M6-P Series Servo System

User Manual

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Shenzhen Megmeet Electrical Co., Ltd. provides professional technical support for our customers. You can contact the local branch office or customer service center, or directly contact the company headquarters.

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Foreword

Thank you for choosing the M6 series servo system of Shenzhen Megmeet Electrical Co., Ltd.

M6 servo system uses a new hardware design platform and a new generation of control algorithms, this series of drive with excellent performance, perfect function, compact structure, convenient installation, simple debugging, easy maintenance, is the cost-effective products for drive generic and OEM markets. This series of servo supports Modbus/CANopen communication protocol, supports pulse reference and analog reference, and can realize network operation of multiple sets of servo systems with the host computer. With the functions of rigid table setting, inertia identification and oscillation suppression, making the servo easy to use, it is applicable for machine tool servo feed axes, printing, textile, cutting, manipulator, punching machine, semiconductor welding machine and other industries, realizing rapid and accurate position,speed and torque control.

M6 servo system can realize fast response and high precision together with small inertia servo motor; it can realize high mechanical time constant and stable operation together with medium and large inertia servo motor.This series of servo supports 23-bit multi-turn absolute encoder and incremental encoder.

The relevant precautions during the installation, wiring, parameter setting, troubleshooting and daily maintenance will be detailed in this manual. To ensure the correct installation and operation of the M6 series servo system as well as its high performance, please read carefully this user manual before installing the equipment. This manual shall be kept properly and delivered to the actual users of the drive.

Precautions for unpacking inspection

Please check carefully when unpacking the product:

- Whether the product has the damage signs;
- Whether the rotating shaft of the servo motor rotates smoothly(except for motor with brake);
- Whether the rated value in the nameplate is consistent with your order requirement;
- Whether the wiring is damaged and whether the wiring can be used.

We have implemented strict inspection on the manufacturing, package and delivery of the product. If there is any error, please contact us or your distributor immediately.

We are engaged in the continuous improvement of drive. The relevant manuals provided by us are subject to change without prior notice.

Safety Precautions

DANGER Operation without following instructions can cause death or severe personal injury.

WARNING Operation without following instructions can cause medium or slight personal injury or damage to the product and other equipment.

DANGER

- Please install the product on the incombustible materials (e.g., metal), otherwise, fire may be caused.
- Do not place any combustible material near the product, otherwise, fire may be caused.
- Do not install the product in the environment with explosive gas, otherwise, explosion may be caused.
- Only qualified personnel can wire the drive, otherwise, electric shock may be caused.
- Never wire the drive unless the input AC supply is completely disconnected, otherwise, electric shock may be caused.
- The grounding terminal of the drive must be reliably grounded, otherwise, electric shock may be caused.
- The cover must be properly closed before power up, otherwise, electric shock and explosion may be caused.
- When powering up the drive that has been stored for over 2 years, the input voltage must be gradually increased with the voltage regulator, otherwise, electric shock and explosion may be caused.
- Do not touch the terminals when the product is powered up, otherwise, electric shock may be caused.
- Do not operate the drive with wet hands, otherwise, electric shock may be caused.
- Maintenance operation can not be conducted until 10 minutes has passed after disconnecting the power supply. Meanwhile, be sure to confirm that the charge LED is completely off and the DC bus voltage is below 36V, otherwise, electric shock may be caused.
- Only qualified personnel can replace the components. Do not leave any wire or metal parts inside the drive, otherwise, fire may be caused.
- The bare parts of the terminal lugs in the main circuit must be wrapped with insulation tape, otherwise, electric shock may be caused.

WARNING

- Please install the drive on the place that can withstand the weight of the drive, otherwise, the drive may drop and cause human injury or property damage.
- Do not install the drive in the environment with water splash (e.g., near the water pipe), otherwise, you may suffer the property loss.
- Take care not to drop any foreign objects, such as the screws, gaskets and metal bars, into the drive, otherwise, fire and property damage may be caused.
- Do not install and operate the drive if it is damaged or its components are not complete, otherwise, fire and human injury may be caused.
- Do not install the product in the place exposed to direct sunlight, otherwise, property damage may be caused.
- Cable lugs must be firmly connected to the terminals of main circuit, otherwise, property damage may be caused.
- When removing the servo motor, you can not just pull the cable or hold the rotating shaft to pull the motor, otherwise, the motor may drop and cause human injury or property damage.
- Do not directly strike the axis core, for example: tap or beat, this may cause the axis core and the encoder attached to the opposite side of the axis damaged, otherwise, property damage may be caused.
- Do not store the servo motor in the place that exceeds predetermined vibration, otherwise, property damage may be caused.

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1.1 Servo motor and drive model

1.1.1 Servo motor model

Fig.1-1 Servo motor model

1.1.2 Servo motor nameplate

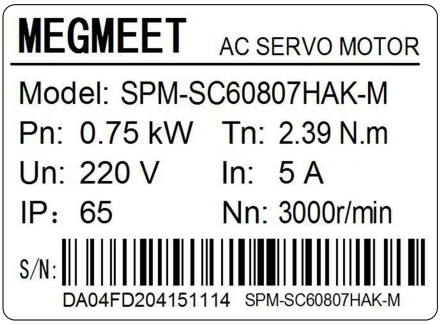


Fig.1-2 Servo motor nameplate

1.1.3 Servo drive model

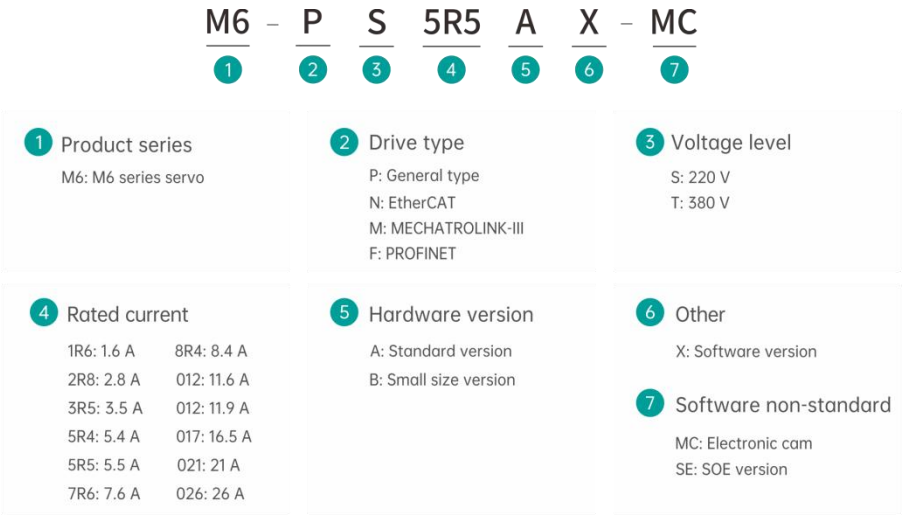


Fig.1-3 Servo drive model

1.1.4 Servo drive nameplate

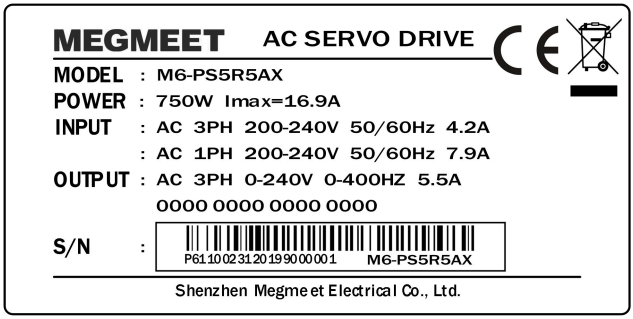
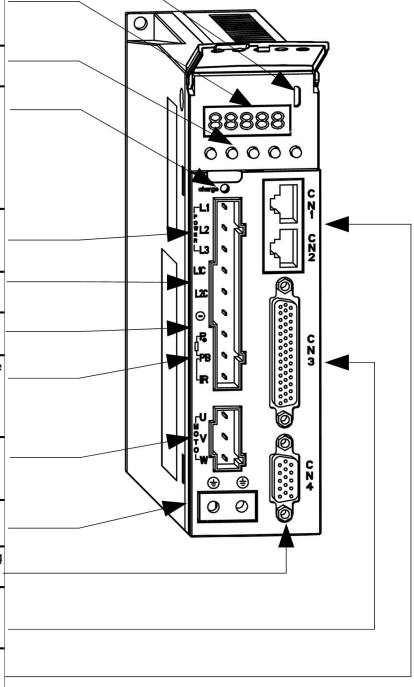


Fig.1-4 M6-P servo drive nameplate

1.1.5 The name and introduction of each part of the servo drive

Interface name	Interface description
CN5 Micro USB communication port	Connect the USB of the computer through this port, you can adjust the parameters of the drive and debug the performance
LED digital tube	5-digit 8-segment digital tube for status monitoring, parameter display and setting
Operation keys	5 keys for parameter adjustment and display status switching, etc.
CHARGE Bus power indicator	It is used to indicate the state of the bus power. The indicator light indicates that the capacitor of the bus is charged. Do not touch the power terminal even if the main power supply is cut off to avoid electric shock
L1,L2, L3 Main power supply input	Main power input, 220V or 380V, single-phase or three-phase, please refer to 2.1.1 for specific specifications
L1C,L2C Control power input	Single-phase 220V control power input
⊖、P⊕ DC bus terminal	DC bus terminal for common bus connection
P⊕ , PB, IR Brake resistor wiring terminal	Braking resistor wiring terminals, please short-circuit PB and IR for internal braking resistors; connect between P+ and PB for external braking resistors
U, V, W Servo motor power terminals	Servo motor UVW power terminal
⏚ Ground terminal	Ground terminal, please short-circuit with the ground and the motor shell
CN4 Encoder interface	DB15 female connector for connecting motor encoder
CN3 Control IO interface	DB44 female connector, control IO interface, used to connect with external IO and host controller
CN1, CN2 Communication interface	Two parallel RJ45 ports for CAN and RS485 communication



1.2 Servo system configuration specifications

Table 1-1 220 V medium inertia servo motor configuration

Voltage	Rated speed (rpm)	Max. Speed (rpm)	Power (W)	Motor model	Rated torque (N·m)	Motor frame	Drive model	Drive SIZE
220 V	3000	6000	50	SPM-SC6045AM**-L	0.16	40	M6-*S1R6AX	A
	3000	6000	50	SPM-SC8045AM**-L	0.16	40	M6-*S1R6AX	A
	3000	6000	100	SPM-SC60401M**-L	0.32	40	M6-*S1R6AX	A
	3000	6000	100	SPM-SC80401M**-L	0.32	40	M6-*S1R6AX	A
	3000	6500	200	SPM-SC60602M**-L	0.64	60	M6-*S1R6AX	A
	3000	6500	200	SPM-SC80602M**-L	0.64	60	M6-*S1R6AX	A
	3000	5000	400	SPM-SC60604M**-L	1.27	60	M6-*S2R8AX	A
	3000	5000	400	SPM-SC80604M**-L	1.27	60	M6-*S2R8AX	A
	3000	5000	750	SPM-SC60807M**-L	2.39	80	M6-*S5R5AX	A
	3000	5000	750	SPM-SC80807M**-L	2.39	80	M6-*S5R5AX	A
	3000	5000	1000	SPM-SC60810M**-L	3.19	80	M6-*S7R6AX	A
	3000	5000	1000	SPM-SC80810M**-L	3.19	80	M6-*S7R6AX	A
	3000	5000	1700	SPM-SC61317M**-W	5.399	130	M6-*S012AX	B
	2000	4000	1100	SPM-SE61311M**-W	5.39	130	M6-*S7R6AX	B
	2000	4000	1700	SPM-SE61317M**-W	8.34	130	M6-*S012AX	B

Table 1-2 380 V medium inertia servo motor configuration

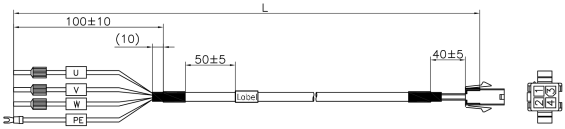
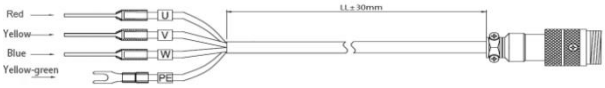
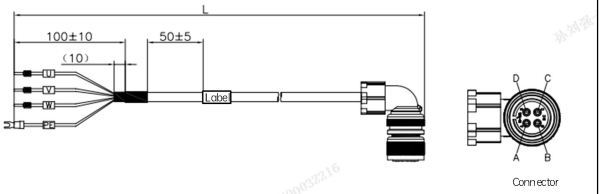
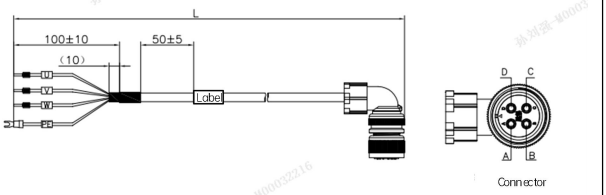
Voltage	Rated speed (rpm)	Max. Speed (rpm)	Power (W)	Motor model	Rated torque (N·m)	Motor frame	Drive model	Drive SIZE
380V	2000	4000	1100	SPM-TE61311M**-W	5.39	130	M6-*T5R4AX	B
	2000	4000	1700	SPM-TE61317M**-W	8.34	130	M6-*T8R4AX	B
	2000	4000	2400	SPM-TE61324M**-W	9.5	130	M6-*T017AX	C
	2000	4000	3000	SPM-TE61330M**-W	14.3	130	M6-*T017AX	C
	3000	5000	1700	SPM-TC61317M**-W	5.399	130	M6-*T8R4AX	B
	3000	5000	2600	SPM-TC61326M**-W	8.34	130	M6-*T012AX	B
	3000	5000	3600	SPM-TC61336M**-W	11.5	130	M6-*T012AX	B
	3000	5000	4500	SPM-TC61345M**-W	14.3	130	M6-*T017AX	C
	1500	3000	2900	SPM-TD11829M**-P	18.6	180	M6-*T012AX	B
	1500	3000	2900	SPM-TD61829M**-P	18.6	180	M6-*T012AX	B
	1500	3000	4400	SPM-TD11844M**-P	28.4	180	M6-*T017AX	C
	1500	3000	4400	SPM-TD61844M**-P	28.4	180	M6-*T017AX	C
	1500	3000	5500	SPM-TD11855M**-P	35	180	M6-*T021AX	C

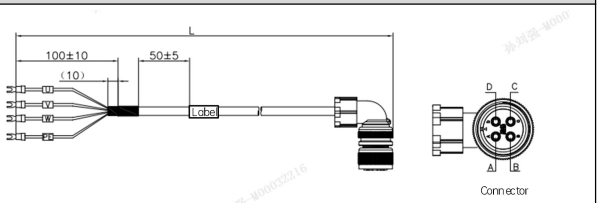
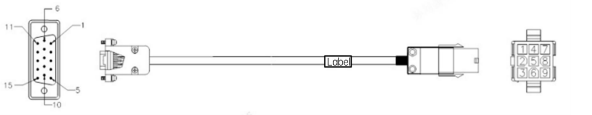
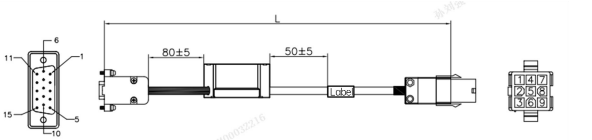
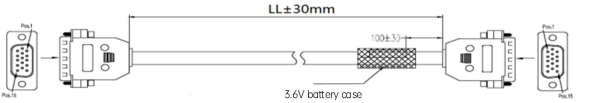
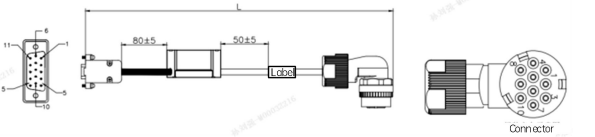
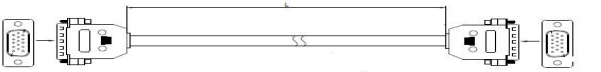
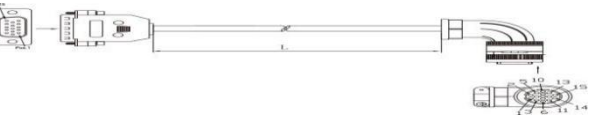
Voltage	Rated speed (rpm)	Max. Speed (rpm)	Power (W)	Motor model	Rated torque (N·m)	Motor frame	Drive model	Drive SIZE
	1500	3000	5500	SPM-TD61855M**-P	35	180	M6-*T021AX	C
	1500	3000	7500	SPM-TD11875M**-P	48	180	M6-*T026AX	C
	1500	3000	7500	SPM-TD61875M**-P	48	180	M6-*T026AX	C

1.3 Applicative cables and models

Servo system cable options and their descriptions are shown in the following table.

Table 1-3 Servo system cable options

Cable name	Cable model	Drawing
Main motor cable (60/80 frame)	SPL-MA04-xx-x	
Main motor cable (60/80 frame)	SPL-MA01-xx-x	
Main motor cable (130 frame)	SPL-MC04-xx-x	
Main motor cable (180 frame)	SPL-MD01-xx-x	

Cable name	Cable model	Drawing
Main motor cable (180 frame)	SPL-MD02-xx-x	
Single-turn absolute encoder cable	SPL-E09-xx-x	
Multi-turn absolute encoder cable	SPL-E07-xx-x	
23-bit absolute encoder cable (60/80 frame)	SPL-E01-xx-x	
23-bit absolute encoder cable (130/180 frame medium inertia)	SPL-E02-xx-x	
Incremental encoder cable (60/80 frame)	SPL-E11-xx-x	
Incremental encoder cable (130/180 frame medium inertia)	SPL-E12-xx-x	
Brake cable (60/80 frame)	SPL-B01-xx-x	

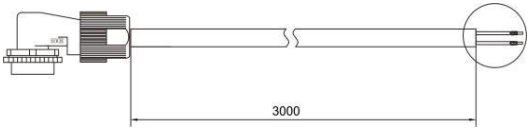
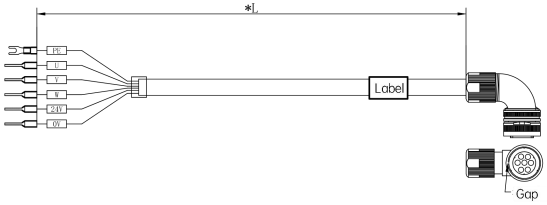
Cable name	Cable model	Drawing
Brake cable (130/180 frame medium inertia)	SPL-B02-xx-x	
Brake & Power cable (130 frame medium inertia)	SPL-BMC04-xx-x	

Table 1-4 Cable description

No.	Model	Name	Description	Length	Diameter (mm^2)
1	SPL-MA04-xx-x	Main motor cable (60/80 frame)	Main motor cable, AMP female connector at the motor side	3 m/5 m/10 m	0.75
2	SPL-MA01-xx-x	Main motor cable (60/80 frame)	Main motor cable, straight pin aviation plug at the motor side	3 m/5 m/10 m	0.75
3	SPL-MC04-xx-x	Main motor cable (130 frame)	Main motor cable, straight pin aviation plug at the motor side	3 m/5 m/10 m	1.0
4	SPL-MD01-xx-x	Main motor cable (180 frame)	One end: AMP four-core female connector The other end: straight terminal (SIZE B)	3 m/5 m/10 m	1.5
5	SPL-MD02-xx-x	Main motor cable (180 frame)	One end: AMP four-core female connector The other end: U-type terminal (SIZE C)	3 m/5 m/10 m	2.5
6	SPL-E09-xx-x	Single-turn absolute encoder cable	One end: 3-row 15-core DB male connector The other end: 3-row 7-core AMP female connector	3 m/5 m/10 m	—
7	SPL-E07-xx-x	Multi-turn absolute encoder cable	One end: 3-row 15-core DB male connector The other end: 3-row 7-core AMP female connector	3 m/5 m/10 m	—
8	SPL-E01-xx-x	23-bit absolute encoder cable (60/80 frame)	One end: 3-row 15-core DB male connector The other end: 3-row 15-core DB male connector	3 m/5 m/10 m	—
9	SPL-E02-xx-x	23-bit absolute encoder cable (130/180 frame medium inertia)	One end: 3-row 15-core DB male connector The other end: 10-core aviation female connector	3 m/5 m/10 m	—
10	SPL-E11-xx-x	Incremental encoder cable (60/80 frame)	One end: 3-row 15-core DB male connector The other end: 3-row 15-core DB male connector	3 m/5 m/10 m	—
11	SPL-E12-xx-x	Incremental encoder cable (130/180 frame medium inertia)	One end: 3-row 15-core DB female connector The other end: 15-core aviation plug (SUNCHU)	3 m/5 m/10 m	—

No.	Model	Name	Description	Length	Diameter (mm^2)
12	SPL-B01-xx-x	Brake cable (60/80 frame)	One end: AMP 2-core female connector The other end: straight terminal	3 m/5 m/10 m	0.5
13	SPL-B02-xx-x	Brake cable (130/180 frame medium inertia)	One end: 3-core female straight aviation plug The other end: straight terminal	3 m/5 m/10 m	0.5
14	SPL-BMC04-xx-x	Brake & Power cable (130 frame medium inertia)	Main motor cable, straight pin aviation plug at the motor side, with brake	3 m/5 m/10 m	1.0

Note: "xx" means cable length; "x" means flexible line, when x is R1, it means 500W flexible line, and when x is R2, it means 1000W flexible line.

Chapter 2 Servo System Specifications

2.1 Servo drive standard specifications

2.1.1 Servo drive electrical specifications

220V class drive list and electrical specifications

Table 2-1 220V class drive list and electrical specifications

Voltage level	220V					
Model	PS1R6AX	PS2R8AX	PS5R5AX	PS7R6BX	PS7R6AX	PS012AX
Power level	200W	400W	750W	1KW	1KW	1.5KW
Outline	SIZE A				SIZE B	
Phase	Single phase		Single/three phase	Three phase		
Rated input current (A)	2.2	4	7.6/4.2	5.1	5.1	8
Rated output current (A)	1.6	2.8	5.5	7.6	7.6	11.6
Maximum output current (A)	5.8	9.3	16.9	17	22	28
Main circuit power supply	200~240V, -10%~+10%, 50/60HZ			200~240V, -15%~+10%，50/60HZ		
Control circuit power supply	Single-phase 200~240V, -15%~+10%, 50/60HZ					
Braking resistor	No built-in braking resistor		Built-in braking resistor			

380V class drive list and electrical specifications

Table 2-2 380V class drive list and electrical specifications

Voltage level	380V						
Model	PT3R5AX	PT5R4AX	PT8R4AX	PT012AX	PT017AX	PT021AX	PT026AX
Power level	0.85KW	1.3 KW	2.0KW	2.9KW	4.4KW	5.5KW	7.5KW
Outline	SIZE B				SIZE C		
Phase	Three phase						
Rated input current (A)	2.4	3.6	5.5	8	12	16	21
Rated output current (A)	3.5	5.4	8.4	11.9	16.5	21	26
Maximum output current (A)	8.5	14	22	28	42	55	65
Main circuit power supply	Three-phase 380~440V, -15%~+10%, 50/60HZ						
Control circuit power supply	Single-phase 200~240V, -15%~+10%, 50/60HZ						
Braking resistor	Built-in braking resistor				No built-in braking resistor		

2.1.2 Servo drive basic specifications

Table 2-3 Servo drive basic specifications

Basic specifications			
Basic specifications	Control mode		IGBT, PWM control, sine wave current drive mode
	Encoder	Rotating motor	Absolute encoder
			Full-line/line-saving incremental encoder
			Sin/Cos encoder (in development)
		Linear motor	Support incremental, absolute value, sine and cosine signals (in development)
		Second encoder	Support incremental, absolute value, sine and cosine signals (in development)
Control IO	DI	Different functions configured according to parameters	10 general inputs, optocoupler isolation, NPN and PNP inputs can be selected Input voltage range 20~30V, input impedance 3.9K
	DO	Different functions configured according to parameters	6 general outputs, optocoupler isolation, NPN and PNP output can be selected
			Maximum operating voltage 30V, maximum current 100mA
	AI	Configure different functions according to different modes	2 analog inputs, +/-10V, AI1 supports 16bit, AI2 supports 12bit
			Input impedance: AI1 impedance 12K, AI2 impedance 17K
			Signal delay: AI1 delays 70uS, AI2 delays 80uS
Communication function	RS485		Support MODBUS communication protocol, only M6P series support
	CAN		Support CANopen communication protocol, follow CiA402 profile, only M6P series support
	EtherCAT		Support CoE and SoE communication protocol, follow CiA402 profile, only M6N series support
	MECHATROLINK-III		Support MECHATROLINK-III bus protocol, only M6M series support
	PROFINET		Support PROFINET bus communication protocol, integrate PROFIdrive profile, only M6F series configuration
	USB		Connect the computer and the servo drive to debug and adjust the servo
Other ports	Button		5 buttons
	LED display		5 8-segment LED display
	Power indicator		CHARGE lamp
	STO safety function		General safety STO function, optional
	Expansion card interface		Extensible motion control card
General function	Auto-adjust		The host computer issues an action command, drives the motor to run, estimates and determines the load rotational inertia ratio in real time, and automatically sets the rigidity level
	Multi-control mode switching		Position mode, speed mode, torque mode, position/speed mode switching, speed/torque mode switching, position/torque mode switching, full closed loop control, CANopen mode, EtherCAT mode, ProfiNet mode
	Pulse frequency division		Arbitrary frequency division
	Protection function		Overvoltage, undervoltage, overcurren,t overspeed, stall, overheat, overload, encoder abnormality, input phase loss, excessive position deviation
	High frequency vibration suppression		4 sets of notch filters, suppressing the vibration from 0 to 4000 Hz; 1 set of speed reference notch filter from 0 to 1000 Hz

	End vibration suppression	2 sets of filters suppress the end low frequency vibration of 1~100Hz		
	Homing mode	Multiple homing functions		
	Gantry control	Gantry synchronization function		
	Reverse clearance compensation	Function to improve the response delay that occurs when the direction of travel of the machine is reversed		
	Mechanical analyzer function	Analyze the frequency characteristics of the mechanical system through the host computer software		
	Inertia identification	Offline and online system inertia identification		
	Torque observer	Load torque observation and compensation		
	Electronic cam	512 point electronic cam curve		
	Friction compensation	Compensate system friction		
Position control	Control input	Deviation counter clearing, command pulse prohibition input, electronic gear switching, etc.		
	Control output	Positioning completed		
	Pulse input	Pulse state	1. Pulse + direction; 2. Quadrature A/B pulse; 3. CW/CCW pulse	
		Input state	1. Differential input; 2. Open collector input	
		Pulse frequency	High-speed pulse port	Support differential input, high-speed maximum 4Mpps, pulse width cannot be less than 0.125us.
			Low speed pulse port	Differential input, the maximum is 500Kpps, and the pulse width cannot be less than 1us.
				Collector input, the maximum is 200Kpps, and the pulse width cannot be less than 2.5us.
		Pulse filtering	First-order instruction smoothing filter or FIR filter	
		Electronic gear	4 sets of electronic gear ratio/on line	
	Analog input	Torque limit	Electric and braking torque limitation can be performed separately	
		Torque feedforward	Torque feedforward can be input according to the analog voltage	
	Multi-segment position command selection	Configure 5 DIs so that their function is to realize the position selection of segment 1~32.		
Speed control	Performance	Speed variation rate	Load variation rate	0 ~ 100% load: below 0.5% (at rated speed)
			Voltage variation rate	Rated voltage ±10%: 0.5% (at rated speed)
			Temperature variation rate	25±25 ℃: below 0.5% (at rated speed)
		Speed control range	1~6000	
		Speed loop response characteristics	2.6kHz	
		Soft start time	0~6000ms	
	Control input	Internal speed command selection 1/2/3/4, zero speed clamp, etc.		
	Control output	Speed arrival etc.		
	Analog input	Speed command input	Input speed command according to analog voltage	

		Torque limit command input	Electric, braking torque limit available
		Torque feedforward input	Input torque feedforward according to analog voltage
	Internal speed command	Switch the internal 16-segment speed according to 4 DIs	
	Speed command filter	Primary delay filter of analog input speed command	
Torque control	Performance	Torque control accuracy	±1%
		Frequency characteristics	3kHz
	Control input	Zero speed clamp, torque command symbol input, etc.	
	Control output	Speed arrival etc.	
	Analog input	Torque command input	Analog torque command input
		Speed limit input	Via analog speed limit
	Speed limit function	The speed limit value can be set according to the parameters	
	Torque command filter	Primary delay filter of analog input torque command	

2.2 Servo motor standard specifications

2.2.1 Servo motor basic specifications

Table 2-4 General basic specifications of servo motors

Servo motor basic index items	
Protection degree	IP65
Ambient temperature	-20℃~+40℃
Ambient humidity	Relative humidity <90% (no frost condition)
Installation method	Flange mounted
Insulation resistance	50MΩ (500V)
Insulation voltage	1500V (220V motor) 1800V (380V motor)
Insulation class	F
Altitude	Used at a place below 1000 m. Derating is required above 1000 m.
Installation site	● It is strictly forbidden to install in places with corrosive, flammable and explosive gases and liquids ● In places with metal powder, grinding fluid, oil mist, cutting, etc., please choose a motor with oil seal ● Do not use the motor in a high temperature closed environment that will greatly shorten the life of the motor

2.2.2 Servo motor rated specifications

Table 2-5 Electrical specifications of 40/60/80 medium inertia servo motors

Motor model	Rated voltage (V)	Rated power (W)	Rated speed (rpm)	Max. Speed (rpm)	Rated torque (N·m)	Peak torque (N·m)	Rated current (A)	Peak current (A)	Rotor inertia (10^{-4}kg·m^2)
SPM-SC6045AM**-L	220	50	3000	6000	0.16	0.48	0.93	2.88	0.036(0.046)
SPM-SC8045AM**-L	220	50	3000	6000	0.16	0.48	0.93	2.88	0.036(0.046)
SPM-SC60401M**-L	220	100	3000	6000	0.32	0.95	0.92	2.85	0.062(0.072)
SPM-SC80401M**-L	220	100	3000	6000	0.32	0.95	0.92	2.85	0.062(0.072)
SPM-SC60602M**-L	220	200	3000	6500	0.64	1.91	1.5	4.66	0.28(0.3)
SPM-SC80602M**-L	220	200	3000	6500	0.64	1.91	1.5	4.66	0.28(0.3)
SPM-SC60604M**-L	220	400	3000	5000	1.27	3.81	2.1	6.5	0.56(0.58)
SPM-SC80604M**-L	220	400	3000	5000	1.27	3.81	2.1	6.5	0.56(0.58)
SPM-SC60807M**-L	220	750	3000	5000	2.39	7.17	4.1	13.4	1.5(1.65)
SPM-SC80807M**-L	220	750	3000	5000	2.39	7.17	4.1	13.4	1.5(1.65)
SPM-SC60810M**-L	220	1000	3000	5000	3.19	9.56	5.7	17.7	2(2.15)
SPM-SC80810M**-L	220	1000	3000	5000	3.19	9.56	5.7	17.7	2(2.15)

Table 2-6 Electrical specifications of 130/180 medium inertia servo motors

Motor model	Rated voltage (V)	Rated power (W)	Rated speed (rpm)	Max. Speed (rpm)	Rated torque (N·m)	Peak torque (N·m)	Rated current (A)	Peak current (A)	Rotor inertia (10^{-4}kg·m^2)
SPM-SE61311M**-W	220	1100	2000	4000	5.39	16.17	7.5	22.5	10.9(12.3)
SPM-SE61317M**-W	220	1700	2000	4000	8.34	25.22	12	36	16.9(18.3)
SPM-SC61317M**-W	220	1700	3000	5000	5.399	10.78	9.5	19	10.9(12.3)
SPM-TE61311M**-W	380	1100	2000	4000	5.39	16.17	4.5	13.5	10.9(12.3)
SPM-TE61317M**-W	380	1700	2000	4000	8.34	25.2	6.6	19.8	16.9(18.3)
SPM-TE61324M**-W	380	2400	2000	4000	9.5	28.5	11.5	34.5	21.4(22.6)
SPM-TE61330M**-W	380	3000	2000	4000	14.3	40	11.5	32.2	27.1(28.4)
SPM-TC61317M**-W	380	1700	3000	5000	5.399	10.78	9.5	19	10.9(12.3)
SPM-TC61326M**-W	380	2600	3000	5000	8.34	16.7	9.5	19	16.9(18.3)
SPM-TC61336M**-W	380	3600	3000	5000	11.5	23	12	24	18.3(21.4)
SPM-TC61345M**-W	380	4500	3000	5000	14.3	28.6	14.5	29	27.1(28.4)
SPM-TD11829M**-P	380	2900	1500	3000	18.6	54	11.9	34.5	44(59)

Motor model	Rated voltage (V)	Rated power (W)	Rated speed (rpm)	Max. Speed (rpm)	Rated torque (N·m)	Peak torque (N·m)	Rated current (A)	Peak current (A)	Rotor inertia (10^{-4}kg·m^2)
SPM-TD61829M**-P	380	2900	1500	3000	18.6	54	11.9	34.5	44(59)
SPM-TD11844M**-P	380	4400	1500	3000	28.4	71	16.5	41.3	66(80)
SPM-TD61844M**-P	380	4400	1500	3000	28.4	71	16.5	41.3	66(80)
SPM-TD11855M**-P	380	5500	1500	3000	35	87.5	21	52.5	102(110)
SPM-TD61855M**-P	380	5500	1500	3000	35	87.5	21	52.5	102(110)
SPM-TD11875M**-P	380	7500	1500	3000	48	96	25.5	51	146(156)
SPM-TD61875M**-P	380	7500	1500	3000	48	96	25.5	51	146(156)

Note: Parameters in parenthesis is the parameter of the motor with brake.

2.3 Servo drive dimensions

1. SIZE A (Applicable drive: PS1R6AX, PS2R8AX, PS5R5AX, PS7R6BX)

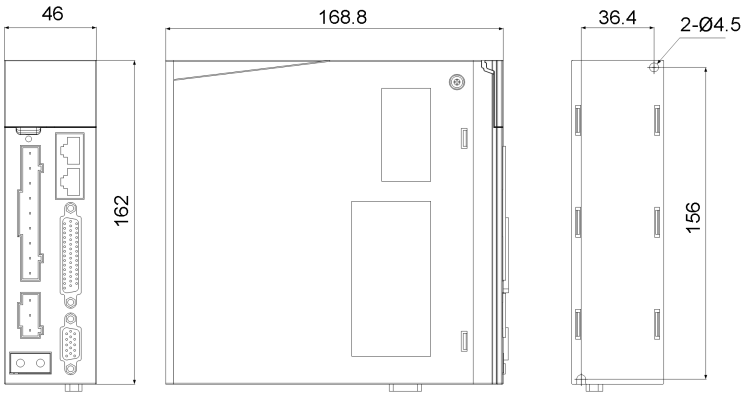


Fig.2-1 Dimensions for servo drive of SIZE A

2. SIZE B (Applicable drive: PS7R6AX, PS012AX, PT3R5AX, PT5R4AX, PT8R4AX, PT012AX)

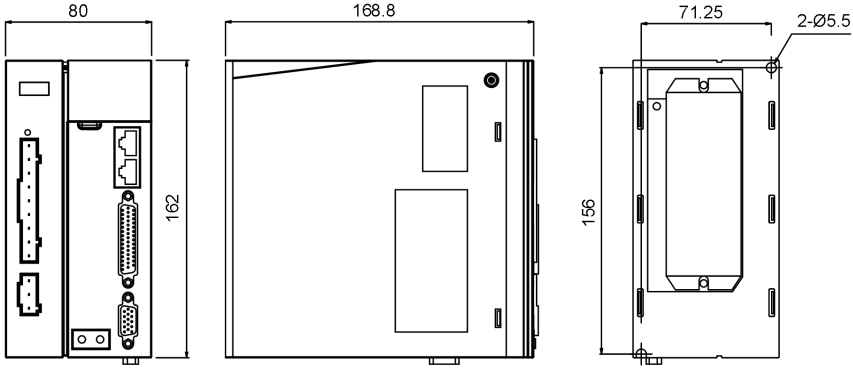


Fig.2-2 Dimensions for servo drive of SIZE B

3. SIZE C (Applicable drive: PT017AX, PT021AX, PT026AX)

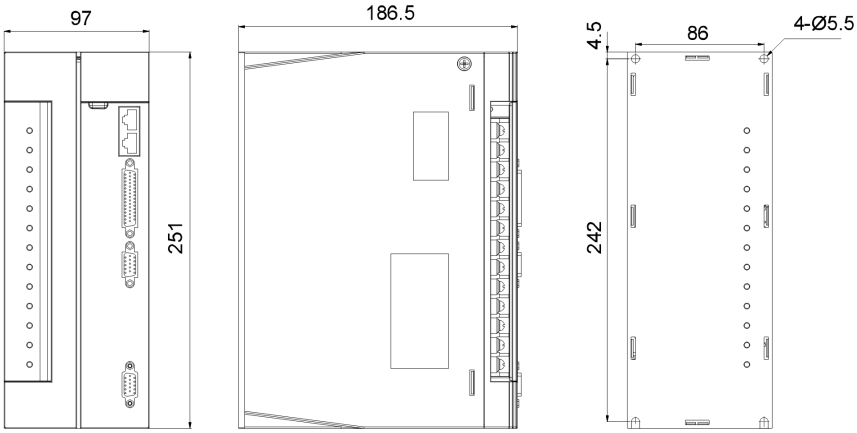


Fig.2-3 Dimensions for servo drive of SIZE C

2.4 Servo motor dimensions and interface definition

2.4.1 40 frame medium inertia servo motors

2.4.1.1 Dimensions

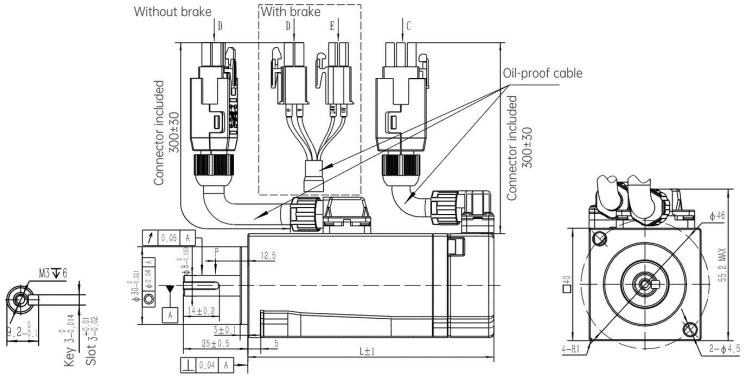


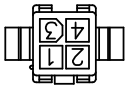
Fig.2-4 Dimensions for 40 frame medium inertia servo motor

Table 2-7 Dimensions for 40 frame medium inertia servo motor

Model	L (mm)
SPM-SC6045AM**-L	56 (84)
SPM-SC8045AM**-L	56 (84)
SPM-SC60401M**-L	67.7 (95)
SPM-SC80401M**-L	67.7 (95)

Note: Dimensions in parentheses are dimensions for motors with brakes.

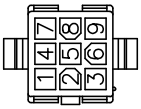
2.4.1.2 Interface definition



Motor power interface definition	
Signal	Pin
U	1
V	3
W	2
PE	4

Motor brake interface definition	
Signal	Pin
24V	1

Motor brake interface definition	
Signal	Pin
GND	2



Absolute encoder interface definition	
Signal	Pin
E- (Battery-)	7
E+ (Battery+)	6
SD+	4
SD-	5
GND	3
5V	2
PE	1

2.4.2 60 frame medium inertia servo motors

2.4.2.1 Dimensions

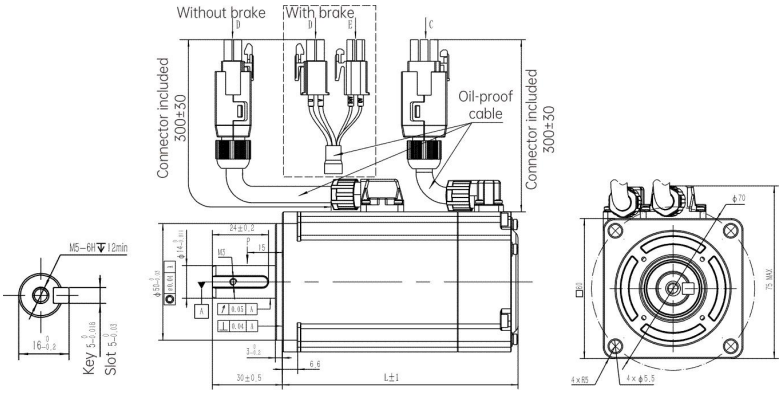


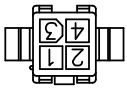
Fig.2-5 Dimensions for 60 frame medium inertia servo motor

Table 2-8 Dimensions for 60 frame medium inertia servo motor

Model	L (mm)
SPM-SC60602M**-L	71.8 (101.2)
SPM-SC80602M**-L	71.8 (101.2)
SPM-SC60604M**-L	88.8 (118.2)
SPM-SC80604M**-L	88.8 (118.2)

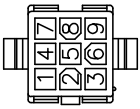
Note: Dimensions in parentheses are dimensions for motors with brakes.

2.4.2.2 Interface definition



Motor power interface definition	
Signal	Pin
U	1
V	3
W	2
PE	4

Motor brake interface definition	
Signal	Pin
24V	1
GND	2



Absolute encoder interface definition	
Signal	Pin
E- (Battery-)	7
E+ (Battery+)	6
SD+	4
SD-	5
GND	3
5V	2
PE	1

2.4.3 80 frame medium inertia servo motors

2.4.3.1 Dimensions

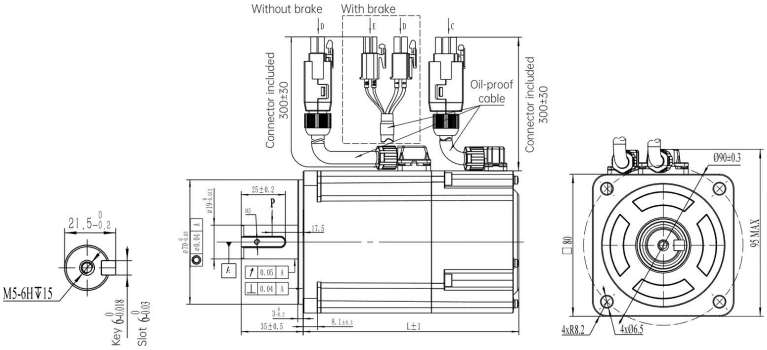


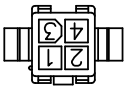
Fig.2-6 Dimensions for 60 frame medium inertia servo motor

Table 2-9 Dimensions for 60 frame medium inertia servo motor

Model	L (mm)
SPM-SC60807M**-L	90 (121.9)
SPM-SC80807M**-L	90 (121.9)
SPM-SC60810M**-L	103.9 (134.9)
SPM-SC80810M**-L	103.9 (134.9)

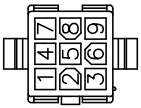
Note: Dimensions in parentheses are dimensions for motors with brakes.

2.4.3.2 Interface definition



Motor power interface definition	
Signal	Pin
U	1
V	3
W	2
PE	4

Motor brake interface definition	
Signal	Pin
24V	1
GND	2



Absolute encoder interface definition	
Signal	Pin
E- (Battery-)	7
E+ (Battery+)	6
SD+	4
SD-	5
GND	3
5V	2
PE	1

2.4.4 130 frame medium inertia servo motors

2.4.4.1 Dimensions

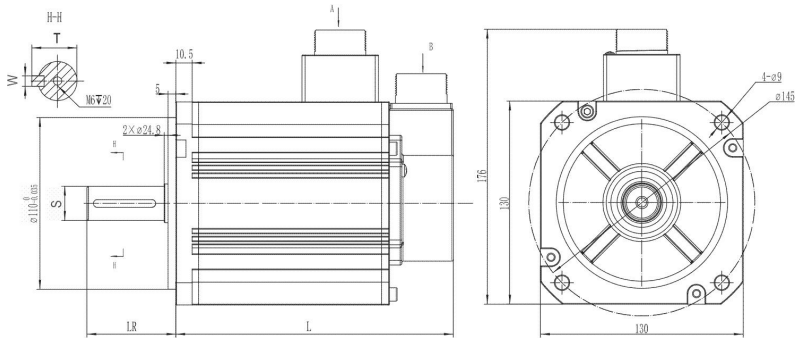


Fig.2-7 Dimensions for 130 frame medium inertia servo motor

Table 2-10 Dimensions for 130 frame medium inertia servo motor

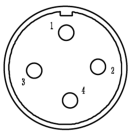
Model	L (mm)	LR (mm)	ϕS (mm)	W (mm)	T (mm)
SPM-SE61311M**-W	135 (187)	57	22	6	24.5
SPM-SE61317M**-W	152.5 (204)	57	22	6	24.5
SPM-SC61317M**-W	135 (187)	57	22	6	24.5
SPM-TE61311M**-W	135 (187)	57	22	6	24.5
SPM-TE61317M**-W	152.5 (204)	57	22	6	24.5
SPM-TE61324M**-W	170 (222)	57	22	6	24.5
SPM-TE61330M**-W	200 (252)	57	22	6	24.5

Model	L (mm)	LR (mm)	ϕS (mm)	W (mm)	T (mm)
SPM-TC61317M**-W	135 (187)	57	22	6	24.5
SPM-TC61326M**-W	152.5 (204)	57	22	6	24.5
SPM-TC61336M**-W	170 (222)	57	22	6	24.5
SPM-TC61345M**-W	200 (252)	57	22	6	24.5

Note: Dimensions in parentheses are dimensions for motors with brakes.

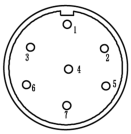
2.4.4.2 Interface definition

Power cable



Plug model	YD28J4Z-E			
Pin	1	2	3	4
Definition	PE	U	V	W

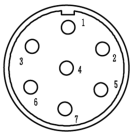
Encoder cable



Plug model	YD28J7Z-E						
Pin	1	2	3	4	5	6	7
Definition	PE	E-	E+	SD-	0V	SD+	+5v

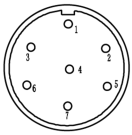
Motor power interface definition (without brake)	
Signal	Pin
PE	1
U	2
V	3
W	4

Power cable



Plug model	YD28J7Z-E						
Pin	1	2	3	4	5	6	7
Definition	PE	U	V	W	Brk+	Brk-	/

Encoder cable



Plug model	YD28J7Z-E						
Pin	1	2	3	4	5	6	7
Definition	PE	E-	E+	SD-	0V	SD+	+5v

Motor power interface definition (with brake)	
Signal	Pin

Motor power interface definition (with brake)	
Signal	Pin
PE	1
U	2
V	3
W	4
24V	5
0V	6

Absolute encoder interface definition	
Signal	Pin
E- (Battery-)	2
E+ (Battery+)	3
SD+	6
SD-	4
0V	5
+5V	7
PE	1

2.4.5 180 frame medium inertia servo motors

2.4.5.1 Dimensions

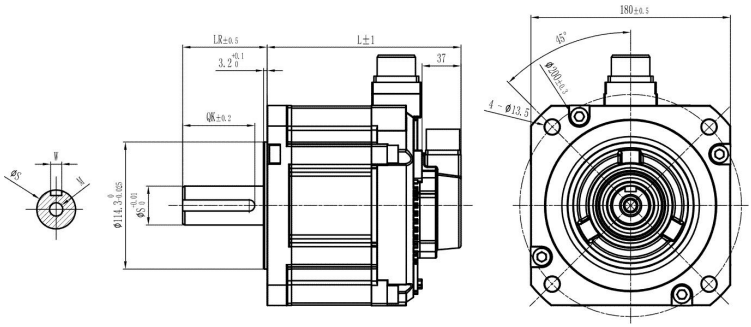


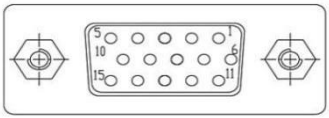
Fig.2-8 Dimensions for 180 frame medium inertia servo motor

Table 2-11 Dimensions for 180 frame medium inertia servo motor

Model	L (mm)	LR (mm)	φS (mm)	W (mm)
SPM-TD11829M**-P	176 (224)	79	35	10
SPM-TD61829M**-P	176 (224)	79	35	10
SPM-TD11844M**-P	200 (248)	79	35	10
SPM-TD61844M**-P	200 (248)	79	35	10
SPM-TD11855M**-P	237 (285)	113	42	12
SPM-TD61855M**-P	237 (285)	113	42	12
SPM-TD11875M**-P	283 (331)	113	42	12
SPM-TD61875M**-P	283 (331)	113	42	12

Note: Dimensions in parentheses are dimensions for motors with brakes.

2.4.5.2 Interface definition

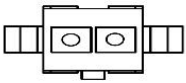


Incremental full-line encoder interface definition		
Pin	Signal	Color
Shell	FG	Shield
1	A+	Blue
2	A-	Blue-Black
3	B+	Green
4	B-	Green-Black
5	Z+	Yellow
6	Z-	Yellow-Black
7	U+	Brown
8	U-	Brown-Black
9	V+	Grey
10	V-	Grey-Black
11	W+	White
12	W-	White-Black
13	5V	Red
14	GND	Black
15	NC	

Incremental line-saving encoder interface definition		
Pin	Signal	Color
Shell	FG	Shield
1	A+	Blue
2	A-	Blue-Black
3	B+	Green
4	B-	Green-Black
5	Z+	Yellow
6	Z-	Yellow-Black
13	5V	Red
14	GND	Black

Absolute encoder interface definition		
Pin	Signal	Color
Shell	FG	Shield
2	E-	Blue
3	E+	Blue-Black
4	SD-	Green
5	GND	Green-Black
6	SD+	Yellow
7	5V	Yellow-Black

Motor interface definition		
Pin	Signal	Color
1	FG	Yellow-Green
2	U	Red
3	V	Blue
4	W	Black



Motor (with brake) interface definition		
Pin	Signal	Color
1	+	Blue
2	-	Black

Chapter 3 Installation Description

3.1 Servo drive installation

3.1.1 Installation site

- Installed in a cabinet free from direct sunlight or water droplets and rain
- Avoid installing in dusty, metal powder, high temperature or humid places
- It is strictly forbidden to install in places with corrosive or flammable and explosive gases
- No vibration place

3.1.2 Installation environment requirements

Table 3-1 M6 servo drive installation environment requirements

Item		Requirements
Operating conditions	Installation site	Install it vertically on a solid base indoors, with at least 5cm of space for inlet and outlet, and at least 4cm of space for left and right sides of the case. The cooling medium is air.
	Ambient temperature	0 ~+45℃, the air temperature change is less than 0.5℃/min; Derating can be used above 45℃, and keep good ventilation, the maximum temperature is 55℃ (can run at 25% normal load)
	Relative humidity	Relative humidity <90% (no condensation)
	Other climatic conditions	No condensation, icing, rain, snow, hail, etc., the solar radiation is lower than 700W/m^2, and the air pressure is 70~106kPa.
	Salt spray and corrosive gas content	Pollution degree 2
	Dust and solid particle content	Pollution degree 2
	Protection degree	IP20
	Altitude	Used at the place lower than 1000m (derated at the place above 1000m, derated 6% for every increase of 1000m)
	Anti-vibration	Below 4.9m/s^2
	Impact resistance	Below 19.6m/s^2

3.1.3 Servo drive installation precautions

Installed in an indoor, well-ventilated place, generally installed in a cabinet, and installed vertically, and securely fixed on the mounting surface through the two fixing holes of the drive.

1. Installation diagram
   - SIZE A model installation requirements

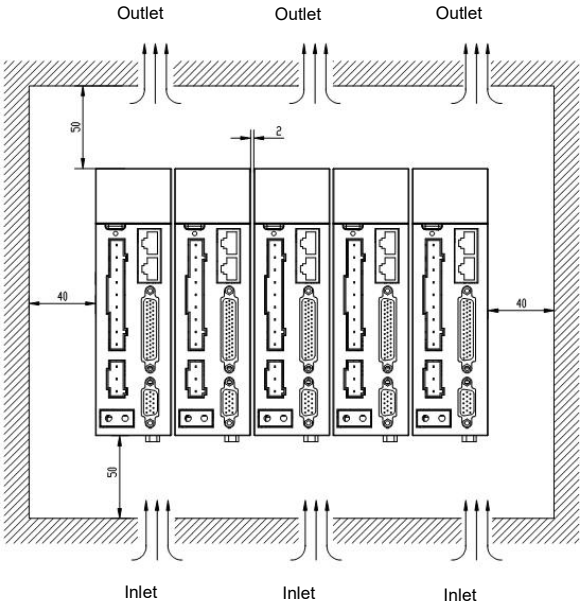


Fig.3-1 SIZE A servo installation diagram

- SIZE B/C model installation requirements

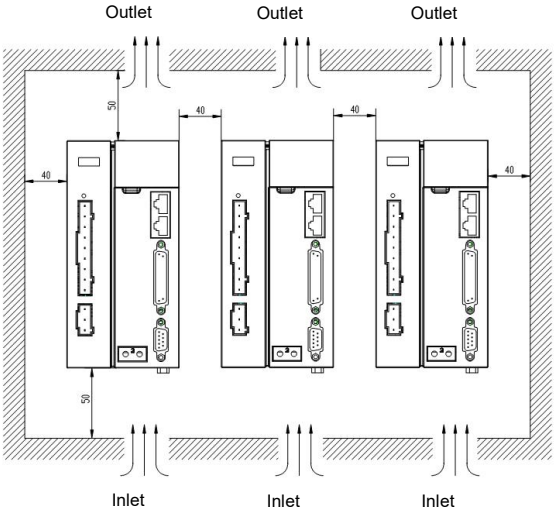


Fig.3-2 SIZE B/C servo installation diagram

2. Side-by-side installation

As shown in the above two pictures, because of their different heat dissipation methods, SIZE A can be completely installed side by side without leaving space between the two, while SIZE B/C needs to be separated by 40mm between the two.

3. Cooling convection

To ensure cooling by the drive's fan and natural convection, the enclosure in which the drive is installed requires air outlets and air inlets above and below, and an exhaust fan on the top. The distance between the top and bottom of the drive is at least 50mm from the cabinet.

4. Grounding requirements

For better EMC performance and protection from electric shock, the drive and motor need to be grounded reliably, and the ground terminal of the drive and the ground terminal of the motor should also be directly short-circuited.

3.2 System wiring diagram

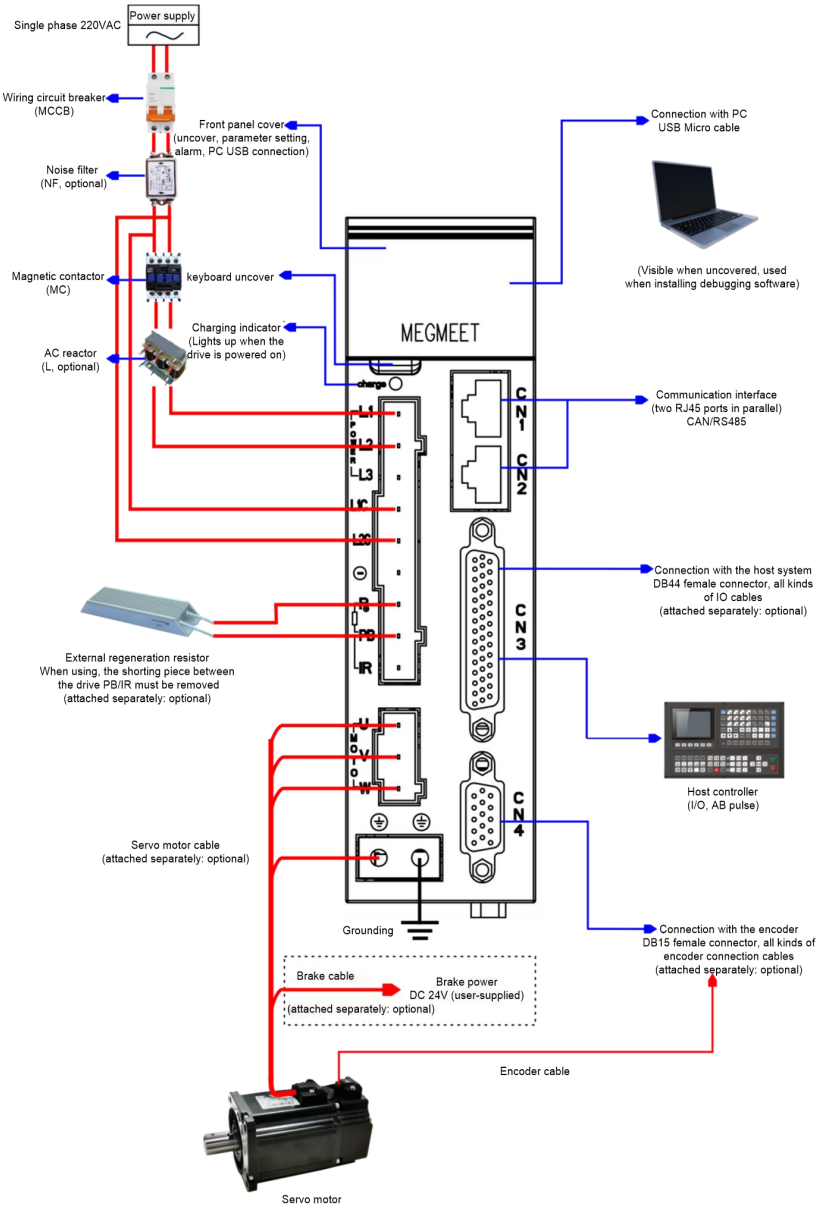


Fig.3-3 Single-phase 220V servo system wiring diagram

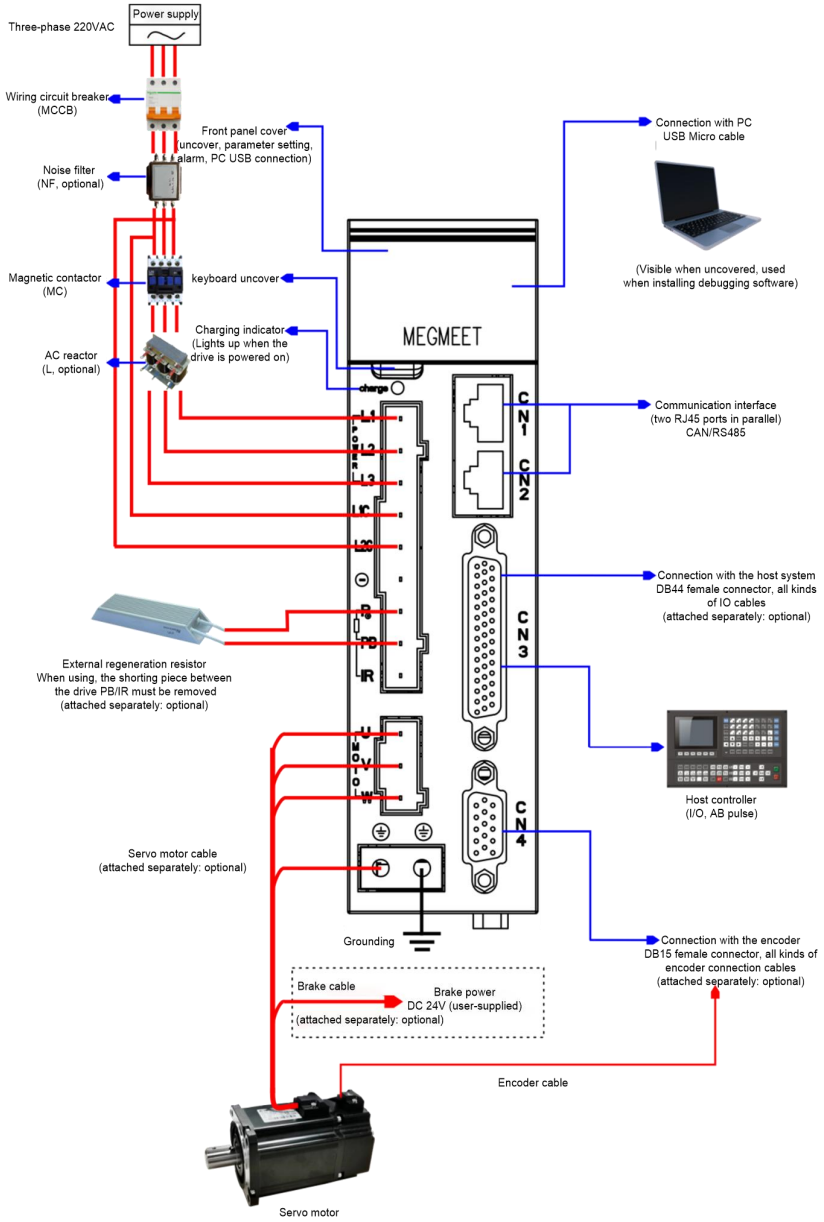


Fig.3-4 Three-phase 220V servo system wiring diagram

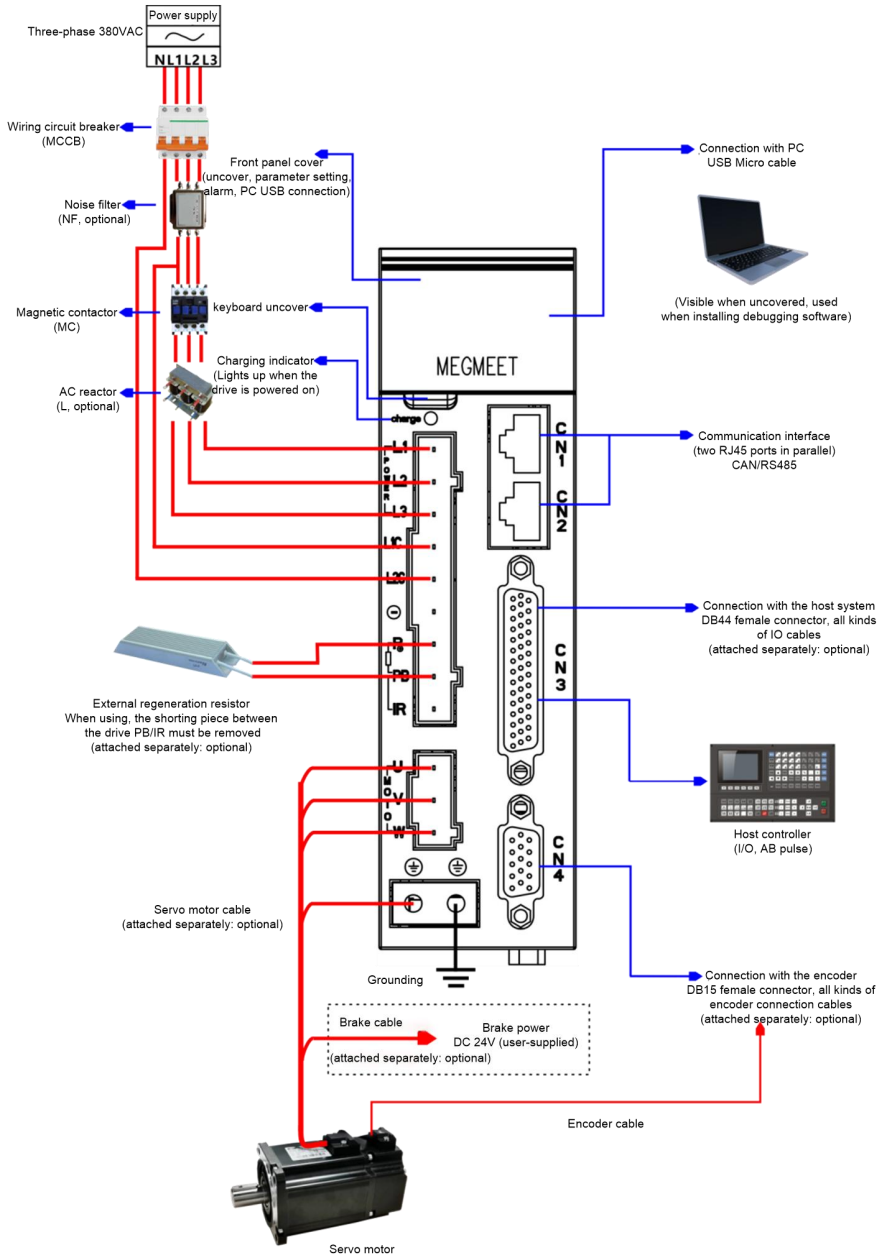


Fig.3-5 Three-phase 380V servo system wiring diagram

Note:

Single-phase 220V system wiring is only applicable to 220V drive models of PS5R5AX and below

Three-phase 220V system wiring is only applicable to 220V drive models of PS5R5AX and above

System wiring should pay attention to:

- Make sure the power specifications and wiring of L1, L2, L3, L1C, L2C are correct to avoid damage and danger to the drive.
- Make sure the motor output U, V, W phase sequence wiring is correct, otherwise it may cause abnormal motor rotation.
- When using an external braking resistor, you need to disconnect the shorting piece between PB and IR, and connect the resistor between P and PB; if you use an internal braking resistor, you can directly short-circuit PB and IR.
- To protect the drive system and prevent cross-electric shock, please use a circuit breaker or fuse for the input power supply. The specifications of the circuit breaker and fuse are shown in Table 3-2.
- The drive does not have a built-in grounding protection circuit, please use a leakage circuit breaker for both overload and short circuit protection or a special leakage circuit breaker with grounding protection.
- It is strictly forbidden to directly use the electromagnetic contactor for the operation and shutdown of the motor. The motor is a large inductance device, and the instantaneous high voltage generated may break down the contactor and other components.
- To ensure reliable operation of the system and reduce interference to the power grid system, it is recommended to add a filter on the input side.

3.3 Recommended specifications for circuit breakers and fuses

Table 3-2 Recommended specifications for circuit breakers and fuses

Drive model	Circuit breaker	Fuse
M6-PS1R6AX	4A	10A
M6-PS2R8AX	10A	15A
M6-PS5R5AX	16A/6A	20A/10A
M6-PS7R6BX	10A	20A
M6-PS7R6AX	10A	25A
M6-PS012AX	16A	35A
M6-PT3R5AX	4A	15A
M6-PT5R4AX	6A	20A
M6-PT8R4AX	10A	20A
M6-PT012AX	16A	35A
M6-PT017AX	20A	50A
M6-PT021AX	25A	70A
M6-PT026AX	32A	100A

3.4 Related specifications of braking resistor

The related specifications of braking resistor are shown in the table below.

Table 3-3 Related specifications of braking resistor

Servo drive model M6-□□□□□□X		Built-in braking resistor specification		Minimum allowable resistance of external braking resistor (Ω)	Max. braking energy absorbed by capacitor(J)
		Resistance (Ω)	Capacity(W)		
Single-phase 220V	PS1R6AX	-	-	45	11
	PS2R8AX	-	-	45	22
Single / three-phase 220V	PS5R5AX	50	50	45	31
Three-phase 220V	PS7R6BX	50	50	45	31
	PS7R6AX	25	80	20	47
	PS012AX	25	80	20	64
Three-phase 380V	PT3R5AX	50	80	45	26
	PT5R4AX	50	80	45	53
	PT8R4AX	50	80	35	53
	PT012AX	50	80	35	106
	PT017AX	-	-	25	106
	PT021AX	-	-	25	128
	PT026AX	-	-	25	128

Note:

1. PB-IR are short-circuited upon delivery, and the internal braking resistor is used by default.

2. When braking capacity of internal braking resistor is insufficient, disconnect the PB-IR, connect external braking resistor between PB and P.

3. For external braking resistor, please contact our technical support.

4. "-" in the table indicates that this model has no built-in braking resistor.

Chapter 4 Wiring of Servo System

This chapter introduces the wiring and cable connection of servo drive, as well as the issues needing attention.

DANGER

- Do not open the cover until the power supply of the servo drive is completely disconnected for at least 10 minutes.
- Even if the power is off, high voltage may remain inside the servo drive. To prevent electric shock, do not touch the power terminals. After discharge is completed, charge LED will turn off. Make sure that the internal wiring be conducted only when the charge LED inside the drive is off.
- Only the well-trained and authorized personnel are allowed to perform the internal wiring of the servo drive.
- Check the wiring carefully when connecting the emergency stop or safety circuit.
- Check the voltage level of the drive before power-on, otherwise, human injury and death or equipment damage may be caused.

WARNING

- Check carefully whether the rated input voltage of the servo drive is consistent with the AC power voltage before power-on.
- The servo drive has passed the dielectric strength test before delivery. Do not conduct this test again.
- Do not connect the AC supply cables to the output terminals U, V and W.
- The diameter of copper cable used as grounding wire should be bigger than 3.5mm and the grounding resistance should be less than 10Ω.
- There is leakage current inside the servo drive and the value of the leakage current depends on the operating conditions. To ensure the safety, the drive and the motor must be grounded and a Residual Current Detector (i.e. RCD) is required. The type B RCD is recommended. The set value of the leakage current is 300mA.
- To provide the over-current protection for the input side and facilitate the power-off maintenance, the servo drive should be connected to the AC supply through a circuit breaker or a fuse.

4.1 Servo drive main circuit connection

4.1.1 Main circuit specifications

Name and function of servo drive main circuit terminals are as shown in Table 4-1, the cable specification is as shown in Table 4-2.

Table 4-1 Name and function of M6 series drive main circuit terminals

Terminal name	Terminal symbol	Drive model M6-PxxxxxX	Terminal function
Main circuit power input terminals	L1, L2	PS1R6AX, PS2R8AX	Main circuit single-phase 220V power input
	L1, L2, L3	PS5R5AX, PS7R6BX, PS7R6AX, PS012AX	Main circuit three-phase 220V power input
		PT3R5AX, PT5R4AX, PT8R4AX, PT012AX, PT017AX, PT021AX, PT026AX	Main circuit three-phase 380V power input
Control circuit input terminal	L1C, L2C	Control power input, single-phase 220VAC input	
DC bus terminal	P, ⊖	Servo DC bus terminal, can be used for multi-machine common bus connection	
Braking resistor connection terminals	P, PB, IR	PS1R6AX, PS2R8AX, PT017AX, PT021AX, PT026AX	When the braking capacity is insufficient, please connect an external braking resistor between P-PB. Please refer to the recommended value for specific specifications.
		PS5R5AX, PS7R6BX, PS7R6AX, PS012AX, PT3R5AX, PT5R4AX, PT8R4AX, PT012AX	By default, PB-IR is short-circuited, and the built-in braking resistor is used; when the braking capacity is insufficient, disconnect PB-IR and connect an external braking resistor between P-PB. Please refer to the recommended value for specific specifications.
Servo motor connection terminals	U, V, W	Connect to U, V and W phases of the servo motor.	
Grounding terminal (two)	PE	Connect to the power supply grounding terminal and the servo motor grounding terminal for grounding.	

Note: PB and IR are short-circuited upon delivery for the drive with built-in resistance.

4.1.2 Main circuit cable dimensions

Recommended main circuit cable dimensions of servo drive are shown in the table below.

Table 4-2 Recommended main circuit cable of M6 series drive

Drive model M6-P□□□□□X		Power supply input L1, L2, L3	Control power input L1C, L2C	Power output U, V, W	Grounding PE	Braking resistor PB, P
SIZE A	PS1R6AX	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)
	PS2R8AX	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)	20AWG ($0.5mm^2$)
	PS5R5AX	18AWG	20AWG	18AWG	18AWG	18AWG

Drive model M6-P[][][][][]X		Power supply input L1, L2, L3	Control power input L1C, L2C	Power output U, V, W	Grounding PE	Braking resistor PB, P
		(0.75mm^2)	(0.5mm^2)	(0.75mm^2)	(0.75mm^2)	(0.75mm^2)
	PS7R6BX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
SIZE B	PS7R6AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	PS012AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	PT3R5AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	PT5R4AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	PT8R4AX	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	PT012AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
SIZE C	PT017AX	14AWG (1.5mm^2)	20AWG (0.5mm^2)	14AWG (1.5mm^2)	14AWG (1.5mm^2)	14AWG (1.5mm^2)
	PT021AX	12AWG (2.5mm^2)	20AWG (0.5mm^2)	12AWG (2.5mm^2)	12AWG (2.5mm^2)	12AWG (2.5mm^2)
	PT026AX	12AWG (2.5mm^2)	20AWG (0.5mm^2)	12AWG (2.5mm^2)	12AWG (2.5mm^2)	12AWG (2.5mm^2)

4.2 Servo motor encoder signal connection (CN4)

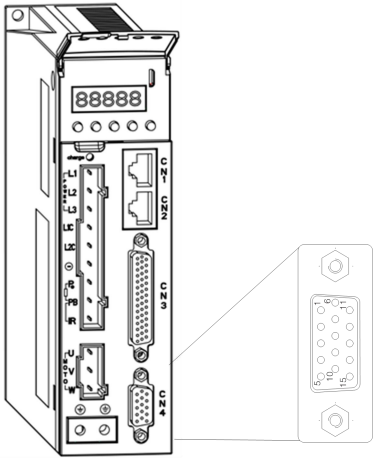


Fig.4-1 Servo motor encoder signal connection diagram

The motor encoder interface of the M6 servo drive supports three types of encoders: 23-bit multi-turn absolute encoder, incremental encoder, and SinCos encoder. The three encoder interfaces are integrated into one DB15 port, and the interface signals are defined in the table 4-3 to Table 4-6.

Table 4-3 Multi-turn absolute encoder port definition

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description
3	SD+	Encoder communication signal (+)
8	SD-	Encoder communication signal (-)
14	GND	Power ground
15	5V	Power +5V
Shell	PE	Shield

Table 4-4 Line-saving incremental encoder interface definition

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description
1	A+	Incremental differential A+ signal
2	B+	Incremental differential B+ signal
3	Z+	Incremental differential Z+ signal
6	A-	Incremental differential A- signal
7	B-	Incremental differential B- signal
8	Z-	Incremental differential Z- signal
14	GND	Power ground
15	5V	Power +5V
Shell	PE	Shield

Table 4-5 Full-line incremental encoder interface definition

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description
1	A+	Incremental differential A+ signal
2	B+	Incremental differential B+ signal
3	Z+	Incremental differential Z+ signal
4	U+	Phase differential U+ signal
5	V+	Phase differential V+ signal
6	A-	Incremental differential A- signal
7	B-	Incremental differential B- signal
8	Z-	Incremental differential Z- signal
9	U-	Phase differential U- signal

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description
10	V-	Phase differential V- signal
11	W+	Phase differential W+ signal
12	W-	Phase differential W- signal
14	GND	Power ground
15	5V	Power +5V
Shell	PE	Shield

Table 4-6 SinCos encoder interface definition

Connection port: CN4, DB15 female head		
Pin	Signal name	Signal description
4	COS+	Sincos COS+ signal
5	SIN+	Sincos SIN+ signal
9	COS-	Sincos COS- signal
10	SIN-	Sincos SIN- signal
11	REF+	Sincos zero + signal
12	REF-	Sincos zero - signal
14	GND	Power ground
15	5V	Power +5V
Shell	PE	Shield

4.3 Control signal interface definition

The control signal includes digital input, digital output, analog input, pulse reference, pulse feedback and other signals. The signal connection mode is DB44, and the drive end is a DB44 female seat.

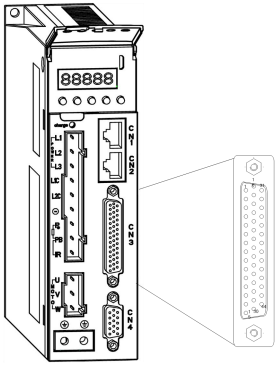


Fig.4-2 Control signal terminal definition diagram

The control signal definitions are shown in the following table

Table 4-7 Control signal definition table

Pin	Signal name	Pin	Signal name	Pin	Signal name
1	AI2	16	AI1+	31	AI1-
2	DO1+	17	DO1-	32	GND
3	DO2+	18	DO2-	33	DI1
4	DO3+	19	DO3-	34	DI2
5	DO4+	20	DO4-	35	DI3
6	DO5+	21	DO5-	36	DI4
7	DO6+	22	DO6-	37	DI5
8	SIGN+	23	DICOM	38	DI6
9	PULS+	24	SIGN-	39	DI7
10	PPH	25	PULS-	40	DI8
11	PAO+	26	PAO-	41	DI9
12	PBO+	27	PBO-	42	DI10
13	PZO+	28	PZO-	43	-
14	HSIGN+	29	HSIGN-	44	GND
15	HPULS+	30	HPULS-		

4.3.1 Digital input and output signals

Digital input and output signals are as shown in the following table.

Table 4-8 Digital input and output signals

Signal name		Default function	Pin No.	Function description
Common	DI1	/SON	33	Servo enable
	DI2	/ARST	34	Fault reset
	DI3	/SPD1	35	Multi-stage operation reference 1
	DI4	/SPD2	36	Multi-stage operation reference 2
	DI5	/GSEL	37	Gain switching
	DI6	/MSEL1	38	Operating mode switching 1
	DI7	/MSEL2	39	Operating mode switching 2
	DI8	/P-OT	40	Positive limit switch
	DI9	/N-OT	41	Negative limit switch
	DI10	/STOP	42	Emergency shutdown
	DICOM	DI common terminal	23	DI common terminal (connect power or power ground)
	DO1+	/SRDY	2	Servo ready
	DO1-		17	
	DO2+	/ALM	3	Fault output
	DO2-		18	
	DO3+	/BRK	4	Brake output
	DO3-		19	
	DO4+	/SRCH	5	Speed to reach
	DO4-		20	
	DO5+	/T-LT	6	Torque limit
	DO5-		21	
	DO6+	/ZSPD	7	Zero speed operation
	DO6-		22	

4.3.1.1 Digital input circuit

M6 series servo has 10 DI terminals in total. The DI common terminal can be connected to power supply or ground, and supports dry contact input, NPN input and PNP input.

M6 series servo does not provide 24 power supply to the outside, and the connection of DI uses external power supply.

Take DI1 as an example, interface circuits of DI1-DI10 are the same.

(1) Dry contact mode

The dry contact wiring method is as shown in Fig. 4-3.

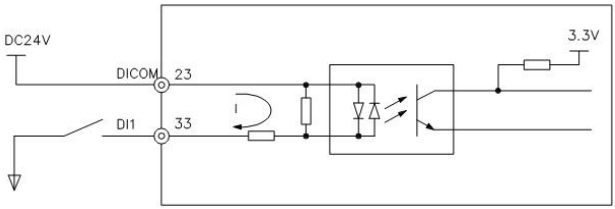


Fig.4-3 DI terminal dry contact connection mode

(2) NPN (drain) mode

The external controller is the NPN common emitter output, the wiring mode is as shown in Fig. 4-4.

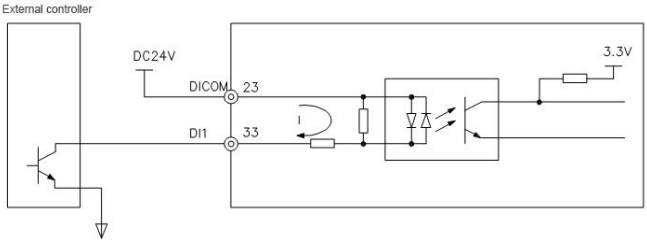


Fig.4-4 DI terminal NPN connection mode

(3) PNP (source) mode

The external controller is the PNP common emitter output, the wiring mode is as shown in Fig. 4-5.

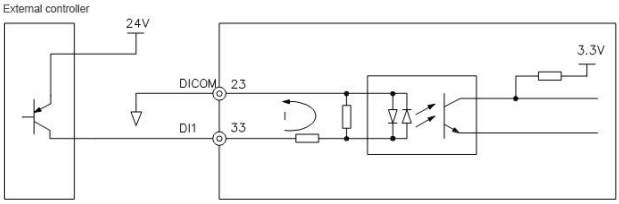


Fig.4-5 DI terminal PNP connection mode

Note: The NPN and PNP modes of multiple DI terminals of the same drive cannot be mixed.

4.3.1.2 Digital output circuit

The DO terminal is a double-ended output, which can have various output modes. There is no internal power supply, and an external power supply must be used. Taking DO1 as an example, the interface circuits of DO1-DO6 are the same (N series DO1-DO5).

(1) The host device is relay input

When the external device is a relay input, the wiring mode is as shown in Fig.4-6.

Warning: The inductive load (such as relay) shall be anti-parallel with the fly-wheel diode!

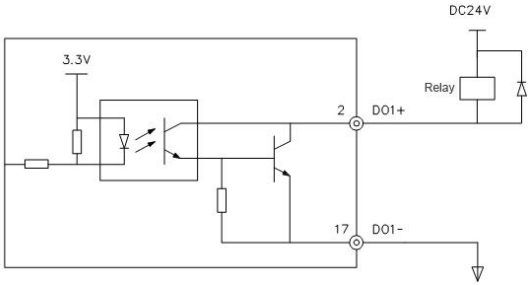


Fig.4-6 DO terminal connection relay wiring mode

(2) Drain (NPN) output

When the controller input is a drain input, the wiring mode is as shown in Fig.4-7.

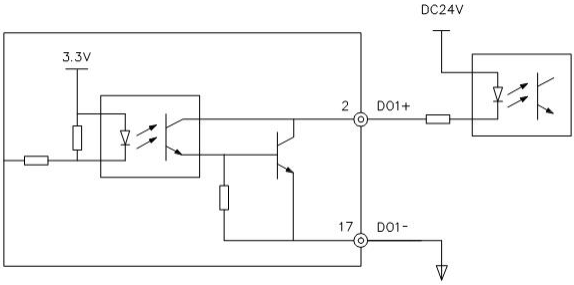


Fig.4-7 DO terminal drain (NPN) output wiring mode

(3) Source (PNP) output

When the controller input is a source input, the wiring mode is as shown in Fig.4-8.

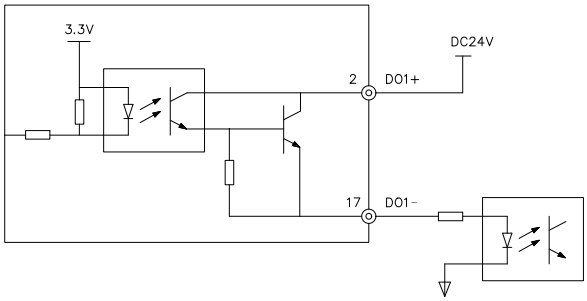


Fig.4-8 DO terminal source (PNP) output wiring mode

4.3.2 Analog input signal

Table 4-9 Analog input signal

Signal name		Pin No.	Function description
Analog	AI1+	16	Analog input 1, differential input, resolution: 16-bit, support voltage input Voltage range: -10V~+10V
	A11-	31	
	AI2	1	Analog input 2, single-ended input, resolution: 12-bit, support voltage input Voltage range: -10V~+10V
	GND	32	

Voltage input range: -10V~ +10V;

Maximum input voltage: ± 11V;

Input inductance: single-ended input about 17kΩ, differential input about 12 kΩ.

1. AI1 receiving differential voltage input wiring diagram

The wiring mode is as shown in Fig.4-9.

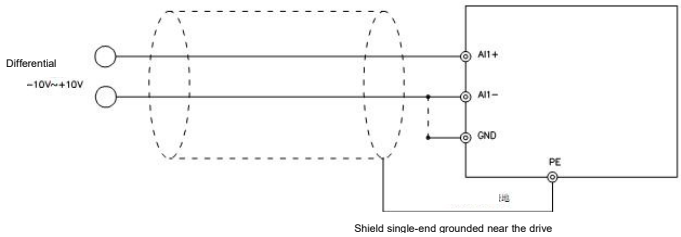


Fig.4-9 AI1 differential voltage input wiring diagram

Note: In most cases, shorting AI1- and GND can improve input stability

2. AI1 receiving single-ended voltage input wiring diagram

The wiring mode is as shown in Fig.4-10.

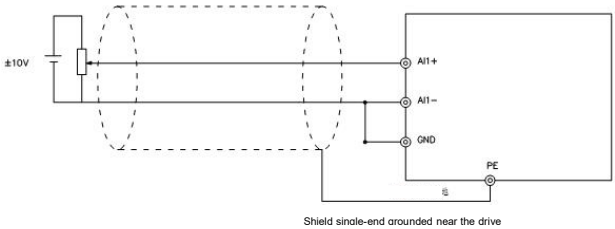


Fig.4-10 AI1 single-ended voltage input wiring diagram

3. AI2 receiving single-ended voltage input wiring diagram

The wiring mode is as shown in Fig.4-11.

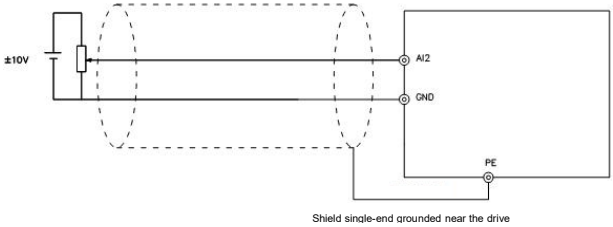


Fig.4-11 AI2 single-ended voltage input wiring diagram

4.3.3 Position command input signal

Table 4-10 Position command input signal

Signal name		Pin No.	Function	
Position command	PULS+	9	Low speed pulse command Open collector input Push-pull input Differential input	Pulse input mode: Puls+Sign CW/CCW A/B phase quadrature
	PULS-	25		
	SIGN+	8		
	SIGN-	24		
	HPULS+	15	High-speed pulse command Differential input	Pulse input mode: Puls+Sign CW/CCW A/B phase quadrature
	HPULS-	30		
	HSIGN+	14		
	HSIGN-	29		
	PPH	10	External power input interface of command pulse	
	GND	44	Differential input pulse signal ground	

There are two channels for pulse command input: low-speed pulse command input and high-speed pulse command input. The former supports differential input and open-collector input, while the latter only supports differential input. Its input maximum frequency and minimum pulse width are shown in the table below.

Table 4-11 Pulse input specification requirements

Pulse channel	Supported input mode	Maximum input frequency	Minimum pulse width	Voltage specification	Current consumption
Low-speed pulse input	Open-collector input	200Kpps	2.5us	24V	<10mA

Pulse channel	Supported input mode	Maximum input frequency	Minimum pulse width	Voltage specification	Current consumption
	Differential input	500Kpps	1us	5V	<10mA
High-speed pulse input	Differential input	4Mpps	0.125us	5V	<5mA

1. Low-speed pulse command input

a) The host device is 5V differential mode output

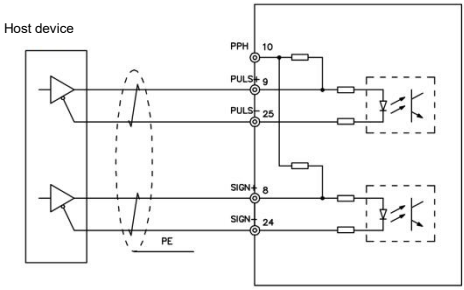


Fig.4-12 Low-speed pulse command differential input wiring diagram

b)The host device is open collector NPN output

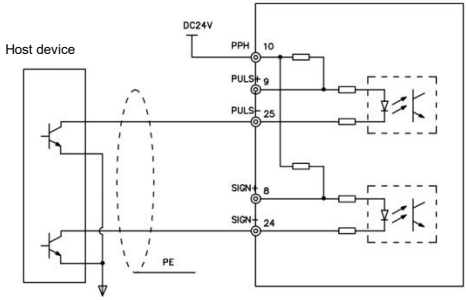


Fig.4-13 Low-speed pulse command NPN input wiring diagram

c)The host device is open collector PNP output

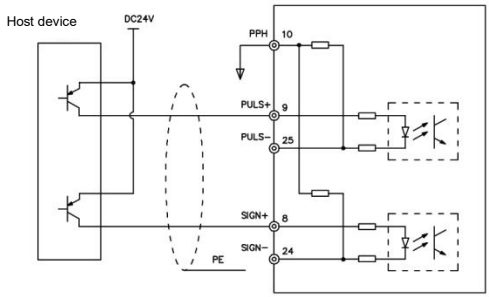


Fig.4-14 Low-speed pulse command PNP input wiring diagram

2. High-speed pulse input

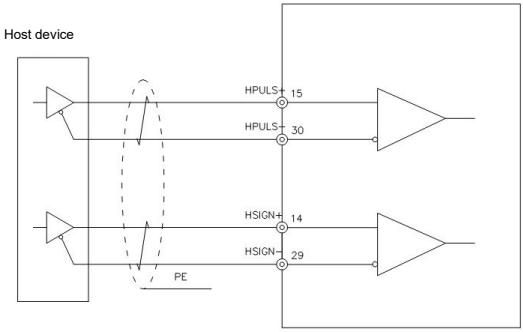


Fig.4-15 High-speed pulse input wiring diagram

4.3.4 Encoder frequency dividing output circuit

Table 4-12 Encoder frequency dividing output signal

Signal name		Pin No.	Function	
Common	PAO+ PAO-	11 26	Phase A output signal	A, B quadrature pulse output
	PBO+ PBO-	12 27	Phase B output signal	
	PZO+ PZO-	13 28	Phase Z output signal	Origin signal
	GND	44	Pulse signal ground	

Encoder frequency dividing output wiring is as shown in Fig.4-16 and Fig.4-17.

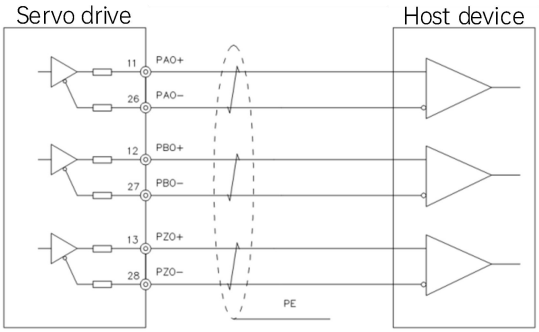


Fig.4-16 Encoder frequency dividing output wiring 1

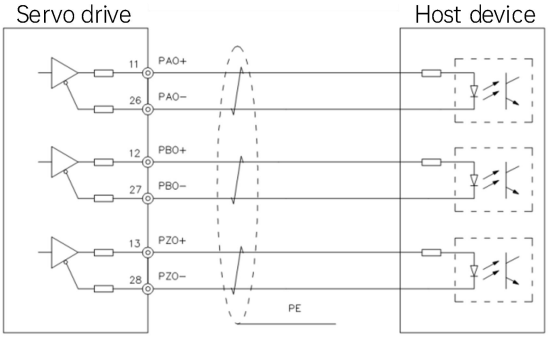


Fig.4-17 Encoder frequency dividing output wiring 2

4.4 Definition of the second encoder interface

M6 series servo supports second encoder for full closed loop control.

The port of the second encoder is CN6, which is a DB15 female connector. It integrates three encoder interfaces and supports three signal types: incremental, absolute and SinCos.

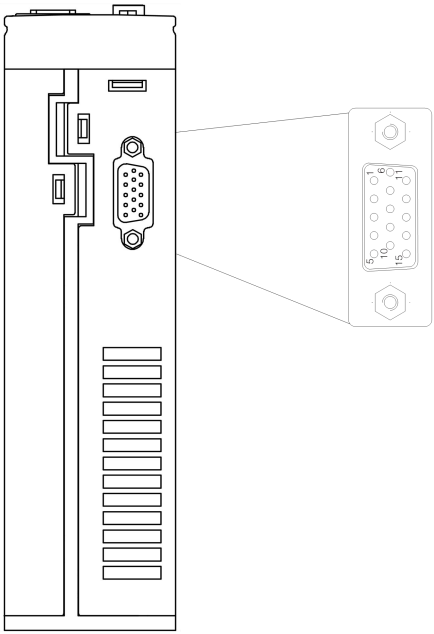


Fig.4-18 The second encoder signal connection diagram

The signal definitions of different encoders are shown in the following table

Table 4-13 Second encoder signal definition table

Second encoder port definition			
Encoder	Pin	Signal name	Signal description
Incremental encoder	1	MA+	Incremental differential input A+
	6	MA-	Incremental differential input A-
	2	MB+	Incremental differential input B+
	7	MB-	Incremental differential input B-
	3	MZ+	Zero differential input Z+
	8	MZ-	Zero differential input Z-
Absolute encoder	3	MD+	Communication data signal+
	8	MD-	Communication data signal-
	11	MCK+	Communication clock signal+
	12	MCK-	Communication clock signal-
SinCos encoder	4	MCOS+	Sincos COS+ signal
	9	MCOS-	Sincos COS- signal
	5	MSIN+	Sincos SIN+ signal
	10	MSIN-	Sincos SIN- signal
Power ground	15	5V	Power +5V
	14	GND	Power ground

Note:

The SinCos encoder interface of the second encoder and the SinCos interface of the motor encoder (CN4) cannot be used at the same time, and the two encoder ports cannot use the same absolute encoder at the same time, but the incremental encoder can be used at the same time.

4.5 Communication port wiring

M6 series servo supports RS485 communication and CANopen communication. The communication ports are CN1 and CN2, which are two RJ45 ports connected in parallel, which is convenient for multi-site cascading, the two ports go from top to bottom.

Among them, CAN supports CANopen protocol and implements CiA 402 sub-protocol; RS485 supports standard driver MODBUS protocol.

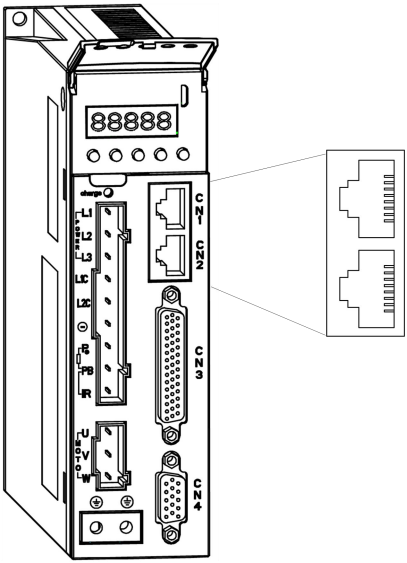


Fig.4-19 Communication interface connection diagram

Table 4-14 Communication port signal definition table

Pin No.	Definition	Description
1	CANH	CAN port
2	CANL	
3	485+	RS485
6	485-	
8	GND	Communication ground
4/5/7	Undefined	

Chapter 5 Operation Panel

5.1 Interface introduction

M6 servo drive operating interface consists of 5 LED digital tubes and 5 keys, which can be used for working status display and parameter settings.

Interface appearance as shown in the figure below.

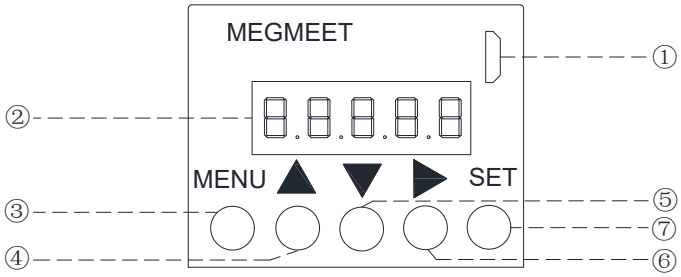


Fig.5-1 Interface appearance

Interface key functions as shown in the table below.

Table 5-1 Interface key functions

Key	Key name	Function
MENU	Menu / exit key	In the working status display or monitor parameters menu, press this key to switch between the working status display or monitor parameters menu and level 1 menu of the parameter settings. In level 2 menu of the parameter setting, press this key to return to the previous menu.
▶	Switch/shift/page key	In the working status display menu, press this key to switch between the working status display and monitor parameters menu. In the parameter setting interface, press this key to left shift the selected blinking digits. When the parameter value is greater than 5 digits and can not be modified, pressing this key, you can scroll the display parameter values.
▲	Increase key	In the monitoring parameter menu, press this key to select the monitoring parameters. In the parameter setting interface, press this key to increase the current blinking digits setting value, long press to increase rapidly.
▼	Decrease key	In the monitoring parameter menu, press this key to select the monitoring parameters. In the parameter setting interface, press this key to decrease the current blinking digits setting value, long press to decrease rapidly.
SET	Enter/confirm/reset key	In the parameter setting interface, press this key to enter the next menu, or confirm the current parameter value and return to the previous menu. Under the fault status display, press this key to reset the fault.

5.2 Working status display

M6 servo drive can display the following several working status.

Table 5-2 Servo drive function status and display

LED display graphics	Symbol	Status description
rSt	“rst”	Power on initialization state, indicate that the system is at start or reset state.
nrd	“nrd”	Start or reset is completed, the servo is not yet ready.
rdy	“rdy”	Servo system self-detection normal, wait for the host to give a command signal.
run	“run”	Servo running status.
Er.XXX	“Er.xxx”	Servo fault status.
AL.XXX	“AL..xxx”	Servo alarm status.

5.3 Working status display and parameter setting flowchart

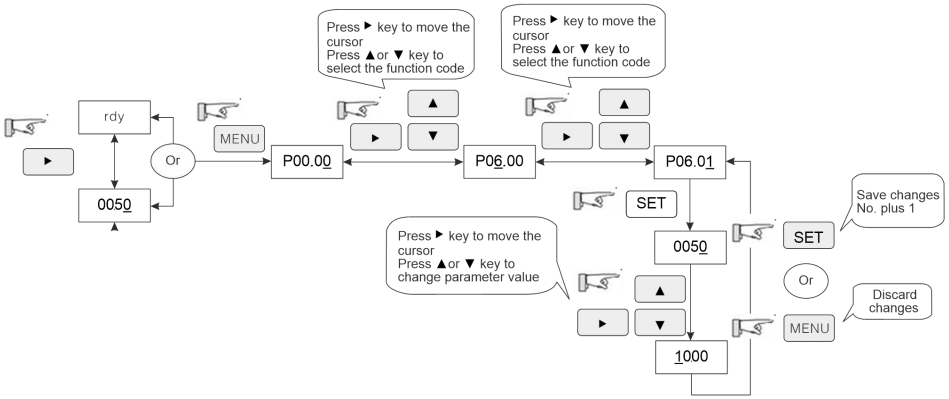


Fig.5-2 Working status display and parameter setting flowchart

1. After the servo drive power on initialization is completed, enter the working status display menu, if the servo system self-detection is normal, it will display "rdy".
2. In the working status display menu, press ► key to switch between the working status display and monitor parameters menu.
3. In the monitoring parameter menu, press▼/▲key to select the monitoring parameters.
4. In the working status display or monitor parameters menu, press the MENU key to switch between the working status display or monitor parameters menu and level 1 menu of the parameter settings.
5. In the parameter setting level 1 menu, press ► key to move the cursor to the parameter group or parameter serial number.

6. In the parameter setting level 1 menu, press ▼/▲ key to select the required parameter group and parameter serial number.

7. In the parameter setting level 1 menu, press the SET key to enter parameter setting level 2 menu to display the current value of the parameters. If at this time, the parameter values can be modified, its lowest digit will flash.

8. In the parameter setting level 2 menu, press ▸ key to select the number of digits to be modified, press ▼/▲ key to increase or decrease the value.

9. After the parameter are modified, if press the SET key to save the changes and return to the previous menu, if press the MENU key to discard the changes, and return to the previous menu.

5.4 Parameter value display

1. Five-digit and below parameter values display

When the parameter value is in the [-9999 to 99999] , it can be displayed and edited in one page.

2. Above five-digit parameter values display

When the parameter value exceeds [-9999 to 99999] , the parameter value need to turn the page to display and edit. The drive can display up to three page parameters, the following illustrates the page display logic. For example, to display -21474836.48, can be divided into [-21], [4748], [36.48] three pages, as shown in the figure below.

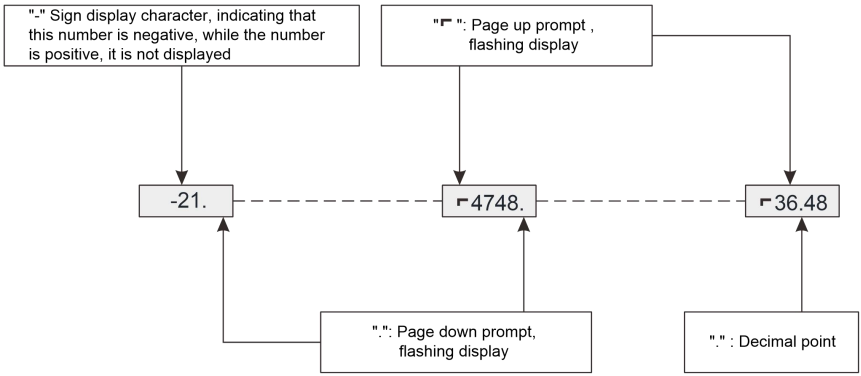


Fig.5-3 Parameter page display logic

If the parameter value can be modified currently, press ▶ key to select the number of digits to be modified. If the parameter value can not be modified currently, at this time can only press ▶ key to scrolling display.

Chapter 6 Running Mode and Commissioning Instructions

6.1 Check before running

Disconnect the servo motor from the load, the coupling connected to the motor shaft, and other related components. To prevent potential risks, check that the servo motor can work properly without load, and then connect the load.

Before running, check that the following requirements are met:

1. There is no obvious damage on the appearance of the servo drive.
2. The wiring terminals have been insulated.
3. There are no conductive objects such as screw or metal sheet or combustible objects inside the servo drive, and there are no conductive objects around the wiring terminals.
4. The servo drive or external braking resistor is not placed on combustible objects.
5. The wiring is completed and correct:

• Power cables, auxiliary power cables and grounding cable of the servo drive
• All control signal cables
• Limit switches and protection signals

6. The servo drive enable switch is in OFF state.
7. The power circuit is cut off, and the emergency stop circuit is ON.
8. The external voltage reference of the servo drive is correct.

When the host controller does not send the running reference, power on the servo drive. Then, check that:

1. The servo motor can rotate properly without vibration or loud noise.
2. All parameter setting is correct. Unexpected actions may occur due to different mechanical characteristics. Thus, do not set the parameters too large or small.
3. The bus voltage indicator and digital display are normal.

6.2 Commissioning

After the wiring is completed, perform jog commissioning, confirm whether the servo motor can rotate normally and whether there is abnormal vibration or noise when rotating. Using jog running through the panel, configurating two external DI terminals, the motor jog running speed is set by function code P06.05.

a. Panel jog

Enter the control mode selection through the panel operation function code P02.00 and set it to 0, then set the jog running speed through the panel operation function code P06.05, then operate the function code P06.06 and press SET to display the current jog speed. Adjust jog running forward and reverse through the ▼/▲ keys. Press SET/ MENU key to exit the jog mode.

b. DI terminal jog

Configure two external DI terminals, set FunIN.17, FunIN.18 function, after set P06.05 jog speed, control jog running forward and reverse through DI state.

6.3 Position control mode instructions

6.3.1 Position control mode wiring

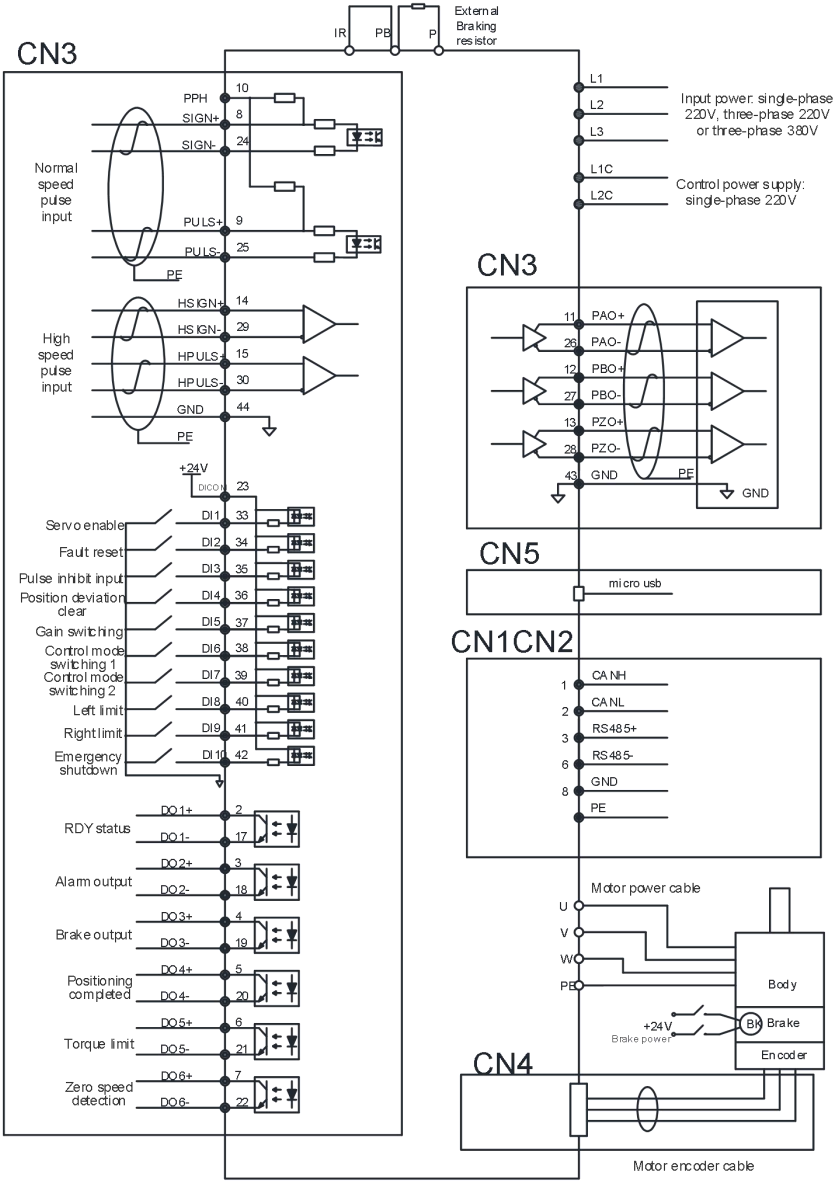


Fig.6-1 Position control mode wiring

6.3.2 Position control mode function code setting

Position control is selected by P02.00

Function code	Name	Setting range/value	Effective time	Property	Default value
P02.00	Control mode selection	1: Position mode	Immediate	At stop	0

6.3.2.1 Position command input setting

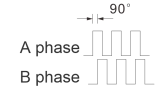
Pulse input source, pulse command input mode and logical form are set by P05.01, P05.02 and P05.03 respectively.

(1) Pulse input source

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.01	Pulse command input terminal selection	0: Low-speed terminal 1: High-speed terminal	Immediate	At stop	0

(2) Pulse command input mode setting

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.02	Pulse command mode	0: A/B phase pulse 1: PULSE+SIGN 2: CW/CCW pulse	Immediate	At stop	1

Pulse command input mode	Forward command	Reverse command
A/B phase pulse		
PULSE+SIGN pulse		
CW/CCW pulse		

(3) Pulse command logic

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.03	Pulse command logic	0: Positive logic 1: Inverse logic	Immediate	At stop	0

(4) Command pulse disable

Set the function FunIN.12 by DI to disable command pulse input.

Type	Function No.	Function name	Description	Remarks
Input (DI)	FunIN.12	Command pulse disable (INHIBIT)	ON: Closed OFF: Disconnected	ON: Stop command pulse count OFF: Start command pulse count

6.3.2.2 Position command filter

The command pulse input is filtered to make rotation of the servo motor smoother.

This function has obvious effects in the following occasions:

● Acceleration/deceleration processing is not performed on the command pulses output by the host controller

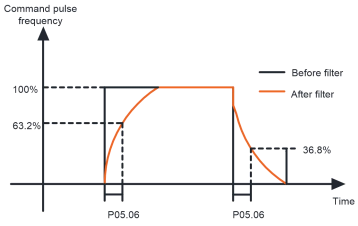
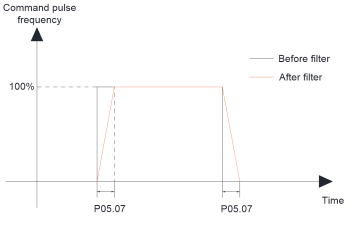
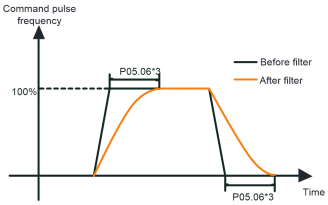
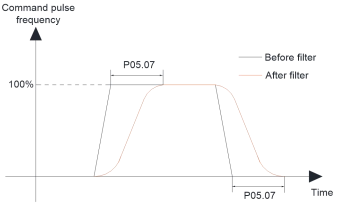
● The command pulse frequency is too low.

Position command smoothing function parameters were set as follows, do not enter the command pulse when changing the setting value, and modify when the motor stop.

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.06	Position command first-order low-pass filter time	0.0 to 2000.0 ms	Immediate	At stop	0.0
P05.07	Position command moving average filter time	0.0 to 12.8 ms	Immediate	At stop	0.0

NOTE: When set to 0, indicating that the function is disabled.

The difference between the position command first-order low-pass filter time and the position command average filter time as follows:

Position command first-order low-pass filter time	Position command moving average filter time
 Response waveform when the step command input	 Response waveform when the step command input
 Response waveform when the ramp command input	 Response waveform when the ramp command input

6.3.2.3 Positioning close to and positioning completed signal output

Type	Function No.	Function name	Description	Remarks
Output (DO)	/NEAR	Positioning close to	ON: Closed OFF: Disconnected	Output when arriving the point of positioning close to
	/COIN	Positioning completed	ON: Closed OFF: Disconnected	Output when arriving the point of positioning completed

Positioning close to and positioning completed are set by the following parameters, positioning close to is valid only in the internal position.

Function code	Name	Setting range/value	Effective time	Property	Default value

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.18	Positioning complete output condition	0: Position deviation absolute value smaller than amplitude of positioning completed 1: Position deviation absolute value smaller than amplitude of positioning completed and position reference after filter being 0 2: Position deviation absolute value smaller than amplitude of positioning completed and position reference being 0	Immediate	At stop	0
P05.19	Position positioning completed range	0 to 10000	Immediate	During running	10
P05.20	Position close to signal width	1 to 32767	Immediate	During running	100

Note: This parameter has no effect on final positioning accuracy.

Signal is output when the difference between the host device command pulses and the the amount of movement of the servo motor encoder (position pulse deviation) is lower than the set value.

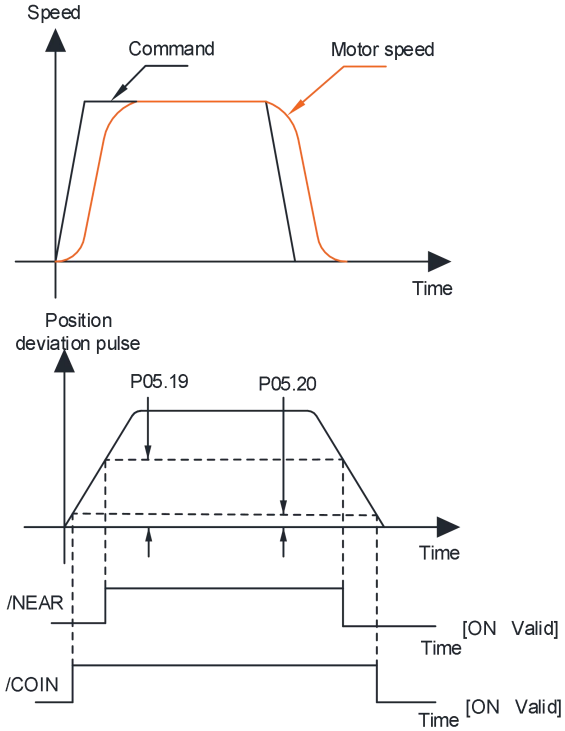


Fig.6-2 Positioning close to and positioning completed signal logic

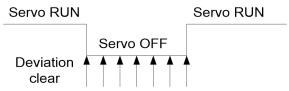
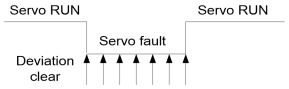
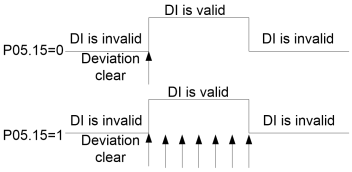
6.3.2.4 Clearing position deviation

(1) Setting clear input signal

Type	Function No.	Function name	Description	Remarks
Input (DI)	FunIN.29	Position deviation clear	ON: Position deviation clear OFF: Position deviation not cleared	Edge valid

(2) Setting clear input signal form

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.14	Position deviation clearing method selection	0: Clear position deviation when servo enable is OFF or stopped 1: Clear position deviation when the servo enable is OFF or a fault/alarm occurs 2: Clear position deviation when the servo enable is OFF or the external position deviation clear DI is valid	Immediate	At stop	0

Command form	Clearing time
Clear position deviation when servo enable is OFF or stop	
Clear position deviation when servo fails/alarm	
The position deviation is cleared when the servo enable is OFF or the external deviation clear DI is valid.	

6.3.3 Electronic gear

The use of "electronic gear" function, movement of the workpiece corresponding to the unit command pulse can be set to any value. In the system control,you can need not consider the mechanical reduction ratio and the number of encoder pulse.

1) Electronic gear setting method is as follows:

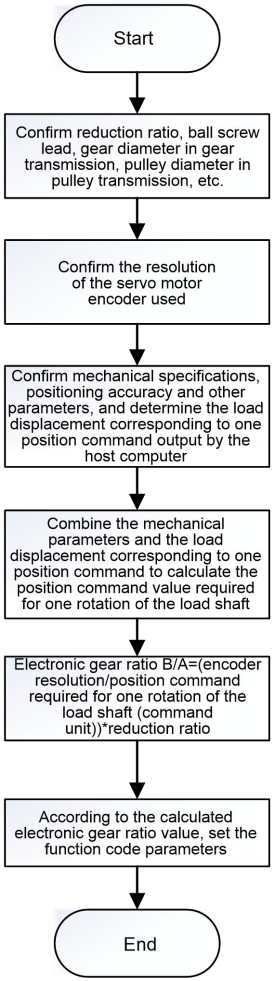


Fig.6-3 Electronic gear ratio setting process

The electronic gear ratio parameter function is shown as follows:

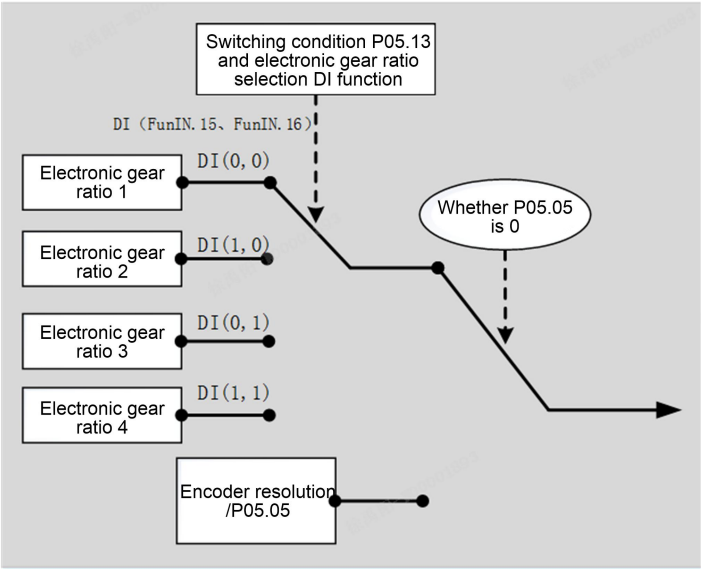


Fig.6-4 Electronic gear ratio function diagram

When P05.05 is not 0, the electronic gear ratio $\frac{B}{A} = \frac{\text{Encoder resolution}}{\text{P05.05}}$, at this time, electronic gear ratio 1, electronic gear ratio 2, electronic gear ratio 3, and electronic gear ratio 4 are invalid.

2) Related function codes

a. Electronic gear ratio parameter value setting:

Function code	Name	Setting range/value	Effective time	Property	Default value
P05.05	Number of command pulses per motor revolution	0~8388608 P/r	Immediate	At stop	2097152
P05.08	Electronic gear numerator	1~1073741824	Immediate	At stop	8388608
P05.09	Electronic gear denominator 1	1~1073741824	Immediate	At stop	10000
P05.10	Electronic gear denominator 2	1~1073741824	Immediate	At stop	10000
P05.11	Electronic gear denominator 3	1~1073741824	Immediate	At stop	10000
P05.12	Electronic gear denominator 4	1~1073741824	Immediate	At stop	10000

Note:

1. The setting range of electronic gear ratio is: $0.001<\frac{B}{A}<30000$, otherwise, fault Er.061 (electronic gear ratio setting error) will occur.

2. For the serial absolute encoder, the encoder resolution $=2^n$, n is the number of bits of the encoder, and the standard absolute encoder number of M6 is 23 bits, so the resolution of the encoder is $2^{23}=8388608$.

For an incremental encoder, encoder resolution = encoder lines * 4, for example, the resolution of a 2500-line incremental encoder is 2500*4=10000.

b. Electronic gear ratio switching setting

When P05.05 is 0, the electronic gear ratio switching function can be used. It should be determined whether it is necessary to switch among 4 sets of electronic gear ratios according to the mechanical operation, and the electronic gear ratio switching conditions should be set. There is one and only one set of electronic gear ratios active at any one time.

Associated function code

Function code	Name	Setting range	Effective time	Property	Default value
P05.13	Electronic gear ratio switching conditions	0: Position command is 0, switch after 3ms duration 1: Real-time switching	Immediate	At stop	0

At the same time, please configure the 2 DI terminals of the servo drive as functions 15 and 16 (FunIN.15 and FunIN.16), and determine the valid logic of the DI terminals. Refer to the table below for electronic gear ratio selection. When no DI is configured as FunIN.15 or FunIN.16, FunIN.15 and FunIN.16 are invalid by default.

P05.05	P05.13	DI level of FunIN15	DI level of FunIN16	Electronic gear ratio B/A
0	0 or 1	Invalid	Invalid	P05.08/P05.09
		Valid	Invalid	P05.08/P05.10
		Invalid	Valid	P05.08/P05.11
		Valid	Valid	P05.08/P05.12
1~8388608	---			Encoder resolution/P05.05

3) Calculation method of electronic gear ratio:

When the machine reduction ratio between the motor shaft and the load side is m/n (when the motor rotates m circle, the load shaft rotates n circle), the set value of the electronic gear ratio can be obtained by the following formula.

$$\text{Electronic gear ratio}\frac{B}{A} = \frac{\text{Encoder resolution}}{\text{the displacement for load shaft rotate a circle (command unit)}} \times \frac{m}{n}$$

a. Confirm the mechanical parameters and servo motor encoder resolution

Confirm mechanical parameters, such as reduction ratio, ball screw lead, belt transmission ratio, confirm the servo motor encoder resolution.

b. Confirm the positioning accuracy (i.e. pulse equivalent)

Pulse equivalent refers to the load minimum movement unit corresponding to each pulse command signal. Pulse equivalent can be 0.001mm, 0.1 °, 0.01 inches, a pulse is entered, moving a pulse equivalent of the distance or angle.

For example, pulse equivalent is 0.001mm, when the input command pulse is 50000, the amount of the load movement is (50000 * 0.001mm) = 50mm.

c. Calculate the number of position command required by load shaft rotate a circle

Use mechanical parameters, pulse equivalent, calculate the number of position command required by load shaft rotate a circle.

For example, the ball screw pitch is 5mm, pulse equivalent is 0.001mm, then:

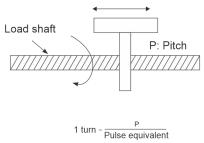
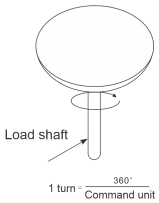
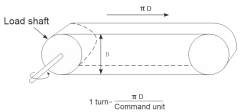
The displacement for load shaft rotate a circle (command bits) = 5mm / 0.001mm = 5000

d. Calculate the electronic gear ratio

If the reduction ratio of the motor shaft and load shaft is m/n (i.e. the motor rotate m circle, load rotate n circle), then:

$$\text{Electronic gear ratio}=\frac{P05.08}{P05.09}=\frac{\text{Encoder resolution}}{\text{the displacement for load shaft rotate a circle（command unit）}}\times\frac{m}{n}$$

4) The setting example is as follows:

Step	Content	Mechanical mechanism		
		Ball screw	Round table	Belt pulley
				
1	Mechanical mechanism	Screw lead: 5mm Reduction ratio: 1/1	1 turn rotation angle: 360 Reduction ratio: 100/1	Pulley diameter 100mm (pulley circumference 314mm) Reduction ratio: 50/1
2	Encoder resolution	8388608(23 bits)	8388608(23 bits)	8388608(23 bits)
3	1 command unit corresponds to load displacement	0.001mm	0.01°	0.005mm
4	The number of position commands required for one rotation of the load	5mm/0.001mm=5000	360°/0.01° =36000	314mm/0.005mm=62800mm
5	Electronic gear ratio	$\frac{B}{A}=\frac{8388608}{5000}\times\frac{1}{1}$	$\frac{B}{A}=\frac{8388608}{36000}\times\frac{100}{1}$	$\frac{B}{A}=\frac{8388608}{62800}\times\frac{50}{1}$
6	Parameter	P05.08= 8388608 P05.09 = 5000	P05.08= 838860800 P05.09 = 36000	P05.08= 419430400 P05.09 = 62800

6.3.4 Homing function

6.3.4.1 Function overview

The homing function means that in the position control mode, the servo motor will search for the zero point according to the homing mode, homing speed and other commands to complete the positioning function, and use this position as the reference point for each subsequent operation.

Electrical homing refers to the process of running from the current position to the zero point after finding the position reference zero point.

Homing operation and pulse input operation, single-point operation and multi-segment operation are mutually exclusive, and other methods of position control can be performed only after one segment is executed.

6.3.4.2 Parameter settings

Function code	Name	Setting range	Minimum unit	Default value
P12.00	Homing selection	0: Disabled 1: Homing enabled by the HomingStart signal input from DI 2: Electrical homing enabled by the HomingStart signal input from DI 3: Homing enabled immediately upon power-on 4: Homing performed immediately 5: Electrical homing started 6: Current position as the home	1	0
P12.01	Homing mode	0: Forward, home switch as deceleration point and home 1: Reverse, home switch as deceleration point and home 2: Forward, motor Z signal as deceleration point and home 3: Reverse, motor Z signal as deceleration point and home 4: Forward, home switch as deceleration point and Z signal as home 5: Reverse, home switch as deceleration point and Z signal as home 6: Forward, positive limit switch as deceleration point and home 7: Reverse, negative limit switch as deceleration point and home 8: Forward, positive limit switch as deceleration point and Z signal as home 9: Reverse, negative limit switch as deceleration point and Z signal as home 101-134: CANopen CiA402 homing mode 1-34	1	9
P12.02	Homing command terminal mode	0: Level mode 1: Edge mode	1	0
P12.04	Positioning acceleration and deceleration curve selection	0: T-shaped curve 1: S-shaped curve	1	0
P12.05	High speed home searching speed	0~1000rpm	1rpm	100
P12.06	Low speed home searching speed	0~1000rpm	1rpm	10
P12.07	Home position offset	-1073741824~1073741824	1	0
P12.08	Home searching acceleration /deceleration time	0~65535ms	1ms	200
P12.09	Homing	0~65535ms	1ms	10000

Function code	Name	Setting range	Minimum unit	Default value
	time limit			

In the process of various homing control, the effective stroke of each switch should be fully considered to avoid the logic error Er.066 of the homing process caused by the long deceleration time of the home searching or the excessive speed of the home searching, and set the homing parameters carefully.

If the time of homing exceeds the homing time limit, the drive will generate the time-out fault Er.037 for homing.

After the drive starts to find the origin according to the homing mode, the homing DO (FunOUT.14) signal outputs a high level, and the origin will be found, and the origin position offset will be run. After the position is reached, the homing complete signal DO (FunOUT.15) will be output. , and clear the homing DO (FunOUT.14).

After the drive starts to find the origin according to the electrical homing mode, the electrical homing DO (FunOUT.16) signal outputs a high level, and will run from the current position to the zero point. After the position is reached, the electrical homing complete signal DO (FunOUT.17) is output. , and clear the homing DO (FunOUT.16).

There are six types of homing control modes:

1. Homing enabled by the HomingStart signal input from DI

Set DI to FunIN.33, which is the HomingStart signal. First enable the drive, and then enable the HomingStart signal to perform the homing. If the homing command terminal mode is set to the level mode, when the HomingStart is low level, the homing process will be stopped, re-enable the function to perform the homing again. If the terminal mode of the homing command is set to pulse mode, the HomingStart level is low level will not affect the homing process, and the servo off enable will stop the homing process.

2. Electrical homing enabled by the HomingStart signal input from DI

Set DI to FunIN.33, which is the HomingStart signal. After the zero point is found in the homing, enable the drive first, and then enable the HomingStart signal for electrical homing. If the homing command terminal mode is set to the level mode, when the HomingStart is low level, the electrical homing process will be stopped and re-enabling will perform the electrical homing again. If the terminal mode of the homing command is set to pulse mode, the HomingStart level is low level will not affect the electrical homing process, and the drive off enable will stop the electrical homing process.

3. Homing enabled immediately upon power-on

The first servo enable after power-on will trigger the homing process according to the homing mode, and the servo enable again will not trigger the homing again until the drive is powered on again.

4. Homing performed immediately

After the servo is enabled, the homing process will be triggered according to the homing mode. After the homing is completed, P12.00 will be cleared. To trigger again, you need to set P12.00=4 and then enable the drive.

5. Electrical homing started

After the zero point is found by the homing, the servo enable will trigger the electrical homing process. After the electrical homing is completed, P12.00 will be cleared. To trigger again, you need to set P12.00=5 and then enable the drive.

6. Current position as the home

After the drive is enabled, the current position is taken as the home. When the home position offset P12.07 is 0, the position feedback=0. When the home position offset P12.07 is not 0, the position feedback is related to the

home offset mode P12.11: when P12.11=0, the position feedback=P12.07; when P12.11=1, the position feedback=current position+P12.07. After the homing is completed, P12.00 will be cleared. To trigger again, you need to set P12.00=6 and then enable the drive.

6.3.4.3 Homing mode

In order to support more applications, the homing mode P12.01 supports CANopen CiA402 homing mode 1-34.

1) P12.01 = 0, homing mode 0

Forward, home switch as deceleration point and home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and the forward high-speed returns to zero. After encountering the rising edge of the home switch, the reverse high-speed deceleration runs, and encountering the falling edge of the home switch , and then run at low speed in the forward direction, and stop when encountering the rising edge of the home switch.

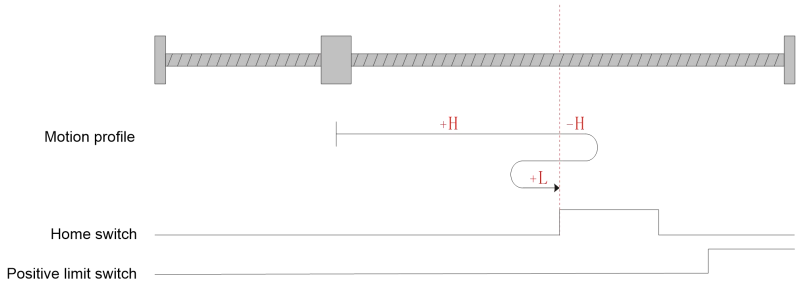


Fig.6-5 Homing mode 0 motion profile Figure 1

The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the forward direction, and stops when it encounters the rising edge of the home switch.

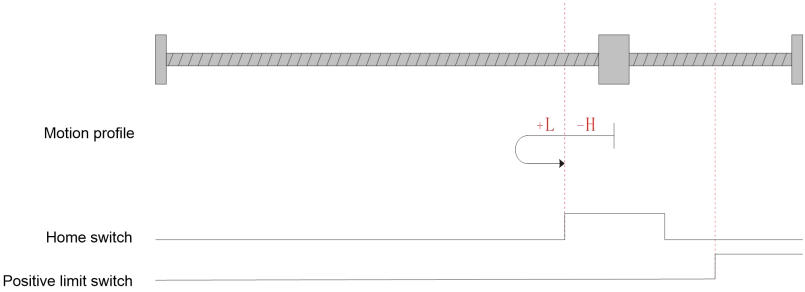


Fig.6-6 Homing mode 0 motion profile Figure 2

The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at a low level, and the forward high-speed returns to zero. After encountering the positive limit switch, the reverse high-speed runs, and encountering the falling edge of the home switch , and then run at low speed in the forward direction, and stop when encountering the rising edge of the home switch.

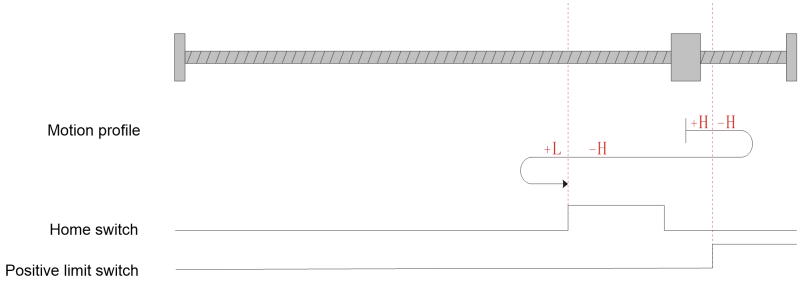


Fig.6-7 Homing mode 0 motion profile Figure 3

2) P12.01 = 1, homing mode 1

Reverse, home switch as deceleration point and home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and the reverse high-speed returns to zero. After encountering the negative limit switch, the forward high-speed runs, and encountering the falling edge of the home switch, and then run at low speed in the reverse direction, and stop when encountering the rising edge of the home switch.

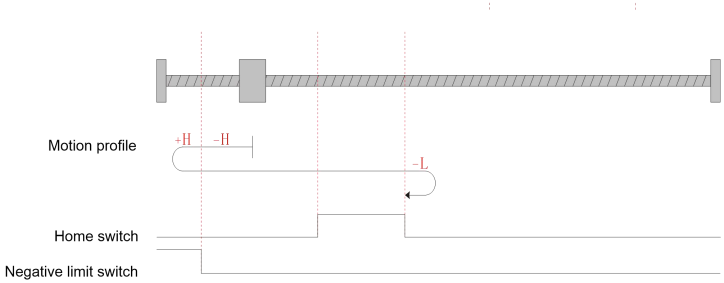


Fig.6-8 Homing mode 1 motion profile Figure 1

The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the reverse direction, and stops when it encounters the rising edge of the home switch.

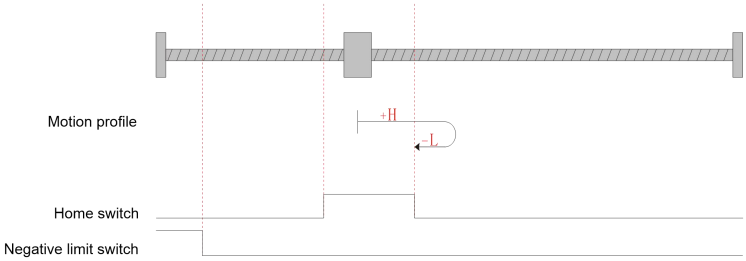


Fig.6-9 Homing mode 1 motion profile Figure 2

The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at a low level, and the reverse high-speed returns to zero. After encountering the rising edge of the home switch, the forward high-speed deceleration runs, and encountering the falling edge of the home switch , and then run at low speed in the reverse direction, and stop when encountering the rising edge of the home switch.

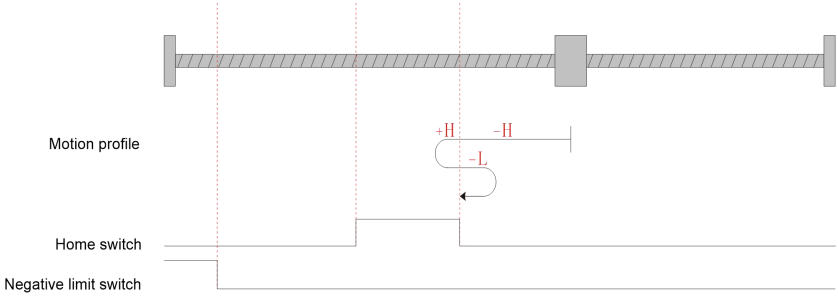


Fig.6-10 Homing mode 1 motion profile Figure 3

3) P12.01 = 2, homing mode 2

Forward, motor Z signal as deceleration point and home

When there is at least one Z signal in the distance between the current position of the motor and the positive limit switch, it will return to zero at low speed in the forward direction and stop at the rising edge of the Z signal.

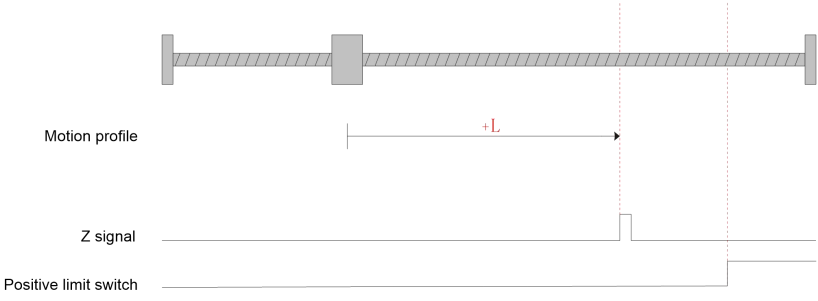


Fig.6-11 Homing mode 2 motion profile Figure 1

When the current position of the motor is at the Z signal, the homing enable is triggered, and the current position is immediately remembered as the origin position to stop.

When there is no Z signal between the current position of the motor and the positive limit switch, the forward low speed returns to zero, encounters the rising edge of the positive limit switch, and the reverse runs at a low speed. After encountering the falling edge of the Z signal, the forward low speed finds the Z signal to stop.

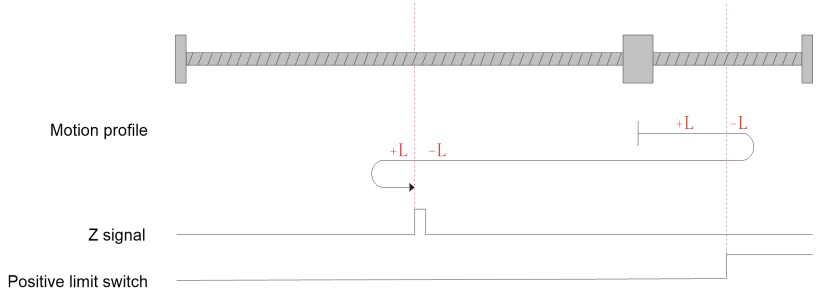


Fig.6-12 Homing mode 2 motion profile Figure 2

4) P12.01 = 3, homing mode 3

Reverse, motor Z signal as deceleration point and home

When there is at least one Z signal in the distance between the current position of the motor and the negative limit switch, it will return to zero at low speed in the reverse direction and stop at the rising edge of the Z signal.

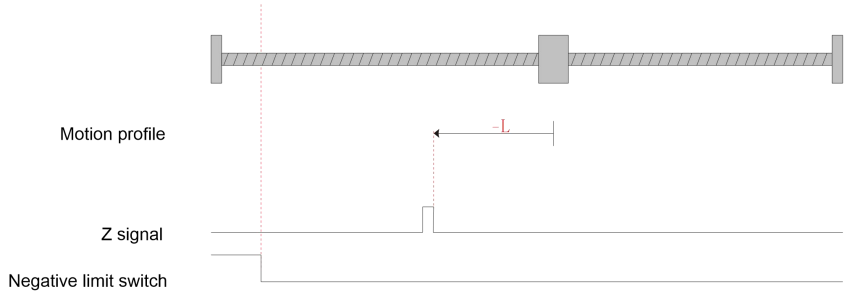


Fig.6-13 Homing mode 3 motion profile Figure 1

When the current position of the motor is at the Z signal, the homing enable is triggered, and the current position is immediately remembered as the origin position to stop.

When there is no Z signal between the current position of the motor and the negative limit switch, the reverse low speed returns to zero, encounters the rising edge of the negative limit switch, and the forward runs at a low speed. After encountering the falling edge of the Z signal, the reverse low speed finds the Z signal to stop.

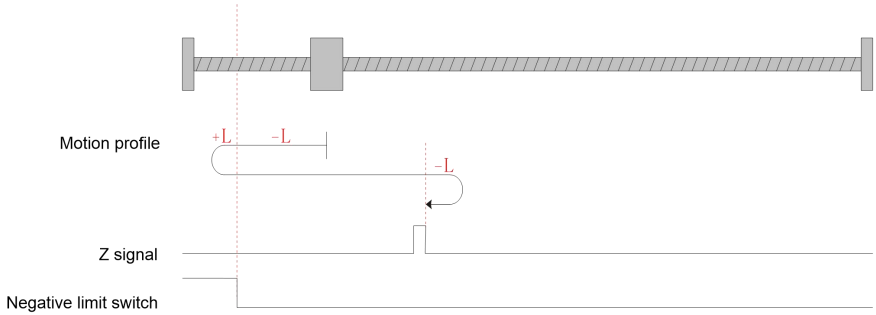


Fig.6-14 Homing mode 3 motion profile Figure 2

5) P12.01 = 4, homing mode 4

Forward, home switch as deceleration point and Z signal as home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and the forward high-speed returns to zero. After encountering the rising edge of the home switch, and then run at low speed in the forward direction, and stop at the rising edge of the Z signal.

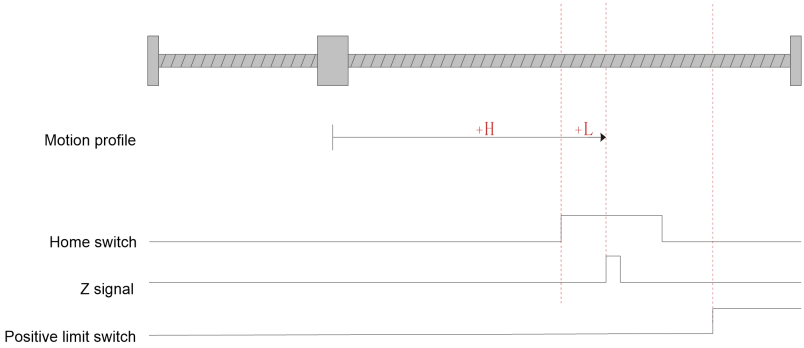


Fig.6-15 Homing mode 4 motion profile Figure 1

The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a high-speed in the forward direction, after encountering the rising edge of the home switch, it will find the rising edge of the Z signal at a forward low speed and stop.

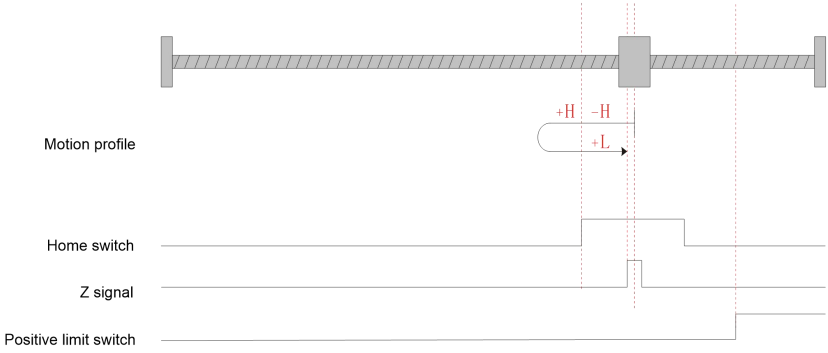


Fig.6-16 Homing mode 4 motion profile Figure 2

The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and the forward high-speed returns to zero. After encountering the rising edge of the positive limit switch, and then run at high speed in the reverse direction. After encountering the falling edge of the home switch, it will run forward at high speed, and when it encounters the rising edge of the home switch, it will find the rising edge of the Z signal at a forward low

speed and stop.

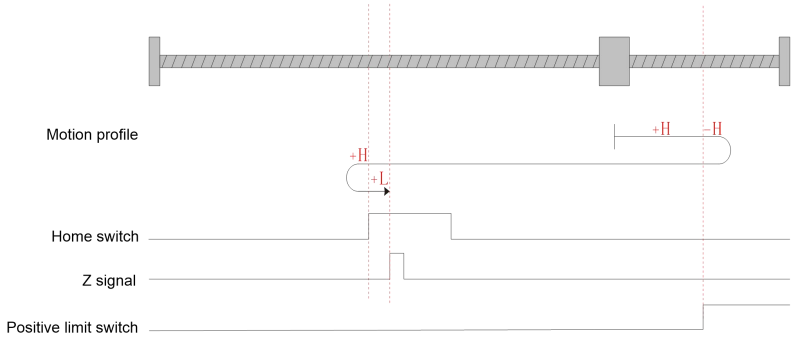


Fig.6-17 Homing mode 4 motion profile Figure 3

6) P12.01 = 5, homing mode 5

Reverse, home switch as deceleration point and Z signal as home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and the reverse high-speed returns to zero. After encountering the rising edge of the negative limit switch, and then run at high speed in the forward direction. After encountering the falling edge of the home switch, it will run reverse at high speed, and when it encounters the rising edge of the home switch, it will find the rising edge of the Z signal at a low speed and stop.

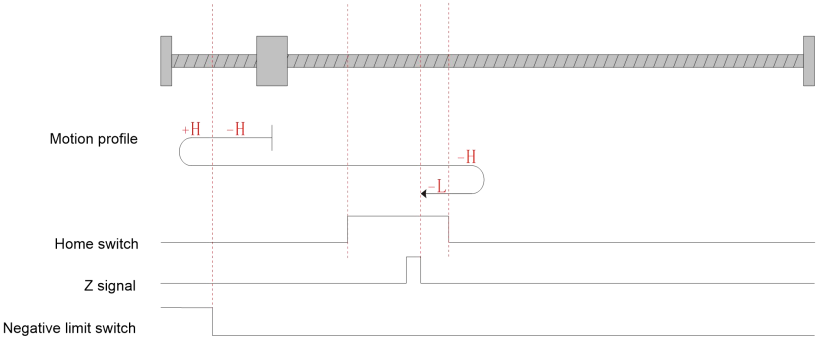


Fig.6-18 Homing mode 5 motion profile Figure 1

The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a high-speed in the reverse direction, after encountering the rising edge of the home switch, it will find the rising edge of the Z signal at a reverse low speed and stop.

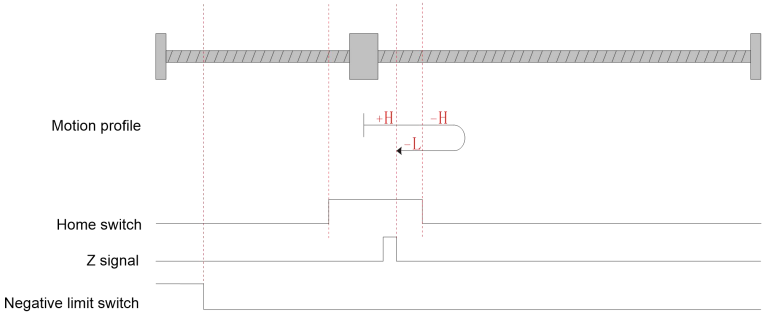


Fig.6-19 Homing mode 5 motion profile Figure 2

The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and the reverse high-speed returns to zero. After encountering the rising edge of the home switch, and then forward high speed deceleration operation. After encountering the rising edge of the home switch, it will run reverse at low speed, and stop when encountering the rising edge of Z signal.

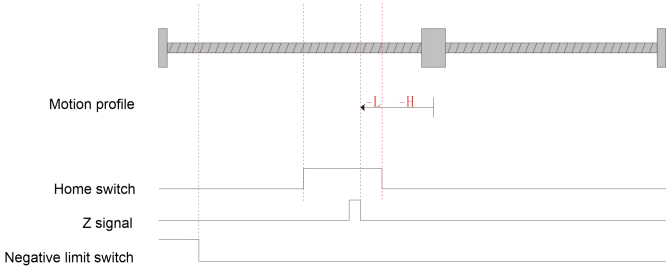


Fig.6-20 Homing mode 5 motion profile Figure 3

7) P12.01 = 6, homing mode 6

Forward, positive limit switch as deceleration point and home

The current position of the motor is where the positive limit switch is invalid. When the homing is started, the positive limit switch is at a low level, and forward high-speed returns to zero. After encountering the rising edge of the positive limit switch, it runs at a high-speed in the reverse direction, after encountering the falling edge of the positive limit switch, it will run forward at low speed, and stop when encountering the rising edge of the positive limit switch.

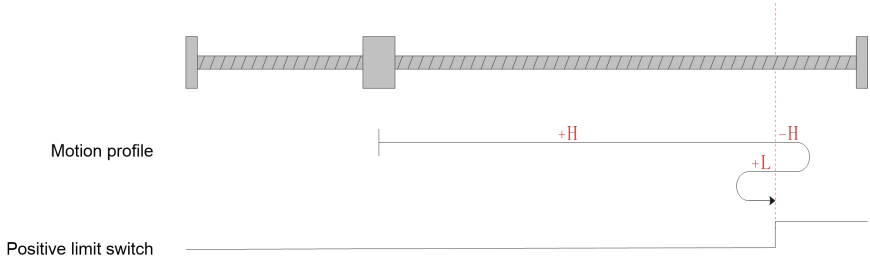


Fig.6-21 Homing mode 6 motion profile Figure 1

The current position of the motor is at the positive limit switch. When the homing is started, the positive limit switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the positive limit switch, it runs at a low speed in the forward direction, and stop when encountering the rising edge of the positive limit switch.

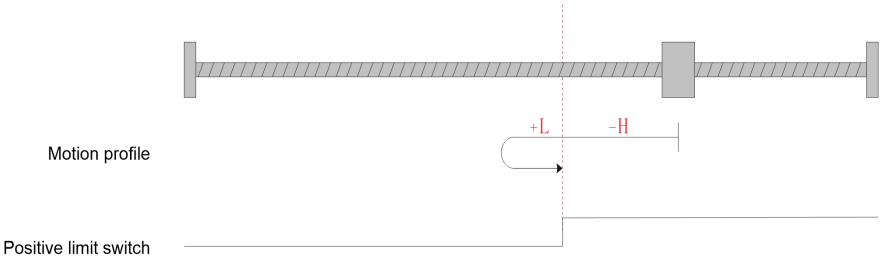


Fig.6-22 Homing mode 6 motion profile Figure 2

8) P12.01 = 7, homing mode 7

Reverse, negative limit switch as deceleration point and home

The current position of the motor is where the negative limit switch is invalid. When the homing is started, the negative limit switch is at a low level, and reverse high-speed returns to zero. After encountering the rising edge of the negative limit switch, it runs at a high-speed in the forward direction, after encountering the falling edge of the negative limit switch, it will run reverse at low speed, and stop when encountering the rising edge of the negative limit switch.

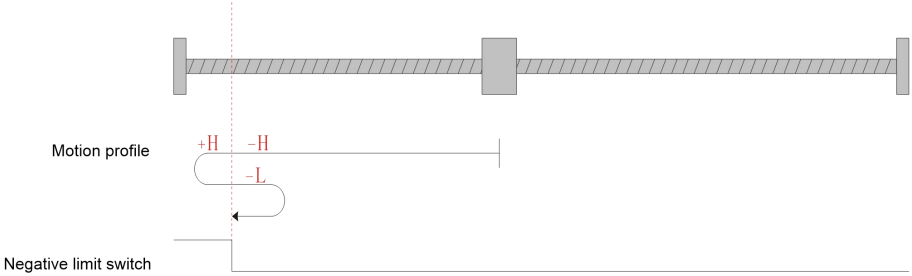


Fig.6-23 Homing mode 7 motion profile Figure 1

The current position of the motor is at the negative limit switch. When the homing is started, the negative limit switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the negative limit switch, it runs at a low speed in the reverse direction, and stop when encountering the rising edge of the negative limit switch.

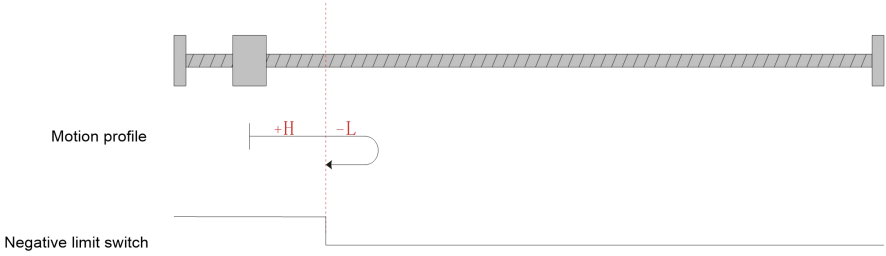


Fig.6-24 Homing mode 7 motion profile Figure 2

9) P12.01 = 8, homing mode 8

Forward, positive limit switch as deceleration point and Z signal as home

The current position of the motor is where the positive limit switch is invalid. When the homing is started, the positive limit switch is at a low level, and forward high-speed returns to zero. After encountering the rising edge of the positive limit switch, it runs at a high-speed in the reverse direction, after encountering the falling edge of the positive limit switch, it will run reverse at low speed, and stop when encountering the rising edge of the Z signal.

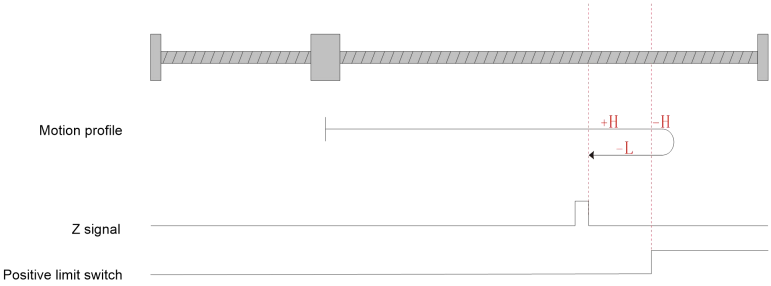


Fig.6-25 Homing mode 8 motion profile Figure 1

The current position of the motor is at the positive limit switch. When the homing is started, the positive limit switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the positive limit switch, it runs at a low speed in the reverse direction, and stop when encountering the rising edge of the Z signal.

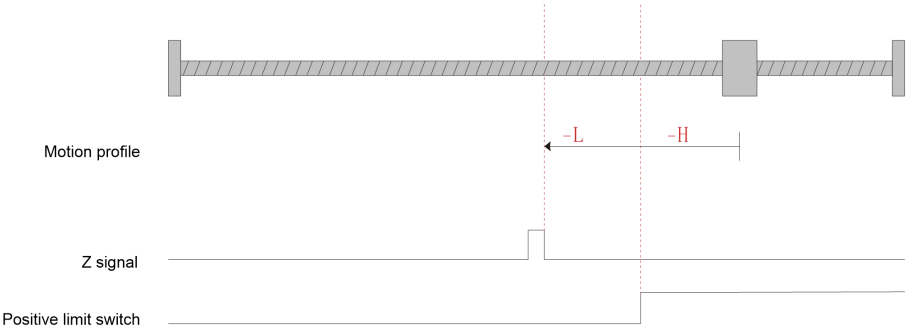


Fig.6-26 Homing mode 8 motion profile Figure 2

10) P12.01 = 9, homing mode 9

Reverse, negative limit switch as deceleration point and Z signal as home

The current position of the motor is where the negative limit switch is invalid. When the homing is started, the negative limit switch is at a low level, and reverse high-speed returns to zero. After encountering the rising edge of the negative limit switch, it runs at a high-speed in the forward direction, after encountering

the falling edge of the negative limit switch, it will run forward at low speed, and stop when encountering the rising edge of the Z signal.

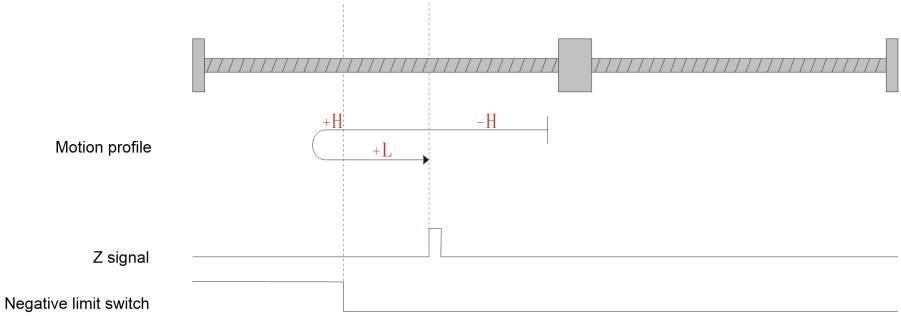


Fig.6-27 Homing mode 9 motion profile Figure 1

The current position of the motor is at the negative limit switch. When the homing is started, the negative limit switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the negative limit switch, it runs at a low speed in the forward direction, and stop when encountering the rising edge of the Z signal.

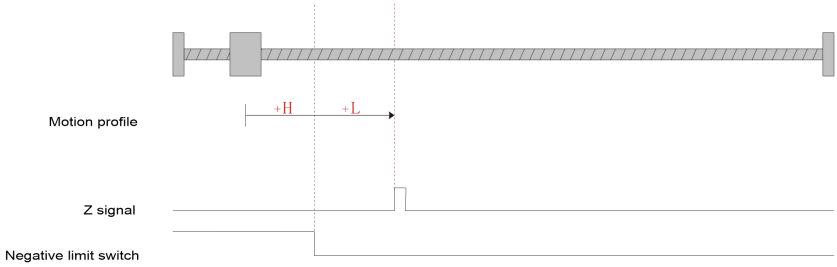


Fig.6-28 Homing mode 9 motion profile Figure 2

6.3.5 Interrupt positioning

6.3.5.1 Function overview

In the position control mode, if interrupt positioning is triggered, the servo drive aborts current non-zero speed operation and turns to executing the preset position reference. When the servo receives the external trigger signal, it will shield the external position command signal and run according to the internal preset length, speed and other commands. When the operation is completed, the interrupt positioning completion signal is output, and then the next command action will be performed according to the external trigger signal.

When the interrupt positioning function is valid, DI10 is forced to be the interrupt positioning enable signal terminal. In the process of pulse reference, single point and multi-point operation, the interrupt positioning function is enabled at non-zero speed, and the enable is valid. If the speed is zero, alarm AL.062 is generated, and the alarm will be cleared when the DI10 interrupt positioning enable signal is disabled.

6.3.5.2 Parameter settings

When the DI terminal function selects 31 interrupt positioning prohibition function, its priority is higher than the parameter setting of P12.86.

Function code	Name	Setting range/value	Effective time	Property	Default value
P03.00–P03.07	DI terminal function selection	30: Interrupt positioning cancel 31: Interrupt positioning inhibit	Immediate	At stop	-
P03.15–P03.20	DO terminal function selection	27: Interrupt positioning completed	Immediate	At stop	-
P12.86	Interrupt positioning selection	0: Disable 1: Enable	Immediate	At stop	0
P12.87	Displacement of interrupt positioning	0 to 1073741824	Immediate	At stop	10000
P12.88	Constant operating speed in interrupt positioning	0.0 to 6000.0 rpm	Immediate	At stop	200.0
P12.89	Acceleration/ deceleration time of interrupt positioning	0 to 1000 ms	Immediate	At stop	10
P12.90	Interrupt positioning cancel signal enable	0: Disable 1: Enable	Immediate	At stop	1

When P12.90 positioning lock contact signal enable is enabled, after interrupt positioning completion signal output, it is necessary to enable the interrupt positioning function again after the function of DI terminal 30 is released. If P12.90 is in the non-enable state, then the next interrupt positioning can be performed without the terminal to cancel the state.

6.3.5.3 Sequence diagram

When the interrupt positioning is triggered during position control, it will run to the maximum constant speed P12.88 according to the current running speed direction, and then decelerate until the set interrupt positioning displacement is completed.

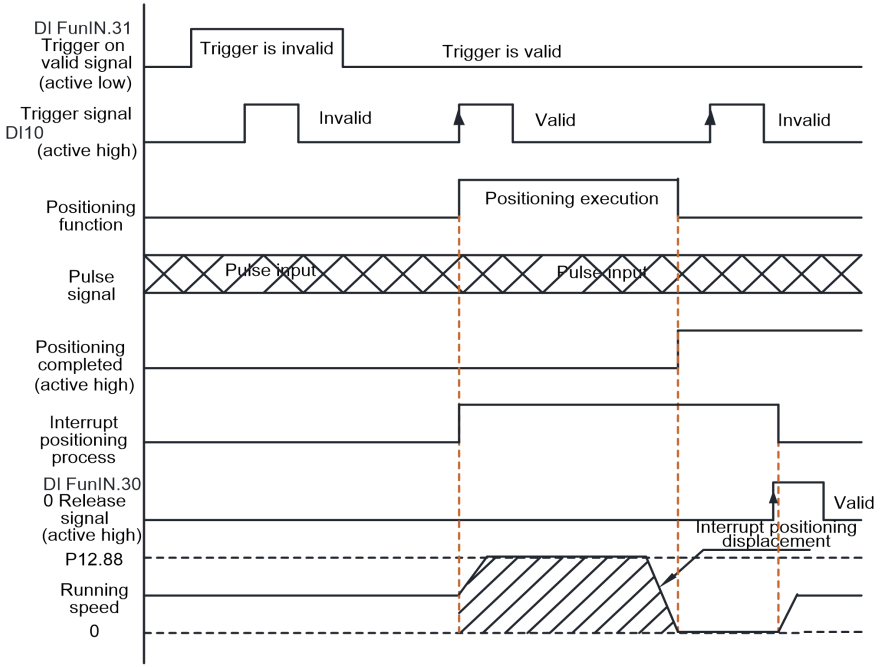


Fig.6-29 Interrupt positioning sequence diagram

6.3.6 Function block diagram of position control mode

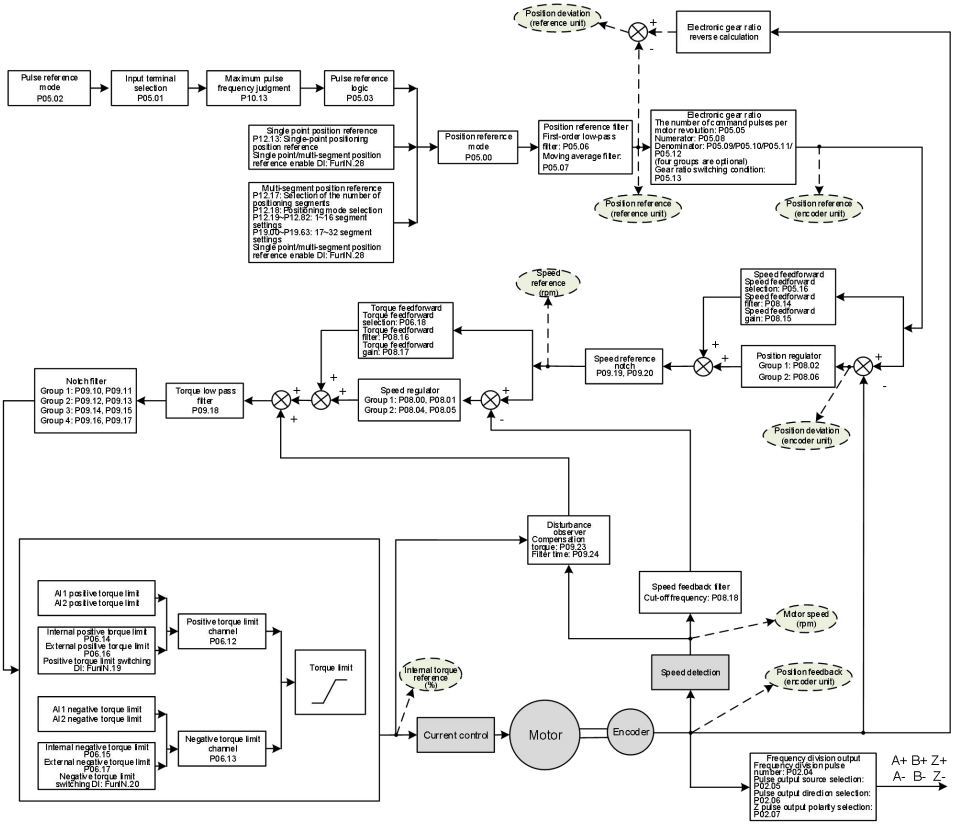


Fig.6-30 Function block diagram of position control mode

6.4 Speed control mode instructions

6.4.1 Speed control mode wiring

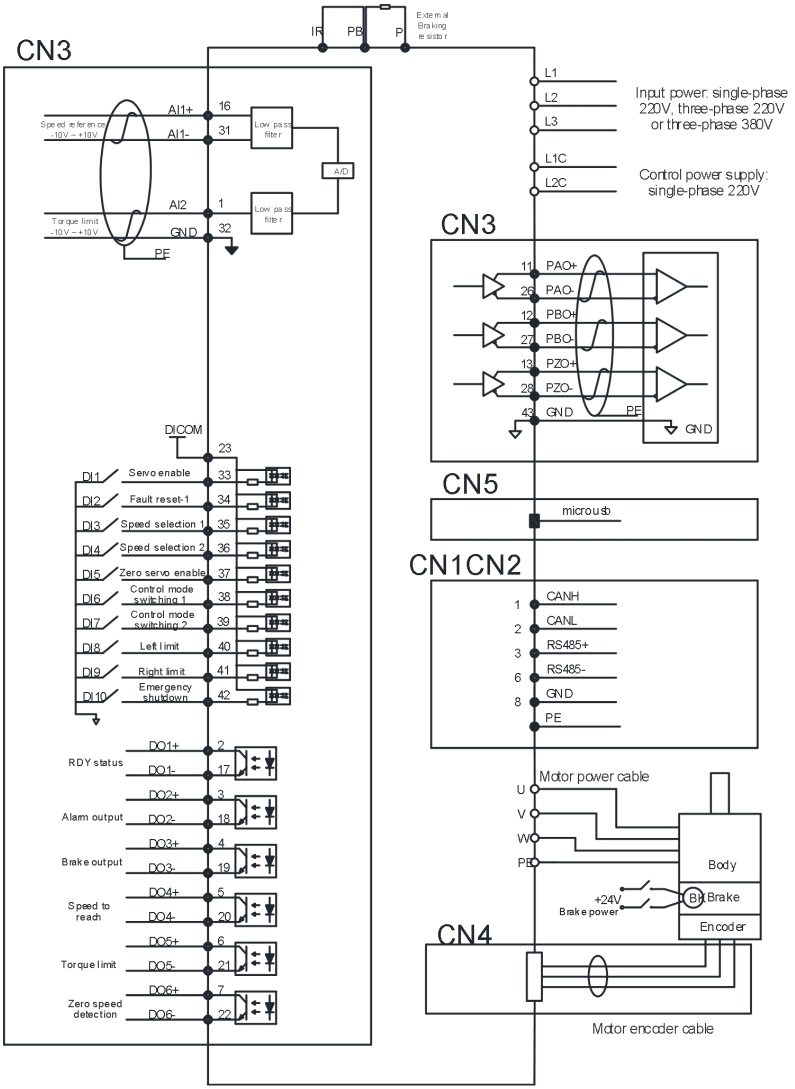


Fig.6-31 Speed control mode wiring

6.4.2 Speed control mode function code setting

6.4.2.1 Speed command input setting

(1) Speed control selection

Function code	Name	Setting range/value	Effective time	Property	Default value
P02.00	Control mode selection	0: Speed mode	Immediate	At stop	0

(2) Speed command source

Function code	Name	Setting range/value	Effective time	Property	Default value
P06.00	Main reference source selection	0: Digital reference (P06.01) 1: AI1 analog reference 2: AI2 analog reference 3: Serial port communication reference 4: Multi-segment speed reference (auxiliary reference is not supported)	Immediate	At stop	0
P06.01	Main reference speed setting	-6000.0~6000.0rpm	Immediate	During running	0.0
P06.02	Auxiliary speed source selection	0: No auxiliary reference 1: Digital reference (P06.03) 2: AI1 analog reference 3: AI2 analog reference 4: Serial port communication reference	Immediate	At stop	0
P06.03	Auxiliary reference speed setting	-6000.0~6000.0rpm	Immediate	During running	0.0
P06.05	Jog speed	0.0~6000.0rpm	Immediate	During running	100.0

(3) Speed command direction switching

Type	Function No.	Function name	Description	Remarks
Input (DI)	FunIN.26	Speed command direction switching	ON: Switch OFF: Do not switch	Level valid

6.4.2.2 Command ramp function settings

The ramp control function converts the stepped speed references to smooth speed references with constant acceleration/deceleration, you can set the acceleration and deceleration times. In speed control (including internal set speed control), you can use this function to achieve smooth speed control.

Function code	Name	Setting range/value	Effective time	Property	Default value
P06.07	Speed command acceleration time 1	0~65535ms	Immediate	During running	1000
P06.08	Speed command deceleration time 1	0~65535ms	Immediate	During running	1000

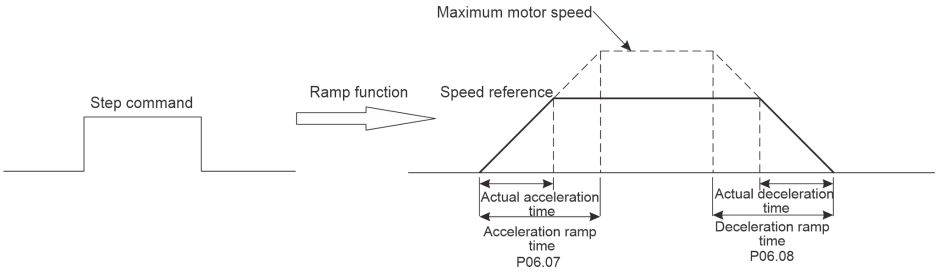


Fig.6-32 Command ramp function operating logic

The actual acceleration and deceleration time is calculated as follows:

Actual acceleration time = (speed reference / P06.09) * P06.07

Actual deceleration time = (speed reference /P06.09) * P06.08

6.4.2.3 Zero clamp

Zero clamp refers to that at zero clamp signal (/ P-CON) ON state, when the speed reference is below the speed set by zero clamp starting speed (P06.21), the servo motor enters servo lock. At this point in the inner of the servo drive position loop is constituted, speed command will be ignored.

The servo motor is fixed within ± 1 pulse of zero clamp effective position, even if the rotation occurs due to an external force, it will return to the zero clamp position.

Zero clamp function is used for the system that host device does not constitute position closed loop in speed control.

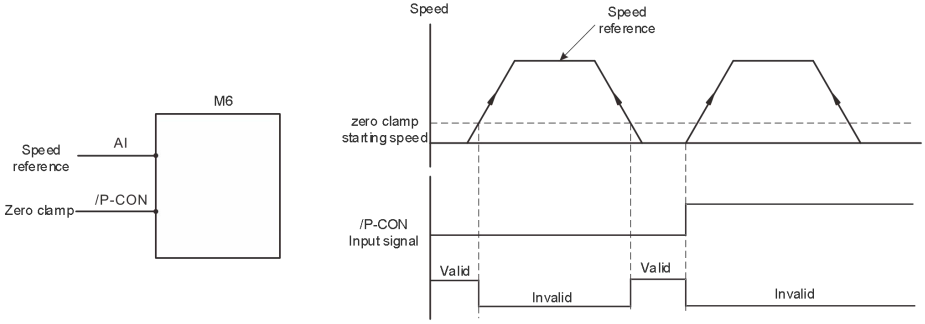


Fig.6-33 Zero clamp logic

DI function selection:

Type	Function No.	Function name	Description	Remarks
Input (DI)	FunIN.11	Zero clamp（/P-CON）	ON: Perform zero clamp function OFF: Do not perform zero clamp function	Level valid

Related function codes:

Function code	Name	Setting range/value	Effective time	Property	Default value

Function code	Name	Setting range/value	Effective time	Property	Default value
P06.19	Zero clamp function	0: Disabled 1: Always enabled 2: Enabled under conditions (terminal enabled)	Immediate	At stop	0
P06.20	Zero clamp gain	0~6.000	Immediate	During running	1.000
P06.21	Zero clamp starting speed	0.0~1000.0rpm	Immediate	During running	2

If the servo motor oscillation occurs at zero clamp control status, you can adjust zero clamp gain.

6.4.3 Function block diagram of speed control mode

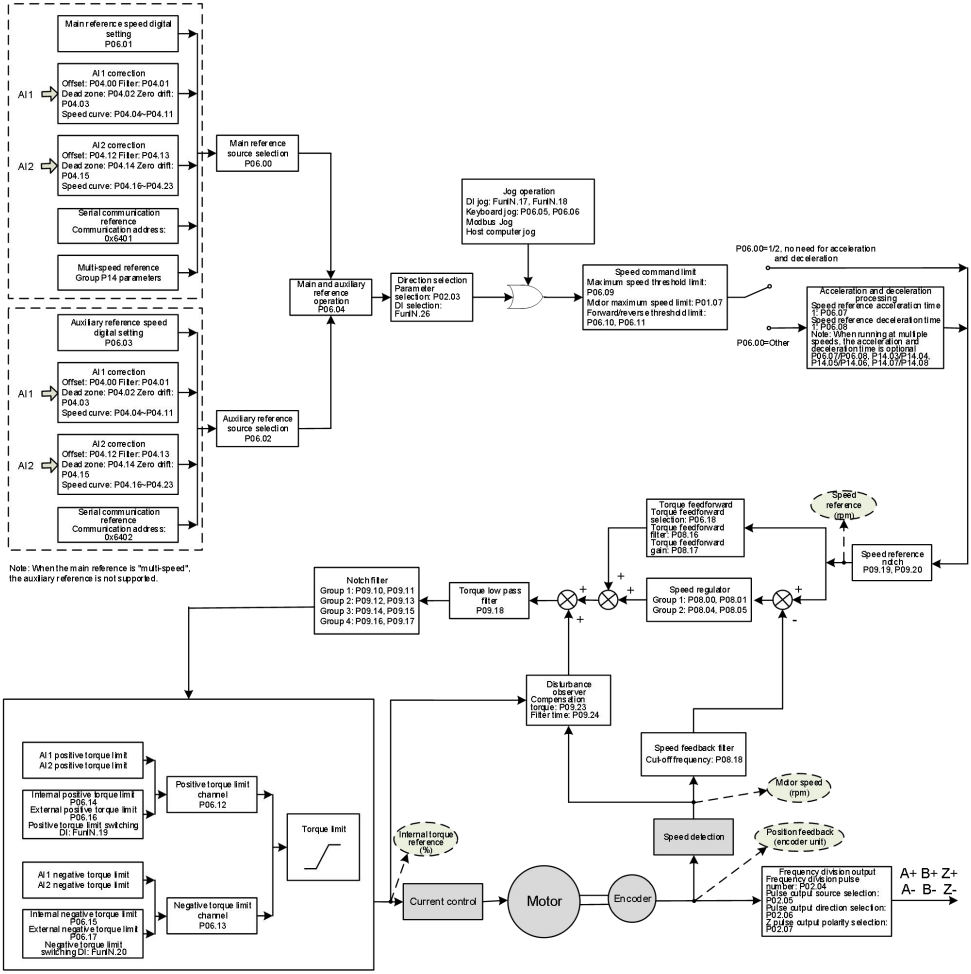


Fig.6-34 Function block diagram of speed control mode

6.5 Torque control mode instructions

6.5.1 Torque control mode wiring

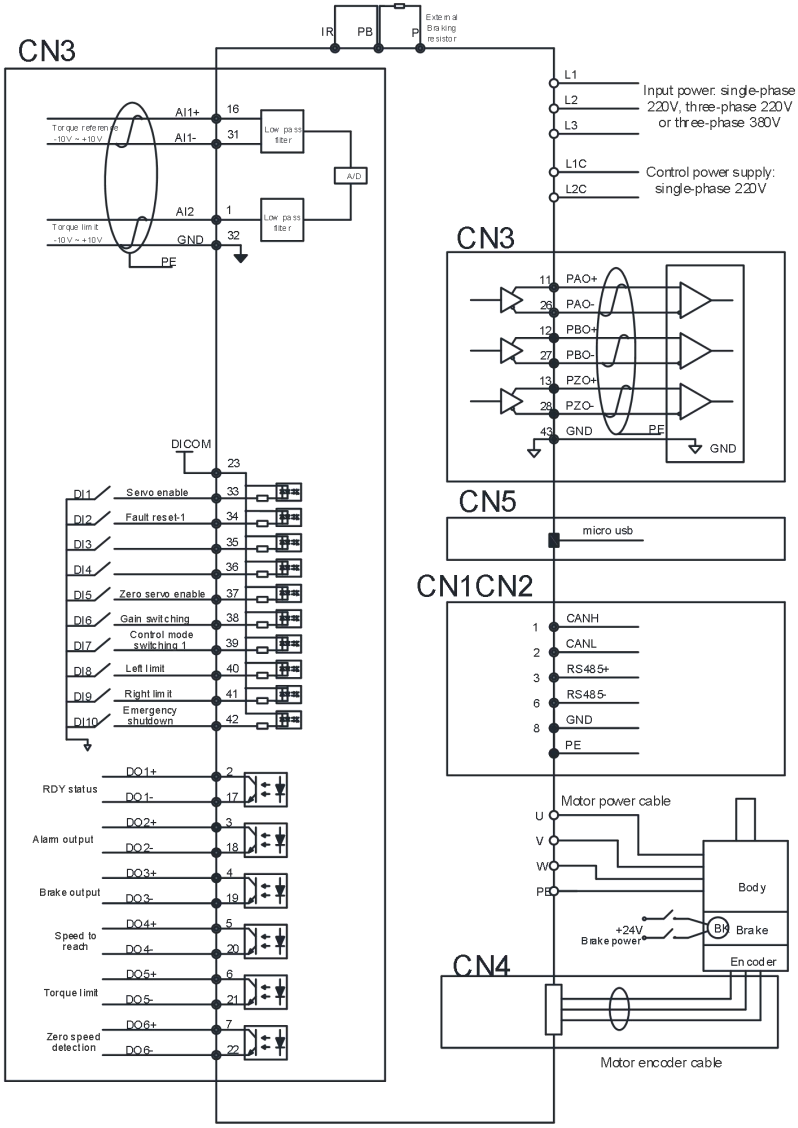


Fig.6-35 Torque control mode wiring

6.5.2 Torque control mode function code setting

6.5.2.1 Torque command input setting

(1) Torque control selection

Function code	Name	Setting range/value	Effective time	Property	Default value
P02.00	Control mode selection	2: Torque mode	Immediate	At stop	0

(2) Torque command source

Function code	Name	Setting range/value	Effective time	Property	Default value
P07.00	Torque reference selection	0: Digital reference (P07.03) 1: AI1 analog reference 2: AI2 analog reference 3: Serial port communication reference	Immediate	At stop	0
P07.03	Torque digital reference value	-400.0%~400.0%	Immediate	At stop	0.0%

(3) Torque command direction switching

Type	Function No.	Function name	Description	Remarks
Input (DI)	FunIN.27	Torque command direction switching	ON: Switch OFF: Do not switch	Level valid

6.5.2.2 Speed limiter in torque control

This function is to limit servo motor speed to protect the mechanical.

In the torque control mode, only the output torque command of the servo motor is limited, and the speed is not controlled. Therefore, if the set torque reference is larger than the load torque on the mechanical side, the motor will keep acceleration. This may cause overload. In this case, the speed limit needs to be set.

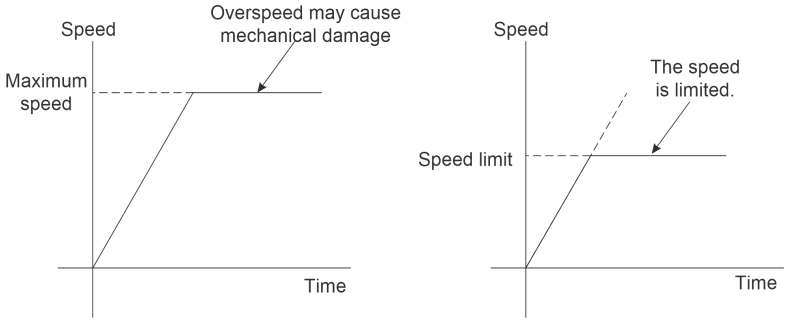


Fig.6-36 Speed limiter in torque control

(1) Output signal in motor speed limit

Type	Function No.	Function name	Output status	Description

Type	Function No.	Function name	Output status	Description
Output (DO)	FunOUT.9	Speed limit(VLT)	ON (closed) OFF (disconnected)	Motor speed limited Motor speed not limited

(2) Speed limit value selection

Function code	Name	Setting range	Effective time	Property	Default value
P07.09	FWD speed limit channel	0: FWD speed limit value 1: Bus speed limit value 2: MIN (FWD speed limit value, bus speed limit value) 3: AI1 4: AI2	Immediate	At stop	0
P07.10	FWD speed limit value	0.0%~+100.0%	Immediate	During running	100.0%
P07.11	REV speed limit channel	0: REV speed limit value 1: Bus speed limit value 2: MIN (REV speed limit value, bus speed limit value) 3: AI1 4: AI2	Immediate	At stop	0
P07.12	REV speed limit value	0.0%~+100.0%	Immediate	During running	100.0%

6.5.3 Function block diagram of torque control mode

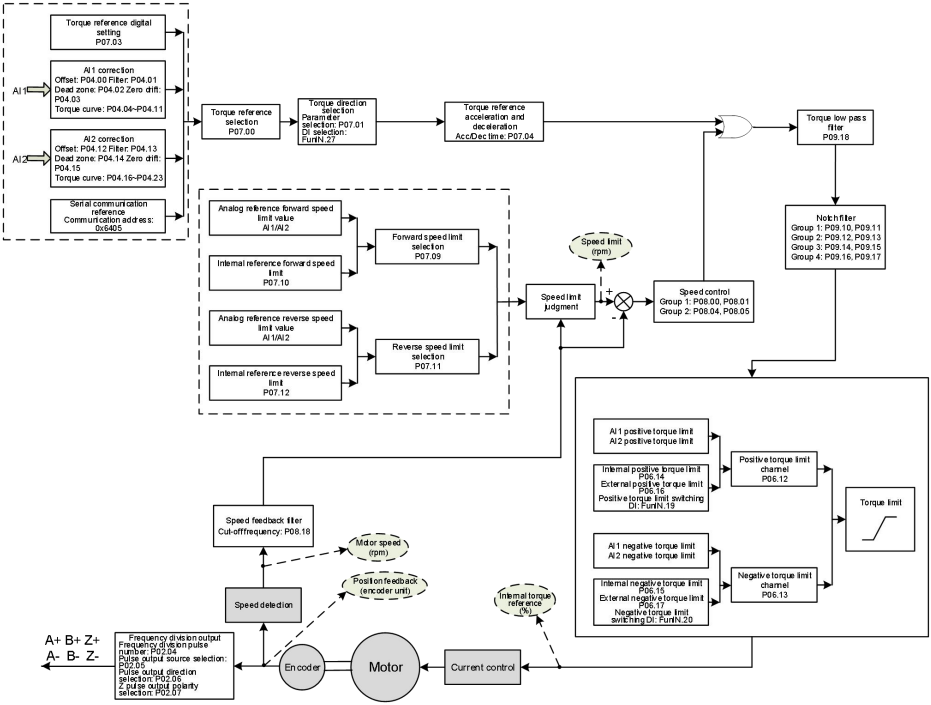


Fig.6-37 Function block diagram of torque control mode

6.6 Brake settings

6.6.1 Servo motor brake wiring diagram

The brake signal connection has no polarity. The customer needs to prepare a 24V power supply. The standard connection of the brake signal BK and the brake power supply is as follows:

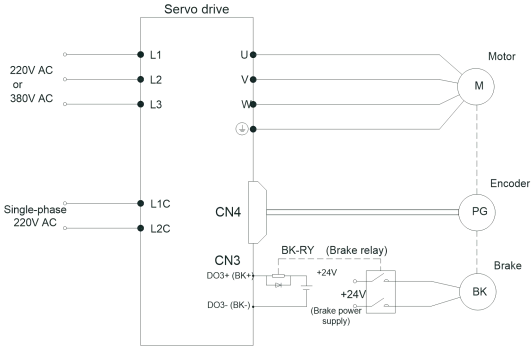


Fig.6-38 Brake wiring diagram

Note: It is best not to share the power supply with other electrical appliances to prevent the brake from malfunctioning due to voltage or current reduction due to the work of other electrical appliances.

6.6.2 Brake timing

For servo motor with brake, a DO terminal of servo drive shall be configured to function 18 (brake output signal) and determine the valid logic of DO terminal.

According to the current state of the servo drive, the operation timing of the brake mechanism can be divided into servo drive "normal state" brake timing and servo drive " fault state" brake timing.

The brake timing of the normal state is divided into "motor stationary" and "motor rotation" two cases:

a. Stationary: Motor actual speed is lower than P02.12;

b. Rotation: Motor actual speed is higher than the P02.12 and above.

6.6.3 The brake timing when the servo motor is stationary

When the servo enable changes from ON to OFF, if the current motor speed is lower than P02.12, the drive operates in accordance with stationary timing.

Note:

● After the brake output is set from OFF to ON, within the time set by P02.10, do not enter the speed / position / torque command, which will cause the command loss or operational errors;

● When used in the vertical axis, the gravity or external force of the mechanical moving parts may cause slight mechanical movement. When the servo motor is stationary, servo enable OFF, brake output immediately turn OFF, but within the time set by P02.11 , the motor is still powered on to prevent mechanical parts from moving due to gravity or external force.

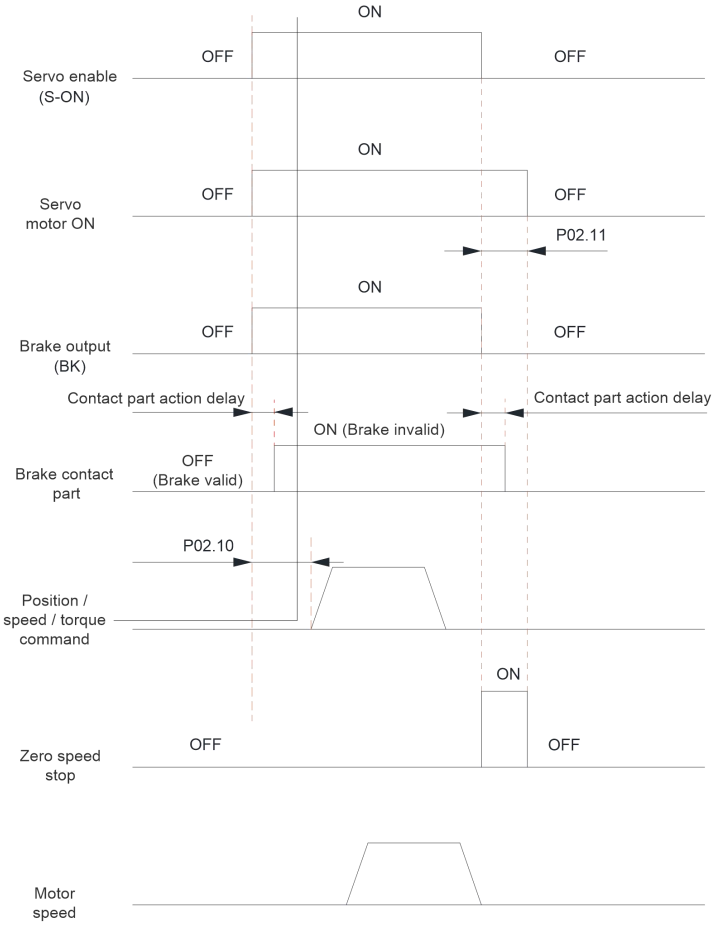


Fig.6-39 The brake timing when the servo motor is stationary

As shown in Fig.6-39, the brake function when the servo motor is stationary as follows:

a. Servo enable is ON, the brake output is set to ON, meanwhile the motor enter into the power-on state;

b. Brake contact part delay time, please refer to the motor related specifications;

c. From the brake output is set to ON to input command, the time interval should be more than the value set by P02.10;

d. When the servo motor is stationary (motor speed is lower than P02.12), servo enable OFF, meanwhile brake output is set to OFF, you can set delay by P02.11 for the motor into a non-conducting state after the brake output is set to OFF.

Function code	Name	Setting range	Effective time	Property	Default value
P02.10	Delay from	20~500ms	Immediate	During running	250

Function code	Name	Setting range	Effective time	Property	Default value
	brake outputting ON signal to command received				
P02.11	Delay from brake outputting OFF signal to motor power-off in the standstill state	1~1000ms	Immediate	During running	150

6.6.4 The brake timing when the servo motor is rotating

When the servo motor is rotating, should pay attention to matters:

● After the brake output is set from OFF to ON, within the time set by P02.10, do not enter the speed / position / torque command, which will cause the command loss or operational errors;

● When the servo motor rotates, servo enable OFF, the motor enter zero speed shutdown, but the brake output must meet one of the conditions then it can be set OFF:

a. P02.13 time has not come, but the motor has decelerated to P02.12;

b. P02.13 the time has come, but the motor speed is still higher than the P02.12.

● After the brake output change from ON to OFF, within 40ms, the motor is still powered on to prevent mechanical parts from moving due to gravity or external force.

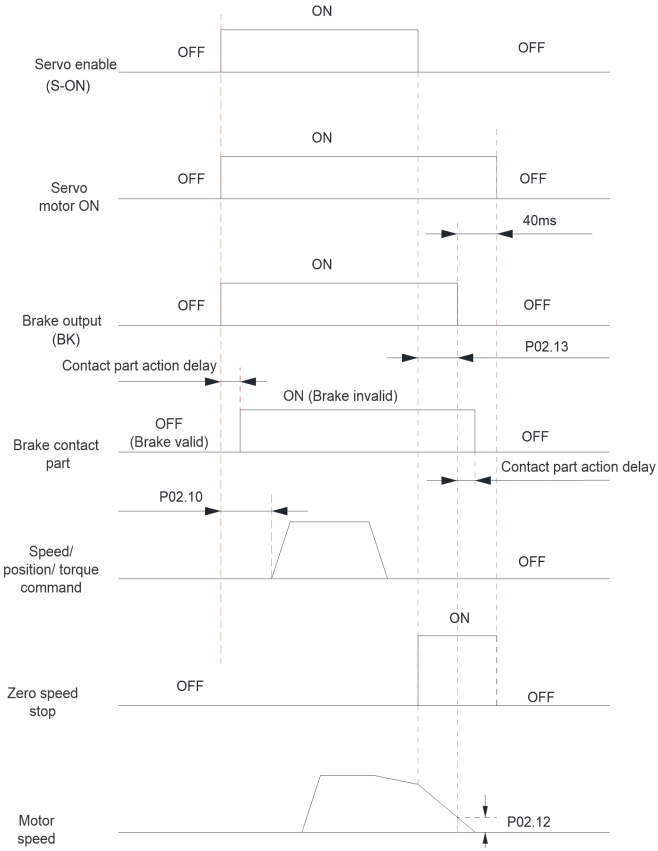


Fig.6-40 The brake timing when the servo motor is rotating

As shown in Fig. 6-40, the brake function when the servo motor is rotating as follows:

a. Servo enable is ON, the brake output is set to ON, meanwhile the motor enter into the power-on state;

b. Brake contact part delay time, please refer to the motor related specifications;

c. From the brake output is set to ON to input command, the time interval should be more than the value set by P02.10;

d. When the servo motor is rotating, servo enable OFF, P02.12 and P02.13 can be used to set the delay of the brake output after the servo enable is OFF, after the brake output OFF, then delay 50ms, the motor enter non-conducting state.

Function code	Name	Setting range	Effective time	Property	Default value
P02.12	Brake command output speed limit value	0~3000rpm	Immediate	During running	10.0

Function code	Name	Setting range	Effective time	Property	Default value
P02.13	Servo OFF brake command waiting time	1~30000ms	Immediate	During running	500

6.6.5 Servo drive fault status brake timing

When a drive failure occurs, the motor immediately enter into the non-conductive state, meanwhile the brake output change from ON to OFF, the brake close.

Chapter 7 Parameter List

Explanation to the terms in the function code parameter table

Table field	Explanation
Function code number	Representing the number of the function code, e.g. P00.00
Function code name	Name of the function code, explaining it
Default value	The value of the function code after restoring the default settings
Setting range	The minimum and maximum values of the function code allowed to set
Unit	V: Voltage; A: Current; ℃: temperature; Ω: resistance; mH: inductance; rpm: rotate speed; %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power;⁄: no unit
Property	Function code change condition
Effective time	Function code parameter settings valid condition
Mode	Function code effective control mode

Function code parameter group description

Function code group	Parameter group description	Function code group	Parameter group description
P00	Drive parameters	P10	Fault and protection parameters
P01	Servo motor parameters	P11	Display parameters
P02	Basic control parameters	P12	Servo positioning parameters
P03	Digital input and output parameters	P13	Full closed loop control parameters
P04	Analog input parameters	P14	Multi-stage speed parameters
P05	Position control parameters	P15	Modbus communication parameters
P06	Speed control parameters	P16	CANopen communication parameters
P07	Torque control parameters	P17	Reserved
P08	Gain parameters	P18	Advanced parameters
P09	Adjustment parameters	P19	Internal positioning parameter 2

Function code parameter table

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P00: Drive parameters							
P00.00	Serial No.	0~FFFF	1	Manufacturer setting	–	At display	PST
P00.01	DSP software version No.	0.00~99.99	0.01	Manufacturer setting	–	At display	PST
P00.02	User-customized version No.	0~9999	1	Manufacturer setting	–	At display	PST
P00.03	FPGA software version No.	0.00~99.99	0.01	Manufacturer setting	–	At display	PST
P00.04	Voltage class of servo drive	0: 220V 1: 380V	1	Manufacturer setting	–	At display	PST
P00.05	Rated current of servo drive	0~999.9A	0.1A	Manufacturer setting	–	At display	PST
P00.06	Maximum current of servo drive	0~999.9A	0.1A	Manufacturer setting	–	At display	PST
P01: Servo motor parameters							
P01.00	Motor SN	0: Motor parameters can be set 0x0001~0xFFFF: Motor parameters are automatically set according to the number	1	0	Immediate	At stop	PST
P01.01	Rated power	0.04~99.99kW	0.01kW	Model dependent	Power-on again	At stop	PST
P01.02	Rated voltage	0~ rated voltage of servo drive	1V	0	Power-on again	At stop	PST
P01.03	Rated current	0.1~999.9A	0.1A	Model dependent	Power-on again	At stop	PST
P01.04	Rated torque	0.1~655.35Nm	0.01Nm	Model dependent	Power-on again	At stop	PST
P01.05	Maximum torque	0.1~655.35Nm	0.01Nm	Model dependent	Power-on again	At stop	PST
P01.06	Rated speed	0.1~6000.0rpm	0.1rpm	Model dependent	Power-on again	At stop	PST
P01.07	Maximum speed	0.1~6000.0rpm	0.1rpm	Model dependent	Power-on again	At stop	PST
P01.08	Rotor inertia Jm	0.01~655.35kg*cm^2	0.01kg*cm^2	Model dependent	Power-on again	At stop	PST
P01.09	Number of pole pairs	2~72 pairs of poles	1 pair of poles	Model dependent	Power-on again	At stop	PST
P01.10	Stator resistance R1	0.000~65.000Ω	0.001Ω	Model dependent	Power-on again	At stop	PST
P01.11	Direct axis inductance Ld	0.00~200.00mH	0.01mH	Model dependent	Power-on again	At stop	PST
P01.12	Q-axis inductance Lq	0.00~200.00mH	0.01mH	Model dependent	Power-on again	At stop	PST
P01.13	Back-EMF constant	1~600.0V/krpm	0.1V/krpm	Model dependent	Power-on again	At stop	PST
P01.14	Torque coefficient Kt	0.001~65.000N·M/A	0.01N·M/A	Model dependent	Power-on again	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P01.15	Electrical constant Te	0.01~650.00ms	0.01ms	Model dependent	Power-on again	At stop	PST
P01.16	Mechanical constant Tm	0.01~650.00ms	0.01ms	Model dependent	Power-on again	At stop	PST
P01.17	Brake function	0: Without brake 1: With brake	1	Model dependent	Immediate	At stop	PST
P01.18	Encoder selection	1: Tamagawa protocol 23-bit absolute encoder 2: Line-saving incremental encoder 4: Full-line incremental encoder 5: Tamagawa protocol 17-bit absolute encoder 6: Nikon protocol 20-bit absolute encoder	1	1	Immediate	At stop	PST
P01.19	Number of encoder lines	1~4194304	1	2097152	Immediate	At stop	PST
P01.20	Encoder installation initial angle tuning	0: Disabled 1: Enabled (motor in static status) 2: Enabled (motor in rotate status)	1	0	Immediate	At stop	PST
P01.21	Rotation direction	0: A before B 1: B before A	1	0	Immediate	At stop	PST
P01.22	Initial angle for installing encoder	0.0~359.9°	0.1°	180.0	Immediate	At stop	PST
P01.23	Initial angle of encoder Z pulse	0.0~359.9°	0.1°	180.0	Immediate	At stop	PST
P02: Basic control parameters							
P02.00	Control mode selection	0: Speed mode (actually effective, combined with P06.00) 1: Position mode 2: Torque mode 3: Speed mode ← → position mode (9th function switching) 4: Torque mode ← → position mode (9th function switching) 5: Speed mode ← → torque mode (9th function switching) 6: Speed mode ← →torque mode ← → position mode (9th function switching torque, 10th function switching position, It does not switch when it is valid at the same time or invalid at the	1	0	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		same time, and it remains in the speed mode) 7: CANopen mode					
P02.01	Internal servo enable	0~1	1	0	Immediate	During running	PST
P02.02	Absolute value system mode selection	0: Absolute position linear mode 1: Absolute position rotation mode	1	0	Immediate	At stop	PST
P02.03	Rotation direction selection	0: Take the CCW direction as the forward direction (A before B) 1: Take the CW direction as the forward direction (reverse mode, B before A)	1	0	Immediate	During running	PST
P02.04	Encoder frequency dividing output pulses	1~32768 P/r	1	2500 P/r	Immediate	During running	PST
P02.05	Pulse output source selection	0: Motor encoder frequency dividing output 1: Pulse command synchronous output 2: Frequency dividing or synchronous output disabled	1	2	Immediate	During running	PST
P02.06	Output pulse direction selection	0: A before B 1: B before A	1	0	Immediate	During running	PST
P02.07	Z pulse output polarity selection	0: Positive output (Z pulse is high level) 1: Negative output (Z pulse is low level)	1	0	Immediate	During running	PST
P02.08	Stop mode	0: Decelerate to stop 1: Coast to stop	1	0	Immediate	During running	PST
P02.09	Emergency stop enable	0: No operation, keep the current running state 1: Enable emergency stop, stop according to the set stop mode (P02.08), and alarm AL.038	1	0	Immediate	During running	PST
P02.10	Delay from brake outputting ON signal to command received	20~500ms	1ms	250	Immediate	During running	PS
P02.11	Delay from brake outputting OFF signal to motor power-off in the standstill state	1~1000ms	1ms	150	Immediate	During running	PS
P02.12	Brake command output speed limit	0~3000.0rpm	1rpm	10.0	Immediate	During running	PS

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	value						
P02.13	Servo OFF brake command waiting time	1~30000ms	1ms	500	Immediate	During running	PS
P02.14	Minimum energy consumption resistor allowed by drive	–	1	Model dependent	–	At display	PST
P02.15	Internal energy consumption resistor power	–	1	Model dependent	–	At display	PST
P02.16	Internal energy consumption resistor value	–	1	Model dependent	–	At display	PST
P02.17	Resistor heat dissipation coefficient	0: 0% 1: 25% 2: 50% 3: 75% 4: 100%	1	2	Immediate	During running	PST
P02.18	Energy consumption resistor selection	0: Use internal energy consumption resistor 1: Use external energy consumption resistor 2: Don't use energy consumption resistor	1	0	Immediate	At stop	PST
P02.19	External energy consumption resistor power	1~65535W	1W	Model dependent	Immediate	At stop	PST
P02.20	External energy consumption resistor value	1~65535Ω	1Ω	Model dependent	Immediate	At stop	PST
P02.21	Parameter protection setting	0: All the data can be changed; 1: Only P06.01 and this function code can be changed 2: Only this function code can be changed	1	0	Immediate	During running	PST
P02.22	Parameter initialization	0: Parameter changing status 1: Clear fault memory information 2: Restore to leave-factory value	1	0	Immediate	At stop	PST
P02.23	LED display parameter selection	0: Switching display P11.00 1: Switching display P11.01 2: Switching display P11.02 3: Switching display P11.03 4: Switching display P11.04 5: Switching display P11.05	1	0	Immediate	During running	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P03: Digital input and output parameters							
P03.00	DI1 terminal function selection	0: No function 1: Servo enable 2: External reset (RESET) input 3: Gain switching 4: Multi-speed DI switching running direction 5: Multi-segment operation reference switching 1 6: Multi-segment operation reference switching 2 7: Multi-segment operation reference switching 3 8: Multi-segment operation reference switching 4 9: Control mode switching 1 10: Control mode switching 2 11: Zero servo enable terminal 12: Pulse input disable 13: FWD disabled 14: REV disabled 15: Electronic gear ratio switching 1 16: Electronic gear ratio switching 2 17: Forward jog 18: Reverse jog 19: Forward external torque limit 20: Reverse external torque limit 21: Multi-segment position reference 1 22: Multi-segment position reference 2 23: Multi-segment position reference 3 24: Multi-segment position reference 4 25: Multi-segment position reference 5 26: Speed command direction switching 27: Torque command direction switching 28: Multi-segment/ single-point position command enable 29: Position deviation counter is cleared	1	1	Immediate	At stop	PST
P03.01	DI2 terminal function selection		1	2	Immediate	At stop	PST
P03.02	DI3 terminal function selection		1	5	Immediate	At stop	PST
P03.03	DI4 terminal function selection		1	6	Immediate	At stop	PST
P03.04	DI5 terminal function selection		1	3	Immediate	At stop	PST
P03.05	DI6 terminal function selection		1	9	Immediate	At stop	PST
P03.06	DI7 terminal function selection		1	10	Immediate	At stop	PST
P03.07	DI8 terminal function selection		1	35	Immediate	At stop	PST
P03.08	DI9 terminal function selection		1	36	Immediate	At stop	PST
P03.09	DI10 terminal function selection		1	34	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		30: Interrupt positioning state release 31: Interrupt positioning prohibition 32: Home switch 33: Homing enable 34: Emergency stop 35: Positive limit switch 36: Negative limit switch 37: Speed main/auxiliary reference switching 38: External fault input					
P03.10	DI1~DI8 terminal filtering time	1~500ms	1ms	10	Immediate	During running	PST
P03.11	DI9/DI10 terminal filtering time	0~127 (filter time = set value x 100ns)	100ns	50	Immediate	During running	PST
P03.12	DI enable terminal valid type selection	0: Enable terminal level valid 1: Enable terminal transition edge valid	1	1	Immediate	During running	PST
P03.13	Input terminal enabled status	Binary setting: 0: Normal logical, enabled upon connection 1: Inverted logical, enabled upon disconnection Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0~BIT1: DI9~DI10	1	000	Immediate	During running	PST
P03.14	Virtual input terminal setting	Binary setting: 0: Disabled 1: Enabled Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0~BIT1: DI9~DI10	1	000	Immediate	During running	PST
P03.15	DO1 function selection	0: Servo drive ready (RDY) 1: Servo drive running signal (RUN) 2: The speed is consistent 3: Speed arrival signal 4: Zero speed operation 5: Drive fault 6: Drive alarm 7: Host device switch signal	1	0	Immediate	At stop	PST
P03.16	DO2 function selection		1	1	Immediate	At stop	PST
P03.17	DO3 function selection		1	3	Immediate	At stop	PST
P03.18	DO4 function selection		1	11	Immediate	At stop	PST
P03.19	DO5 function selection		1	5	Immediate	At stop	PST
P03.20	DO6 function		1	6	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	selection	8: Torque limit 9: Speed limit 10: Zero servo completed 11: Positioning completed 12: Positioning close to 13: Position tolerance alarm 14: Homing 15: Homing completed 16: Electrical homing 17: Electrical homing completed 18: Brake output (brake output signal) 19: Torque arrival signal 20: FWD/REV indication terminal 21: Reserved 22: Positioning position arrival 1 23: Positioning position arrival 2 24: Positioning position arrival 3 25: Positioning position arrival 4 26: Positioning position arrival 5 27: Interrupt positioning completed					
P03.21	Output terminal enabled status setting	Binary setting 0: Enabled upon connection 1: Enabled upon disconnection Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0~BIT1: DO5~DO6	1	00	Immediate	During running	PST
P04: Analog input parameters							
P04.00	AI1 offset	-5000~5000mV	1mV	0	Immediate	During running	PST
P04.01	AI1 filter	0.0~6000.0ms	0.1ms	20.0	Immediate	During running	PST
P04.02	AI1 dead zone	0~1000.0mV	0.1mV	10.0	Immediate	During running	PST
P04.03	AI1 zero drift	-1000.0~1000.0mV	0.1mV	0	Immediate	During running	PST
P04.04	AI1 maximum reference	P04.10~100.00%	0.01%	100.00	Immediate	During running	PST
P04.05	Actual value corresponds to AI1 maximum reference	Speed reference: 0.00~100.00% Smax Torque: 0.00~400.00%Te Speed feedforward:	0.01%	100.00	Immediate	During running	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		0.00~100.00%					
P04.06	AI1 inflection point 2 reference	P04.08~ P04.04	0.01%	100.00	Immediate	During running	PST
P04.07	Actual value corresponds to AI1 inflection point 2	The same as P04.05	0.01%	100.00	Immediate	During running	PST
P04.08	AI1 inflection point 1 reference	P04.10~ P04.06	0.01%	0.0	Immediate	During running	PST
P04.09	Actual value corresponds to AI1 inflection point 1	The same as P04.05	0.01%	0.00	Immediate	During running	PST
P04.10	AI1 minimum reference	0.00%~P04.04	0.01%	0.00	Immediate	During running	PST
P04.11	Actual value corresponds to AI1 minimum reference	The same as P04.05	0.01%	0.00	Immediate	During running	PST
P04.12	AI2 offset	-5000~5000mV	1mV	0	Immediate	During running	PST
P04.13	AI2 filter	0.0~6000.0ms	0.1ms	20.0	Immediate	During running	PST
P04.14	AI2 dead zone	0~1000.0mV	0.1mV	10.0	Immediate	During running	PST
P04.15	AI2 zero drift	-1000.0~1000.0mV	0.1mV	0	Immediate	During running	PST
P04.16	AI2 maximum reference	P04.22~100.00%	0.01%	100.00	Immediate	During running	PST
P04.17	Actual value corresponds to AI2 maximum reference	Speed reference: 0.00~100.00% Smax Torque: 0.00~400.00%Te Speed feedforward: 0.00~100.00%	0.01%	100.00	Immediate	During running	PST
P04.18	AI2 inflection point 2 reference	P04.20~ P04.16	0.01%	100.00	Immediate	During running	PST
P04.19	Actual value corresponds to AI2 inflection point 2	The same as P04.17	0.01%	100.00	Immediate	During running	PST
P04.20	AI2 inflection point 1 reference	P04.22~ P04.18	0.01%	0.00	Immediate	During running	PST
P04.21	Actual value corresponds to AI2 inflection point 1	The same as P04.17	0.01%	0.00	Immediate	During running	PST
P04.22	AI2 minimum reference	0.00%~P04.16	0.01%	0.00	Immediate	During running	PST
P04.23	Actual value corresponds to AI2 minimum reference	The same as P04.17	0.01%	0.00	Immediate	During running	PST
P04.24~ P04.29	Reserved						
P04.30	AI automatic zero	0: No correction	1	0	Immediate	During	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	drift correction	1: AI1 automatic zero drift correction 2: AI2 automatic zero drift correction				running	
P05: Position control parameters							
P05.00	Position reference mode	0: Pulse reference 1: Single point position reference 2: Multi-segment position reference	1	0	Immediate	At stop	P
P05.01	Pulse command input terminal selection	0: Low-speed terminal 1: High-speed terminal	1	0	Immediate	At stop	P
P05.02	Pulse command mode	0: A/B phase pulse 1: PLUSE+SIGN 2: CW/CCW pulse	1	0	Immediate	At stop	P
P05.03	Pulse command logic	0: Positive logic 1: Inverse logic	1	0	Immediate	At stop	P
P05.04	Reserved						
P05.05	Pulses for one motor revolution	0~8388608P/r	1P/r	2097152	Immediate	At stop	P
P05.06	Position command first-order low-pass filter time	0.0~2000.0ms	0.1ms	0	Immediate	During running	P
P05.07	Position command moving average filter time	0.0~12.8ms	0.1ms	0	Immediate	During running	P
P05.08	Electronic gear ratio numerator	1~1073741824	1	8388608	Immediate	At stop	P
P05.09	Electronic gear ratio denominator 1	1~1073741824	1	10000	Immediate	At stop	P
P05.10	Electronic gear ratio denominator 2	1~1073741824	1	10000	Immediate	At stop	P
P05.11	Electronic gear ratio denominator 3	1~1073741824	1	10000	Immediate	At stop	P
P05.12	Electronic gear ratio denominator 4	1~1073741824	1	10000	Immediate	At stop	P
P05.13	Electronic gear ratio switching conditions	0: Position command is 0, switch after 3ms duration 1: Real-time switching	1	0	Immediate	At stop	P
P05.14	Position deviation clearing method selection	0: Clear position deviation when servo enable is OFF or stopped 1: Clear position deviation when the servo enable is OFF or	1	0	Immediate	At stop	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		a fault/alarm occurs 2: Clear position deviation when the servo enable is OFF or the external position deviation clear DI is valid					
P05.15	Position deviation clear DI signal type	0: Pulse mode 1: Level mode	0	0	Immediate	At stop	P
P05.16	Speed feedforward control selection	0: No speed feedforward 1: Internal speed feedforward (Take the speed information corresponding to the position command of the encoder unit as the source of the speed feedforward signal) 2: AI1 3: AI2	1	1	Immediate	At stop	P
P05.17	Position controller output limiter	0~maximum speed	0.1rpm	3000.0	Immediate	During running	P
P05.18	Positioning complete output condition	0: Position deviation absolute value smaller than amplitude of positioning completed 1: Position deviation absolute value smaller than amplitude of positioning completed and position reference after filter being 0 2: Position deviation absolute value smaller than amplitude of positioning completed and position reference being 0	1	0	Immediate	At stop	P
P05.19	Position positioning completed range	0~10000	1 command unit	10	Immediate	During running	P
P05.20	Position close to signal width	1~32767	1 command unit	100	Immediate	During running	P
P05.21	Position error detection range	0~32767	1 encoder unit	20000	Immediate	During running	P
P05.22	Position error alarm selection	0: Valid 1: Invalid	1	0	Immediate	During running	P
P05.23	Servo shutdown mode	0: Switch to servo speed control according to the downtime 1: Switch to the speed control deceleration stop	1	1	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P05.24	Servo downtime	0~3000ms When the PL (CCWL), NL (.CWL) occurs, according to the time to slow down	1	0	Immediate	During running	P
P05.25	Absolute position rotation mode mechanical gear ratio numerator	1~65535	1	1	Immediate	At stop	P
P05.26	Absolute position rotation mode mechanical gear ratio denominator	1~65535	1	1	Immediate	At stop	P
P05.27	Absolute position linear mode position offset (lower 32 bits)	0~ 4294967295	1 encoder unit	0	Immediate	At stop	P
P05.28	Absolute position linear mode position offset (upper 32 bits)	0~ 4294967295	1 encoder unit	0	Immediate	At stop	P
P05.29	The number of pulses for one revolution of the load in absolute position rotation mode (lower 32 bits)	0~ 4294967295	1 encoder unit	0	Immediate	At stop	P
P05.30	The number of pulses for one revolution of the load in absolute position rotation mode (upper 32 bits)	0~127	1 encoder unit	0	Immediate	At stop	P
P05.31	Soft limit function setting	0: Disable soft limit 1: Enable software limit immediately after power-on 2: Enable soft limit after homing	1	0	Immediate	At stop	P
P05.32	Software limit maximum point	-2147483647~2147483647	1 command unit	2147483647	Immediate	At stop	P
P05.33	Software limit minimum point	-2147483647~2147483647	1 command unit	-2147483648	Immediate	At stop	P
P06: Speed control parameters							
P06.00	Main reference source selection	0: Digital reference (P06.01) 1: AI1 analog reference 2: AI2 analog reference 3: Serial port communication reference 4: Multi-step speed reference (auxiliary reference is not supported)	1	0	Immediate	At stop	S
P06.01	Main reference	-6000.0~6000.0rpm	0.1rpm	0.0	Immediate	During	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	speed setting					running	
P06.02	Auxiliary speed source selection	0: No auxiliary reference 1: Digital reference 2: AI1 analog reference 3: AI2 analog reference 4: Serial port communication reference	1	0	Immediate	At stop	S
P06.03	Auxiliary reference speed setting	-6000.0~6000.0rpm	0.1rpm	0.0	Immediate	During running	S
P06.04	Main/auxiliary reference calculation	0: + 1: - 2: Terminal switching main and auxiliary reference 3: MAX (main reference, auxiliary reference) 4: MIN (main reference, auxiliary reference)	1	0	Immediate	During running	S
P06.05	Jog speed	-6000.0rpm~6000.0rpm	0.1rpm	100.0	Immediate	During running	S
P06.06	Jog operation	-6000.0rpm~6000.0rpm	0.1rpm	100.0	Immediate	At stop	S
P06.07	Speed command acceleration time 1	0~65535ms	1ms	1000	Immediate	During running	S
P06.08	Speed command deceleration time 1	0~65535ms	1ms	1000	Immediate	During running	S
P06.09	Maximum speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running	S
P06.10	Forward speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running	S
P06.11	Reverse speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running	S
P06.12	Positive torque limit channel	0: Internal positive torque limit value 1: Bus positive torque limit value 2: MIN (internal positive torque limit value, bus positive torque limit value) 3: External positive torque limit value 4: AI1 5: AI2	1	0	Immediate	At stop	PST
P06.13	Negative torque limit channel	0: Internal negative torque limit value 1: Bus negative torque limit value 2: MIN (internal negative torque limit value, bus negative torque limit value)	1	0	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		3: External negative torque limit value 4: AI1 5: AI2					
P06.14	Internal positive torque limit value	0.0%~400.0%	0.1%	Model dependent	Immediate	During running	PST
P06.15	Internal negative torque limit value	0.0%~400.0%	0.1%	Model dependent	Immediate	During running	PST
P06.16	External positive torque limit value	0.0%~400.0%	0.1%	100.0	Immediate	During running	PST
P06.17	External negative torque limit value	0.0%~400.0%	0.1%	100.0	Immediate	During running	PST
P06.18	Torque feedforward control selection	0: No torque feedforward 1: Internal torque feedforward	1	1	Immediate	During running	PST
P06.19	Zero clamp function	0: Disabled 1: Always enabled 2: Enabled under conditions (terminal enabled)	1	0	Immediate	At stop	S
P06.20	Zero clamp gain	0~6.000	0.001	1.000	Immediate	During running	S
P06.21	Zero clamp starting speed	0.0~1000.0rpm	0.1 rpm	2.0	Immediate	During running	S
P06.22	Speed arrival detection width	0.0~5000.0rpm	0.1 rpm	20.0	Immediate	During running	PST
P06.23	Zero speed threshold	0.0%~100.0% maximum speed	0.1%	1.0	Immediate	During running	S
P06.24	Speed consistency threshold	0.0~100.0rpm	0.1rpm	10.0	Immediate	During running	S
P07: Torque control parameters							
P07.00	Torque reference selection	0: Digital reference 1: AI1 reference 2: AI2 reference 3: Serial communication reference	1	0	Immediate	At stop	T
P07.01	Torque positive direction selection	0: Forward drive is positive 1: Reverse drive is positive	1	0	Immediate	At stop	T
P07.02	Speed/torque switching mode selection	0: Switching directly 1: Switching once over the torque switching point	1	0	Immediate	At stop	T
P07.03	Torque digital reference value	-400.0%~+400.0%	0.1%	0.0	Immediate	During running	T
P07.04	Torque reference acceleration/deceleration time	0~6553.5ms	0.1ms	0	Immediate	At stop	T
P07.05	Torque command filter time constant	0~30.0ms	0.1ms	1.0	Immediate	At stop	T

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P07.06	Second torque command filter time constant	0~30.0ms	0.1ms	1.0	Immediate	At stop	T
P07.07	Speed/torque switching point	0.0%~400.0% initial torque	0.1%	100.0	Immediate	At stop	ST
P07.08	Speed/torque switching delay	0~1000.0ms	0.1ms	0.0	Immediate	At stop	ST
P07.09	FWD speed limit channel	0: FWD speed limit value 1: Bus speed limit value 2: MIN (FWD speed limit value, bus speed limit value) 3: AI1 4: AI2	1	0	Immediate	At stop	T
P07.10	FWD speed limit value	0.0%~100.0%	0.1%	100.0	Immediate	During running	T
P07.11	REV speed limit channel	0: REV speed limit value 1: Bus speed limit value 2: MIN (REV speed limit value, bus speed limit value) 3: AI1 4: AI2	1	0	Immediate	At stop	T
P07.12	REV speed limit value	0.0%~100.0%	0.1%	100.0	Immediate	During running	T
P07.13	Torque reached reference value	0.0~400.0%	0.1%	0.0	Immediate	During running	T
P07.14	Torque reached valid value	0.0~400.0%	0.1%	20.0	Immediate	During running	T
P07.15	Torque reached invalid value	0.0~400.0%	0.1%	10.0	Immediate	During running	T
P08: Gain parameters							
P08.00	Speed loop proportional gain 1	0.1~5000.0Hz	0.1Hz	20.0	Immediate	During running	PS
P08.01	Speed loop integral time 1	0.00~100.00ms	0.01ms	5.00	Immediate	During running	PS
P08.02	Position loop gain 1	1~8000rad/s	1rad/s	100	Immediate	During running	P
P08.03	Speed regulator output filter time 1	0~32.0ms	0.1ms	0.8	Immediate	During running	PS
P08.04	Speed loop proportional gain 2	0.1~5000.0Hz	0.1Hz	20.0	Immediate	During running	PS
P08.05	Speed loop integral time 2	0.00~10.000ms	0.01ms	1.00	Immediate	During running	PS
P08.06	Position loop gain 2	1~8000rad/s	1rad/s	60	Immediate	During running	P
P08.07	Speed regulator output filter time 2	0~32.0ms	0.1ms	0.8	Immediate	During running	PS

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P08.08	Gain selection mode	0: The first gain is fixed, use external DI for P/PI switching 1: Use gain switching according to the condition of P08.09	1	0	Immediate	During running	PS
P08.09	Gain switching condition selection	0: Gain 1 is not switched 1: Use external DI terminal switching 2: Torque command 3: Speed command 4: Feedback speed 5: Speed command change rate 6: Position deviation 7: Speed command high and low speed threshold 8: Position command 9: Positioning uncompleted 10: Position command + actual speed	1	0	Immediate	During running	PS
P08.10	Gain switching delay time	0~1000ms	1ms	5	Immediate	During running	PS
P08.11	Gain switching level	0~20000	Switch according to conditions	50	Immediate	During running	PS
P08.12	Gain switching hysteresis	0~20000	Switch according to conditions	30	Immediate	During running	PS
P08.13	Position gain switching time	0~1000ms	1ms	5	Immediate	During running	P
P08.14	Speed feedforward filter time	0.00~64.00ms	0.01ms	0.05	Immediate	During running	P
P08.15	Speed feedforward gain	0.0~100.0%	0.01%	0.0	Immediate	During running	P
P08.16	Torque feedforward filter time	0.00~64.00ms	0.01	0.05	Immediate	During running	PS
P08.17	Torque feedforward gain	0.0~200.0%	0.1%	0.0	Immediate	During running	PS
P08.18	Feedback speed low-pass filter cutoff frequency (currently encoder filter time)	100~4000Hz (0.0~40.0)	0.0	40.0	Immediate	During running	PS
P08.19	PDFF (pseudo-differential feedforward) control coefficient (in non-torque control mode, reserved)	0.0~100.0%	0.1%	100.0	Immediate	During running	PS

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P09: Adjustment parameters							
P09.00	Offline inertia identification function	--	0.01	0.00	Immediate	At stop	PST
P09.01	Inertia identification maximum speed	200~2000rpm	1rpm	800	Immediate	At stop	PST
P09.02	Inertia identification acceleration time	10~1000ms	1ms	60	Immediate	At stop	PST
P09.03	Motor revolutions for inertia identification	0.00~2.00r	0.01r	0.00	Immediate	At stop	PST
P09.04	Waiting time after single inertia identification	50~10000	1ms	800	Immediate	At stop	PST
P09.05	Online inertia identification mode	0: Disabled 1: Enabled, change slowly 2: Enabled, change generally 3: Enabled, change quickly	1	0	Immediate	At stop	PST
P09.06	Gain adjustment mode	0: The parameter self-adjustment is invalid, and the parameter is adjusted manually 1: parameter self-adjustment mode, use the rigidity table to automatically adjust the gain parameters 2: Positioning mode, use the rigidity table to automatically adjust the gain parameters	1	0	Immediate	At stop	PST
P09.07	Rigidity level	0~31	1	0	Immediate	At stop	PST
P09.08	Adaptive notch filter mode	0: The 3rd and 4th notch filter parameters are not updated 1: 3rd notch filter parameter adaptive result update 2: 3rd and 4th notch filter parameter adaptive results update 3: Automatically detect the mechanical resonance frequency, but do not set the relevant parameters of the notch filter 4: All 4 notch filter parameters return to default values	1	0	Immediate	At stop	PST
P09.09	Automatic suppression	1~100	1	1	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	vibration sensitivity setting						
P09.10	Notch filter 1 frequency	0~4000Hz	1Hz	0	Immediate	At stop	PS
P09.11	Notch filter 1 width	10~1000Hz	1Hz	100	Immediate	At stop	PS
P09.12	Notch filter 2 frequency	0~4000Hz	1Hz	0	Immediate	At stop	PS
P09.13	Notch filter 2 width	10~1000Hz	1Hz	100	Immediate	At stop	PS
P09.14	Notch filter 3 frequency	0~4000Hz	1Hz	0	Immediate	At stop	PS
P09.15	Notch filter 3 width	10~1000Hz	1Hz	100	Immediate	At stop	PS
P09.16	Notch filter 4 frequency	0~4000Hz	1Hz	0	Immediate	At stop	PS
P09.17	Notch filter 4 width	10~1000Hz	1Hz	100	Immediate	At stop	PS
P09.18	Torque low-pass filter time constant	0~65536us	1us	0	Immediate	At stop	PS
P09.19	Speed reference notch filter frequency	0~1000Hz	1Hz	0	Immediate	At stop	PS
P09.20	Speed reference notch filter width	10~500Hz	1Hz	100	Immediate	At stop	PS
P09.21	Reserved						
P09.22	Resonance frequency identification result	0~2000Hz	1Hz	-	Immediate	At stop	PS
P09.23	Disturbance torque compensation gain	0.0%~100.0%	0.1%	0	Immediate	At stop	PS
P09.24	Disturbance observer filter time	0.0~25.0ms	0.1ms	0	Immediate	At stop	PS
P09.25	Low frequency resonance suppression mode selection	0: Manually set vibration suppression parameters 1: Automatically set vibration suppression parameters	1	0	Immediate	During running	P
P09.26	Low frequency resonance frequency	0.0~100.0Hz	0.1Hz	0.0	Immediate	During running	P
P09.27	Low frequency resonance frequency filter setting	0~10	1	0	Immediate	During running	P
P09.28	Low frequency resonance position deviation judgment threshold	1~1000P	1P	5	Immediate	At stop	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P09.29	Torque command offset (vertical axis mode)	-300.00% ~ 300.00%	0.01%	0.00	Immediate	During running	P
P09.30	Viscous friction compensation gain	0~1000.0	0.1%/ 10000rpm	0	Immediate	At stop	PST
P09.31	Positive friction compensation	0~50.0%	0.1	0	Immediate	At stop	PST
P09.32	Negative friction compensation	0~50.0%	0.1%	0	Immediate	At stop	PST
P09.33	Quadrant protrusion positive direction compensation value	-100.00%~100.00%	0.01%	0.00	Immediate	At stop	PST
P09.34	Quadrant protrusion opposite direction compensation value	-100.00%~100.00%	0.01%	0.00	Immediate	At stop	PST
P09.35	Quadrant protrusion compensation delay time	0~1000.0	0. 1ms	0.0	Immediate	At stop	PST
P09.36	Quadrant protrusion compensation filter	0~1000.0	0. 1ms	0.0	Immediate	At stop	PST
P09.37	Quadrant protrusion compensation effective position	0~65535	1	1	Immediate	At stop	PST
P09.38	Load moment of inertia ratio	0.00~120.00	0.01	1.00	Immediate	At stop	PST
P10: Fault and protection parameters							
P10.00	Action upon phase loss	0: Activate protection upon input and output phase loss 1: No protection upon input phase loss 2: No protection upon output phase loss 3: No protection upon input and output	1	0	Immediate	During running	PST
P10.01	Action upon communication fault	0: Activate protection and coast to stop 1: Alarm and keep running	1	0	Immediate	During running	PST
P10.02	Action upon temperature sampling disconnection	0: Activate protection and coast to stop 1: Alarm and keep running	1	0	Immediate	During running	PST
P10.03	Action upon analog input fault	0: Activate protection and coast to stop 1: Alarm and keep running	1	0	Immediate	During running	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P10.04	Overtravel stop mode selection	0: Activate protection and coast to stop 1: Alarm, decelerate to zero, keep position locked	1	1	Immediate	During running	P
P10.05	Reserved						
P10.06	Overload protection setting for motor	0: Activate protection and coast to stop 1: Alarm and keep running	1	1	Immediate	At stop	PST
P10.07	Motor overload protection gain	20.0%~300.0%	0.1%	100.0%	Immediate	During running	PST
P10.08	Runaway protection selection(reserved)	0: Disabled 1: Enabled	1	1	Immediate	At stop	PST
P10.09	Stall over temperature protection enable	0: Shielded motor stall over-temperature protection detection 1: Enable motor stall over-temperature protection detection	1	0	Immediate	At stop	PST
P10.10	Stall over temperature protection time window	10~65535ms	1ms	100	Immediate	At stop	PST
P10.11	Encoder multi-turn overflow fault selection	0: Not shielded 1: Shielded	1	1	Immediate	At stop	PST
P10.12	Overspeed fault threshold	0~15000rpm	1rpm	10800	Immediate	At stop	PST
P10.13	Maximum position pulse frequency	100~4000kHz	kHz	4000	Immediate	At stop	P
P10.14	Absolute encoder battery troubleshooting	0: Enable absolute encoder battery undervoltage, disconnection and other fault detection 1: Shield absolute encoder battery undervoltage, disconnection and other fault detection	1	0	Immediate	At stop	PST
P10.15 ~ P10.17	Reserved						
P10.18	Last fault type	0: No abnormal record 1: Over-current 2: Main circuit overvoltage 3: Control circuit overvoltage 4: Motor blocked 5: Reserved 6: Phase loss on the	1	0	–	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		input side 7: Phase loss on the output side 8: Heatsink over-temperature 9: Braking resistor overload 10: Power module protection 11: Servo drive overload 12: Motor overload 13: EEPROM read and write error 14: Serial port communication error 15: Reserved 16: Abnormal current detection circuit 17: Reserved 18: Poor auto-tuning 19: Encoder fault 20: Undervoltage during main circuit operation 21: AI function conflict 22: Parameter setting error 23: Reserved 24: AI input abnormal 25: Inverter module sampling disconnection protection 26: Reserved 27: Overspeed 28~29: Reserved 30: Encoder multi-turn count error 31: Encoder multi-turn count overflow 32: Position deviation is too large 33: Abnormal pulse input 34: The position deviation of the full closed loop is too large 35: Full closed-loop function parameter setting error 36: CAN bus communication connection is interrupted 37: Homing timeout 38: DI emergency brake warning 39: Forward overtravel 40: Reverse overtravel					

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		41: Encoder battery failure 42: Reserved 43: External fault 44~45: Reserved 46: Short circuit to ground at power-on 47: Internal logic error 1 48: Internal logic error 2 49: Internal logic error 3 50~52: Reserved fault numbers for bus version products 53~60: Reserved 61: Abnormal electronic gear ratio 62: Interrupt positioning alarm 63~65: Reserved 66: Homing logic error 70: Matching motor number setting error 71: Incremental encoder UVW error 72: Software does not match the control board 73: Bootstrap timeout 74: Reserved 75: Absolute encoder battery undervoltage 76: Absolute encoder battery disconnection 77: The actual encoder type is inconsistent with that read by P01.00 78: Parameter not stored in EEPROM of absolute encoder 79: Absolute encoder EEPROM parameter write error 80: Control circuit undervoltage					
P10.19	The second fault type	The same as P10.18	1	0	–	At display	PST
P10.20	The first fault type	The same as P10.18	1	0	–	At display	PST
P10.21	The bus voltage at the last fault	0~999V	1V	0	–	At display	PST
P10.22	V-phase current at the last fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.23	W-phase current at the last fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.24	D-axis current reference value at the last fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.25	Q-axis current reference value	0.0~999.9A	0.1A	0.0	–	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	at the last fault						
P10.26	D-axis current feedback value at the last fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.27	Q-axis current feedback value at the last fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.28	Speed at the last fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display	PST
P10.29	Encoder position feedback at the last fault (PUU unit)	-2147483648~2147483647	1	0	–	At display	PST
P10.30	DI status at the last fault	Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0~BIT1: DI9~DI10	1	0	–	At display	PST
P10.31	DO status at the last fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0~BIT1: DO5~DO6	1	0	–	At display	PST
P10.32	Drive status at the last fault	0~FFFFH (the same as P11.11)	1	0	–	At display	PST
P10.33	Temperature at the last fault	-40.0℃~200.0℃	0.1℃	0.0	–	At display	PST
P10.34	The bus voltage at the second fault	0~999V	1V	0	–	At display	PST
P10.35	V-phase current at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.36	W-phase current at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.37	D-axis current reference value at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.38	Q-axis current reference value at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.39	D-axis current feedback value at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.40	Q-axis current feedback value at the second fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.41	Speed at the second fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display	PST
P10.42	Encoder position feedback at the second fault (PUU unit)	-2147483648~2147483647	1	0	–	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P10.43	DI status at the second fault	Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0~BIT1: DI9~DI10	1	0	–	At display	PST
P10.44	DO status at the second fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0~BIT1: DO5~DO6	1	0	–	At display	PST
P10.45	Drive status at the second fault	0~FFFFH (the same as P11.11)	1	0	–	At display	PST
P10.46	Temperature at the second fault	-40.0℃~200.0℃	0.1℃	0.0	–	At display	PST
P10.47	The bus voltage at the first fault	0~999V	1V	0	–	At display	PST
P10.48	V-phase current at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.49	W-phase current at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.50	D-axis current reference value at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.51	Q-axis current reference value at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.52	D-axis current feedback value at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.53	Q-axis current feedback value at the first fault	0.0~999.9A	0.1A	0.0	–	At display	PST
P10.54	Speed at the first fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display	PST
P10.55	Encoder position feedback at the first fault (PUU unit)	-2147483648~2147483647	1	0	–	At display	PST
P10.56	DI status at the first fault	Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0~BIT1: DI9~DI10	1	0	–	At display	PST
P10.57	DO status at the first fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0~BIT1: DO5~DO6	1	0	–	At display	PST
P10.58	Drive status at the first fault	0~FFFFH (the same as P11.11)	1	0	–	At display	PST
P10.59	Temperature at the first fault	-40.0℃~200.0℃	0.1℃	0.0	–	At display	PST
P11: Display parameters							
P11.00	Speed command	-6000.0~6000.0rpm	0.1rpm		–	At display	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P11.01	Actual motor speed	-6000.0~6000.0rpm	0.1rpm		–	At display	PST
P11.02	Output voltage	0~480V	1V		–	At display	PST
P11.03	Output current	0.0~4Ie A	0.1A		–	At display	PST
P11.04	Q-axis current	-400.0~+400.0%Ie	0.1%		–	At display	PST
P11.05	D-axis current	-100.0~+100.0%Ie	0.1%		–	At display	PST
P11.06	Output torque	-300.00~+300.00 Nm	0.01Nm		–	At display	PST
P11.07	Output power	0~60000W	1W			At display	PST
P11.08	Average load rate	0.0~400.0% Te	0.1%		–	At display	PST
P11.09	Bus voltage	0~900V	1V		–	At display	PST
P11.10	Control voltage	0~450V	1V		–	At display	PST
P11.11	Operation state of the servo drive	0~FFFFH Bit 0: RUN/STOP Bit 1: REV/FWD Bit 2: Running at zero speed Bit 3: Accelerating Bit 4: Decelerating Bit 5: Running at constant speed Bit 6: Reserved Bit 7: Reserved Bit 8: Over-current limiting Bit 9: DC over-voltage limiting Bit 10: Torque limiting Bit 11: Speed limiting Bit 12: Drive in fault Bit 13: Speed control Bit 14: Torque control Bit 15: Position control	1		–	At display	PST
P11.12	DI terminal state	0~3FFH, 0: off; 1: on The high-speed pulse reference will not be refreshed synchronously	1		–	At display	PST
P11.13	DO terminal state	0~FH, 0: open; 1: close The high-speed pulse output will not be refreshed synchronously	1		–	At display	PST
P11.14	AI1 input voltage	-20.000~20.000V	0.001V		–	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P11.15	AI2 input voltage	-20.000~20.000V	0.001V		–	At display	PST
P11.16	Input pulse frequency	0~4000kpps	1kpps		–	At display	PS
P11.17	Corresponding speed of input pulse command	-6000.0~6000.0rpm	0.1rpm		–	At display	PS
P11.18	Motor encoder counter value	0~4 times motor encoder lines -1	1		–	At display	PST
P11.19	Motor encoder Z pulse position	0~4 times motor encoder lines -1	1		–	At display	PST
P11.20	Number of input pulses	-2147483648~2147483 647			–	At display	PST
P11.21	Position reference point position	-2147483648~2147483 647	1		–	At display	P
P11.22	Position reference	-2147483648~2147483 647	1		–	At display	P
P11.23	Position feedback	-2147483648~2147483 647	1		–	At display	P
P11.24	Position error pulse	-2147483648~2147483 647	1		–	At display	P
P11.25	Position reference point position (PUU unit)	-2147483648~2147483 647	1		–	At display	P
P11.26	Position reference (PUU unit)	-2147483648~2147483 647	1		–	At display	P
P11.27	Position feedback (PUU unit)	-2147483648~2147483 647	1		–	At display	P
P11.28	Position error pulse (PUU unit)	-2147483648~2147483 647	1		–	At display	P
P11.29	Accumulated power-on hours	0 ~ maximum 65535 hours	1 hour		–	At display	PST
P11.30	Accumulated work hours	0 ~ maximum 65535 hours	1 hour		–	At display	PST
P11.31	Module temperature	-40.0℃~150.0℃	0.1℃		–	At display	PST
P11.32	Encoder single-turn position	0~8388608	1		–	At display	PST
P11.33	Absolute encoder rotation data	0~65535r	1r		–	At display	PST
P11.34	Load moment of inertia ratio	0.00~120.00	0.01		–	At display	PST
P11.35	Absolute position PUU value	Machine current absolute position (command unit) = mechanical absolute position / mechanical gear ratio -2147483648~2147483	Command unit		–	At display	PS

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		647					
P11.36	Mechanical absolute position (lower 32 bits)	In absolute position linear mode or absolute position rotary mode, the load position is converted to the position of the motor side (encoder unit) Mechanical absolute position = encoder absolute position - origin offset	Encoder unit		–	At display	PST
P11.37	Mechanical absolute position (upper 32 bits)		Encoder unit		–	At display	PST
P11.38	Absolute encoder absolute position (lower 32 bits)	The absolute position of the absolute encoder feedback. Encoder unit	Encoder unit		–	At display	PST
P11.39	Absolute encoder absolute position (upper 32 bits)		Encoder unit		–	At display	PST
P11.40	Rotating load single-turn position (lower 32 bits)	In the absolute position rotation mode, the position within one revolution of the rotating load is converted to the motor position of the motor side. Encoder unit	Encoder unit		–	At display	PST
P11.41	Rotating load single-turn position (upper 32 bits)		Encoder unit		–	At display	PST
P11.42	Rotating load single-turn position	In absolute position rotation mode, the unit of position command within one revolution of the rotation load	Command unit		–	At display	PST
P11.43	Mechanical angle (number of pulses from origin)		Encoder unit		–	At display	PST
P11.44	Electrical angle	0.00~360.00°	0.01°		–	At display	PST
P11.45~ P11.49	Reserved						
P11.50	Incremental encoder UVW position	1~6	1		–	At display	PST
P11.51~ P11.54	Reserved						
P12: Servo positioning parameters							
P12.00	Homing selection	0: Disabled 1: Homing enabled by the HomingStart signal input from DI 2: Electrical homing enabled by the HomingStart signal input from DI 3: Homing enabled immediately upon power-on 4: Homing performed immediately	1	0	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		5: Electrical homing started 6: Current position as the home					
P12.01	Homing mode	0: Forward, home switch as deceleration point and home 1: Reverse, home switch as deceleration point and home 2: Forward, motor Z signal as deceleration point and home 3: Reverse, motor Z signal as deceleration point and home 4: Forward, home switch as deceleration point and Z signal as home 5: Reverse, home switch as deceleration point and Z signal as home 6: Forward, positive limit switch as deceleration point and home 7: Reverse, negative limit switch as deceleration point and home 8: Forward, positive limit switch as deceleration point and Z signal as home 9: Reverse, negative limit switch as deceleration point and Z signal as home	1	9	Immediate	At stop	P
P12.02	Homing command terminal mode	0: Level mode 1: Pulse mode	1	0	Immediate	At stop	P
P12.03	Reserved						
P12.04	Positioning acceleration and deceleration curve selection	0: T-shaped curve 1: S-shaped curve	1	0	Immediate	At stop	P
P12.05	High speed home searching speed	0.0~1000.0rpm	0.1rpm	100.0	Immediate	At stop	P
P12.06	Low speed home searching speed	0.0~1000.0rpm	0.1rpm	10.0	Immediate	At stop	P
P12.07	Home position offset	-1073741824~1073741824	1	0	Immediate	At stop	P
P12.08	Home searching acceleration/dec	0~65535ms	1	200	Immediate	At stop	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	eleration time						
P12.09	Homing time limit	0~65535ms	1	10000	Immediate	At stop	P
P12.10	Positioning mode selection	0: Relative position 1: Absolute position	1	0	Immediate	At stop	P
P12.11	Home offset mode	0: After the home is found, the position feedback=home position offset P12.07 1: After the home is found, the position feedback=current position+home position offset P12.07 2: After the home is found, continue to perform the home position offset segment, and after it is done, the position feedback=0 3: After the home is found, continue to perform the home position offset segment, and after it is done, the position feedback=home position offset P12.07	1	0	Immediate	At stop	P
P12.12	Positioning timing selection	0: Receiving new positioning signal in the process of positioning, no response 1: Receiving new positioning signal in the process of positioning, positioning the new position directly	1	0	Immediate	At stop	P
P12.13	Single point positioning position reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.14	Positioning speed	0.1rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.15	Positioning acceleration time	1~65535ms	1ms	100	Immediate	During running	P
P12.16	Positioning deceleration time	1~65535ms	1ms	100	Immediate	During running	P
P12.17	Internal positioning end point setting	1~32	1	32	Immediate	At stop	P
P12.18	Multi-point positioning mode	0: Stop after a single operation (P12.17 selects the number of segments) 1: Cycle operation (P12.17 selects the number of segments) 2: DI switching operation (selected by DI)	1	0	Immediate	At stop	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P12.19	Internal position 1 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.20	Internal position 2 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.21	Internal position 3 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.22	Internal position 4 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.23	Internal position 5 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.24	Internal position 6 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.25	Internal position 7 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.26	Internal position 8 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.27	Internal position 9 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.28	Internal position 10 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.29	Internal position 11 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.30	Internal position 12 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.31	Internal position 13 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.32	Internal position 14 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.33	Internal position 15 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.34	Internal position 16 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P12.35	Internal position 1 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.36	Internal position 2 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.37	Internal position 3 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.38	Internal position 4 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.39	Internal position 5 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.40	Internal position 6 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P12.41	Internal position 7 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.42	Internal position 8 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.43	Internal position 9 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.44	Internal position 10 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.45	Internal position 11 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.46	Internal position 12 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.47	Internal position 13 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.48	Internal position 14 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.49	Internal position 15 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.50	Internal position 16 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P12.51	Automatic operation mode timer 1	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.52	Automatic operation mode timer 2	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.53	Automatic operation mode timer 3	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.54	Automatic operation mode timer 4	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.55	Automatic operation mode timer 5	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.56	Automatic operation mode timer 6	0~600.00s	0.01s	1.00	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P12.57	Automatic operation mode timer 7	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.58	Automatic operation mode timer 8	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.59	Automatic operation mode timer 9	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.60	Automatic operation mode timer 10	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.61	Automatic operation mode timer 11	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.62	Automatic operation mode timer 12	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.63	Automatic operation mode timer13	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.64	Automatic operation mode timer 14	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.65	Automatic operation mode timer 15	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.66	Automatic operation mode timer16	0~600.00s	0.01s	1.00	Immediate	During running	P
P12.67	Internal position 1 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.68	Internal position 2 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.69	Internal position 3 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.70	Internal position 4 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.71	Internal position 5 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.72	Internal position 6 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.73	Internal position 7 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.74	Internal position 8 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.75	Internal position 9 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P12.76	Internal position 10 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.77	Internal position 11 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.78	Internal position 12 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.79	Internal position 13 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.80	Internal position 14 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.81	Internal position 15 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.82	Internal position 16 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P12.83	Current positioning reference position display	1~32	1	0	Immediate	At stop	P
P12.84	Current positioning completed position display	1~32	1	0	Immediate	At stop	P
P12.85	Reserved						
P12.86	Interrupt positioning selection	0: Disable 1: Enabled	1	0	Immediate	At stop	P
P12.87	Displacement of interrupt positioning	0~1073741824	Command unit	10000	Immediate	At stop	
P12.88	Constant operating speed in interrupt positioning	0.0~6000.0rpm	0.1rpm	200.0	Immediate	At stop	
P12.89	Acceleration/ deceleration time of interrupt positioning	0~1000ms	1ms	10	Immediate	At stop	
P12.90	Interrupt positioning cancel signal enable	0: Disable 1: Enable	1	1	Immediate	At stop	
P13: Full closed loop control parameters							
P13.00	Second encoder type selection	0: Reserved 1: Tamagawa serial 23-bit absolute encoder (invalid when P01.18 = 1, 5, 6) 2: Line-saving incremental encoder	1	1	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		3: Reserved 4: Reserved 5：Reagle 17-bit absolute encoder (invalid when P01.18 = 1, 5, 6) 6: Reserved 7: BiSS-C encoder					
P13.01	The number of pulses of the second encoder for one rotation of the motor	1~1073741824	1	10000	Immediate	At stop	PST
P13.02	Second encoder counting direction	0: Same as the first encoder counting direction 1: Opposite to the first encoder counting direction	1	0	Immediate	At stop	PST
P13.03	Encoder feedback mode	0: First encoder feedback 1: Second encoder feedback 2: The first/second encoder feedback switch is performed when the electronic gear ratio is switched	1	0	Immediate	During running	P
P13.04	Full closed loop position deviation too large threshold	0 ~1073741824	1 external encoder unit	10000	Immediate	During running	P
P13.05	Full closed loop position deviation clear setting	0~100r	1r	0	Immediate	During running	P
P13.06	Hybrid vibration suppression filter time constant	0~6553.5ms	1ms	0	Immediate	During running	P
P13.07	Full closed loop position deviation counter	-1073741824 ~1073741824	1 external encoder unit	0	–	At display	P
P13.08	Internal encoder feedback pulse counter	-1073741824 ~1073741824	1 external encoder unit	0	–	At display	P
P13.09	External encoder feedback pulse counter	-1073741824 ~1073741824	1 external encoder unit	0	–	At display	P
P14: Multi-stage speed parameters							
P14.00	Multi-speed command operation	0: Stop at the end of a single operation 1: Cyclic operation 2: Switch via external DI	1	0	Immediate	During running	S
P14.01	Speed command segments selection	1~16	1	16	Immediate	During running	S
P14.02	Runtime unit selection	0: s	1	0	Immediate	During running	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		1: min					
P14.03	Acceleration time 2	0~65535ms	1ms	10	Immediate	During running	S
P14.04	Deceleration time 2	0~65535ms	1ms	10	Immediate	During running	S
P14.05	Acceleration time 3	0~65535ms	1ms	10	Immediate	During running	S
P14.06	Deceleration time 3	0~65535ms	1ms	10	Immediate	During running	S
P14.07	Acceleration time 4	0~65535ms	1ms	10	Immediate	During running	S
P14.08	Deceleration time 4	0~65535ms	1ms	10	Immediate	During running	S
P14.09	1st stage speed command	-9000~9000rpm	1rpm	0	Immediate	During running	S
P14.10	1st stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.11	1st stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.12	2nd stage speed command	-6000.0~6000.0rpm	0.1rpm	200.0	Immediate	During running	S
P14.13	2nd stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.14	2nd stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.15	3rd stage speed command	-6000.0~6000.0rpm	0.1rpm	400.0	Immediate	During running	S
P14.16	3rd stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.17	3rd stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3	1	0	Immediate	During running	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		4- Acceleration and deceleration time 4					
P14.18	4th stage speed command	-6000.0~6000.0rpm	0.1rpm	600.0	Immediate	During running	S
P14.19	4th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.20	4th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.21	5th stage speed command	-6000.0~6000.0rpm	0.1rpm	800.0	Immediate	During running	S
P14.22	5th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.23	5th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.24	6th stage speed command	-6000.0~6000.0rpm	0.1rpm	600.0	Immediate	During running	S
P14.25	6th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.26	6th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.27	7th stage speed command	-6000.0~6000.0rpm	0.1rpm	400.0	Immediate	During running	S
P14.28	7th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.29	7th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and	1	0	Immediate	During running	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4					
P14.30	8th stage speed command	-6000.0~6000.0rpm	0.1rpm	200.0	Immediate	During running	S
P14.31	8th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.32	8th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.33	9th stage speed command	-6000.0~6000.0rpm	0.1rpm	0.0	Immediate	During running	S
P14.34	9th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.35	9th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.36	10th stage speed command	-6000.0~6000.0rpm	0.1rpm	-200.0	Immediate	During running	S
P14.37	10th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.38	10th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.39	11th stage speed command	-6000.0~6000.0rpm	0.1rpm	-400.0	Immediate	During running	S
P14.40	11th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.41	11th stage speed command	0- Zero acceleration and deceleration time	1	0	Immediate	During running	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	acceleration and deceleration time selection	1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4					
P14.42	12th stage speed command	-6000.0~6000.0rpm	0.1rpm	-600.0	Immediate	During running	S
P14.43	12th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.44	12th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.45	13th stage speed command	-6000.0~6000.0rpm	0.1rpm	-800.0	Immediate	During running	S
P14.46	13th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.47	13th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.48	14th stage speed command	-6000.0~6000.0rpm	0.1rpm	-600.0	Immediate	During running	S
P14.49	14th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.50	14th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.51	15th stage speed command	-6000.0~6000.0rpm	0.1rpm	-400.0	Immediate	During running	S
P14.52	15th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P14.53	15th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P14.54	16th stage speed command	-6000.0~6000.0rpm	0.1rpm	-200.0	Immediate	During running	S
P14.55	16th stage speed command running time	0~6553.5s (min)	0.1s (min)	0.5	Immediate	During running	S
P14.56	16th stage speed command acceleration and deceleration time selection	0- Zero acceleration and deceleration time 1- Acceleration and deceleration time 1 2- Acceleration and deceleration time 2 3- Acceleration and deceleration time 3 4- Acceleration and deceleration time 4	1	0	Immediate	During running	S
P15: Modbus communication parameters							
P15.00	Drive Modbus communication address	0~247 (0 is the broadcast address during Modbus communication)	1	5	Immediate	At stop	PST
P15.01	Modbus communication configuration	Unit place of LED: Baud rate selection 0: 2400BPS 1: 4800BPS 2: 9600BPS 3: 19200BPS 4: 38400BPS 5: 57600BPS 6: 115200BPS Tens place of LED: Data format 0: 1-8-2-N format, RTU 1: 1-8-1-E format, RTU 2: 1-8-1-O format, RTU 3: 1-8-1-N format,RTU	1	01	Immediate	At stop	PST
P15.02	Modbus communication timeout detection time	0.0~1000.0s (When the parameter is set to 0, no disconnection detection is performed)	0.1s	0.0	Immediate	At stop	PST
P15.03	Modbus response delay	0~1000ms	1ms	5	Immediate	At stop	PST
P15.04	Whether the function code parameters written through Modbus are	0x06, 0x10 Whether to store parameters during write operation 0: Do not store	1	0	Immediate	At stop	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	stored in the EEPROM	1: Store					
P16: CANopen communication parameters							
P16.00	CAN software version number	000~FFF	1	Factory setting	–	At display	PST
P16.01	CAN communication address	0~127	1	5	Power-on again	At stop	PST
P16.02	CAN communication baud rate setting	0: 125kbits/s 1: 250kbits/s 2: 500kbits/s 3: 1000kbits/s	1kbits/s	0	Power-on again	At stop	PST
P16.03	CAN communication disconnection detection time	0.0~1000.0s (When the parameter is set to 0, no disconnection detection is performed)	0.1s	0.0	Power-on again	At stop	PST
P16.04	CAN communication status	0: Boot-up 4: Stopped 5: Operational 127: Pre-operational	1	-	–	At display	PST
P16.05	PDO configuration mode selection	0: Menu configuration 1: Master configuration	1	0	Power-on again	At stop	PST
P16.06	TPDO1 transfer type	0~255	1	255	Power-on again	Setting	PST
P16.07	TPDO1 event timer	0~65535ms	1ms	10	Power-on again	Setting	PST
P16.08	Number of valid mapping objects for TPDO1	0~4	1	2	Power-on again	Setting	PST
P16.09	TPDO1 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.10	TPDO1 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	60410010	Power-on again	Setting	PST
P16.11	TPDO1 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex	1	606C0020	Power-on again	Setting	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		ZZ - object length					
P16.12	TPDO1 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.13	TPDO1 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.14	TPDO2 transfer type	0~255	1	255	Power-on again	Setting	PST
P16.15	TPDO2 event timer	0~65535ms	1ms	0	Power-on again	Setting	PST
P16.16	Number of valid mapping objects for TPDO2	0~4	1	0	Power-on again	Setting	PST
P16.17	TPDO2 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.18	TPDO2 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.19	TPDO2 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.20	TPDO2 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.21	TPDO2 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary	1	0	Power-on again	Setting	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		subindex ZZ - object length					
P16.22	TPDO3 transfer type	0~255	1	255	Power-on again	Setting	PST
P16.23	TPDO3 event timer	0~65535ms	1ms	0	Power-on again	Setting	PST
P16.24	Number of valid mapping objects for TPDO3	0~4	1	0	Power-on again	Setting	PST
P16.25	TPDO3 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.26	TPDO3 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.27	TPDO3 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.28	TPDO3 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.29	TPDO3 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.30	TPDO4 transfer type	0~255	1	255	Power-on again	Setting	PST
P16.31	TPDO4 event timer	0~65535ms	1ms	0	Power-on again	Setting	PST
P16.32	Number of valid mapping objects for TPDO4	0~4	1	0	Power-on again	Setting	PST
P16.33	TPDO4 mapping status	0: The mapping object is configured correctly 1: The parameter does	1	0	-	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other					
P16.34	TPDO4 mapping object 1	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.35	TPDO4 mapping object 2	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.36	TPDO4 mapping object 3	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.37	TPDO4 mapping object 4	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.38	Number of valid mapping objects for RPDO1	0~4	1	2	Power-on again	Setting	PST
P16.39	RPDO1 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.40	RPDO1 mapping object 1	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	60400010	Power-on again	Setting	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
P16.41	RPDO1 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	60FF0020	Power-on again	Setting	PST
P16.42	RPDO1 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.43	RPDO1 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.44	Number of valid mapping objects for RPDO2	0~4	1	0	Power-on again	Setting	PST
P16.45	RPDO2 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.46	RPDO2 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.47	RPDO2 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.48	RPDO2 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.49	RPDO2 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary	1	0	Power-on again	Setting	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		subindex ZZ - object length					
P16.50	Number of valid mapping objects for RPDO3	0~4	1	0	Power-on again	Setting	PST
P16.51	RPDO3 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not match other	1	0	-	At display	PST
P16.52	RPDO3 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.53	RPDO3 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.54	RPDO3 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.55	RPDO3 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.56	Number of valid mapping objects for RPDO4	0~4	1	0	Power-on again	Setting	PST
P16.57	RPDO4 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read-only 5: Parameter write only 6: PDO length does not	1	0	-	At display	PST

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
		match other					
P16.58	RPDO4 mapping object 1	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.59	RPDO4 mapping object 2	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.60	RPDO4 mapping object 3	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.61	RPDO4 mapping object 4	0 – 0xXXXXYZZ XXXX - object dictionary index YY - object dictionary subindex ZZ - object length	1	0	Power-on again	Setting	PST
P16.62	Whether the CANopen communication write function code parameters are stored in the EEPROM	0: Do not store 1: The data written through the CAN bus is stored in the EEPROM of the drive	1	1	Immediate	At stop	_
P18: Advanced parameters							
P18.00	User password						
P18.01	Drive operation mode	1: VC 2: IF (P02.00 is invalid at this time, and the speed reference is P06.01) 3: VF (same as above)	1	1	Immediate	At stop	PST
P18.02	Current loop gain	1~50.00	0.01	10.00	Immediate	At stop	PST
P18.03	Current loop integral	0.5~100.0ms	0.1ms	10.0	Immediate	At stop	PST
P18.04~ P18.15	Advanced parameters						PST
P18.16~ P18.28	Reserved						
P19: Internal positioning parameter 2							
P19.00	Internal position 17 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.01	Internal position 18 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.02	Internal position	-1073741824~1073741	1	0	Immediate	During	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	19 reference	824				running	
P19.03	Internal position 20 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.04	Internal position 21 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.05	Internal position 22 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.06	Internal position 23 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.07	Internal position 24 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.08	Internal position 25 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.09	Internal position 26 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.10	Internal position 27 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.11	Internal position 28 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.12	Internal position 29 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.13	Internal position 30 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.14	Internal position 31 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.15	Internal position 32 reference	-1073741824~1073741824	1	0	Immediate	During running	P
P19.16	Internal position 17 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.17	Internal position 18 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.18	Internal position 19 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.19	Internal position 20 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.20	Internal position 21 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.21	Internal position 22 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.22	Internal position 23 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.23	Internal position	0~65535ms	1ms	100	Immediate	During	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	24 acceleration and deceleration time					running	
P19.24	Internal position 25 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.25	Internal position 26 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.26	Internal position 27 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.27	Internal position 28 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.28	Internal position 29 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.29	Internal position 30 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.30	Internal position 31 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.31	Internal position 32 acceleration and deceleration time	0~65535ms	1ms	100	Immediate	During running	P
P19.32	Automatic operation mode timer 17	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.33	Automatic operation mode timer 18	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.34	Automatic operation mode timer 19	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.35	Automatic operation mode timer 20	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.36	Automatic operation mode timer 21	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.37	Automatic operation mode timer 22	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.38	Automatic operation mode timer 23	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.39	Automatic operation mode	0~600.00s	0.01s	1.00	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	timer 24						
P19.40	Automatic operation mode timer 25	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.41	Automatic operation mode timer 26	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.42	Automatic operation mode timer 27	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.43	Automatic operation mode timer 28	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.44	Automatic operation mode timer 29	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.45	Automatic operation mode timer 30	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.46	Automatic operation mode timer 31	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.47	Automatic operation mode timer 32	0~600.00s	0.01s	1.00	Immediate	During running	P
P19.48	Internal position 17 positioning speed	0.0rpm~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.49	Internal position 18 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.50	Internal position 19 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.51	Internal position 20 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.52	Internal position 21 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.53	Internal position 22 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.54	Internal position 23 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.55	Internal position 24 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.56	Internal position 25 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.57	Internal position 26 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.58	Internal position 27 positioning	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Related mode
	speed						
P19.59	Internal position 28 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.60	Internal position 29 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.61	Internal position 30 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.62	Internal position 31 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P
P19.63	Internal position 32 positioning speed	0.0rpm ~P05.17	0.1rpm	100.0	Immediate	During running	P

Chapter 8 Troubleshooting

All possible fault types, fault cause and solutions for M6 are summarized as shown in table 8-1.

Table 8-1 Fault record table

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.001	Drive overcurrent	The motor cables are in poor contact.	Check whether the cable connector is loose	Fasten the connector that become loose.
		The motor cables are grounded	Check the insulation resistance between the UVW and the grounding cable of the motor.	Replace the motor if the insulation is poor.
		The motor UVW cables are short circuited.	Check whether the motor UVW cables are short circuited.	Connect the motor cables correctly.
		The motor is damaged.	Check whether resistance between the motor cables UVW is balanced.	Replace the motor if the resistance is unbalanced.
		The gain setting is improper and the motor oscillates.	Check whether the motor oscillates or generates a shrill, noise, or view the running graphics.	Re-adjust the gain.
		The encoder cable is incorrectly wired, corrosive, or connected loosely.	Check whether the encoder wiring is good and reliable.	Re-weld or fasten the encoder cable
Er.002	Drive main circuit overvoltage	The main circuit input voltage is too high.	Measure the input power line voltage range.	Adjust the power voltage according to the specification.
		The braking resistor fails.	Measure the resistance between P and PB.	If the resistor is open, replace the external braking resistor.
		External braking resistor value does not match (The resistance of the the external resistor is too large, and the energy absorption during braking is insufficient.)	Confirm the braking resistor value.	Select the appropriate braking resistor value according to operating conditions and load.
		The motor is in abrupt acceleration/deceleration state.	Confirm the deceleration ramp time during running and monitor the DC bus voltage P11.09.	Increase the acceleration/deceleration time in the allowed range.
Er.003	Drive control power overvoltage	The control supply voltage is higher than the input voltage range.	Measure the control power line voltage range.	Adjust the control supply voltage to within the product specification.
Er.004	Motor is blocked	The power output phase (UVW) loss or incorrect phase sequence occurs on the servo drive.	Perform motor trial running when the motor has no load and check the motor wiring.	Connect the motor cables correctly again or replace them.
		The UVW cable breaks.	Check the wiring.	Connect the motor cables correctly again or replace them.
		The motor rotor is locked due to mechanical factors.	Confirm the running command and motor speed.	Eliminate mechanical factors.
Er.006	Input side phase loss	There is phase loss in input L1, L2, L3.	Check input wiring; check input power.	If the input power is single-phase 220V, then P10.00=1; if the input

Fault code	Fault type	Fault cause	Confirming method	Solutions
				power is three-phase 220V, check whether the input power is missing phase, and replace the cable wiring.
Er.007	Output side phase loss	There is phase loss in output U, V, W.	Check the output wiring Check the motor and the cables	Replace the cable wiring.
Er.008	Drive overheat	Ambient temperature is too high	Check the cooling conditions around the drive.	Improve the servo drive cooling conditions, reduce the ambient temperature.
		Multiple overload operation	Check fault records, whether overload fault has been reported.	Waiting for 60s to reset after overload, increase the drive, motor capacity, increase the acceleration and deceleration time, reduce the load.
		The fan is damaged.	Whether the fan is running when running	Replace the fan
Er.009	Braking resistor overload	The cable of the external braking resistor is in poor connection, becomes loose or breaks.	Check the braking resistor wiring according to the correct wiring diagrams.	Rewire according to the correct wiring diagrams.
		The jumper across terminals P and PB is disconnected when the internal braking resistor is used.	Confirm the power terminal jumper wiring	Properly connect the jumper.
		The capacity of the servo drive or the braking resistor is insufficient.	Calculate the maximum braking energy	Improve braking resistor capacity or servo unit capacity, increase acceleration and deceleration time.
		The load inertia is too large.	Confirm the load inertia	Improve the drive, motor, resistor capacity.
Er.010	Power module protection	There is interphase short circuit or grounding short circuit in output three phases.	Check cable and output motor insulation.	Replace the cable or motor.
		Instantaneous over-current of the drive	See the over-current solutions	See the over-current solutions
		The auxiliary power supply is damaged; the drive voltage is insufficient.	Seek for service support	Seek for service support
		Inverter module bridging conduction	Seek for service support	Seek for service support
		Abnormal control board	Seek for service support	Seek for service support
		Braking pipe damaged	Seek for service support	Seek for service support
Er.011 Er.012	Er.011: Servo drive overload Er.012: Motor overload	Wiring of the motor and encoder is incorrect.	Check the wiring according to the correct wiring diagram	Rewire according to the correct wiring diagram, replace the cable.
		The load is too heavy. The motor keeps output of effective torque higher than the rated torque for a long time.	Confirm the overload characteristic and operation instructions of the servo drive or servo motor.	Increase the drive, motor capacity, reduce the load, increase the acceleration and deceleration time.
		The acceleration/ deceleration is too frequent or the load inertia is too large.	View inertia ratio, confirm start-stop cycle	Increase the acceleration and deceleration time.

Fault code	Fault type	Fault cause	Confirming method	Solutions
		The gain adjustment is inappropriate, the rigidity is too strong, the motor vibrates and the sound is abnormal	Observe whether the motor vibrates and generates noise during running.	Re-adjust the gain.
		The servo drive or motor model is set incorrectly.	View motor model settings	Set the correct model.
		The motor block occurs due to mechanical factors, resulting in very heavy load during running.	Check the running reference and the actual motor speed by using the drive debugging platform or the operation panel.	Eliminate mechanical factors.
		Note:You can clear the fault or re-power on the system 60s after occurrence of the overload fault.		
Er.013	EEPROM read/write fault	The read/write error of the control parameters occurs.	Confirm whether the instantaneous power failure occurs in the process of writing parameter.	After restoring the default parameter (P02.22), re-enter the parameters.
		Writing parameter times exceeds the maximum within a certain time.	Confirm whether the change of parameters is frequent from the host device.	Change the parameter writing method and write again.
Er.014	Abnormal serial port communication	Improper setting of communication parameters.	Confirm the function code setting.	Set the correct baud rate, communication data format, etc.
		The communication cable is wired incorrectly or unreliably connected, disconnected, etc.	Check whether the communication cable is correct and reliable.	Reconnect the communication cable, or replace the communication cable.
		Improper setting of fault parameters.	Check whether the P15.02 setting is too short.	Set P15.02 correctly.
		The host device does not work.	Confirm the host system signal	Check whether the host device is working.
Er.015	External braking resistor is too small	The resistance of the external braking resistor is smaller than the minimum value required by the servo drive.	Measure the resistance and approval function code P02.20	It must be replaced to meet the requirements of the braking resistor, changing the function code P02.20.
Er.016	Current detection circuit abnormal	The wiring or the plug-in units of the control board loosens.	Check whether the control board cables and plug-in units are loose	Check them and rewiring
		The AI analog input voltage is too high.	Check whether the AI analog voltage input is above 12V	Adjust AI analog input.
Er.018	Poor auto-tuning	The parameters of the motor are incorrect.	Confirm the motor nameplate parameters	Re-enter the correct motor parameters.
		When reverse running is prohibited, reverse rotating auto-tuning is performed.	Confirm whether it is set to prohibit reverse function.	Cancel the reverse running prohibition
		Motor wiring is wrong.	Check motor wiring.	Confirm that the UVW power cable is connected properly and the phase sequence is correct.

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.019	Encoder fault	Encoder type error	Check encoder type	Enter the correct encoder parameters.
		Encoder disconnection	Check encoder cable	Replace encoder cable.
Er.020	Undervoltage during main circuit operation	Grid voltage drop	Measure whether the grid voltage is abnormal	Improve the power grid.
		The load is too large or the motor does not match the drive	Confirm the load matching conditions	Select the appropriate drive and motor.
Er.021	AI function conflict	The same AI is used for different functions.	Check the settings of the AI channel in the function parameters.	Confirm AI functions and avoid conflicts.
Er.022	The control mode parameter setting is incorrect	Parameter identification is performed in non-VC control mode.	Confirm the setting of the control mode in the parameter.	Confirm the control mode parameters.
Er.024	Abnormal AI analog input	The AI voltage is too high.	Measure AI channel input voltage	Reduce the AI voltage to less than 12V
		The AI wiring is incorrect	Check the AI wiring according to the correct wiring diagram.	Re-wiring.
Er.025	Temperature sampling disconnection	The temperature sampling circuit is abnormal.		Seek for service support
		The temperature sensor or signal cable is abnormal.		Seek for service support
Er.027	Servo motor overspeed	The initial angle of the encoder is wrong	See P01.22 to check and confirm the initial angle of the encoder	Retune the encoder angle
		The actual speed of the servo motor exceeds the overspeed threshold.	Confirm whether the overspeed threshold is appropriate (the overspeed threshold is set by P10.12, if P10.12 is equal to 0, the overspeed threshold is 1.2 times the maximum motor speed; if P10.12 is not equal to 0, the overspeed threshold is P10.12 and 1.2 times the maximum speed of the motor, whichever is smaller).	Set the correct overspeed threshold.
		The UVW phase sequence is incorrect.	Check whether the UVW phase sequence on the servo drive side is consistent with that on the motor side.	Connect the UVW cables according to the correct phase sequence.
		Input reference is higher than the overspeed level.	Confirm the input reference	Reduce the input reference, or adjust the gain.
		The motor speed overshoots.	Confirm the motor speed waveform	Reduce the controller gain, adjust the servo gain, or adjust the operating conditions.
		The servo drive is faulty.	Confirm whether the fault remains after the drive is powered off and powered on again	Replace the servo drive.

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.031	Encoder multi-turn count overflow	The multi-turn count exceeds 65535.	Check whether P11.33 exceeds the maximum number of encoder turns.	Run the motor under the speed mode, and make the multi-turn count value deviate from the overflow threshold 65535; or hide the multi-turn overflow fault
Er.032	Position deviation is too large	The position deviation exceeds the set value of P05.21.	Check whether the position deviation detection range P05.21 is too small or whether the position gain P08.02 is too small.	Increase the position loop gain P08.02.
Er.033	Pulse input abnormal	The pulse frequency exceeds the value set by P10.13.	Confirm whether the maximum position pulse frequency P10.13 is too small	Set P10.13 again according to the maximum position pulse frequency required for the normal operation of the machine. If the output pulse frequency of the upper computer is greater than 4MHz, the output pulse frequency of the upper computer must be reduced.
Er.034	Full closed loop position deviation is too large	The position deviation of the external encoder and the internal encoder is too large.	Confirm whether the number of pulses of the external encoder per revolution of the motor P13.01 is set correctly, and whether the threshold value of the full-closed loop position deviation is too large to increase the P13.04 is too small.	Increase the full-closed loop position deviation excessive threshold P13.04.
Er.035	Full closed loop function parameter setting error	In the full closed loop position mode, the source of the position command is the internal position command, but the inner and outer loop switching mode is used.	Check whether P13.03 is 2, and confirm whether the source of position command is internal position command: multi-segment position command, interrupt positioning function.	When using the full-closed loop function and the position command source is the internal position command, only the external encoder feedback mode can be used, that is, P13.03 can only be 1.
Er.036	CAN bus communication connection interrupted	The communication between the CAN master station and the servo is interrupted for more than the time of P16.03.	Confirm the wiring between the CAN master and the servo.	Rewire or set the appropriate disconnection detection time P16.03 according to the communication cycle.
Er.037	Homing timeout	After the homing is enabled, the home is not found within the time of P12.09.	Confirm the homing mode and the homing timeout detection time P12.09.	Set an appropriate homing timeout detection time according to the homing path.
Er.039	Positive overtravel	When P10.04=0, it exceeds the positive limit switch during running.	Check whether mechanical equipment encounters limit switch.	Run the motor in reverse to get the device off the limit switch.
Er.040	Negative overtravel	When P10.04=0, it exceeds the negative limit switch during running.	Check whether mechanical equipment encounters limit switch.	Run the motor in reverse to get the device off the limit switch.
Er.043	External fault	External fault terminal action.	Check whether the fault terminal is triggered by mistake.	Check external wiring.

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.046	Output-to-ground short-circuit	The power output cables (UVW) of the servo drive are short circuited to ground.	Disconnect the UVW cables from the motor, and measure whether the motor UVW cables are short circuited to ground.	Connect the cables again or replace them.
		The motor is short circuited to ground.	Disconnect the UVW cables from the motor, and measure whether the motor UVW cables are short circuited to the motor grounding wire.	Replace the motor.
Er.047 Er.048 Er.049	Internal logic error	----------	----------	Seek for service support
Er.061	Electronic gear ratio error	The electronic gear ratio is set incorrectly.	Confirm whether the electronic gear ratio parameter setting is reasonable.	Correctly set the electronic gear ratio parameters.
Er.066	Homing logic is wrong	The setting of the homing parameters is unreasonable, or the homing command is executed during positioning.	Confirm the homing parameters such as acceleration and deceleration time of homing search and homing mode.	Set the appropriate homing parameters according to the actual homing mode, or wait for the positioning to complete before returning to the homing operation.
Er.070	The matching motor number setting is invalid or incorrect	An invalid motor number was set.	Reset after confirming the correct motor number.	Correctly set the motor number parameter P01.00.
Er.071	Incremental encoder UVW position is wrong	The UVW position of the incremental encoder is invalid.	Check whether the motor end and servo end of the encoder cable are reversed. Re-plug the encoder terminals, and repeat the power-on several times to see if there is still a fault.	Replace the encoder cable plug (marked on the servo end) Check the encoder wiring or replace the encoder.
Er.072	Program programming error	The software program is inconsistent with the hardware	Check whether the hardware model and software model match	Seek for service support
Er.073	Failed to bootstrap	When the 220V drive is enabled, the motor speed is too large (over 100rpm).	Before enabling, check if the motor rotates.	Enable it after the motor is stationary or lower than 100rpm.
Er.076	Absolute encoder battery disconnection	The absolute value encoder battery is disconnected or the battery voltage is lower than 2.75V during the drive is powered off	Confirm whether the encoder battery wiring is disconnected during the drive is powered off; measure whether the battery voltage is too low.	If Er.076 is reported when the power is turned on for the first time, press the reset button to clear the fault; if the fault cannot be cleared after multiple resets, replace the encoder cable or the encoder battery.
Er.077	Encoder type setting error	The actual encoder type is inconsistent with that read by P01.00.	Check whether the encoder type to be read written in P01.00 is consistent with the actual encoder type	Determine the motor model and change the value of P01.00.
Er.078	No parameter is stored in absolute encoder EEPROM	When P01.00 reads the absolute value encoder EEPROM, the EEPROM has no parameters.	Check whether the parameters have been written in the encoder EEPROM.	Seek for service support

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.079	Absolute encoder EEPROM parameter write error	An error occurred when writing parameters to the EEPROM in the absolute encoder.	Power off and restart to see if the parameters can be rewritten.	Confirm the encoder type, replace the encoder, or replace the motor.
Er.080	Control circuit undervoltage	When the control circuit is powered off or under voltage, only the USB is powered.	Check and measure whether the control circuit power supply voltage is within the normal range, and whether the control circuit power supply wiring is normal.	Check the power supply wiring and replace the control power supply.

All the possible alarm types for M6 are summarized as shown in table 8-2.

Table 8-2 Alarm code table

Alarm code	Alarm type	Alarm cause	Confirming method	Solutions
AL.012	Motor overload	Wiring of the motor and encoder is incorrect or poor	Check the wiring according to correct wiring diagram.	Rewire according to correct wiring diagram, replace the cable.
		The load is too heavy. The motor keeps output of effective torque higher than the rated torque for a long time.	Confirm the overload characteristic and operating instructions of the servo drive or servo motor.	Increase the drive, motor capacity, reduce the load, increase the acceleration and deceleration time.
		The acceleration/ deceleration is too frequent or the load inertia is too large.	View inertia ratio, confirm start-stop cycle	Increase the acceleration and deceleration time.
		The gain adjustment is inappropriate, the rigidity is too strong, the motor vibrates and the sound is abnormal	Observe whether the motor vibrates and generates noise during running.	Re-adjust the gain.
		The servo drive or motor model is set incorrectly.	Check the motor model setting.	Set the correct motor model .
		Motor blocking occurs due to mechanical factors, resulting in very heavy load during running.	Check the running reference and the actual motor speed by using the drive debugging platform or the operation panel.	Eliminate mechanical factors.
AL.014	Abnormal serial port communication	Improper setting of communication parameters.	Confirm the function code setting.	Set the correct baud rate, communication data format, etc.
		The communication cable is wired incorrectly or unreliably connected, disconnected, etc.	Check whether the communication cable is correct and reliable.	Reconnect the communication cable, or replace the communication cable.
		Improper setting of alarm parameters.	Check whether the P15.02 setting is too short.	Set P15.02 correctly.
		The host device does not work.	Confirm the host system signal	Check whether the host device is working.
AL.024	AI input abnormal	AI channel voltage is too high.	Measure AI channel input voltage.	Adjust the input voltage not to exceed 12V.
		The AI channel is wired incorrectly.	Check with the correct wiring diagram.	Rewire.

Alarm code	Alarm type	Alarm cause	Confirming method	Solutions
AL.025	Temperature sampling disconnection	The temperature sampling circuit is abnormal.		Seek for service support
		The temperature sensor or signal cable is abnormal.		Seek for service support
AL.038	DI emergency brake warning	Emergency brake terminal action.	P02.09=1, enable emergency braking. When the drive is running, if the emergency brake terminal is activated, it will alarm.	Given by normal logic
AL.039	Positive overtravel warning	When P10.04=1, the drive position exceeds the positive limit switch.	Check whether the DI terminal of group P03 is set with DI function 35 Check whether the DI terminal logic of the corresponding bit of input signal monitoring P11.12 is valid.	Check the running mode, and under the premise of safety, give a negative command or rotate the motor to make the logic of the "positive limit switch" terminal invalid.
AL.040	Negative overtravel warning	When P10.04=1, the drive position exceeds the negative limit switch.	Check whether the DI terminal of group P03 is set with DI function 36 Check whether the DI terminal logic of the corresponding bit of input signal monitoring P11.12 is valid.	Check the running mode, and under the premise of safety, give a negative command or rotate the motor to make the logic of the "negative limit switch" terminal invalid.
AL.062	Interrupt positioning warning	Enable interrupt positioning command at zero speed.	Check the servo operation status.	Interrupt positioning operation in non-zero speed state.
AL.075	Absolute encoder battery undervoltage	Absolute encoder battery voltage is lower than 3.1V during drive power-up.	When the operation is enabled, it will report low, and if it is not enabled, it will report AL.075, and measure whether the battery voltage is lower than 3.1V.	Replace the encoder cable or encoder battery.

Appendix 1 Motor Number Quick Lookup Table

The M6 servo system needs to set the correct motor number in the P01.00 function code before running, otherwise it will not run normally, please find the motor number according to the following table. The medium inertia motor is divided into three sub-series M, P and N according to the design code. The last letter of the motor model is the design code.

1. Medium inertia M series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
Medium inertia M series	220V	200	SPM-SC60602MAK-M	1211	SPM-SC60602MBK-M	1219
			SPM-SC10602MAK-M	1214	SPM-SC10602MBK-M	121C
			SPM-SC50602MAK-M	1215	SPM-SC50602MBK-M	121D
		400	SPM-SC60604MAK-M	1221	SPM-SC60604MBK-M	1229
			SPM-SC10604MAK-M	1224	SPM-SC10604MBK-M	122C
			SPM-SC50604MAK-M	1225	SPM-SC50604MBK-M	122D
		750	SPM-SC60807MAK-M	1231	SPM-SC60807MBK-M	1239
			SPM-SC10807MAK-M	1234	SPM-SC10807MBK-M	123C
			SPM-SC50807MAK-M	1235	SPM-SC50807MBK-M	123D
		1000	SPM-SC60810MAK-M	1241	SPM-SC60810MBK-M	1249
			SPM-SC10810MAK-M	1244	SPM-SC10810MBK-M	124C
			SPM-SC50810MAK-M	1245	SPM-SC50810MBK-M	124D
		850	SPM-SD61308MAK-M1	1251	SPM-SD61308MBK-M1	1259
			SPM-SD11308MAK-M1	1254	SPM-SD11308MBK-M1	125C
			SPM-SD51308MAK-M1	1255	SPM-SD51308MBK-M1	125D
		1300	SPM-SD61313MAK-M1	1261	SPM-SD61313MBK-M1	1269
			SPM-SD11313MAK-M1	1264	SPM-SD11313MBK-M1	126C
			SPM-SD51313MAK-M1	1265	SPM-SD51313MBK-M1	126D
	380V	850	SPM-TD61308MAK-M1	2211	SPM-TD61308MBK-M1	2219
			SPM-TD11308MAK-M1	2214	SPM-TD11308MBK-M1	221C
			SPM-TD51308MAK-M1	2215	SPM-TD51308MBK-M1	221D
		1300	SPM-TD61313MAK-M1	2221	SPM-TD61313MBK-M1	2229
			SPM-TD11313MAK-M1	2224	SPM-TD11313MBK-M1	222C
			SPM-TD51313MAK-M1	2225	SPM-TD51313MBK-M1	222D
		1800	SPM-TD61318MAK-M1	2231	SPM-TD61318MBK-M1	2239
			SPM-TD11318MAK-M1	2234	SPM-TD11318MBK-M1	223C
			SPM-TD51318MAK-M1	2235	SPM-TD51318MBK-M1	223D
		2200	SPM-TD61322MAK-M1	2251	SPM-TD61322MBK-M1	2259
			SPM-TD11322MAK-M1	2254	SPM-TD11322MBK-M1	225C
			SPM-TD51322MAK-M1	2255	SPM-TD51322MBK-M1	225D
		2900	SPM-TD61829MAK-M	2261	SPM-TD61829MBK-M	2269
			SPM-TD11829MAK-M	2264	SPM-TD11829MBK-M	226C

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
			SPM-TD51829MAK-M	2265	SPM-TD51829MBK-M	226D
		4400	SPM-TD61844MAK-M	2281	SPM-TD61844MBK-M	2289
			SPM-TD11844MAK-M	2284	SPM-TD11844MBK-M	228C
			SPM-TD51844MAK-M	2285	SPM-TD51844MBK-M	228D
		5500	SPM-TD61855MAK-M	22A1	SPM-TD61855MBK-M	22A9
			SPM-TD11855MAK-M	22A4	SPM-TD11855MBK-M	22AC
			SPM-TD51855MAK-M	22A5	SPM-TD51855MBK-M	22AD
		7500	SPM-TD61875MAK-M	22C1	SPM-TD61875MBK-M	22C9
			SPM-TD11875MAK-M	22C4	SPM-TD11875MBK-M	22CC
			SPM-TD51875MAK-M	22C5	SPM-TD51875MBK-M	22CD

2. Medium inertia P series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
Medium inertia P series	380V	2900	SPM-TD61829MAK-P	2271	SPM-TD61829MBK-P	2279
			SPM-TD11829MAK-P	2274	SPM-TD11829MBK-P	227C
			SPM-TD51829MAK-P	2275	SPM-TD51829MBK-P	227D
		4400	SPM-TD61844MAK-P	2291	SPM-TD61844MBK-P	2299
			SPM-TD11844MAK-P	2294	SPM-TD11844MBK-P	229C
			SPM-TD51844MAK-P	2295	SPM-TD51844MBK-P	229D
		5500	SPM-TD61855MAK-P	22B1	SPM-TD61855MBK-P	22B9
			SPM-TD11855MAK-P	22B4	SPM-TD11855MBK-P	22BC
			SPM-TD51855MAK-P	22B5	SPM-TD51855MBK-P	22BD
		7500	SPM-TD61875MAK-P	22D1	SPM-TD61875MBK-P	22D9
			SPM-TD11875MAK-P	22D4	SPM-TD11875MBK-P	22DC
			SPM-TD51875MAK-P	22D5	SPM-TD51875MBK-P	22DD

3.Medium inertia N series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
Medium inertia N series	220V	200	SPM-SC60602MAK-N	3211	SPM-SC60602MBK-N	3219
			SPM-SC10602MAK-N	3214	SPM-SC10602MBK-N	321C
			SPM-SC50602MAK-N	3215	SPM-SC50602MBK-N	321D
		400	SPM-SC60604MAK-N	3221	SPM-SC60604MBK-N	3229
			SPM-SC10604MAK-N	3224	SPM-SC10604MBK-N	322C
			SPM-SC50604MAK-N	3225	SPM-SC50604MBK-N	322D
		750	SPM-SC60807MAK-N	3231	SPM-SC60807MBK-N	3239
			SPM-SC10807MAK-N	3234	SPM-SC10807MBK-N	323C
			SPM-SC50807MAK-N	3235	SPM-SC50807MBK-N	323D
		1000	SPM-SC60810MAK-N	3241	SPM-SC60810MBK-N	3249
			SPM-SC10810MAK-N	3244	SPM-SC10810MBK-N	324C

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
			SPM-SC50810MAK-N	3245	SPM-SC50810MBK-N	324D
		850	SPM-SD61308MAK-N	3251	SPM-SD61308MBK-N	3259
			SPM-SD11308MAK-N	3254	SPM-SD11308MBK-N	325C
			SPM-SD51308MAK-N	3255	SPM-SD51308MBK-N	325D
		1300	SPM-SD61313MAK-N	3261	SPM-SD61313MBK-N	3269
			SPM-SD11313MAK-N	3264	SPM-SD11313MBK-N	326C
			SPM-SD51313MAK-N	3265	SPM-SD51313MBK-N	326D
	380V	850	SPM-TD61308MAK-N	4211	SPM-TD61308MBK-N	4219
			SPM-TD11308MAK-N	4214	SPM-TD11308MBK-N	421C
			SPM-TD51308MAK-N	4215	SPM-TD51308MBK-N	421D
		1300	SPM-TD61313MAK-N	4221	SPM-TD61313MBK-N	4229
			SPM-TD11313MAK-N	4224	SPM-TD11313MBK-N	422C
			SPM-TD51313MAK-N	4225	SPM-TD51313MBK-N	422D
		1800	SPM-TD61318MAK-N	4231	SPM-TD61318MBK-N	4239
			SPM-TD11318MAK-N	4234	SPM-TD11318MBK-N	423C
			SPM-TD51318MAK-N	4235	SPM-TD51318MBK-N	423D
		2200	SPM-TD61322MAK-N	4251	SPM-TD61322MBK-N	4259
			SPM-TD11322MAK-N	4254	SPM-TD11322MBK-N	425C
			SPM-TD51322MAK-N	4255	SPM-TD51322MBK-N	425D
		2900	SPM-TD61829MAK-N	4261	SPM-TD61829MBK-N	4269
			SPM-TD11829MAK-N	4264	SPM-TD11829MBK-N	426C
			SPM-TD51829MAK-N	4265	SPM-TD51829MBK-N	426D
		4400	SPM-TD61844MAK-N	4271	SPM-TD61844MBK-N	4279
			SPM-TD11844MAK-N	4274	SPM-TD11844MBK-N	427C
			SPM-TD51844MAK-N	4275	SPM-TD51844MBK-N	427D
		5500	SPM-TD61855MAK-N	4281	SPM-TD61855MBK-N	4289
			SPM-TD11855MAK-N	4284	SPM-TD11855MBK-N	428C
			SPM-TD51855MAK-N	4285	SPM-TD51855MBK-N	428D
		7500	SPM-TD61875MAK-N	4291	SPM-TD61875MBK-N	4299
			SPM-TD11875MAK-N	4294	SPM-TD11875MBK-N	429C
			SPM-TD51875MAK-N	4295	SPM-TD51875MBK-N	429D

4. Small inertia series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
Small inertia series	220V	200	SPM-SC60602LAK-M	1111	SPM-SC60602LBK-M	1119
			SPM-SC10602LAK-M	1114	SPM-SC10602LBK-M	111C
			SPM-SC50602LAK-M	1115	SPM-SC50602LBK-M	111D
		400	SPM-SC60604LAK-M	1121	SPM-SC60604LBK-M	1129
			SPM-SC10604LAK-M	1124	SPM-SC10604LBK-M	112C

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
			SPM-SC50604LAK-M	1125	SPM-SC50604LBK-M	112D
		750	SPM-SC60807LAK-M	1131	SPM-SC60807LBK-M	1139
			SPM-SC10807LAK-M	1134	SPM-SC10807LBK-M	113C
			SPM-SC50807LAK-M	1135	SPM-SC50807LBK-M	113D
		1000	SPM-SD61310LAK-M	1141	SPM-SD61310LBK-M	1149
			SPM-SD11310LAK-M	1144	SPM-SD11310LBK-M	114C
			SPM-SD51310LAK-M	1145	SPM-SD51310LBK-M	114D
			SPM-SE61310LAK-M	1151	SPM-SE61310LBK-M	1159
			SPM-SE11310LAK-M	1154	SPM-SE11310LBK-M	115C
			SPM-SE51310LAK-M	1155	SPM-SE51310LBK-M	115D
		1500	SPM-SD61313LAK-M	1161	SPM-SD61313LBK-M	1169
			SPM-SD11313LAK-M	1164	SPM-SD11313LBK-M	116C
			SPM-SD51313LAK-M	1165	SPM-SD51313LBK-M	116D

5. High inertia series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
High inertia series	220V	400	SPM-SC60604HAK-K	1311	SPM-SC60604HBK-K	1319
			SPM-SC10604HAK-K	1314	SPM-SC10604HBK-K	131C
			SPM-SC50604HAK-K	1315	SPM-SC50604HBK-K	131D
		750	SPM-SC60807HAK-K	1321	SPM-SC60807HBK-K	1329
			SPM-SC10807HAK-K	1324	SPM-SC10807HBK-K	132C
			SPM-SC50807HAK-K	1325	SPM-SC50807HBK-K	132D

Appendix 2 Modbus Communication Protocol

1. Networking mode

The drive has two networking modes: single host/multiple slaves mode and single host/single slave mode.

2. Interface mode

RS485 interface: asynchronous and half-duplex. Default: 1-8-N-2, 9600bps, RTU. Refer to Group P15 function code for the parameter setting.

3. Communication mode

(1) The communication protocol of the drive is Modbus protocol, which does not only support common register reading and writing, but also expands some commands to manage the drive function codes.

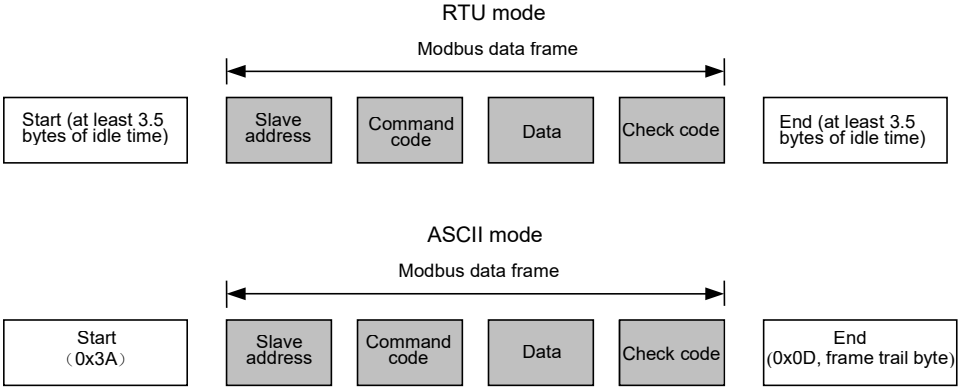
(2) The drive is slave, adopting host/salve mode P2P communication. The drive will not response to the command sent by the host via broadcast address.

(3) In multiple units communication or long-distance communication, parallel connecting the resistance of 100 to 120 ohms with the positive end and negative end of the communication signal line of the host station can enhance its immunity to interference.

(4) M6 provides RS485 interface only. If the communication interface of the external equipment is RS232, the RS232/RS485 conversion equipment is needed.

4. Protocol format

Modbus protocol supports both RTU mode and ASCII mode, and the corresponding frame format is as shown in Attached Fig.1-1.



Attached Fig.1-1 Modbus protocol format

Modbus adopts the ”Big Endian” encoding mode, which sends the high bytes first and then sends the low bytes.

Modbus data frame is RTU mode. The minimum idle time value between frames under the internal convention is as follows: the idle time that the frame head and frame trail pass the bus shall not be less than that of 3.5 bytes to define the frame. The data verification adopts CRC-16 and the verify checksum includes the whole information. The high and low bytes of the checksum can only be sent after their exchanging. Please refer to the example after the protocol for the detailed CRC verification. Please note: At least 3.5 characters of the BUS idle time shall be kept between the frames and it doesn't need to accumulate the start and end idle time.

In the sample below, it is used to read the parameters of the internal register 0101 (P01.01) of No.5 slave in the RTU mode.

Request frame:

Slave address	Command code	Data				Check code	
		Register address		Number of bytes read			
0x05	0x03	0x01	0x01	0x00	0x01	0xD5	0xB2

Response frame:

Slave address	Command code	Data			Check code	
		Number of bytes responded	Register content			
0x05	0x03	0x02	0x13	0x88	0x44	0xD2

In the above table, the check code is the CRC verification value. Please refer to the following text for the computing method of the CRC verification.

5. Protocol functions

The main function of Modbus is reading/writing parameters. Different command codes determine different operation requests. The Modbus protocol of M6 drive supports the operations as shown in the following table:

Command code	Meaning
0x03	Reading the drive parameters, including function code parameters, control parameters and status parameters.
0x06	Change the single 16-byte function code parameter or control parameter of the drive, and whether the parameter value is saved is determined by P15.04 after power off.
0x10	Change multiple function code or control parameters of the drive, and whether the parameter value is saved is determined by P15.04 after power off.
0x41	Change the single 16-byte function code parameter or control parameter of the drive, and the parameter value will be saved after power off.
0x43	Change multiple function code or control parameters of the drive, and the parameter values will be saved after power off.

All the function code parameters, control parameters and status parameters of the drive are mapped as the read/write registers of Modbus. The read/write features and range of the function code parameter follow the drive user manual. The group number of the drive function code is mapped as the high byte of the register address and the group internal index (i.e. the serial number of the parameter in the group) is mapped as the low byte of the register address. The control parameter and status parameter of the drive are virtual function code groups of the drive. The correspondence between the group numbers of the function codes and the high bytes of the register address mapped are as shown in the following table.

Drive parameter group	High byte of the address mapped	Drive parameter group	High byte of the address mapped
Group P00	0x00	Group P12	0x0C
Group P01	0x01	Group P13	0x0D
Group P02	0x02	Group P14	0x0E
Group P03	0x03	Group P15	0x0F
Group P04	0x04	Group P16	0x10
Group P05	0x05	Group P17	0x11
Group P06	0x06	Group P18	0x12
Group P07	0x07	Group P19	0x13
Group P08	0x08	Group P20	0x14
Group P09	0x09	Control parameter group	0x64
Group P10	0x0A	Status parameter group	0x65
Group P11	0x0B	……	……

For example, the register address of the function code parameter P03.02 of the drive is 0x0302, and the register address of the first control parameter (control word 1) is 0x6400.

As the format of the whole data frame has been detailed in the above text, the following text will focus on the format and meanings of the “command code” and “data” of Modbus protocol. These two parts constitute the Modbus application layer protocol data unit. Any reference to application layer protocol data unit to below refers to such two parts. The following introduction to the frame format is based on RTU mode. For the ASCII mode, the length of the application-layer protocol data unit shall be doubled.

(1) Read the drive parameters

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Start register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x000A

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x03
Number of bytes read	1	2 * Number of registers
Content read	2 * Number of registers	Parameter value

If the operation fails, it will return to the abnormal response frame. The abnormal response frame includes the error code and exception code. In which, the error code = (command code + 0x80), and the exception code indicates the error cause.

Abnormal response frame format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Error code	1	(Command code + 0x80)
Exception code	1	

The exception codes and their meanings are as follows:

Exception code	Meaning
0x01	Invalid command code
0x02	Invalid register address.
0x03	Data error (the data is not within the upper/lower range).
0x04	Slave operation failure (including the error caused by that the data is within the upper/lower range, but it is invalid).
0x05	The command is valid and in process (It is mainly used to save the data into the nonvolatile memory cell).
0x06	The salve is busy, please try again later. It is mainly used to save the data into the nonvolatile memory cell.
0x16	Operation not supported (mainly refer to the control parameter and status parameter, for example, do not support reading the property, leave-factory value and upper/lower limit)
0x17	The number of registers in the request frame is wrong (for example, when the operation is 32-byte, the number of bytes is odd).
0x18	Information frame error (including information length error and verification error).
0x20	Parameters cannot be changed.
0x21	Parameters cannot be changed during the drive running.
0x22	Password required for parameters.

(2) Change the single 16-byte function code parameter and status parameter of the drive, and whether the parameter value is saved is determined by P15.04 after power off.

When this command is used, whether the rewritten parameter value is saved or not is set by P15.04 upon power on after power off.

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06
Register address	2	0x0000~0xFFFF

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Register content	2	0x0000~0xFFFF

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF

If the operation is failed, it will return to the abnormal response frame and its format is as shown above.

(3) Change multiple function code parameters and control parameters of the drive, and whether the parameter value is saved is determined by P15.04 after power off. When this command is used, whether the rewritten parameter value is saved or not is set by P15.04 upon power on after power off.

The application-layer protocol data units are as follows.

Request format:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x10
Start register address	2	0x0000~0xFFFF
Number of registers in operation	2	0x0001~0x000A
Number of bytes of register content	1	2 * Number of registers in operation
Register content	2 * Number of registers in operation	

If the operation is successful, the response frame is as follows:

Application-layer protocol data unit	Data length (number of bytes)	Value or range
Command code	1	0x10
Start register address	2	0x0000~0xFFFF
Number of registers in operation	2	0x0001~0x000A

This command is used to change the content of the continuous data cells from the start register address. If the operation is failed, it will return to the abnormal response frame and its format is as shown above.

(4) Change single 16-byte function code parameters and status parameters of the drive, and the parameter values will be saved after power off. The command code 0x41 is used to change the single 16-byte function code parameters or control parameters of the drive, and store the value into the nonvolatile memory cell. Its command format is the same as that of 0x06. The only difference is as follows: when the 0x06 command operation is successful, whether the parameter value is saved after power-off is set by P15.04, and when the 0x41 operation is successful, the parameter value is saved after power-off.

(5) Rewrite multiple drive function code parameters and status parameters, and the parameter values will be saved after power off. The command code 0x43 is used to rewrite multiple drive function code parameters or control parameters, and store them in the non-volatile memory cell. Its command format is the same as that of 0x10. The only difference is as follows: when the 0x10 command operation is successful, whether the parameter

value is saved after power off is set by P15.04, and when the 0x43 operation is successful, the parameter value is saved after power off.

6. Control parameters and status parameters of drive

The control parameters of the drive can realize the start, stop, running speed setting and other functions of the drive. Inquiring the status parameters of the drive can get the parameters like output current, output torque, motor speed, and encoder position, etc.

(1) Control parameters

The control parameters of the drive are as shown in the following table:

Register address	Parameter name	Save upon power off	Remarks
0x6400	Control word 1	No	Refer to its bit definition list
0x6401	Speed reference	No	
0x6402	Auxiliary speed reference	No	Enabled when the auxiliary reference channel is serial port communication and the auxiliary reference is in valid bit (BIT2 of control word 2).
0x6403	Reserved		
0x6404	Reserved		
0x6405	Torque reference	No	In the torque control mode, it is enabled when the torque reference channel is serial port and is in the torque control mode.
0x6406	Virtual DI terminal setting	No	BIT0~BIT9: DI1~DI10, the corresponding selected bit of P03.14 is enabled.
0x6407	Virtual DO terminal setting	No	BIT0~BIT5: DO1~DO6, when P03.15~P03.20=7, the corresponding terminal is enabled.

Note

1. When reading the control parameter, the value returned is the value written in the previous communication;

2. In the control parameters, the maximum length of “speed setting” and “auxiliary speed reference” is 32 bits, and for the others, the length is 16 bits;

3. In the control parameters, for the scaling of each reference, input/output setting range and decimal point, please refer to the corresponding function code parameter.

The bit definition of the control word 1 is as shown in the following table:

Bit	Value	Function	Remarks
BIT2~BIT0	111B	Stop for external fault	Coast to stop and the drive displays external fault
	110B	Stop in mode 1	Coast to stop
	101B	Stop in mode 0	Stop according to the deceleration time set (enabled when the jog is disabled)
	100B	Running command	Start the drive (enabled when the jog is disabled)

Bit	Value	Function	Remarks
	Others	No command	
BIT3	1	Run reversely	Set the running direction when the running command is valid
	0	Run forward	
BIT4	1	Enable acceleration/deceleration	BIT0~BIT3, BIT7~BIT8 of control character 1 will be enabled only when this bit is enabled
	0	Disable acceleration/deceleration	
BIT5	1	The control character 1 of the host device is valid	The select bit for the validity of the control character 1 of the host device
	0	The control character 1 of the host device is disabled	
BIT6	0	Reserved	
BIT7	1	Jog forward	When both jog forward and reversely are valid, it does not run; when both are disabled, the jog will stop.
	0	The “jog forward” is disabled	
BIT8	1	Jog reversely	
	0	The “jog reversely” is disabled	
BIT9	1	The fault reset is valid	The select bit for the validity of the fault reset of the host device
	0	The fault reset is disabled	
BIT15~BIT10	0	Reserved	

Note

1. The control command (control words 1 and 2) of the host device is valid only when the value of “running command channel selection” is “communication command”; the overall word 1 is valid only when its BIT5 is valid; BIT0~BIT3, BIT7~ BIT8 are valid only when its BIT4 is valid.

2. The host device processes the faults and alarms as follows: when the drive meets faults, for control words 1 and 2, only the fault reset command is valid, any other commands from the host device are disabled. That is, the host device shall reset the fault first before sending any other commands. When the alarm occurs, the control character is valid.

(2) Status parameters

Register address	Parameter name	Remarks
0x6500	Status word 1	
0x6501	Speed command	
0x6502	Actual motor speed	
0x6503	Output voltage	
0x6504	Output current	
0x6505	q-axis current	
0x6506	d-axis current	
0x6507	Output torque	

Register address	Parameter name	Remarks
0x6508	Reserved	
0x6509	Bus voltage	
0x650A	Control voltage	
0x650B	Servo drive running status	
0x650C	DI terminal status	BIT0~BIT9: DI1~DI10
0x650D	DO terminal status	BIT0~BIT5: DO1~DO6
0x650E	AI1 input voltage	
0x650F	AI2 input voltage	
0x6510	Input pulse frequency	
0x6511	Input pulse command corresponding speed	
0x6512	Motor encoder counter value	
0x6513	Motor encoder Z pulse position	
0x6514	Number of input pulses	
0x6515	Position reference point position	
0x6516	Position reference	
0x6517	Position feedback	
0x6518	Position error pulse	
0x6519	Position reference point position (PUU units)	
0x651A	Position reference (PUU units)	
0x651B	Position feedback (PUU units)	
0x651C	Position error pulse (PUU units)	
0x651D	Module temperature	
0x651E	Last fault type	
0x651F	Second fault type	
0x6520	First fault type	
0x6521	The bus voltage at the last fault time	
0x6522	V-phase current at the last fault time	
0x6523	W-phase current at the last fault time	
0x6524	The d-axis current reference value at the last fault time	
0x6525	The q-axis current reference value at the last fault time	
0x6526	D-axis current feedback value at the last fault time	
0x6527	Q-axis current feedback value at the last fault time	
0x6528	Speed at the last fault time	
0x6529	Encoder position feedback at the last fault time (PUU units)	
0x652A	DI status at the last fault time	
0x652B	DO status at the last fault time	
0x652C	Drive status at the last fault time	
0x652D	Temperature at the last fault time	
0x652E	Drive operating status word 2	

Note

1. The status parameter does not support the writing operation.

2. In the status parameter, the maximum length of “speed command” and “actual motor speed” is 32 bits, and for the others, the length is 16 bits.

The bit definition of the status word 1 of the drive is as shown in the following table:

Bit	Value	Function	Remarks
BIT0	0	Reserved	
BIT1	1	Drive running	
	0	Drive stop	
BIT2	1	Drive runs reversely	
	0	Drive runs forward	
BIT3	1	Enable serial port reference	
	0	Disable serial port reference	
BIT4	1	Meet the main setting	
	0	Does not meet the main setting	
BIT5	1	Fault	If the value is 1, it means there is a fault. Please refer to BIT15~BIT8 of status word 1 to identify the current fault type.
	0	No fault	
BIT6	1	Alarm	If the value is 1, it means there is an alarm. Please refer to BIT15~BIT8 of status word 1 to identify the current alarm type.
	0	No alarm	
BIT7	0	Reserved	
BIT15~BIT8	0x00~0xFF	Fault or alarm code	0: No fault or alarm; Not 0: it means there is a fault or alarm, you need to consider both the status of BIT5 and BIT6 to identify if it is a fault or alarm code. Please refer to P97.15 for the fault and alarm types.

The bit definition of the status word 2 of the drive is as shown in the following table:

Bit	Value	Function	Remarks
BIT1~ BIT0		Drive operating mode: 0: Speed mode 1: Position mode 2: Torque mode	
BIT2	1	Jog operation	
	0	Non-jog operation	
BIT3	1	Homing in progress	
	0	Non-homing operation	
BIT4	1	Inertia identification in progress	
	0	Non-inertia identification	
Other		Reserved	

7. Expand access mode

The standard protocol only supports the register of 16 bits, and the above description is also based on the register of 16 bits. The parameters of M6 series drive include both 16 bits (single character) and 32 bits (double characters). So, the data of both lengths shall be considered when reading/writing the parameters.

There are two modes in which the drive parameters are accessed to, including 16-bit mode and 32-bit mode, that is, the user can read/write the parameters with 16 bits or 32 bits as the unit separately. The 16-bit mode and 32-bit mode are identified through the “start register address” of the request frame. If the highest byte of the address is 0, the reading/writing shall be done in the 16-bit mode, otherwise, they shall be done in the 32-bit mode. As shown in the following table.

Start register address		Access mode	Remarks
BIT15	BIT14~BIT0		
0	Actual address of the start parameter	16-bit	
1	Actual address of the start parameter	32-bit	

When accessing to the parameters in the 32-bit mode, as the unit of the register of the request frame is 16 bits and each parameter of 32 bits needs two registers of 16 bits, the “number of registers” shall be set correctly. The “number of registers” in the request frame shall be twice of that of the parameters to be accessed to, otherwise, it will return to the abnormal response frame.

(1) Reading operation

The 16-bit access mode is as described above.

For the 32-bit access mode, the unit of the data returned is 32 bits.

As shown in the following table, reading 4 continuous function codes with P01.01 as the start address (the slave address is 5).

Request frame:

Bytes	Value		Description
	16-bit mode	32-bit mode	
0	0x05	0x05	Slave address
1	0x03	0x03	Command code
2~3	0x0101	0x8101	Start address (in the 32-bit mode, the highest byte of the start address is 1)
4~5	0x0004	0x0008	Number of registers (in the 32-bit mode, the number of registers is twice of that of parameters)
6~7	Check code	Check code	CRC verification

If the operation is successful, the response frame is as follows:

Bytes	Value		Description
	16-bit mode	32-bit mode	
0	0x05	0x05	Slave address

Bytes	Value		Description
	16-bit mode	32-bit mode	
1	0x03	0x03	Command code
2	0x08	0x16	Number of bytes read
3~4	Value P01.01	Value P01.01	Content read: 16-bit mode: 8 bytes in total 32-bit mode: 16 bytes in total
5~6	Value P01.02		
7~8	Value P01.03	Value P01.02	
9~10	Value P01.04		
11~12	Check code	Value P01.03	
13~14	—		
15~16	—	Value P01.04	
17~18	—		
19~20	—	Check code	

If the operation is failed, it will return to the abnormal response frame and its format is as shown above.

There are two types of drive parameters: one type of parameters adopts the decimal system and the other type is the variables adopting the hexadecimal system. The former is used to indicate the actual variables, such as the current, voltage, speed, power, torque, percentage, etc. which shall consider the positive and negative. Its data type is int or long. The latter is used for the mode selection or the status indication, such as displaying the parameters selection, indicating the running status, etc. which needn't consider the positive and negative. Its data type is unsigned int or unsigned long. The type and the value range of parameters are as shown in the following table:

Type	Number of bits	Value range	Remarks
int	16	-32768~32767	Parameter of type I
long	32	-2147483648~2147483647	
unsigned int	16	0~65535	Parameter of type II
unsigned long	32	0~4294967296	

If the 16-bit access mode is adopted to read the parameter with an actual length of 32 bits, the 16 low bits of this parameter of 32 bits will be captured and returned. This value may be not equal to the original value; it will be detailed in the following text.

If the 32-bit access mode is adopted to read the parameter with an actual length of 16 bits, the 32-bit data returned is the data expanded, that is, the length of the 16-bit parameter is expanded. The principles for the length expansion are as follow: if the highest bit of the 16-bit parameter value is 0, its 16 high bits will be filled with 0; if the highest bit is 1, it needs to judge the type of the parameter, for the parameter of type I, its 16 high bits will be filled with 1, but for the parameter of type II, its 16 high bits will be filled with 0.

If the data length is the same, that is, reading the 16-bit parameter in the 16-bit mode or reading the 32-bit parameter in the 32-bit mode, there is no need to expand or cut the length, the original value will be returned.

Assuming the parameter types of P01.01~P01.07 are as follows:

The value of P01.01 is 4500 (16-bit parameter of type I, 0x1194);

The value of P01.02 is 65036 (32-bit parameter of type I, 0x0000FE0C);

The value of P01.03 is -500 (16-bit parameter of type I, 0xFE0C);

The value of P01.04 is 5000 (32-bit parameter of type I, 0x00001388);

The value of P01.05 is 100000 (32-bit parameter of type I, 0x000186A0);

The value of P01.06 is -100000 (32-bit parameter of type I, 0x FFFE7960);

The value of P01.07 is 0x FFFF (16-bit parameter of type II).

The values returned in the reading operation are as shown in the following table:

Register address	Access mode	Value returned	Description
P01.01	16-bit	0x1194	The actual value is returned.
	32-bit	0x00001194	The 16 high bits are filled with 0 and the actual value is returned.
P01.02	16-bit	0xFE0C	The 16 low bits are captured and the value returned is -500, which is different from the actual value.
	32-bit	0x0000FE0C	The actual value is returned.
P01.03	16-bit	0xFE0C	The actual value is returned.
	32-bit	0xFFFFFE0C	The 16 high bits are filled with 1 and the actual value is returned.
P01.04	16-bit	0x1388	The 16 low bits are captured and the actual value is returned .
	32-bit	0x00001388	The actual value is returned.
P01.05	16-bit	0x86A0	The 16 low bits are captured and the value returned is -31072, which is different from the actual value.
	32-bit	0x000186A0	The actual value is returned.
P01.06	16-bit	0x 7960	The 16 low bits are captured and the value returned is 31072, which is different from the actual value.
	32-bit	0x FFFE7960	The actual value is returned.
P01.07	16-bit	0x FFFF	
	32-bit	0x0000FFFF	Parameter of type II, the 16 high bits are filled with 0.

As shown in the above table, when reading the parameter with an actual length of 32 bits in the 16-bit mode, the value returned may not be equal to the actual value. Therefore, please note: the reading operation of the 16-bit mode is only applicable to parameters with the current value range from -32768 to 32767, and the reading operation of other parameters shall adopt the 32-bit mode.

(2) Writing operation

1) Command codes 0x06 and 0x41

Both of these command codes supports changing the single parameter of 16 bits and do not support the 32-bit access mode. If the highest bit of the start register address in the request frame is 1, it will return to the abnormal information frame, indicating that the address is wrong.

Note:

1. The writing operation of the 16-bit mode is only applicable to the parameter of type I with the current value range from -32768 to 32767 and the parameter of type II with the current value range from 0 to 0xFFFF.

2. For the parameter of type I, when these two types of commands are used to write the value of 16 bits into the parameter with an actual length of 32 bits, the actual written value is the expanded value. The principles for the length expansion are as follows: expanding according to the highest bit of the 16-bit parameter value to be written, if the highest bit is 1, the 16 high bits will be filled with 0xFFFF, otherwise, they will be filled with 0x0000. If the expanded value is within the value range of the parameter, the value is valid and it is allowed to change the parameter, then the value can be written successfully. There is no need to expand the parameter of type II.

For example: assuming that the values of function codes P01.01 and P01.02 are 32-bit date and 16-bit data respectively and they are both parameters of type I, when the writing operation on them is successful, the data written are as shown in the following table.

Register address	Value to be written	Actual written value	Description
P01.01	0x1194	0x00001194	The 16 high bits is filled with 0x0000.
	0xFE0C	0xFFFFFE0C	The 16 high bits is filled with 0xFFFF.
P01.02	0x1194	0x1194	
	0xFE0C	0xFE0C	

2) Command codes 0x10 and 0x43

These two types of command codes can be used to change multiple function code parameters or control parameters and they support both 16-bit and 32-bit access modes.

The 16-bit access mode is as described above.

For the 32-bit access mode, the unit of the data to be written is 32 bits.

As shown in the following table, changing 4 continuous function codes with P02.00 as the start address (the slave address is 5).

Request frame:

Bytes	Value		Description
	16-bit mode	32-bit mode	
0	0x05	0x05	Slave address
1	0x10/0x43	0x10/0x43	Command code
2~3	0x0200	0x8200	Start address (in the 32-bit mode, the highest byte of the start address is 1)
4~5	0x0004	0x0008	Number of registers (in the 32-bit mode, the number of registers is twice of that of parameters)
6	0x08	0x16	Number of bytes of register content
7~8	Value P02.00	Value P02.00	Content to be written: 16-bit operation: 8 bytes in total 32-bit operation: 16 bytes in total
9~10	Value P02.01		
11~12	Value P02.02	Value P02.01	
13~14	Value P02.03		
15~16	Check code	Value P02.02	

Bytes	Value		Description
	16-bit mode	32-bit mode	
17~18	—		
19~20	—	Value P02.03	
21~22	—		
23~24	—	Check code	

If the operation is successful, the response frame is as follows:

Bytes	Value		Description
	16-bit mode	32-bit mode	
0	0x05	0x05	Slave address
1	0x10/0x43	0x10/0x43	Command code
2~3	0x0200	0x8200	Start address (in the 32-bit mode, the highest byte of the start address is 1)
4~5	0x0004	0x0008	Number of registers (in the 32-bit mode, the number of registers is twice of that of parameters)
6~7	Check code	Check code	CRC verification

If the operation is failed, it will return to the abnormal response frame and its format is as shown above.

Note

1. The writing operation of the 16-bit mode is only applicable to the parameter of type I with the writing range from -32768 to 32767 and the parameter of type II with the writing range from 0 to 0xFFFF. The writing operation of other parameters shall adopt the 32-bit mode.

2. For the parameter of type I, when the value of 16 bits is written into the parameter with an actual length of 32 bits in the 16-bit mode, the actual written value is the expanded value. The principles for the length expansion are as follow: expanding according to the highest bit of the 16-bit parameter value to be written, if the highest bit is 1, the 16 high bits will be filled with 0xFFFF, otherwise, they will be filled with 0x0000. If the expanded value is within the value range of the parameter, the value is valid and it is allowed to change the parameter, then the value can be written successfully. There is no need to expand the parameter of type II and they are independent of the values of the 16 high bits.

3. In the 32-bit access mode, no matter the actual length is 16 bits or 32 bits, as long as the value to be written is within the value range of the parameter, the value is valid and it is allowed to change the parameter, then the value can be written successfully.

4. To change the parameter with an actual length of 16 bits in the 16-bit mode, please refer to the description above.

8. Cautions

(1)For the command codes 0x10 and 0x43, when writing several function code parameters of the drive continually, if the writing operation of any function code is invalid (for example, the parameter value is invalid, the parameter cannot be changed, etc.), the error message will be returned and none of the parameters can be changed; when writing several control parameters, if the writing operation of any parameter is invalid (for example, the parameter

value is invalid, the parameter cannot be changed, etc.), the operation will return from the storage address of the first fault, this parameter and its following parameters cannot be changed normally, but the parameters before it can be written normally and the error message will be returned.

(2) When the command codes 0x06 and 0x10 are written, the function code P15.04 can be used to set whether the parameters are saved after power off.

9. CRC verification

For the purpose of improving speed, CRC-16 is often realized through the table. The following is the C language source code for realizing CRC-16. Please note: the final results have exchanged high and low bytes, that is, the result is the CRC checksum to be sent.

```
unsigned short CRC16 （unsigned char *msg, unsigned char length）        /* The function returns the CRC as a unsigned short type */
{
    unsigned char uchCRCHi = 0xFF ;                                     /* high byte of CRC initialized */
    unsigned char uchCRCLo = 0xFF ;                                     /* low byte of CRC initialized */
    unsigned uIndex ;                                                   /* index into CRC lookup table */
    while （length--）                                                  /* pass through message buffer */
    {
        uIndex = uchCRCLo ^ *msg++ ;                                    /* calculate the CRC */
        uchCRCLo = uchCRCHi ^
（crcvalue[uIndex] >>8）;
        uchCRCHi =crcvalue[uIndex]&0xff;
    }
    return （uchCRCHi | uchCRCLo<<8） ;
}
/* Table of CRC values */
const unsigned int  crcvalue[ ] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006,0x8007,0x41C7,
0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC1CF,0x81CE,0x400E,
0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,
0x001B,0xC1DB,0x81DA,0x401A,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,
0x0014,0xC1D4,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3,
0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3,0x81F2,0x4032,
0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4,0x003C,0xC1FC,0x81FD,0x403D,
0x01FF,0xC03F,0x803E,0x41FE,0x01FA,0xC03A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,
0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,
```

0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,
0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060,0x8061,0x41A1,
0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067,0x01A5,0xC065,0x8064,0x41A4,
0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,
0x0069,0xC1A9,0x81A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,
0x01BE,0xC07E,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5,
0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071,0x8070,0x41B0,
0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192,0x0196,0xC056,0x8057,0x4197,
0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C,0x805D,0x419D,0x005F,0xC19F,0x819E,0x405E,
0x005A,0xC19A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,
0x004B,0xC18B,0x818A,0x404A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC04D,0x804C,0x418C,
0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042,0x8043,0x4183,
0x0041,0xC181,0x8180,0x4040}

If the CRC checksum of each byte to be sent is computed on line, it will take a longer time, but it can save the program space occupied by the table. The code for computing CRC online is as follows:

```
unsigned int crc_check（unsigned char *data,unsigned char length）
{
    int i;
    unsigned crc_result=0xffff;
    while（length--）
    {
        crc_result^=*data++;
        for（i=0;i<8;i++）
        {
            if（crc_result&0x01）
            {
            crc_result=（crc_result>>1）^0xa001;
            }
            else
            {
        crc_result=crc_result>>1;
            }
        }
    }
    return （crc_result=（（crc_result&0xff）<<8）|（crc_result>>8））;
}
```

10. Application example

To start No.5 drive and make it rotate forward with a speed of 500.0rpm (expressed as 5000 internally), the command is as follows:

Data frame	Address	Command code	Register address	Number of registers	Register content Number of bytes	Register content	Check code
Request	0x05	0x10	0x6400	0x0002	0x04	0x0034, 0x1388	0x30C5
Response	0x05	0x10	0x6400	0x0002	None	None	0x5F7C

No.5 drive coast to stop:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0036	0x1768
Response	0x05	0x06	0x6400	0x0036	0x1768

No.5 drive jog-forward:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x00B0	0x96CA
Response	0x05	0x06	0x6400	0x00B0	0x96CA

No.5 drive jog-stop:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0130	0x96FA
Response	0x05	0x06	0x6400	0x0130	0x96FA

No.5 drive fault reset:

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x6400	0x0220	0x97C6
Response	0x05	0x06	0x6400	0x0220	0x97C6

Read the running speed of No.5 drive and the response running speed is 500.0rpm (16 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x6502	0x0001	None	0x3A82
Response	0x05	0x03	None	0x02	0x1388	0x44D2

Read the running speed of No.5 drive and the response running speed is 500.0rpm (32 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Checksum
Request	0x05	0x03	0xE502	0x0002	None	0x5343
Response	0x05	0x03	None	0x04	0x00001388	0xB2A5

Change the acceleration time 1 (i.e. function code P06.07) of No.5 drive to be 100ms, which cannot be saved upon power off (16 bits mode).

Data frame	Address	Command code	Register address	Register content	Check code
Request	0x05	0x06	0x0607	0x0064	0x38EC
Response	0x05	0x06	0x0607	0x0064	0x38EC

Change the acceleration time 1 (i.e. function code P06.07) of No.5 drive to be 100ms, which cannot be saved upon power off (32 bits mode).

Data frame	Address	Command code	Register address	Number of registers	Number of bytes of register content	Register content	Check code
Request	0x05	0x10	0x8607	0x0002	0x04	0x00000064	0xECF4
Response	0x05	0x10	0x8607	0x0002	None	None	0xD8C5

Read the output current of No.5 drive and the response output current is 30.0A (16 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x6504	0x0001	None	0xDA83
Response	0x05	0x03	None	0x02	0x012C	0x49C9

Read the output current of No.5 drive and the response output current is 30.0A (32 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0xE504	0x0002	None	0xB342
Response	0x05	0x03	None	0x04	0x0000012C	0xBFBE

Read the deceleration time 1 (i.e. P06.08) of No.5 drive and the response deceleration time is 60ms (16 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x0608	0x0001	None	0x04C4
Response	0x05	0x03	None	0x02	0x003C	0x4995

Read the deceleration time 1 (i.e. P06.08) of No.5 drive and the response deceleration time is 60ms (32 bits mode):

Data frame	Address	Command code	Register address	Number of registers or number of bytes read	Register content	Check code
Request	0x05	0x03	0x8608	0x0002	None	0x6D05
Response	0x05	0x03	None	0x04	0x0000003C	0xBFE2

11. Scaling of drive parameters

(1) Scaling of the speed: 1:10

To make the drive run at 500.0rpm, the main setting shall be 0x1388 (5000).

(2) Scaling of time: 1:1

To make the acceleration time of the drive to be 100ms, the function code shall be set as 0x0064 (100).

(3) Scaling of current: 1:10

If the feedback current of the drive is 0x001E (30), the present current shall be 3.0 A.

(4)The output power is its absolute value.

(5) For other parameters, please refer to the function parameter descriptions.

Appendix 3 Warranty and Service

Shenzhen Megmeet Electrical Co., Ltd. manufactures motor drive products strictly according to the ISO9001:2015 standard. In case of any product abnormalities, please contact the distributor or the headquarter. Our company will provide full technical support for you.

1. Warranty period

The product is warranted for 18 months from the purchase date, however, the warranty date shall not exceed 24 months after the manufacturing date on the nameplate.

2. Warranty scope

During the warranty period, any product abnormalities incurred due to our company can be freely repaired or replaced by our company. In case of the following situations, maintenance fees will also be charged even if the product is still in the warranty period.

(1) The damages are caused by fire, flood, strong lightning strike, etc.

(2) The damages are caused by users' unauthorized modifications.

(3) The product is damaged due to drop or in transmission after the purchase.

(4) The product is damaged because the standard requirements are not obeyed in actual use.

(5) The product is damaged because the user does not follow the instructions of the user manual.

3. After-sales service

(1) If there are specific requirements for drive installation and trial operation, or the working status of the drive is not satisfactory (such as unsatisfactory performance and function), please contact the distributor or Shenzhen Megmeet Electrical Co., Ltd.

(2) In case of any abnormality, contact the distributor or Shenzhen Megmeet Electrical Co., Ltd. immediately for help.

(3) During the warranty period, our company will repair any drive abnormality incurred due to the product manufacturing and design free of charge.

(4) If the product is out of the warranty period, our company can provide paid repairing service according to the customers' needs.

(5) The service change is calculated by actual costs. If there is an agreement, the agreement shall prevail.

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Website: https://www.megmeet.com

Parameter record table

Shenzhen Megmeet Electrical Co., Ltd.

M6 Series Servo Drive Warranty Bill

Customer company:	
Detailed address:	
Postal Code:	Contact:
Tel:	Fax:
Machine model:	
Power:	Machine No.:
Contract No.:	Purchase date:
Service unit:	
Contact :	Tel:
Maintenance personnel:	Tel:
Maintenance date:	
Comment on service: ☐Good ☐Fair ☐So so ☐ Poor Other comment: User's signature: Date:	
Return visit record in Customer Service Center: □Telephone return visit □Letter return visit Others: Signature of the technical support engineer: Date:	

Note: This bill becomes invalid if the user can not be visited.

Shenzhen Megmeet Electrical Co., Ltd.

M6 Series Servo Drive Warranty Bill

Customer company:	
Detailed address:	
Postal Code:	Contact :
Tel:	Fax:
Machine model:	
Power:	Machine No.:
Contract No.:	Purchase date:
Service unit:	
Contact :	Tel:
Maintenance personnel:	Tel:
Maintenance date:	
Comment on service: ☐Good ☐Fair ☐So so ☐ Poor Other comment: User's signature: Date:	
Return visit record in Customer Service Center: □Telephone return visit □Letter return visit Others: Signature of the technical support engineer: Date:	

Note: This bill becomes invalid if the user can not be visited.