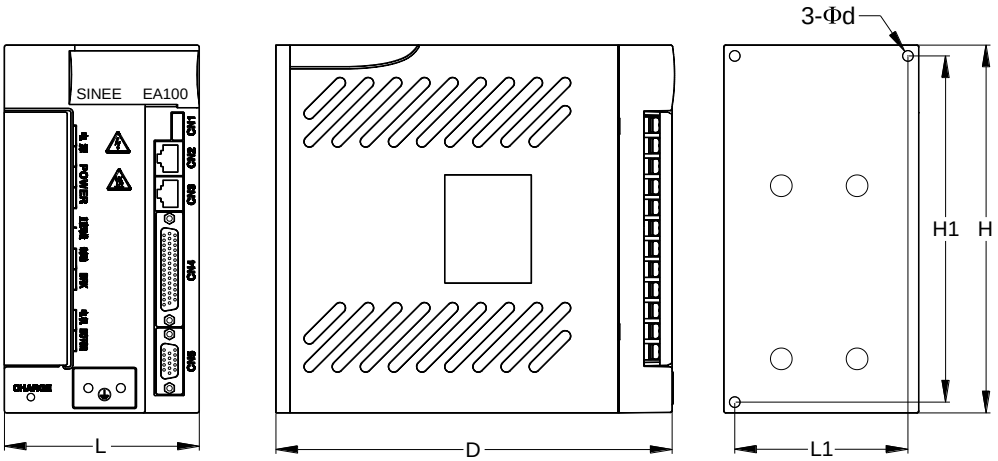
Chapter 8 Specification

8.1 EA180 servo drive specification

Model EA180-		1R6-2A	2R8-2A	5R5-2A	7R6-2A	010-2A	5R4-3A	8R4-3A	012-3A			
Applicable Encoder		2500ppr										
Model EA180-		1R6-2B	2R8-2B	5R5-2B	7R6-2B	010-2B	5R4-3B	8R4-3B	012-3B	018-3B	021-3B	026-3B
Applicable Encoder		17 bit incremental/ absolute,23 bit incremental /absolute										
Frame		SIZE A				SIZE B				SIZE C		
Rated Output Power（kw）		0.1/0.2	0.4	0.75	1.0	1.5	1.5	2.0	3.0	4.5	5.6	7.5
Rated Output Current(A)		1.6	2.8	5.5	7.6	10.0	5.4	8.4	12.0	18.0	21.0	26.0
Power	**Mains Power**	1-ph AC220V ±5% 50/60Hz 3-ph AC220V ±5% 50/60Hz					3-ph AC380V ±10% 50/60Hz					
	Control Power	1-ph AC220V ±5%					1-ph AC380V ±10%					
Working Conditio	**Temperature**	Operation 0～40 °, storage -20 °～85 °										
	Humidity	Operation/storage：≦90%RH（no dew）										
	Altitude	≦1000 meter										
	Vibration	≦4.9m/s^2，10～60Hz										
Cooling Mode		Fan										
Control Mode		SVPWM，vector control										
Six Control Modes		Speed control, position control, torque control, speed / position control, torque / speed control, position / torque control.										
Front Panel		5 keys、LED 5- bit										
Regenerative Braking		Built in brake unit and resistor, external braking resistor is applicable										
Feedback Mode		2500ppr, 17 bit incremental/23 bit absolute encoder										
Digital I/O	**Input**	Servo ON/OFF, fault reset, position pulse error register cleared, direction selection of speed command, zero clamp, internal command trigger, control mode switching, pulse prohibition, P-OT, N-OT, second torque limiting, positive jog, negative jog etc.										
	Output	Servo ready, brake output, motor rotation output, zero speed signal, speed near, speed comparison, position near, position comparison, torque limiting, speed limiting, warning output, fault output, etc.										
Protection	**Software**	Over voltage, under voltage, over speed, over heating, over load, over speed, encoder failure, etc..										
	Hardware	Position error is too large, EEPROM fault, etc..										
Alarm Data Tracking Function		Record 4 sets of historical alarm records and related data										
Communication Function		Modbus RTU										
Encoder Signal Output	**Signal Type**	A、B、Z differential output, Z signal open collector output, Z signal width can be set										
	Resolution	Programmable arbitrary frequency division, optiona l pre- 4 octave or post- 4 octave output										
Position Control Mode	**Maximum Input Pulse Frequency**	Differential input mode: 500Kpps Open collector input mode: 200Kpps										
	PULSE Command Mode	Pulse + sign, AB orthogonal pulse,CW/CCW										
	Command Control Mode	External pulse command, multistage position command										
	Command Smooth Mode	Low pass filter, FIR filter, multistage position command, ladder smoothing										
	Electronic Gear Ratio	Electronic Gear Ratio：N/M times （0.001＜N/M＜64000） N：1~2^{30}，M：1～2^{30}										
	Position Accuracy	±1 command pulse										
contr	**Command control mode**	External analog command, digital speed command, multiple preset speed command, and JOG command										

	Command smoothing mode	Low pass filter, S curve smoothing		
	Analog command input	Voltage	-10V ～ 10V	
		Resistance	10KΩ	
		Time constant	200μs	
	Torque limiting	Digital setting or external analog limiting		
	Speed ratio	1:3000（2500ppr) 1:5000（17bit）		Under rated load, continuous stable operation minimum speed /rated speed
	Bandwidth	Not less than 250Hz（2500ppr) Not less than 800Hz（17bit）		
	Speed Fluctuation Rate	Load variables（0 ~ 100%）	Max.0.1%	17-bit encoder, when the speed command is rated speed, (no-load speed- full load speed) / rated speed
		Volt.fluctuations ±10%	Max.0.1%	
		Ambient (0~ 50℃）	Max.0.1%	
Torque Control Mode	**Command control mode**	external analog command, digital torque command		
	Command smoothing mode	low pass filtering		
	Analog command input	Voltage	-10V～ 10V	
		Resistance	10KΩ	
		Time constant	200μs	
	Speed limiting	Digital setting or external analog limiting		
	Accuracy	±3%（current repitition accuracy		

8.2 Dimension of EA180 servo drive



Structure	L(mm)	H(mm)	D(mm)	L1(mm)	H1(mm)	d(mm)	Screw	Torque Nm
SIZE A	65	170	171	55	160	5	M4	0.6-1.2
SIZE B	90	170	184	80	160	5	M4	0.6-1.2
SIZE C	110	283	233	95	272	5	M4	0.6-1.2

Note：The mounting hole number fo SIZE C is 4, and H is the largest size of the mounting substrate。

8.3 Motor model specification

SER ① | 08 ② | - | 0R7 ③ | - | 30 ④ | - | 2 ⑤ | A ⑥ | A ⑦ | Y ⑧ | 1 ⑨ | -XX ⑩

① product series	② Motor flange size	③ Rated motor output power
SER：standard servo motor SES：high performance servo motor	04：40mm 06：60mm 08：80mm 09：86mm 11: 110mm 13：130mm 18：180mm	0R1：100W 0R2：200W 0R4：400W 0R7：750W 1R0：1000W 1R5：1500W 2R0：2000W 3R0：3000W 4R5：4500W 5R6：5600W 7R5：7500W 011: 11000W
④ Rated motor speed	⑦ Inertia type	
10：1000rpm 15：1500rpm 20：2000rpm 25：2500rpm 30：3000rpm	A：Low inertia B：Medium inertia C：High inertia	
⑤ Voltage class		⑨ Optional
2：220V 3：380V	⑧ Shaft end	Null：No option

⑥ Encoder type		⑩ Special specifications
A：2500ppr B：17bit incremental C: 17 bit absolute F：23bit absolute	Y：Shaft with U-shaped slot and screw hole Z：Shaft with double-circle slot and screw hole	1：with brake（DC24V） 2：with oil seal 3：with brake and oil sea

8.3.1 The common features of the servo motors

Motor insulation class	F Class
Insulation voltage withstanding	1500V 60s
Insulation resistance	DC500V，10M and above
Motor temperature	B
Protection grade	All-sealed self cooling mode IP65 （except shaft-through）
Ambient	Ambient 0-40° humidity 20-80%(no dew）
Installation mode	Flange mounting
Rotation direction	Positive speed command, viewed from the load side, CCW

8.3.2 Brake specifiction：

Motor flange size	40	60	80	86	110	130	180	180
Rated voltage	DC 24~26.4V							
Static friction torque	0.35 N.m	2 N.m	3 N.m	3 N.m	10 N.m	20 N.m	40 N.m	80 N.m*
Rated power	3.5W±7%	6.3W±7%	10.4W±7%	10.4W±7%	11.6W±7%	19.5W±7%	25W±7%*	49W±7%*
Brake engaged voltage	18V DCmax							
Brake disengaged voltage	1.5V DCmin							
Action time	150ms							

*：for 7.5kw servo motor only.

1: The brake is used to prevent the motor from moving after the stop, can not be used for braking.
2: The brake is required for 24V power that should be supplied by the user absolutely can not use 24V on the drive.
3: The brake action time varies with the circuit, please figure it out according to the actual product.
4: Static friction torque is the static friction moment provided by the brake when the motor is static, if there is an external shock, can not guarantee the motor is static.

8.3.3 Servo motor parameters：

Servo motor model		**SES04**	**SER06-**		**SER08-**			**SER09-**
		0R1-30-2□AY□	**0R2-30-2□AY□**	**0R4-30-2□AY□**	**0R7-30-2□AY□**	**0R7-20-2□AY□**	**1R0-30-2□AY□**	**0R7-30-2□BZ□**
Voltage class(V)		220V						
Motor code*3	**2500ppr**	115	107	101	201	205	301	209
	17-bit	105	108	103	203	207	303	213
Rated power(W)*1		100	200	400	750		1000	750
Rated speed(rpm)*1		3000	3000		3000	2000	3000	3000
Highest speed(rpm)*1		6000	5000	4000	4000	2500	3500	3700
Rated current(A)*1		1.1	1.2	2.3	4.3	3.0	4.0	3.43
instantaneous max.current(A)*1		3.3	3.6	6.9	12.9	9.0	12.0	10.3
Rated torque(Nm)*1，*2		0.32	0.64	1.27	2.4	3.5	3.5	2.4
Instantaneous max.torque（Nm)		0.96	1.92	3.81	7.2	10.5	10.5	7.5
Torque constant(Nm/A)		0.29	0.53	0.55	0.58	1.17	0.88	0.74
Moving inertia(Kg.cm2)*4		0.04	0.176	0.30	1.01	1.59	1.59	2.42
Motor weight(Kg)		0.04 (0.67)	1.01(1.4)	1.37(1.78)	2.47(3.33)	3.40(4.10)	3.40(4.10)	3.24(3.94)
Applicable servo drive EA180-		1R6-2□		2R8-2□	5R5-2□			

*1：These values come out when matched with EA180 servo drive and the armature coil temperature is 100 degrees centigrade.

*2：Rated torque represents the continuous permissible torque on the aluminum radiator of the following dimensions and the ambient temperature is 40 degrees C.SER06/08：250*250*6mm SER09/11：300*300*10mm

*3：Motor with brake, if not listed separately in ( ), increase their rotational inertia by 0.02Kg.cm2.

Note: the value in ( ) is for the motor with brake.

Servo motor model						SER13-			
			1R0-20-2□BY□	1R2-30-2□BY□	1R8-30-2□BY□	0R7-20-2□CY□	1R0-10-2□BY□	1R0-20-2□BY□	1R0-30-2□BY□
Voltage class(V)		220V							
Motor code*3	2500ppr	109	319	317	110	211	305	307	309
	17-bit	112	320	111	113	215	311	313	315
Rated power(W)*1		600	1000	1200		1800	750	1000	
Rated speed(rpm)*1		3000	2000	3000	3000	2000	1000	2000	3000
Highest speed(rpm)*1		3600	2400	3400	3400	2500	1300	2500	3500
Rated current(A)*1		2.6	5.0	4.9	6.8	3.88	4.72	4.72	4.96
instantaneous max.current(A)*1		7.8	15.0	14.7	20.4	11.64	14.16	14.16	14.88
Rated torque(Nm)*1，*2		2.0	5.0	4.0	6.0	3.65	9.55	4.77	3.27
Instantaneous max.torque（Nm)		6.0	15.0	12.0	18.0	10.95	28.65	14.31	9.81
Torque constant(Nm/A)		0.8	1.00	0.81	0.88	0.94	2.02	1.01	0.66
Moving inertia(Kg.cm2)*4		3.03	7.22	5.54	8.55	6.17	17.14	8.71	6.17
Motor weight(Kg)		3.93(5.39)	6.42(7.88)	5.46(6.92)	7.26(8.72)	5.20(6.90)	10.12(11.67)	6.41(7.94)	5.31(6.89)
Applicable servo drive EA180-		5R5-2□	7R6-2□	010-2□		5R5-2□	7R6-2□		

Servo motor model			1R5-20-3□BY□	1R5-30-3□BY□	2R0-20-3□BY□	2R0-30-3□BY□	3R0-20-3□BY□	3R0-30-3□BY□
Voltage class(V)		380V						
Motor code*3	2500ppr	126	409	418	501	509	601	611
	17-bit	127	415	417	503	510	603	612
Rated power(W)*1		1500			2000		3000	
Rated speed(rpm)*1		1000	2000	3000	2000	3000	2000	3000
Highest speed(rpm)*1		1500	2500	3500	2500	3500	2500	3500
Rated current(A)*1		5.5	4.1	4.2	6.5	5.8	9.6	8.3
instantaneous max.current(A)*1		16.5	12.4	12.6	19.5	17.4	28.8	24.9
Rated torque(Nm)*1，*2		14.32	7.16	4.77	9.55	6.5	14.32	9.55
Instantaneous max.torque（Nm)		42.96	21.48	14.31	28.65	19.5	42.96	28.65
Torque constant(Nm/A)		2.6	1.74	1.14	1.47	1.12	1.11	1.15
Moving inertia(Kg.cm2)*4		25.58	12.08	8.71	17.14	12.08	25.58	17.16
Motor weight(Kg)		13.82 (15.40)	7.89 (9.43)	6.40 (7.96)	10.12 (11.67)	7.85 (9.40)	13.81 (15.34)	10.12 (11.67)
Applicable servo drive EA180-		8R4-3□	5R4-3□	5R4-3□	8R4-3□		012-3□	

Servo motor model		SER18-				
		3R0-15-3BBZ□	3R0-15-3BCZ□	4R5-15-3BBZ□	5R6-15-3BBZ□	7R5-15-3BBZ□
Voltage class(V)		AC 380				
Motor code*3	2500ppr	-	-	-	-	-
	17-bit	605	615	609	610	607
Rated power(W)*1		3000	3000	4500	5600	7500
Rated speed(rpm)*1		1500				
Highest speed(rpm)*1		1800				
Rated current(A)*1		11.5	7.5	11.0	15.0	20.3
instantaneous max.current(A)*1		25.3	18.8	28.5	37.5	50.8
Rated torque(Nm)*1, *2		19.1	19.1	28.6	34.9	48.0
Instantaneous max.torque（Nm)		42.0	47.8	72.0	87.3	120.0
Torque constant(Nm/A)		1.66	2.55	2.60	2.33	2.37
Moving inertia(Kg.cm^2)*4		25.95 （26.22）	53.0 （53.2）	45.51 （45.78）	79.89 （81.01）	120.36 （121.48）
Motor weight(Kg)		13.50 (18.50)	17.70 （22.6）	17.70 (22.60)	25.60 (33.60)	34.90 (42.90)
Applicable servo drive EA180-		012-3B	012-3B	018-3B	021-3B	026-3B

*1：These values come out when matched with EA180 servo drive and the armature coil temperature is 100 degrees centigrade.

*2：Rated torque represents the continuous permissible torque on the aluminum radiator of the following dimensions and the ambient temperature is 40 degrees C.

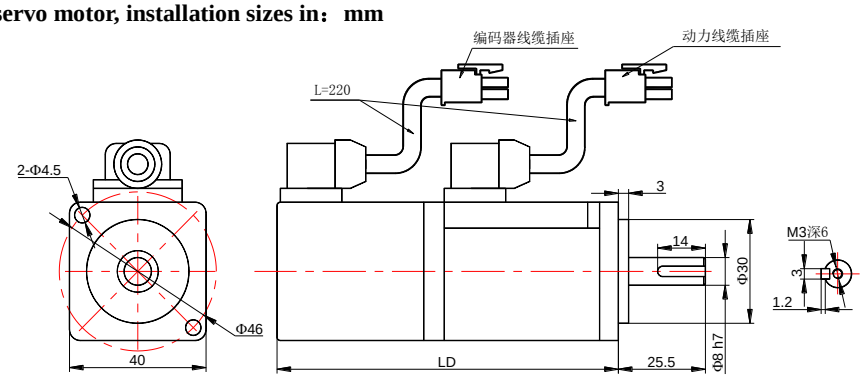
SER11：350*350*12mm ； SER13：400*400*15mm ；SER18：550*550*20mm

*3：Motor with brake, if not listed separately in ( ), increase their rotational inertia by 0.02Kg.cm2.

Note: the value in ( ) is for the motor with brake.

8.4 Servo motor dimensions

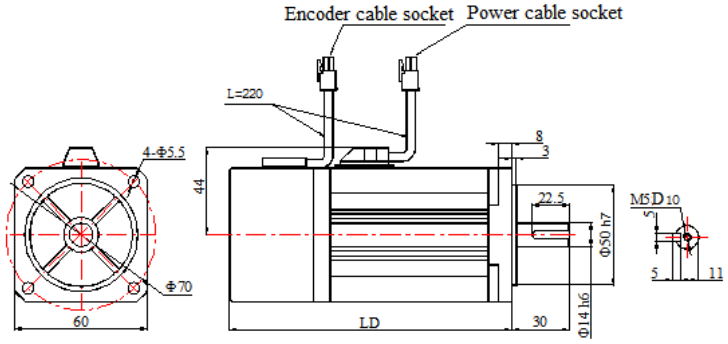
8.4.1 40 flange servo motor, installation sizes in： mm



LD **Sizes vary with different models：**

Motor model	LD		Motor model	LD
SES04-0R1-30-2□AY	100.5mm		SES04-0R1-30-2□AY1	133.5mm

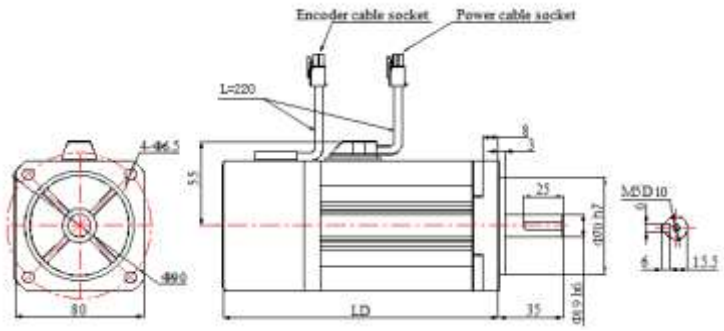
8.4.2 60 flange servo motor, installation sizes in: mm



LD **Sizes vary with different models：**

Motor model	LD		Motor model	LD
SER06-0R2-30-2□AY	113.5mm		SER06-0R2-30-2□AY1	147.0mm
SER06-0R4-30-2□AY	133.0mm		SER06-0R4-30-2□AY1	168.0mm

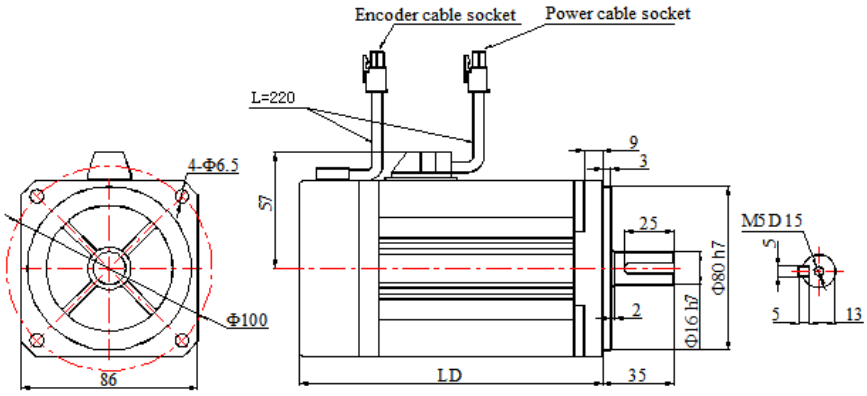
8.4.3 80 flange servo motor, installation sizes in： mm



LD **Sizes vary with different models：**

Motor model	LD		Motor model	LD
SER08-0R7-30-2□AY	142.5mm		SER08-0R7-30-2□AY1	173.0mm
SER08-0R7-20-2□AY	171.5mm		SER08-0R7-20-2□AY1	203.0mm
SER08-1R0-30-2□AY	171.5mm		SER08-1R0-30-2□AY1	203.0mm

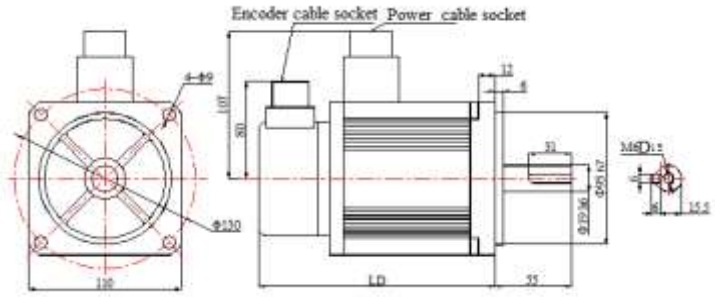
8.4.4 86 flange servo motor, installation sizes in: mm



LD **Sizes vary with different models：**

Motor model	LD		Motor model	LD
SER09-0R7-30-2□BZ	148mm		SER09-0R7-30-2□BZ1	183mm

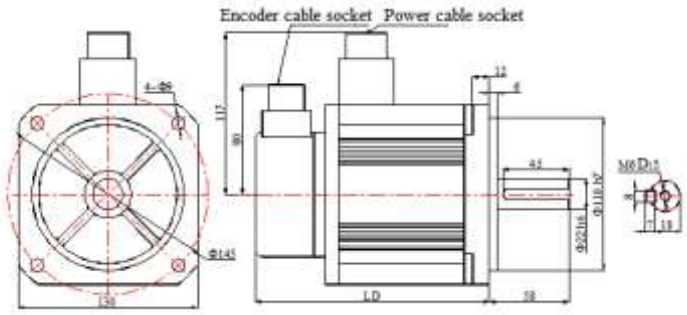
8.4.5 110 flange motor, installation sizes in: mm



LD Sizes vary with different models：

Motor model	LD		Motor model	LD
SER11-0R6-30-2□BY	155.5mm		SER11-1R0-20-2□BY1	210.5mm
SER11-1R0-20-2□BY	205.5mm		SER11-1R0-20-2□BY1	260.5mm
SER11-1R2-30-2□BY	185.5mm		SER11-1R2-30-2□BY1	240.5mm
SER11-1R8-30-2□BY	218.5mm		SER11-1R0-20-2□BY1	273.5mm

8.4.6 130 flange servo motor, installation sizes in: mm

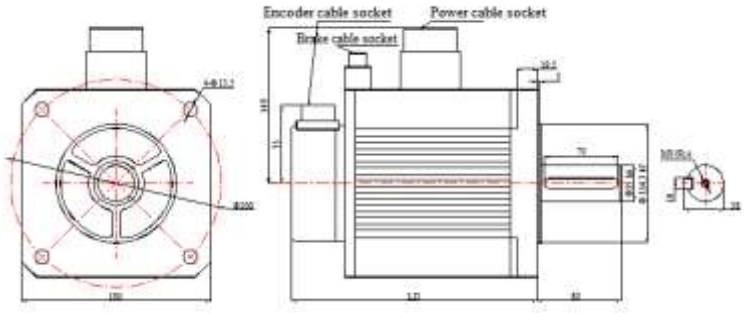


LD Sizes vary with different models：

Motor model	LD		Motor model	LD
SER13-0R7-20-2□CY	150mm		SER13-0R7-20-2□CY1	205mm
SER13-1R0-10-2□BY	215mm		SER13-1R0-10-2□BY1	270mm
SER13-1R0-20-2□BY	165mm		SER13-1R0-20-2□BY1	220mm
SER13-1R0-30-2□BY	150mm		SER13-1R0-30-2□BY1	205mm
SER13-1R5-10-□□BY	265mm		SER13-1R5-10-□□BY1	320mm
SER13-1R5-20-□□BY	185mm		SER13-1R5-20-□□BY1	240mm
SER13-1R5-30-□□BY	165mm		SER13-1R5-30-□□BY1	220mm

SER13-2R0-20-3□BY	215mm		SER13-2R0-20-3□BY1	270mm
SER13-2R0-30-3□BY	185mm		SER13-2R0-30-3□BY1	240mm
SER13-3R0-20-3□BY	265mm		SER13-3R0-20-3□BY1	320mm
SER13-3R0-30-3□BY	215mm		SER13-3R0-30-3□BY1	270mm

8.4.7 180 flange servo motor, installation sizes in： mm



LD Sizes vary with different models：

Motor model	LD		Motor model	LD
SER18-3R0-15-3□BZ	173.5mm		SER18-3R0-15-3□BZ1	222.0mm
SER18-3R0-15-3□CZ	202.5mm		SER18-3R0-15-3□CZ1	251.0mm
SER18-4R5-15-3□BZ	202.5mm		SER18-4R5-15-3□BZ1	251.0mm
SER18-5R6-15-3□BZ	252.5mm		SER18-5R6-15-3□BZ1	323.5mm
SER18-7R5-15-3□BZ	312.5mm		SER18-7R5-15-3□BZ1	392.5mm

8.5 Servo motor overload characteristic

8.5.1 Overload protection definition

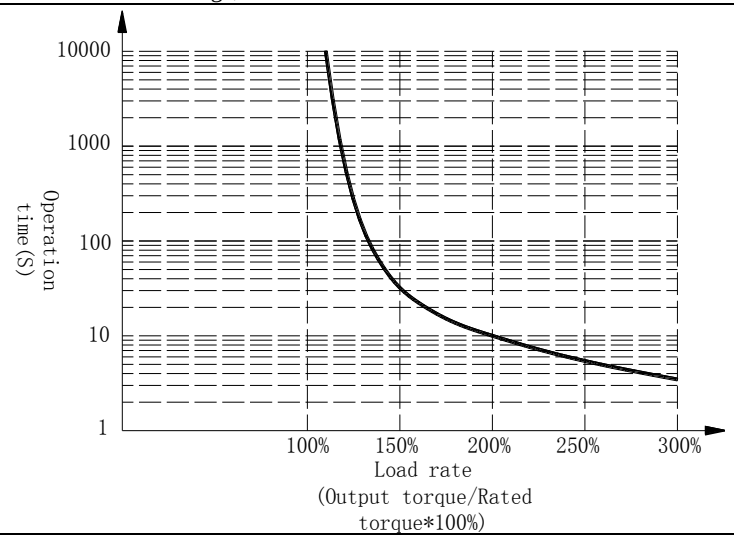
The overload protection of servo motor is to protect the motor from overheating

8.5.2 The causes of Servo motor overload

1) When the motor is running beyond the rated torque, the running time is too long.
2) Load and motor rotor inertia ratio is too large and acceleration and deceleration is too frequent.
3) Motor power cable or encoder wiring error.
4) Servo drive gain is improperly set, resulting in motor shock.
5) The motor that holds the brake operates even if the brake is not open.

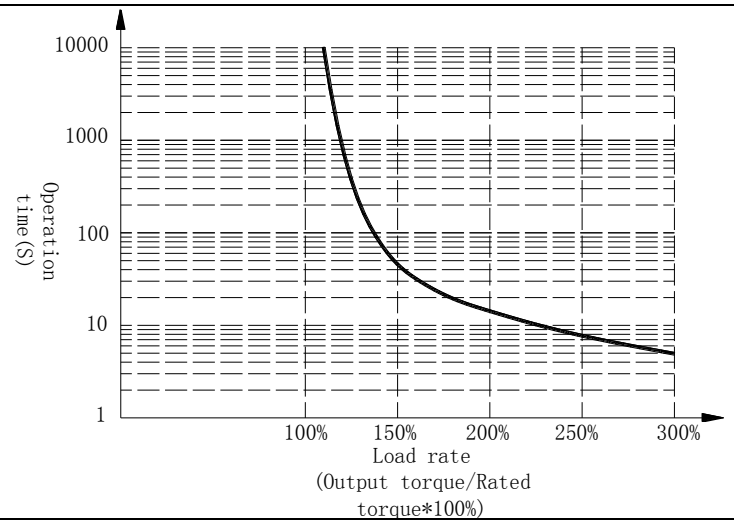
8.5.3 Relation between servo motor load and operation time

40、60、80、86 flange, servo motor



Load rate (%)	Operation time(S)	
	40 flange	60、80、86 flange
120	235.5	327.3
140	31.4	44.0
160	15.7	22.0
180	10.0	14.0
200	7.1	10.0
220	5.4	7.6
240	4.3	6.0
260	3.5	4.9
280	2.9	4.1
300	2.5	3.5

110、130、180 flange, servo motor



Load rate (%)	Operation time(S)	
	110、130 flange	180 flange
120	471.1	608.8
140	62.9	81.2
160	31.4	40.6
180	20.0	25.8
200	14.3	18.5
220	10.9	14.1
240	8.6	11.1
260	7.0	9.0
280	5.9	7.8
300	5.0	6.4