M6-N 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-N series servo system of Shenzhen Megmeet Electrical Co., Ltd.

M6-N servo system use 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 EtherCAT communication protocol 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-N 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-N 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, we 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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Chapter 1 M6-N Servo System Selection

1.1 Servo motor and drive model

1.1.1 Servo motor model

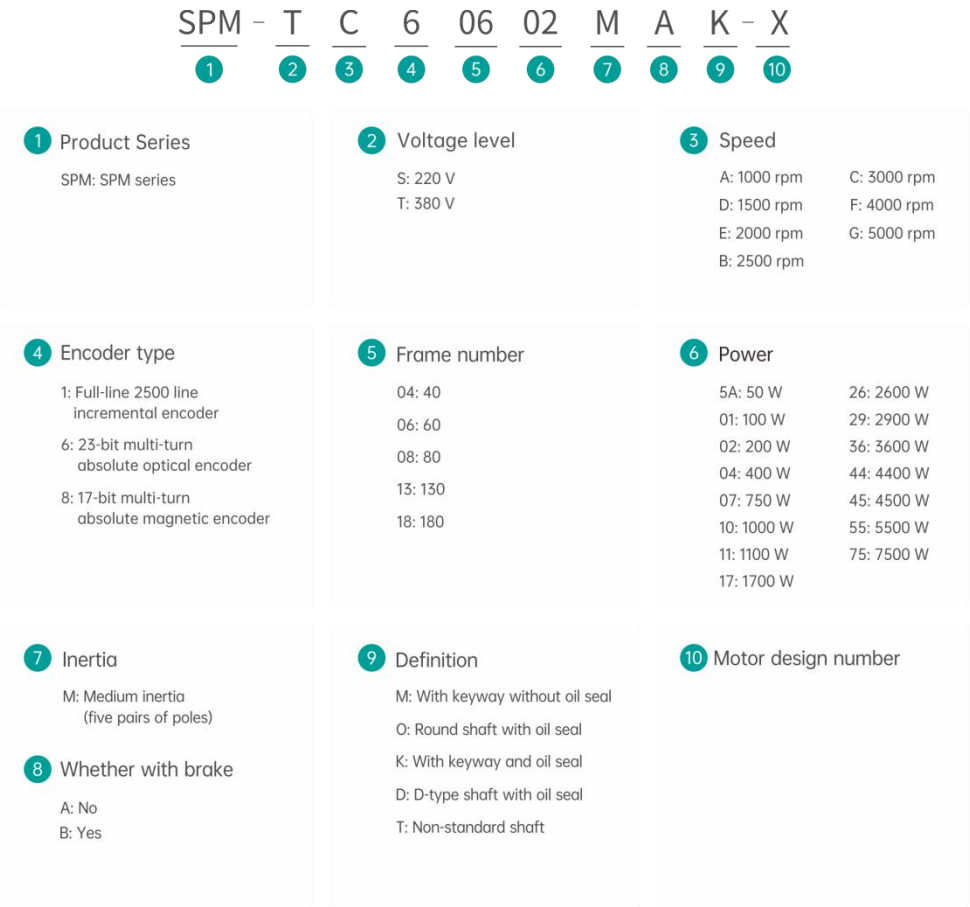


Fig.1-1 Servo motor model

1.1.2 Servo motor nameplate

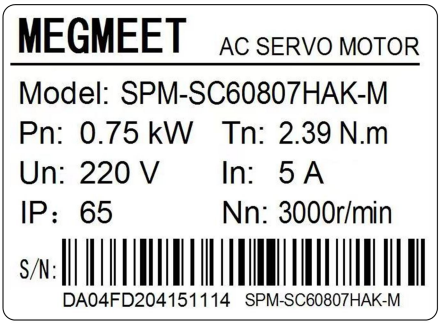


Fig.1-2 Servo motor nameplate

1.1.3 Servo drive model

1 Product series

M6: M6 series servo

2 Drive type

P: General type
N: EtherCAT
M: MECHATROLINK-III
F: PROFINET

3 Voltage level

S: 220 V
T: 380 V

4 Rated current

1R6: 1.6 A	8R4: 8.4 A
2R8: 2.8 A	012: 11.6 A
3R5: 3.5 A	012: 11.9 A
5R4: 5.4 A	017: 16.5 A
5R5: 5.5 A	021: 21 A
7R6: 7.6 A	026: 26 A

5 Hardware version

A: Standard version
B: Small size version

6 Other

X: Software version

7 Software non-standard

MC: Electronic cam
SE: SOE version

Fig.1-3 Servo drive model

1.1.4 Servo drive nameplate

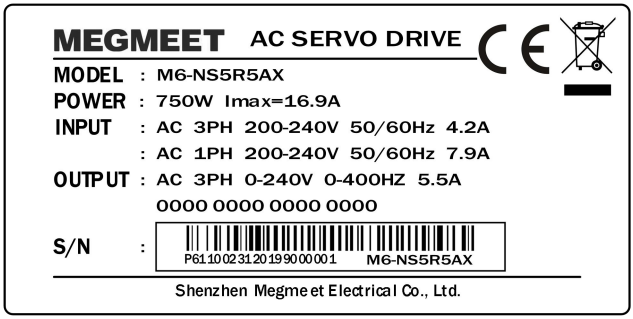
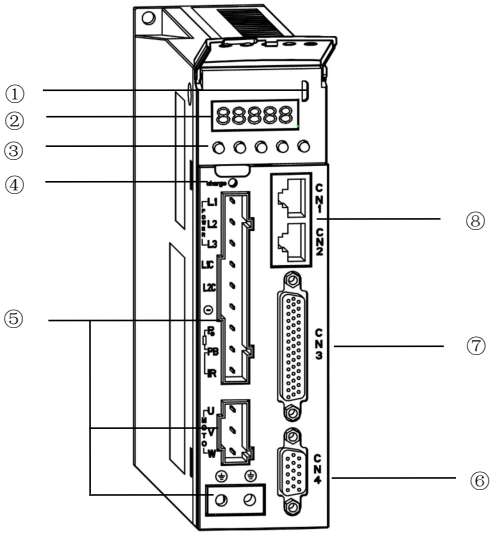


Fig.1-4 M6-N servo drive nameplate

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



No.	Name		Description
①	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
②	LED digital tube		5-digit 8-segment digital tube for status monitoring, parameter display and setting
③	Operation keys		5 keys for parameter adjustment and display status switching, etc.
④	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
⑤	Main	L1, L2, L3	Main power input, 220V or 380V, single-phase or three-phase, please refer to

No.	Name		Description
	circuit terminal	Main power supply input	2.1.1 for specific specifications
		L1C, L2C Control power input	Single-phase 220V control power input
		⊙, $P_{\oplus}$ DC bus terminal	DC bus terminal for common bus connection
		$P_{\oplus}$, PB, IR Brake resistor wiring terminal	Braking resistor wiring terminals, please short-circuit PB and IR for internal braking resistors; connect between $P_{\oplus}$ 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
⑥	CN4 Encoder interface		DB15 female connector for connecting motor encoder
⑦	CN3 Control IO interface		DB44 female connector, control IO interface, used to connect with external IO and host controller
⑧	CN1,CN2 Communication interface		Two RJ45 ports for EtherCAT 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

Voltage	Rated speed (rpm)	Max. Speed (rpm)	Power (W)	Motor model	Rated torque (N·m)	Motor frame	Drive model	Drive SIZE
	2000	4000	1100	SPM-SE61311M**-W	5.39	130	M6-*S7R6AX	B
	2000	4000	1700	SPM-SE61317M**-W	8.34	130	M6-*S012AX	B

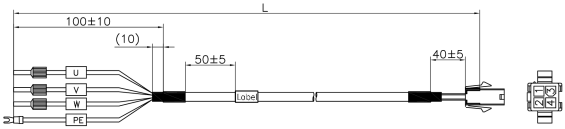
Table 1-2 380 V medium inertia servo motor configuration

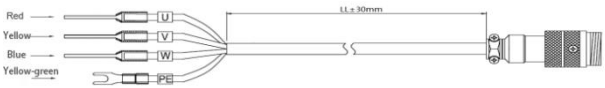
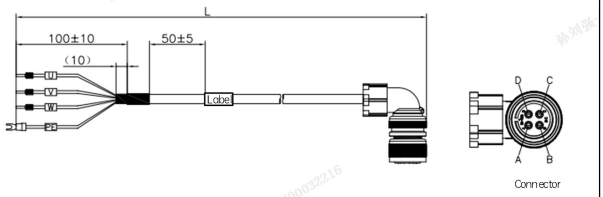
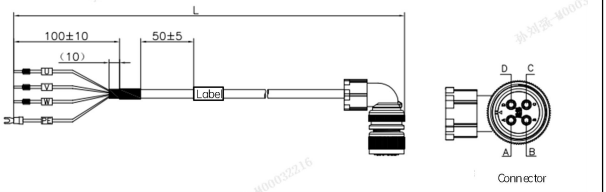
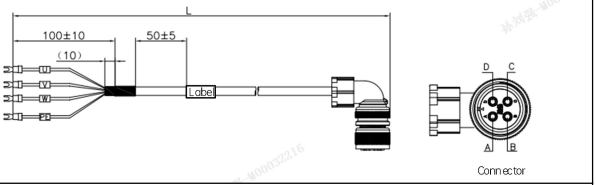
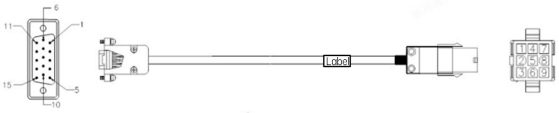
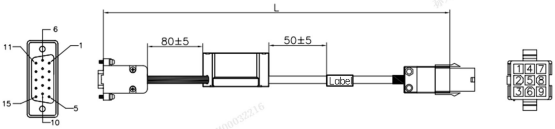
Voltage	Rated speed (rpm)	Max. Speed (rpm)	Power (W)	Motor model	Rated torque (N·m)	Motor frame	Drive model	Drive SIZE
380V	2000	4000	1100	SPM-TE61311M**-W	5.39	130	M6-*T5R4AX	B
	2000	4000	1700	SPM-TE61317M**-W	8.34	130	M6-*T8R4AX	B
	2000	4000	2400	SPM-TE61324M**-W	9.5	130	M6-*T017AX	C
	2000	4000	3000	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
	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	

Cable name	Cable model	Drawing
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	
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	

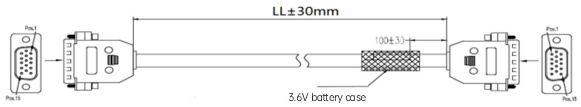
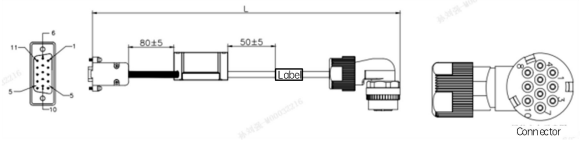
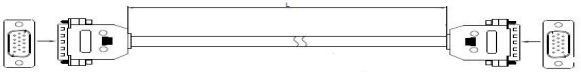
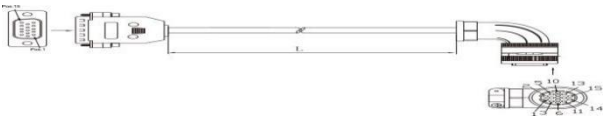
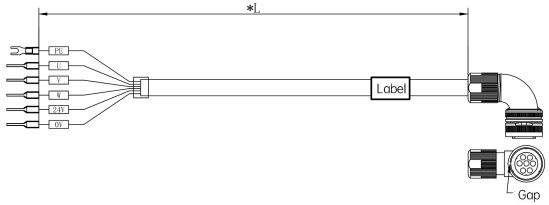
Cable name	Cable model	Drawing
23-bit absolute encoder cable (60/80 frame)	SPL-E01-xx-x	
23-bit absolute encoder cable (130/180 frame medium inertia)	SPL-E02-xx-x	
Incremental encoder cable (60/80 frame)	SPL-E11-xx-x	
Incremental encoder cable (130/180 frame medium inertia)	SPL-E12-xx-x	
Brake cable (60/80 frame)	SPL-B01-xx-x	
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	—
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	NS1R6AX	NS2R8AX	NS5R5AX	NS7R6BX	NS7R6AX	NS012AX
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	NT3R5AX	NT5R4AX	NT8R4AX	NT012AX	NT017AX	NT021AX	NT026AX
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
		Linear motor	Support incremental and absolute encoder
Control IO	DI	Different functions configured according to parameters	4 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	3 general outputs, optocoupler isolation, NPN and PNP output can be selected
			Maximum operating voltage 30V, maximum current 100mA
munic ation functi	EtherCAT		CoE and SoE communication protocol, and compliant with CiA402 profile
	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, EtherCAT mode
	Protection function		Overvoltage, undervoltage, overcurrent, 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, electronic gear switching, etc.		
	Control output	Positioning completed		
	Position reference	EtherCAT		
		Electronic gear	4 sets of electronic gear ratio/on line	
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.		
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.		
	Speed limit function	The speed limit value can be set according to the parameters		

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)

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-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)
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: NS1R6AX, NS2R8AX, NS5R5AX, NS7R6BX)

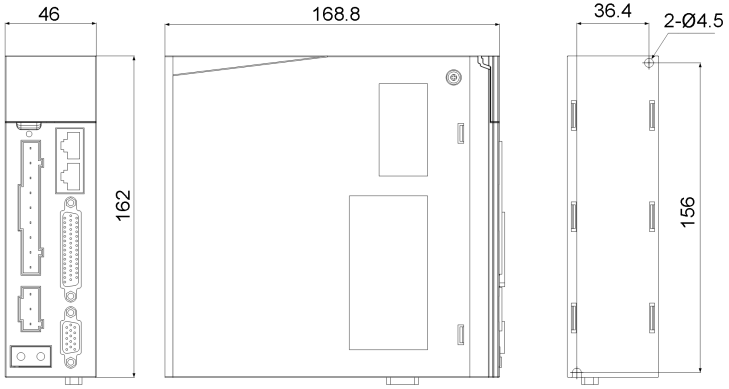


Fig. 2-1 Dimensions for servo drive of SIZE A

2. SIZE B (Applicable drive:NS7R6AX, NS012AX, NT3R5AX, NT5R4AX, NT8R4AX, NT012AX)

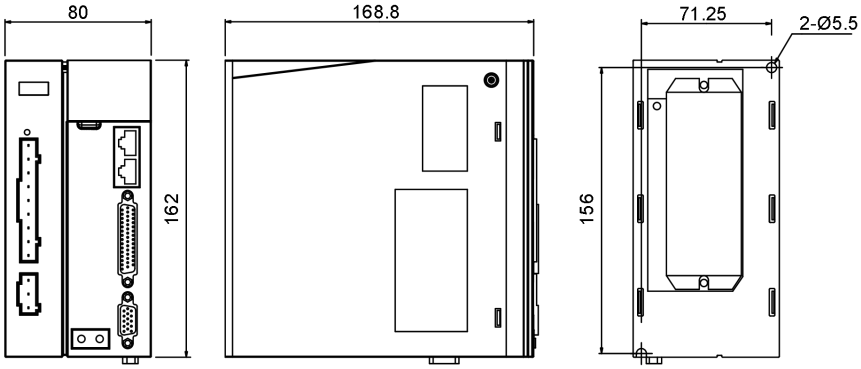


Fig. 2-2 Dimensions for servo drive of SIZE B

3. SIZE C (Applicable drive: NT017AX, NT021AX, NT026AX)

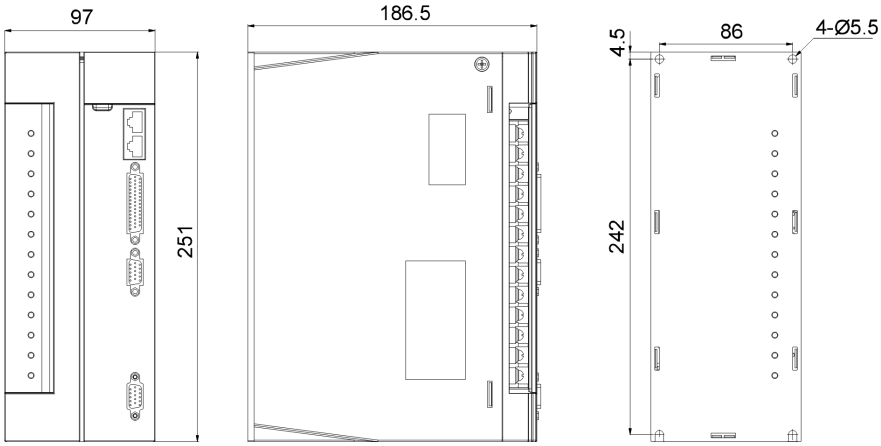


Fig. 2-3 Dimensions for servo drive of SIZE C

2.4 Servo motor dimensions and interface definition

2.4.1 40 frame medium inertia servo motors

2.4.1.1 Dimensions

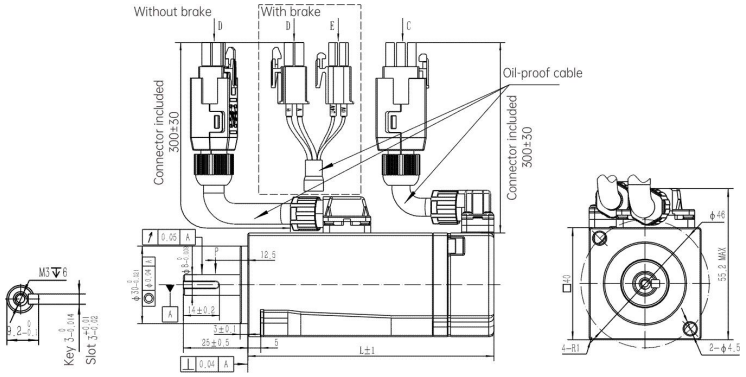


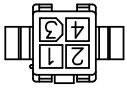
Fig. 2-4 Dimensions for 40 frame medium inertia servo motor

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.

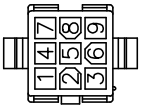
2.4.1.2 Interface definition



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

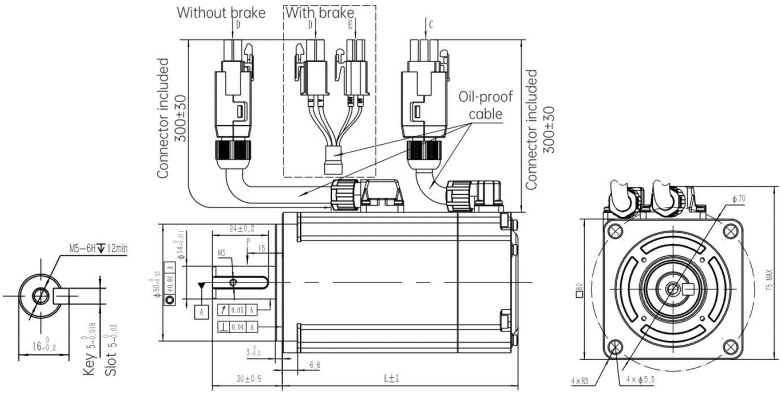


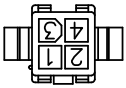
Fig. 2-5 Dimensions for 60 frame medium inertia servo motor

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)

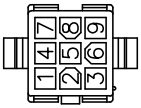
Note: Dimensions in parentheses are dimensions for motors with brakes.

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

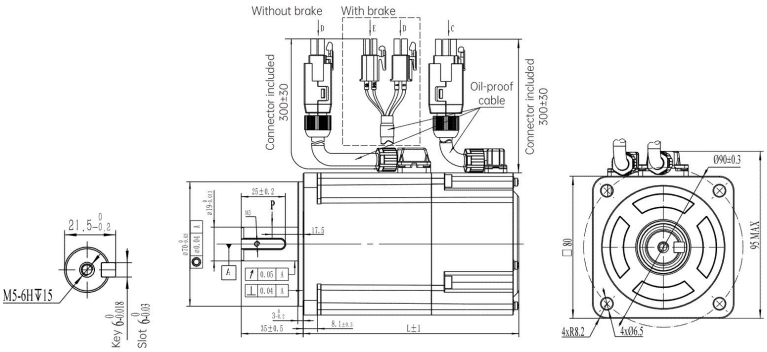


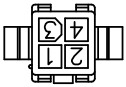
Fig. 2-6 Dimensions for 60 frame medium inertia servo motor

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)

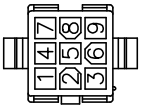
Note: Dimensions in parentheses are dimensions for motors with brakes.

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

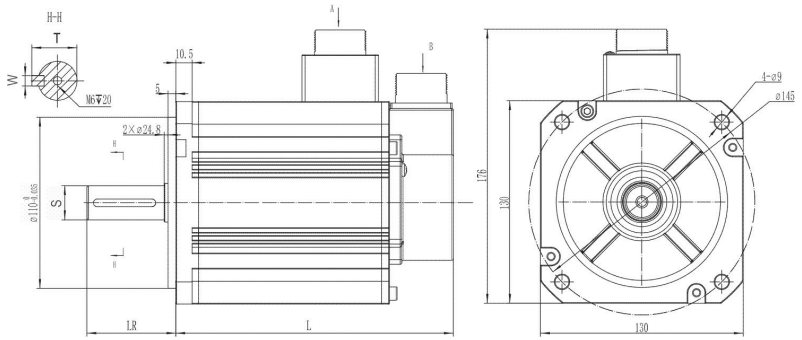


Fig. 2-7 Dimensions for 130 frame medium inertia servo motor

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

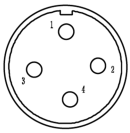
Model	L (mm)	LR (mm)	ϕS (mm)	W (mm)	T (mm)
SPM-SE61311M**-W	135 (187)	57	22	6	24.5
SPM-SE61317M**-W	152.5 (204)	57	22	6	24.5
SPM-SC61317M**-W	135 (187)	57	22	6	24.5
SPM-TE61311M**-W	135 (187)	57	22	6	24.5
SPM-TE61317M**-W	152.5 (204)	57	22	6	24.5
SPM-TE61324M**-W	170 (222)	57	22	6	24.5
SPM-TE61330M**-W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

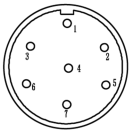
2.4.4.2 Interface definition

Power cable



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

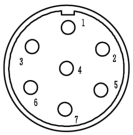
Encoder cable



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

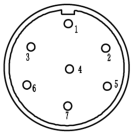
Motor power interface definition (without brake)	
Signal	Pin
PE	1
U	2
V	3
W	4

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

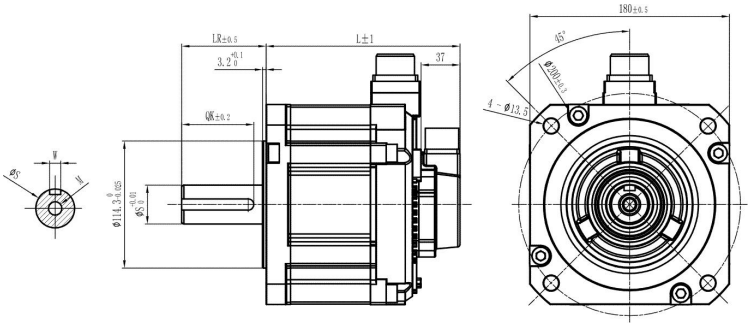


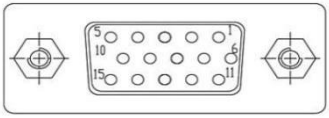
Fig. 2-8 Dimensions for 180 frame medium inertia servo motor

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

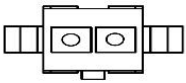


Incremental full-line encoder interface definition		
Pin	Signal	Color
Shell	FG	Shield
1	A+	Blue
2	A-	Blue-Black
3	B+	Green
4	B-	Green-Black
5	Z+	Yellow
6	Z-	Yellow-Black
7	U+	Brown
8	U-	Brown-Black
9	V+	Grey
10	V-	Grey-Black
11	W+	White
12	W-	White-Black
13	5V	Red
14	GND	Black
15	NC	

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-N 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
    - SIZEA model installation requirements

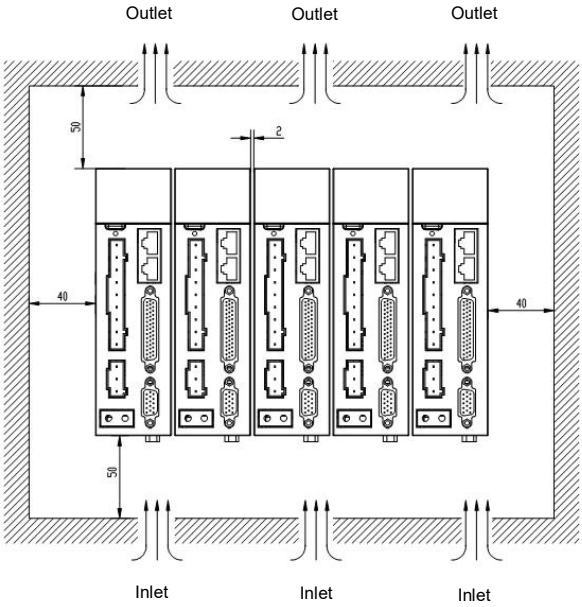


Fig.3-1 SIZE A servo installation diagram

- SIZE B/C model installation requirements

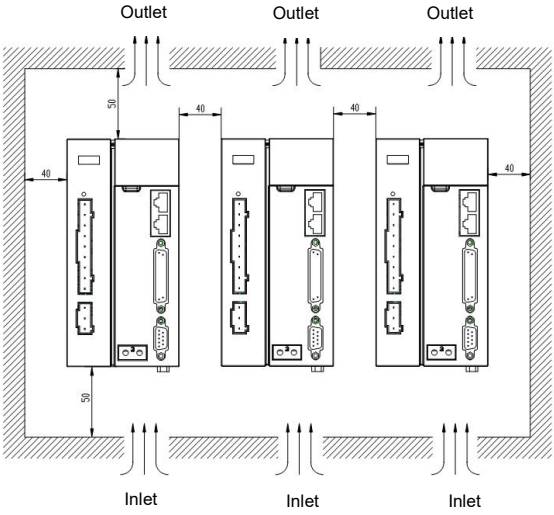


Fig.3-2 SIZE B/C servo installation diagram

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

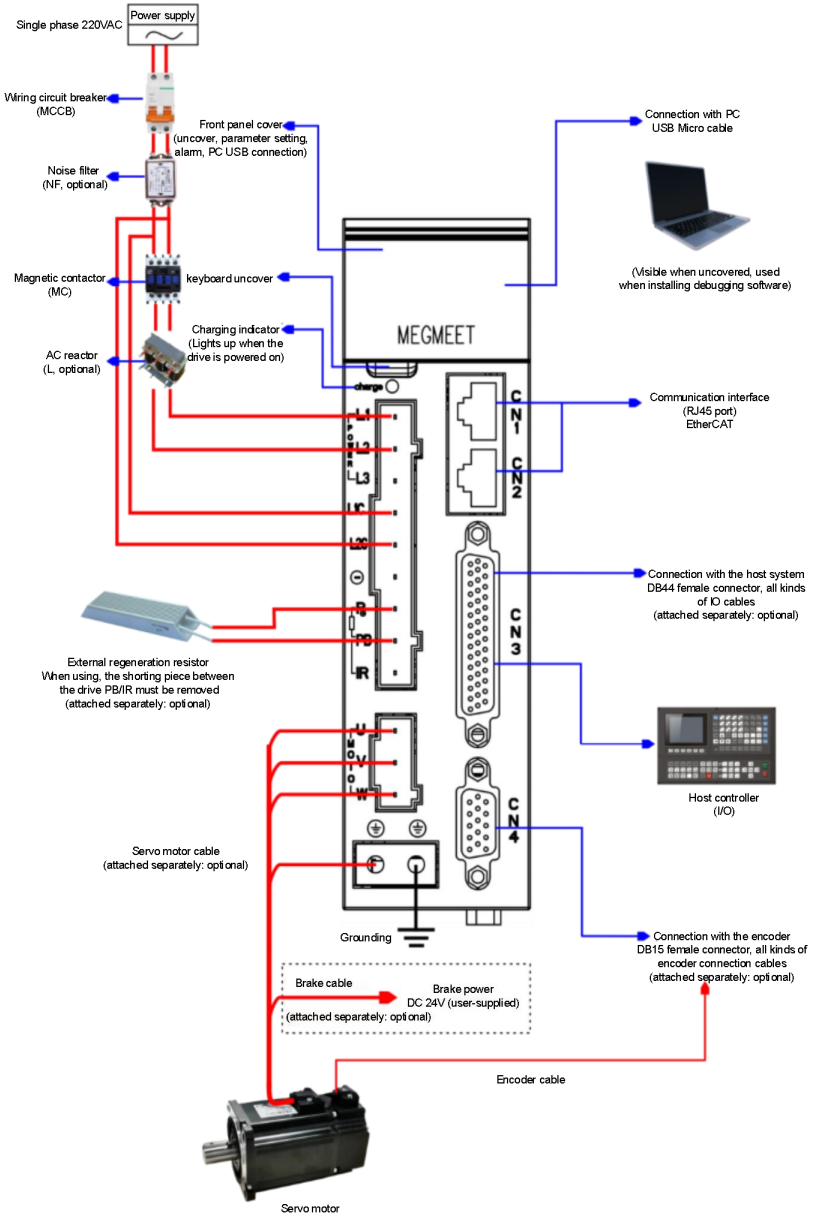


Fig.3-3 Single-phase 220V servo system wiring diagram

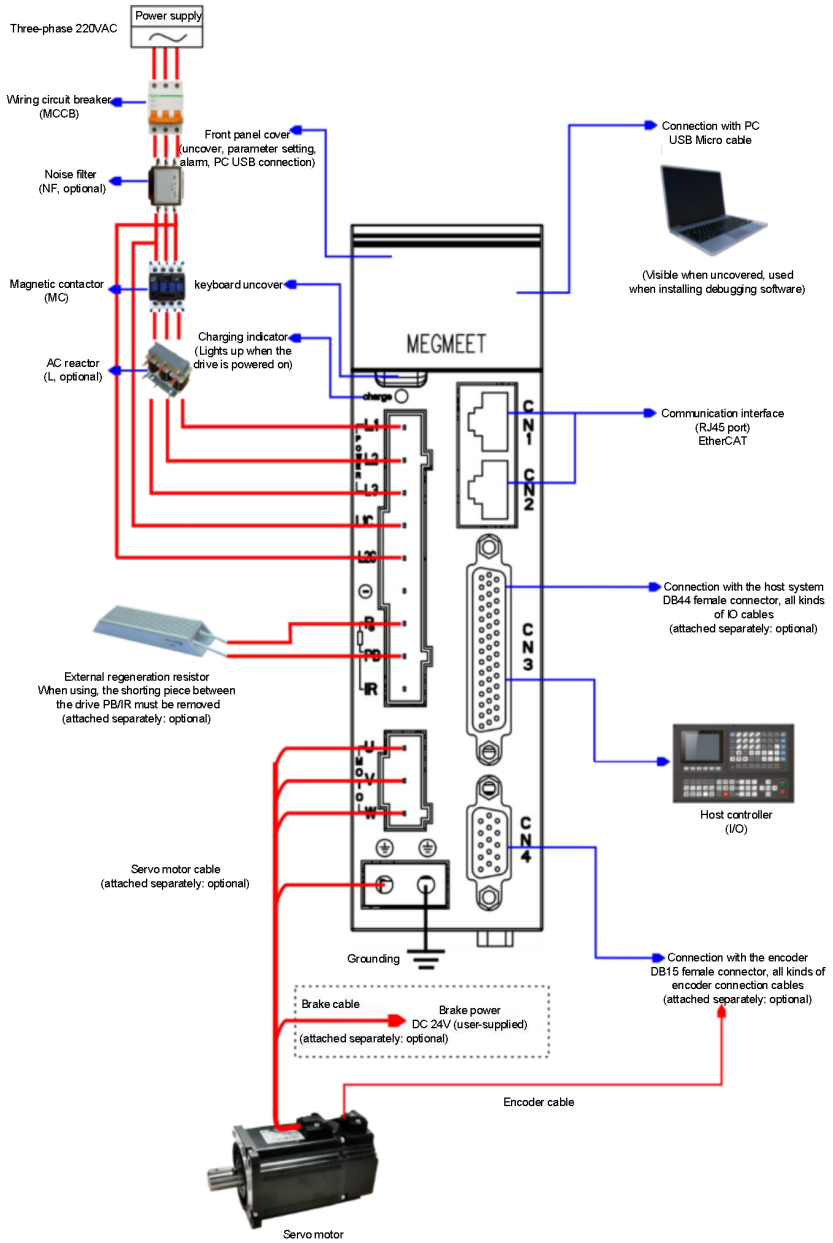


Fig.3-4 Three-phase 220V servo system wiring diagram

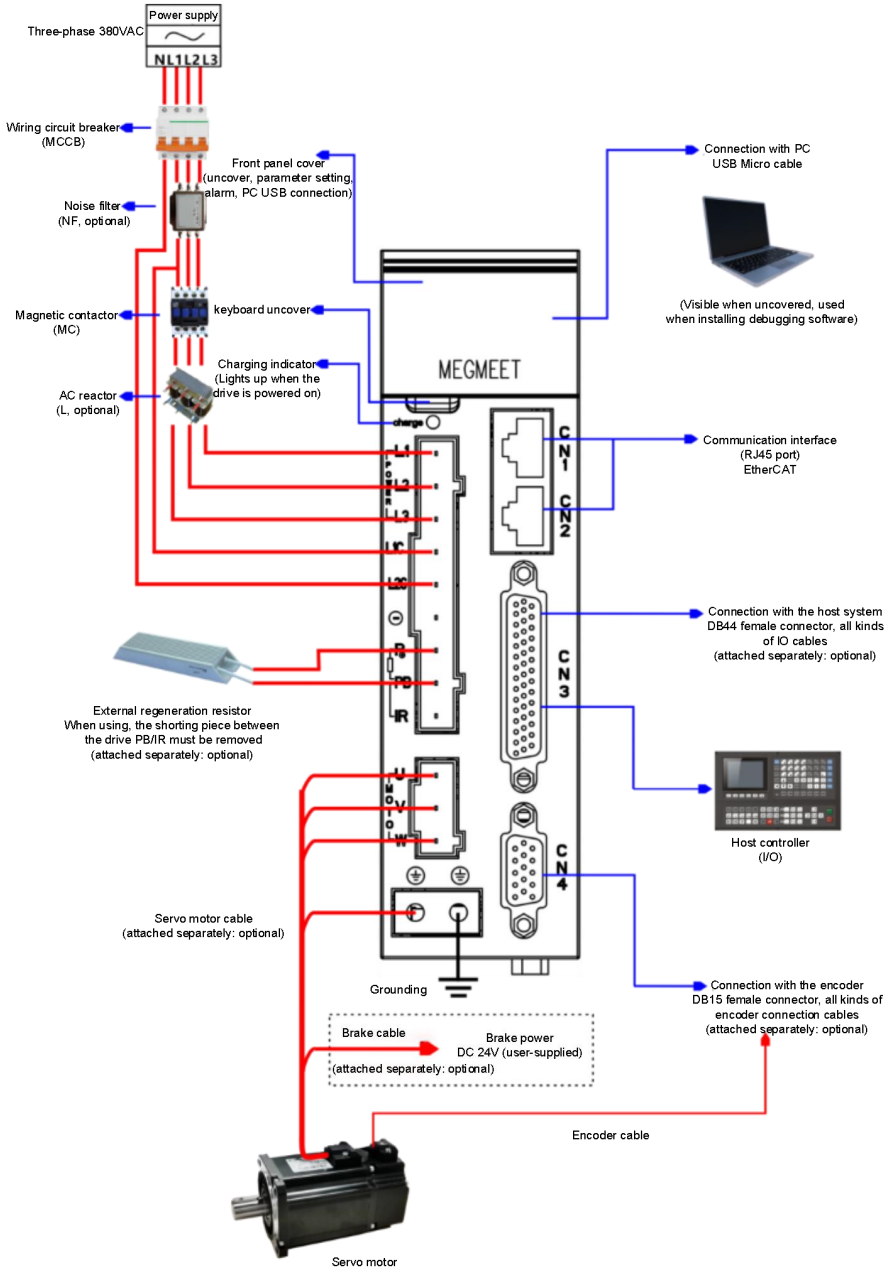


Fig.3-5 Three-phase 380V servo system wiring diagram

Note:

Single-phase 220V system wiring is only applicable to 220V drive models of NS5R5AX and below

Three-phase 220V system wiring is only applicable to 220V drive models of NS5R5AX 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-NS1R6AX	4A	10A
M6-NS2R8AX	10A	15A
M6-NS5R5AX	16A/6A	20A/10A
M6-NS7R6BX	10A	20A
M6-NS7R6AX	10A	25A
M6-NS012AX	16A	35A
M6-NT3R5AX	4A	15A
M6-NT5R4AX	6A	20A
M6-NT8R4AX	10A	20A
M6-NT012AX	16A	35A
M6-NT017AX	20A	50A
M6-NT021AX	25A	70A
M6-NT026AX	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	NS1R6AX	—	—	45	11
	NS2R8AX	—	—	45	22
Single / three-phase 220V	NS5R5AX	50	50	45	31
Three-phase 220V	NS7R6BX	50	50	45	31
	NS7R6AX	25	80	20	47
	NS012AX	25	80	20	64
Three-phase 380V	NT3R5AX	50	80	45	26
	NT5R4AX	50	80	45	53
	NT8R4AX	50	80	35	53
	NT012AX	50	80	35	106
	NT017AX	-	-	25	106
	NT021AX	-	-	25	128
	NT026AX	-	-	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-N series drive main circuit terminals

Terminal name	Terminal symbol	Drive model M6-NxxxxxX	Terminal function
Main circuit power	L1, L2	NS1R6AX, NS2R8AX	Main circuit single-phase 220V power input

Terminal name	Terminal symbol	Drive model M6-NxxxxxX	Terminal function
input terminals	L1, L2, L3	NS5R5AX, NS7R6BX、NS7R6AX, NS012AX	Main circuit three-phase 220V power input
		NT3R5AX, NT5R4AX、NT8R4AX, NT012AX、NT017AX, NT021AX、NT026AX	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	NS1R6AX, NS2R8AX、NT017AX, NT021AX、NT026AX	When the braking capacity is insufficient, please connect an external braking resistor between P-PB. Please refer to the recommended value for specific specifications.
		NS5R5AX, NS7R6BX、NS7R6AX, NS012AX、NT3R5AX, NT5R4AX、NT8R4AX, NT012AX	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-N series drive

Drive model M6-N□□□□□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	NS1R6AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	NS2R8AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	NS5R5AX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
	NS7R6BX	18AWG (0.75mm^2)	20AWG (0.5mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)	18AWG (0.75mm^2)
SIZE B	NS7R6AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
	NS012AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
	NT3R5AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
	NT5R4AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
	NT8R4AX	15AWG	18AWG	15AWG	15AWG	15AWG

Drive model M6-N[][][][][]X		Power supply input L1, L2, L3	Control power input L1C, L2C	Power output U, V, W	Grounding PE	Braking resistor PB, P
		(1.5mm^2)	(0.75mm^2)	(1.5mm^2)	(1.5mm^2)	(1.5mm^2)
	NT012AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
SIZE C	NT017AX	15AWG (1.5mm^2)	20AWG (0.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)	15AWG (1.5mm^2)
	NT021AX	13AWG (2.5mm^2)	20AWG (0.5mm^2)	13AWG (2.5mm^2)	13AWG (2.5mm^2)	13AWG (2.5mm^2)
	NT026AX	13AWG (2.5mm^2)	20AWG (0.5mm^2)	13AWG (2.5mm^2)	13AWG (2.5mm^2)	13AWG (2.5mm^2)

4.2 Servo motor encoder signal connection (CN4)

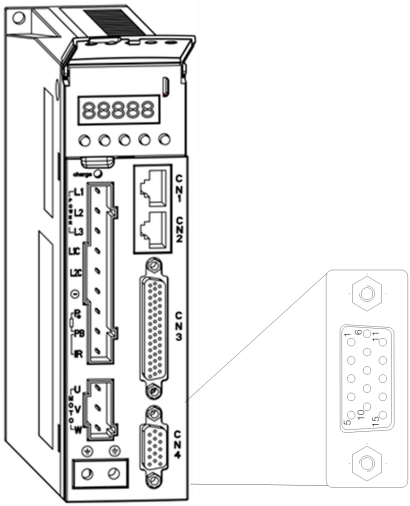


Fig.4-1 Servo motor encoder signal connection diagram

The motor encoder interface of the M6-N servo drive supports two types of encoders: 23-bit multi-turn absolute encoder, incremental encoder. The two encoder interfaces are integrated into one DB15 port, and the interface signals are defined in the Table 4-3 to Table 4-5.

Table 4-3 Multi-turn absolute encoder port definition

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description

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
10	V-	Phase differential V- signal
11	W+	Phase differential W+ signal
12	W-	Phase differential W- signal
14	GND	Power ground

Connection port: CN4, DB15 three row female head		
Pin	Signal name	Signal description
15	5V	Power +5V
Shell	PE	Shield

4.3 Control signal interface definition

The control signal includes digital input and digital output. The signal connection mode is DB44, and the drive end is a DB44 female seat.

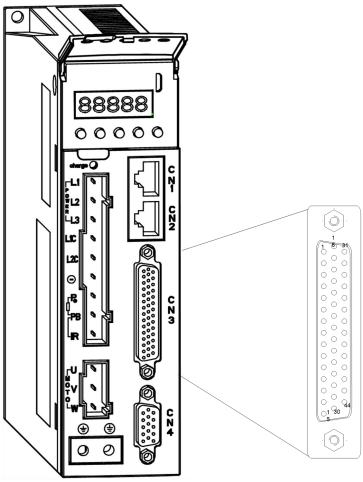


Fig.4-2 Control signal terminal definition diagram

The control signal definitions are shown in the following table

Table 4-6 Control signal definition table

Pin	Signal name	Pin	Signal name	Pin	Signal name
1	-	16	-	31	-
2	DO1+	17	DO1-	32	-
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	-	22	-	37	DI5
8	-	23	DICOM	38	DI6
9	-	24	-	39	DI7
10	-	25	-	40	DI8
11	-	26	-	41	DI9
12	-	27	-	42	-

Pin	Signal name	Pin	Signal name	Pin	Signal name
13	-	28	-	43	-
14	-	29	-	44	-
15	-	30	-		

4.3.1 Digital input and output signals

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

Table 4-7 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
	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	

4.3.1.1 Digital input circuit

M6-N series servo has 9 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-N 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-DI9 are the same.

(1) Dry contact mode

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

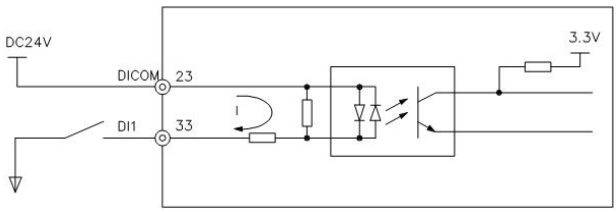


Fig.4-3 DI terminal dry contact connection mode

(2) NPN (drain) mode

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

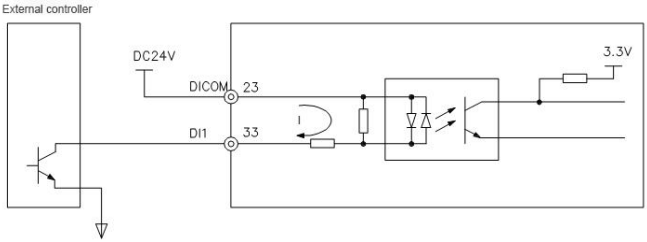


Fig.4-4 DI terminal NPN connection mode

(3) PNP (source) mode

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

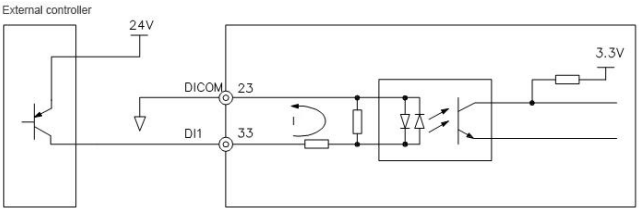


Fig.4-5 DI terminal PNP connection mode

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-DO5 are the same .

(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!

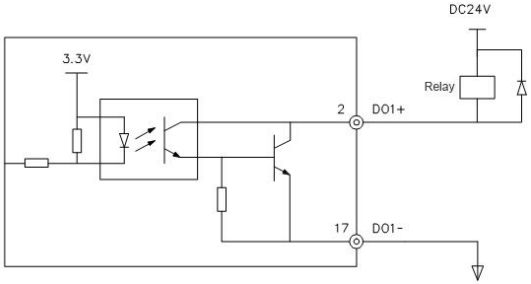


Fig.4-6 DO terminal connection relay wiring mode

(2) Drain (NPN) output

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

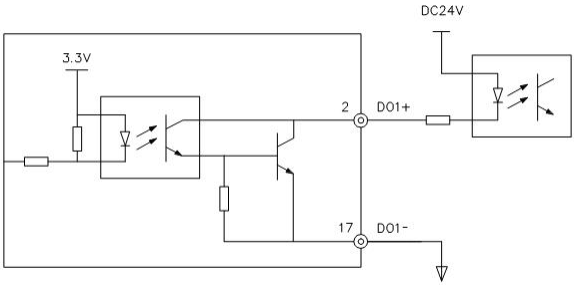


Fig.4-7 DO terminal drain (NPN) output wiring mode

(3) Source (PNP) output

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

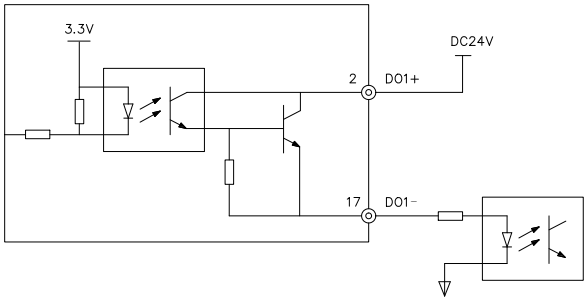


Fig.4-8 DO terminal source (PNP) output wiring mode

4.4 Communication port wiring

M6-N series servo supports EtherCAT communication. The communication ports are CN1 and CN2, where CN1(IN) is connected to the host controller, and CN2(OUT) is connected to the next slave.

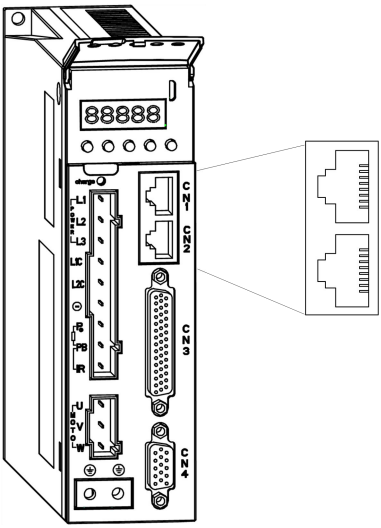


Fig.4-9 Communication interface connection diagram

Table 4-8 Communication port signal definition table

Pin No.	Definition	Description
1	TX+	Data transmit+
2	TX-	Data transmit-
3	RX+	Data receive+
6	RX-	Data receive-
Housing	PE	Shield
4/5/7/8	Undefined	

Chapter 5 Operation Panel

5.1 Interface introduction

M6-N servo drive operating interface consists of five 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.

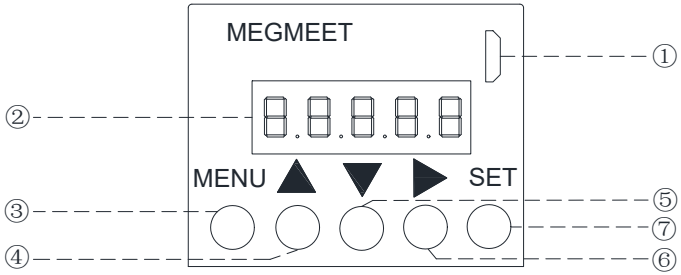


Fig. 5-1 Interface appearance

Interface key functions as shown in the table below.

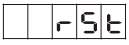
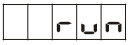
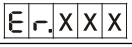
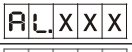
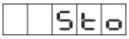
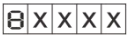
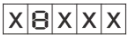
Table 5-1 Interface key functions

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-N 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”	Power on initialization state, indicate that the system is at start or reset state.
	“nrd”	Start or reset is completed, the servo is not yet ready.
	“rdy”	Servo system self-detection normal, wait for the host to give a command signal.
	“run”	Servo running status.
	“Er.xxx”	Servo fault status.
	“AL..xxx”	Servo alarm status.
	“sto”	Servo torque off status
	“8xxxx”	After the drive enters the OP state, the control mode P02.00 is displayed. 0: Speed mode 1: Position mode 2: Torque mode 3: Speed mode←→Position mode 4: Torque mode←→Position mode 5: Speed mode←→Torque mode 6: Speed mode←→Torque mode←→Position mode 8: EtherCAT mode
	“x8xxx”	After the drive enters the OP state, the bus operation mode 6061h is displayed. 1: Profile Position Mode 3: Profile Velocity Mode 4: Profile Torque Mode 6: Homing Mode 8: Cyclic Synchronous Position Mode 9: Cyclic Synchronous Velocity Mode A: Cyclic Synchronous Torque Mode

5.3 Working status display and parameter setting flowchart

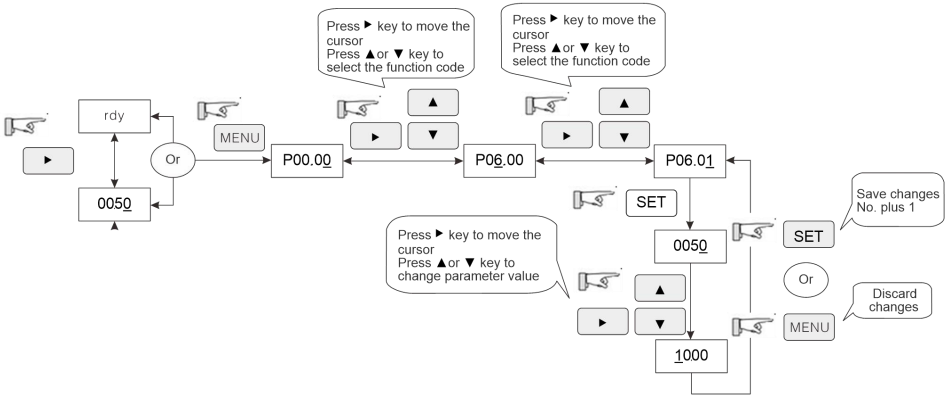


Fig. 5-2 Working status display and parameter setting flowchart

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.

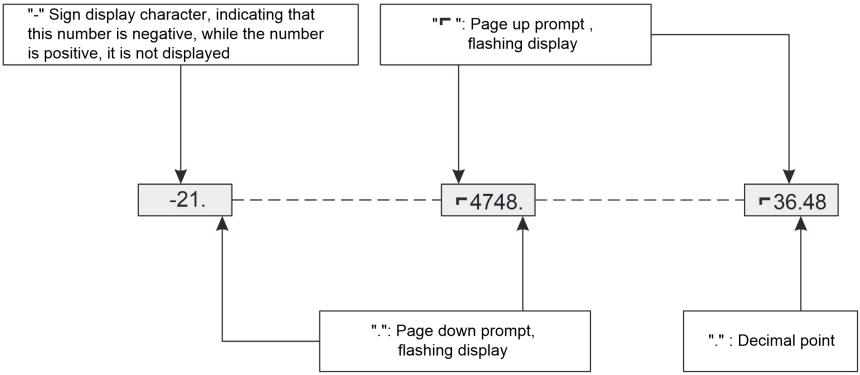


Fig. 5-3 Parameter page display logic

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 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 of the motor through DI state.

6.3 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:

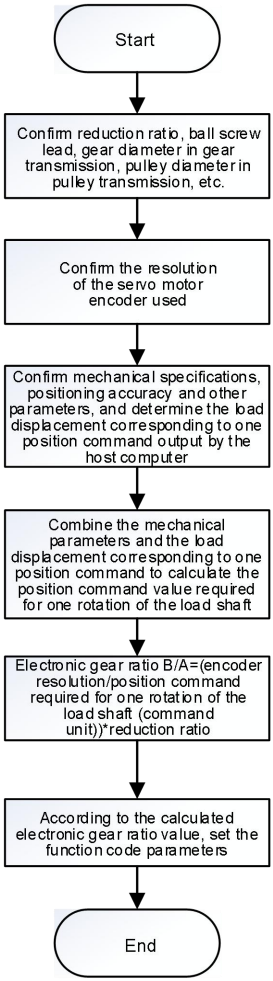


Fig.6-1 Electronic gear ratio setting process

The electronic gear ratio parameter function is shown as follows:

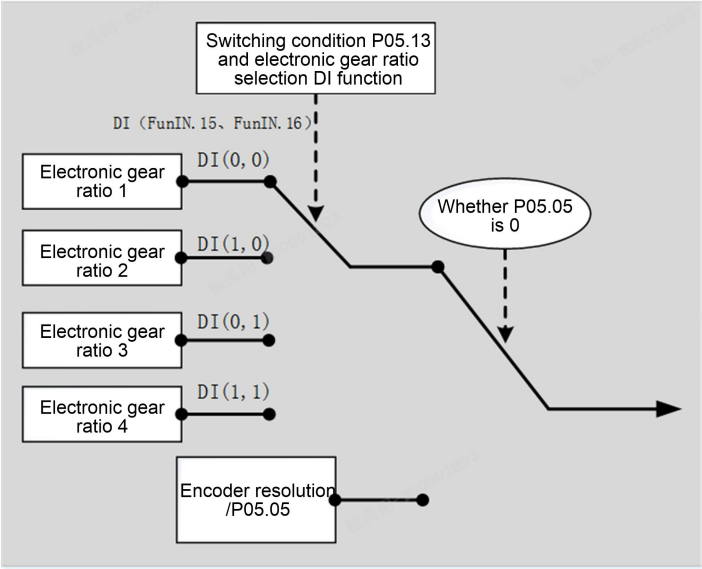


Fig.6-2 Electronic gear ratio function diagram

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	Minimum unit	Default value	Effective time	Property	Function
P05.05	Number of command pulses per motor revolution	0~8388608 P/r	1 P/r	10000	Immediate	At stop	Set the number of position commands for one motor rotation
P05.08	Electronic gear numerator	1~1073741824	1	8388608	Immediate	At stop	Set the numerator of the electronic gear ratio
P05.09	Electronic gear denominator 1	1~1073741824	1	10000	Immediate	At stop	Set the denominator of the first group electronic gear ratio
P05.10	Electronic gear denominator 2	1~1073741824	1	10000	Immediate	At stop	Set the denominator of the second group electronic gear ratio
P05.11	Electronic gear denominator 3	1~1073741824	1	10000	Immediate	At stop	Set the denominator of the 3rd group electronic gear ratio

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P05.12	Electronic gear denominator 4	1~1073741824	1	10000	Immediate	At stop	Set the denominator of the 4th group electronic gear ratio

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-N 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	Minimum unit	Default value	Effective time	Property	Function
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	Set electronic gear ratio switching conditions

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:

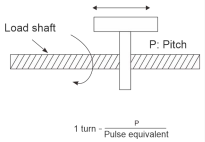
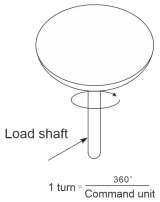
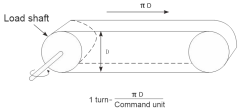
The displacement for load shaft rotate a circle (command bits) = 5mm / 0.001mm = 5000

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: 1/100	Pulley diameter 100mm (pulley circumference 314mm) Reduction ratio: 1/50
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

6.4 Brake settings

6.4.1 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:

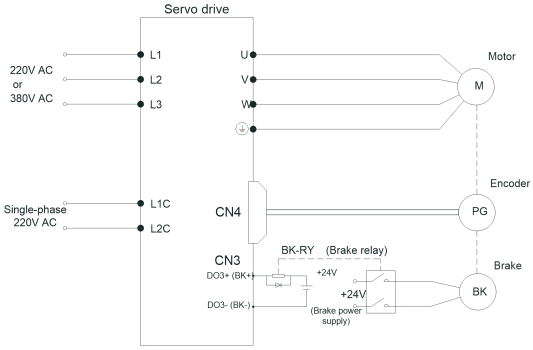


Fig.6-3 Brake wiring diagram

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.

6.4.2 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.

6.4.3 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.

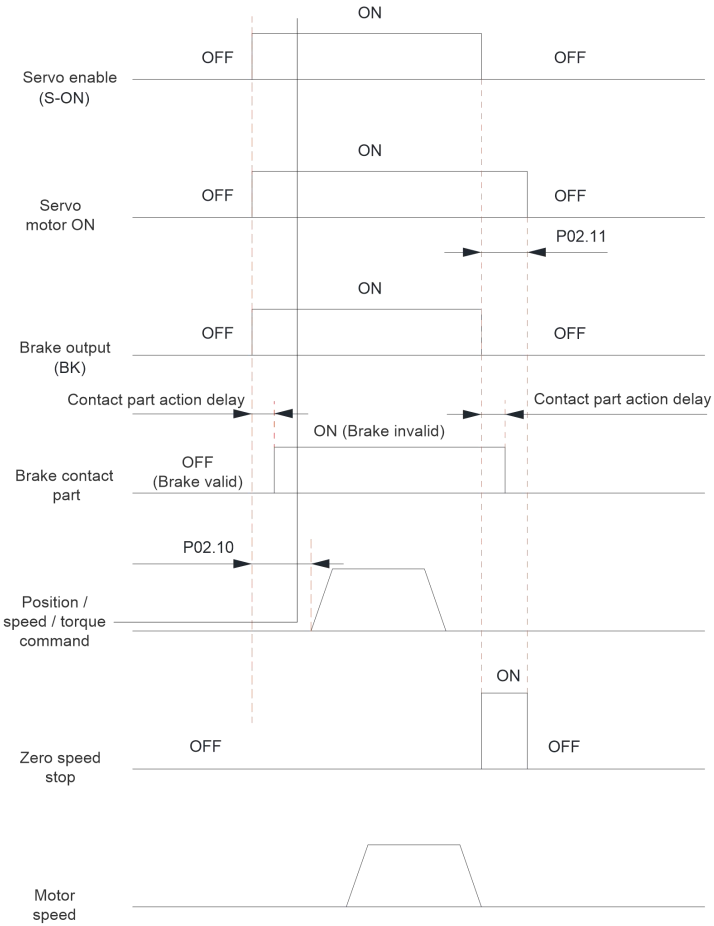


Fig.6-4 The brake timing when the servo motor is stationary

As shown in Fig.6-4, 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	Default value	Effective time	Property
P02.10	Delay from brake outputting ON signal to command received	20~500ms	250	Immediate	During running
P02.11	Delay from brake outputting OFF signal to motor power-off in the standstill state	1~1000ms	150	Immediate	During running

6.4.4 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 time has come, but the motor speed is still higher than 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.

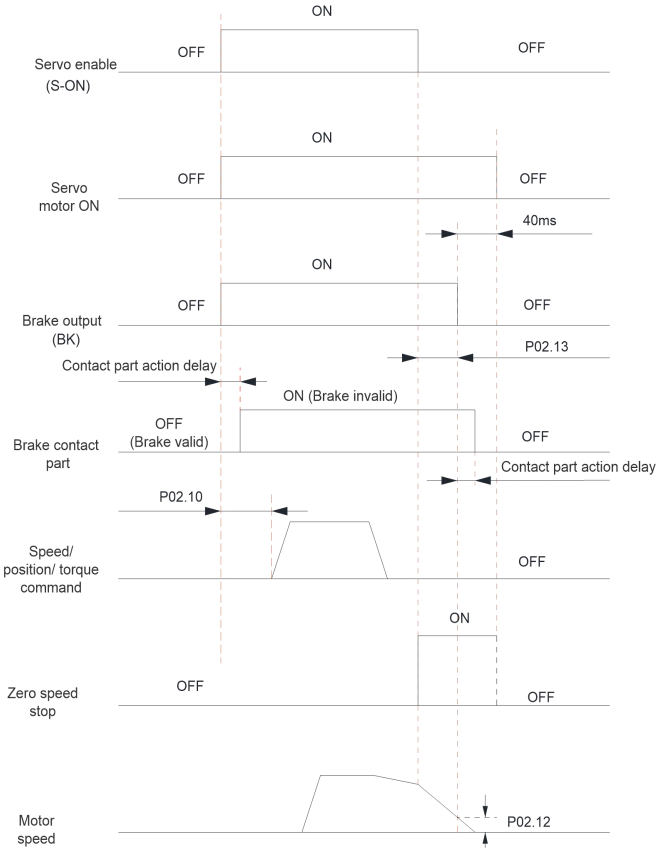


Fig.6-5 The brake timing when the servo motor is rotating

As shown in Fig. 6-5, 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	Default value	Effective time	Property
P02.12	Brake command output speed limit value	0~3000rpm	10	Immediate	During running
P02.13	Servo OFF brake command waiting time	1~30000ms	500	Immediate	During running

6.4.5 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 EtherCAT Communication

7.1 Overview of EtherCAT bus

EtherCAT is an industrial Ethernet-based fieldbus system that features high performance, low cost, easy use and flexible topology. It is applicable to applications requiring ultra-high speed I/O network. EtherCAT adopts standard Ethernet physical layer with twisted pairs or optical fibers (100Base-TX or 100Base-FX) used as the transmission media.

An EtherCAT system includes the master and the slave. The master requires a common network adapter, and the slave requires a special slave control chip, such as ET1100, ET1200, and FPGA.

EtherCAT can process data at the I/O layer without sub-bus or gateway delay.

One system covers all devices, including I/O devices, sensors, actuators, drives and displays.

Transmission rate: 2 x 100 Mbit/s (high-speed Ethernet, full duplex mode).

Synchronization: synchronization jitter < 1 μs (number of nodes up to 300, cable length within 120 m)

Update time (typical application):

256 DI/DOs: 11 μs

1000 DI/DOs distributed in 100 nodes: 30 μs = 0.03 ms

200 AI/AOs (16-bit): 50 μs, sampling rate: 20 kHz

100 servo axes (8 bytes IN + 8 bytes OUT for each): 100 μs = 0.1 ms

12000 DI/DOs: 350 μs

To support more types of devices and applications, EtherCAT establishes the following application protocols:

CANopen over EtherCAT (CoE)

Safety over EtherCAT (SoE, compliant with IEC 61800-7-204)

Ethernet over EtherCAT (EoE)

File over EtherCAT (FoE)

The slave only needs to support the most suitable application protocol.

7.2 M6-N drive bus function introduction

M6-N series servo drivers implement EtherCAT communication (real-time Ethernet communication) and CANopen Drive Profile (CiA402) in its application layer.

7.2.1 M6-N communication specifications

As shown in the following table:

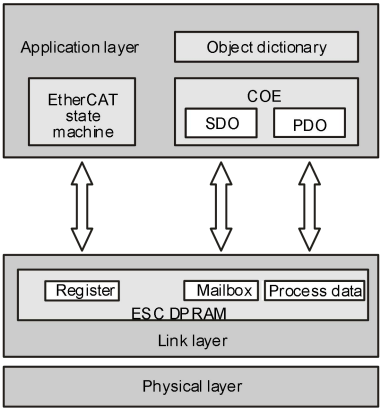
Item		Specification
Communication standard		IEC 61158 Type12, IEC 61800-7 CiA402 Drive Profile
Physical layer	Transfer protocol	100BASE-TX (IEEE802.3)
	Maximum distance	100m

	Interface	CN1 (RJ45): EtherCAT Signal IN CN2 (RJ45): EtherCAT Signal OUT
	Cable	Category 5 twisted pair
Application layer	SDO	SDO request, SDO response
	PDO	Variable PDO mapping
	CiA402 Drive Profile	Profile Position Mode Profile Velocity Mode Profile Torque Mode Homing Mode Cyclic Synchronous Position Mode Cyclic Synchronous Velocity Mode Cyclic Synchronous Torque Mode
Distributed clock		DC mode, DC period≥ 250us

7.2.2 EtherCAT Network reference model

Multiple kinds of application protocols are available for EtherCAT communication.The IEC 61800-7 (CiA 402)-CANopen motion control profile is used for M6-N series servo drives.

The following figure shows the EtherCAT communication structure at CANopen application layer.



The EtherCAT (CoE) network reference model consists of two parts: the data link layer and the application layer.

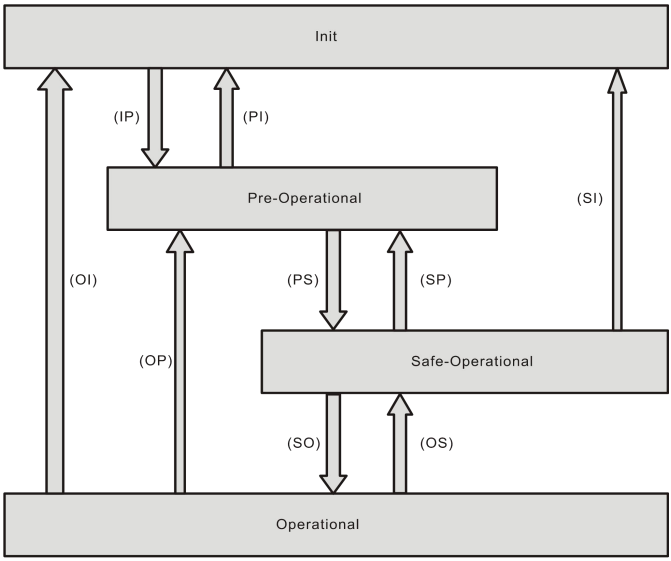
The data link layer is responsible for EtherCAT communication protocol, and the application layer is embedded with the CANopen drive Profile (CiA402) communication protocol. The application layer object dictionary in the CoE contains communication parameters, application data, and PDO mapping information.

The process data object (PDO) consists of objects in the object dictionary that can be mapped to by PDO. The contents of the PDO data are defined by the PDO map. While PDO data is read and written periodically and does not need to look up an object dictionary, mailbox communication (SDO) is aperiodic and looks up an object dictionary when reading and writing them.

7.2.3 EtherCAT network state machine

EtherCAT state machine is used to describe the state and state changes of the slave application.

State change requests are usually initiated by the master station and responded to by the slave station.



The EtherCAT state machine must support the following four states and coordinate the states between the master and slave application program during initialization and operation.

These four states are Init (I), Pre-Operational (P), Safe-Operational (S), and Operational (O).

Transition from "Init" to "Operational" must be in the sequence of "Init → Pre-Operational → Safe-Operational → Operational". Transition from "Operational" to "Init" can be done with certain states skipped. The following table lists the state transition and the initialization process.

State	Description
Init (I)	Communication initialization; No communication in the application layer, EtherCAT slave controller (ESC) register can only be read/written by the master.
IP	Slave address configured by the master; Mailbox channel configured; Distributed clock (DC) configured; Check whether the mailbox is successfully initialized. Request for Pre-Operational state.
Pre-Operational (P)	Mailbox data communication in the application layer (SDO)
PS	Mailbox initialization process data mapping used by the master; Sync Manager channel used during process data communication configured by the master; FMMU configured by the master; Request for Safe-Operational state by the master
Safe-Operational (S)	SDO, TPDO, and distributed clock mode available
SO	Valid output data sent by the master;

	Request for Safe-Operational state
Operational (O)	Normal operational state; Both the input and output valid ; Mailbox communication still available. (SDO,TPDO, RPDO)

7.2.4 Process Data PDO

The real-time data transmission of EtherCAT is achieved through PDO. PDOs can be divided into RPDO(Reception PDO) and TPDO (Transmission PDO) based on the data transmission direction. RPDO transmits the master data to the slave, and TPDO returns the slave data to the master.

7.2.4.1 Sync Manager PDO assignment

The process data can contain multiple PDO mapping data objects during cyclic EtherCAT data communication. The CoE protocol defines the PDO mapping object list of the Sync Manager using data objects 1C10h to 1C2Fh. Multiple PDOs can be mapped to different sub-indexes. The M6-N series servo drive supports assignment of four RPDO and four TPDO, as described in the following table.

Index	Sub-index	Description
1C12h	01	Assign 1600h as the RPDO mapping object
1C13h	01	Assign 1A00h as the TPDO mapping object

7.2.4.2 PDO mapping parameter

PDO mapping is used to establish the mapping relation between the object dictionary and the PDO. 1600h-1603h are RPDOs, and 1A00h-1A03h are TPDOs. The M6-N series servo drive provides one variable RPDO1, three fixed RPDO2-RPDO4, one variable TPDO1and and three fixed TPDO2-TPDO4, as listed in the following table.

PDO	Index	Max. Number of Mapping Objects	Max. Length of the Byte	Default Mapping Object
RPDO1	1600h	10	40	6040h (Control word) ……
RPDO2	1601h	2	6	6040 (Control word) 60FF (Target velocity)
RPDO3	1602h	2	6	6040 (Control word) 607A (Target position)
RPDO4	1603h	2	4	6040 (Control word) 6071 (Target torque)
TPDO1	1A00h	10	40	6041h (Status word) ……
TPDO2	1A01h	3	10	6041 (Status word) 6064 (Position actual value) 606C (Velocity actual value)
TPDO3	1A02h	2	6	6041 (Status word) 6064 (Position actual value)
TPDO4	1A03h	3	8	6041 (Status word) 6064 (Position actual value) 6077 (Torque actual value)

7.2.4.3 PDO configuration

PDO mapping parameters contain indicators of the process data for PDOs, including the index, sub-index and mapping object length. The sub-index 0 indicates the number (n) of mapping objects in the PDO, and the maximum length of each PDO is 4*n bytes. One or multiple objects can be mapped simultaneously. Sub-indexes 1 to n indicate the mapping content, as defined below:

Bit	31	…	16	15	…	8	7	…	0
Meaning	Index			Sub-index			Object length		

The index and sub-index together define the position of an object in the object dictionary. The object length indicates the bit length of the object in hexadecimal, as shown below:

Object Length	Bit Length (bit)
08h	8
10h	16
20h	32

For example, the mapping parameter of the 8-bit operating mode 6060-00h is 60600008h, the mapping parameter of the 16-bit control word 6040-00h is 60400010h, the mapping parameter of the 32-bit interpolated position 60C1-01h is 60C10120h.

7.2.4.4 Steps for PDO mapping

• Stop PDO allocation function (1C12h and 1C13h sub-index 00h write 0, PDO allocation invalid);

• Stop PDO mapping function (set all sub-index 00h of 1600h and 1A00h to 0 to clear the original mapping content).

• Set the content of the PDO mapping object (based on actual application, sub-index 1 to 10 of 1600h and 1A00h are written into the index, sub-index, and length of the mapping object respectively).

• Set the number of PDO mapping objects (based on actual application, the sub-index 00h of 1600h and 1A00h is set to 1~10).

• Set PDO allocation object (set the sub-index 1 of 1C12h and 1C13h);

• Turn on the PDO allocation function again (the sub-index 00h of 1C12h and 1C13h is set to 1).

7.2.5 Mailbox data SDO

The EtherCAT mailbox data SDO is used to transfer non-cyclic data, such as communication parameter configuration and servo drive parameter configuration. The CoE service types of EtherCAT include:Emergency message, SDO request, SDO response, Remote TxPDO transmission request, Remote RxPDO transmission request, SDO message.

The M6-N supports SDO request, SDO response and SDO message.

7.2.6 Distributed Clock (DC)

In EtherCAT Ethernet systems, distributed clock is initialized, configured, started and compensated for clock drift by the master station. The distributed clock at the slave station is implemented by the ESC control chip, which provides interrupt signal and clock information for the slave station. The distributed clock can also be used to record the input time of the latched input signal.

The DC enables all EtherCAT devices to use the same system time and allows synchronous execution of slave tasks. A slave can generate synchronous signals according to the synchronized system time.

The M6-N series servo drive supports the DC synchronization mode. The synchronization cycle is determined by SYNC0.

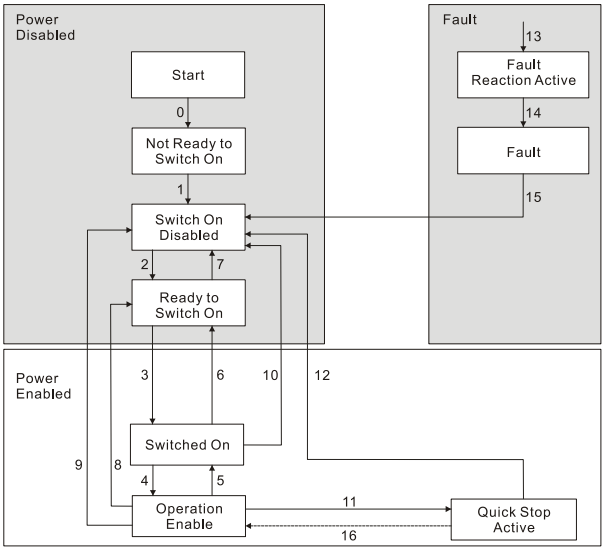
The cycle range varies with the operation mode, the typical synchronization cycle is 250us, 500us, 1ms, and 2ms. The minimum synchronization cycle supported by M6-N is 250 us.

7.3 CiA402 Device Control (Device Protocol)

Device control implements all operating functions of the drive, including device state machine control and device running mode. The master station controls the drive through control word and knows the current status of the drive through status word of the drive.

7.3.1 CoE state machine

The following figure shows the CoE state machine.



As shown in the figure above, the state machine can be divided into three parts: Power Disabled, Power Enabled, and Fault .

After the drive is powered on, the drive is initialized and goes to the SWITCH_ON_DISABLED state. In this case, you can configure the working mode of the drive while the main power is still off.

After State Transition 2, 3, and 4, enter OPERATION ENABLE. At this point, the main power is on, and the drive controls the motor according to the configured working mode. Therefore, this state must be preceded by confirmation that the drive parameters and corresponding input values are correctly configured to zero.

State Transition 9 is complete, turn off the main power of the circuit.

If the drive alarms, the drive state enters the "Fault" state. All states enter Fault after an alarm.

The following table describes the status and meaning of the drive.

Status name	Status description
Not Ready to Switch On	The drive is in the process of initializing.
Switch On Disabled	Drive initialization is complete. Drive parameters are configurable.
Ready to Switch On	The drive can be powered on; Drive parameters are configurable.
Switch On	The drive is powered on. Drive parameters are configurable.
Operation Enable	Drive is fault-free. The drive is enabled. Drive setting parameters are valid.
Quick Stop Active	The drive stops quickly.
Fault Reaction Active	The drive detects that a fault has occurred and performs the fault stop procedure.
Fault	The drive fault occurs and the fault stop ends. The drive function is disabled.

The following table describes the drive status switching.

Status switch ID	Description
0	The state switch is carried out automatically after the drive is reset.
1	The state switch is carried out automatically after the drive is reset.
2	Received Shut Down command
3	Received Switch On command
4	Received Enable Operation command
5	Received Disable Operation command
6	Received Shut Down command
7	Received Quick Stop and Disable Voltage command
8	Received Shut Down command
9	Received Disable Voltage command

Status switch ID	Description
10	Received Quick Stop or Disable Voltage command
11	Received Quick Stop command
12	Received Quick Stop or Disable Voltage command
13	Drive error, automatic switch
14	Drive error response complete, automatic switch
15	Received Fault Reset command
16	Received Enable Operation command

7.3.2 Object dictionary

The object dictionary is the most important part of the device specification. It is an ordered set of parameters and variables, containing all parameters of device description and device network state.

A set of objects that can be accessed through a network in an ordered, predefined manner.

The CANopen protocol uses an object dictionary with 16-bit index and 8-bit sub-index. The structure of the object dictionary is shown in the following table.

Index range	Meaning
0000h–0FFFh	Data type description object area
1000h–1FFFh	Communication object area: store common communication parameters
2000h–5FFFh	Manufacturer definition object area: store manufacturer device parameters, such as drive parameters
6000h–9FFFh	Subprotocol object area: CiA 402 protocol parameters
A000h–FFFFh	Reserved area

7.3.3 Device control word and status word

Index	Object Code	Name	Type	Attr.
6040h	VAR	Control word	UINT16	RW
6041h	VAR	Status word	UINT16	RO

7.3.3.1 Control word

The bit definitions of the control word are shown in the following table.

Bit15~ Bit11	Bit10~ Bit9	Bit8	Bit7	Bit6~ Bit4	Bit3	Bit2	Bit1	Bit0
Manufacture specific	Reserved	Halt	Fault reset	Operation mode specific	Enable operation	Quick stop	Enable voltage	Switch on

O	O	O	M	O	M	M	M	M

(In the table above, O: Optional; M: Mandatory.)

The control commands consisting of Bit0~Bit3 and Bit7 of the control word are used to switch the state machine. The following table describes the defined control commands.

Command	Bit of controlword					Transitions
	Fault reset	Enable operation	Quick stop	Enable voltage	Switch on	
Shutdown	0	X	1	1	0	2,6,8
Switch on	0	0	1	1	1	3*
Switch on	0	1	1	1	1	3**
Disable voltage	0	X	X	0	X	7,9,10,12
Quick stop	0	X	0	1	X	7,10,11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4,16
Fault reset		X	X	X	X	15

(In the table above, the bit marked "X" can be ignored.)

Bit4~Bit6 and Bit8 of the control word are defined differently in different control modes.

Bit	Operation mode					
	Profile position mode	Profile velocity mode	Homing mode	Interpolated position mode	Cyclic Synchronous position mode	Cyclic Synchronous velocity mode
4	New set-point	reserved	Homing operation start	Enable ip Mode	reserved	reserved
5	Change set immediately	reserved	reserved	reserved	reserved	reserved
6	Abs/Rel	reserved	reserved	reserved	reserved	reserved
8	Halt	Halt	Halt	Halt	Halt	Halt

(See the running mode description for the definition of each bit in the table.)

7.3.3.2 Status word

The bit definition of the status word is shown in the following table.

Bit	Description
0	Ready to switch on
1	Switched on

Bit	Description
2	Operation enabled
3	Fault
4	Voltage enabled
5	Quick stop
6	Switch on disabled
7	Warning
8	Manufacturer specific
9	Remote
10	Target reached
11	Internal limit active
12~13	Operation mode specific
14~15	Manufacturer specific

Bit0~Bit3, Bit5, and Bit6 in the status word are used to indicate the state of the drive, as shown in the following table.

Bit value (binary)	State
xxxx xxxx x0xx 0000	Not ready to switch on
xxxx xxxx x1xx 0000	Switch on disabled
xxxx xxxx x01x 0001	Ready to switch on
xxxx xxxx x01x 0011	Switched on
xxxx xxxx x01x 0111	Operation enabled
xxxx xxxx x00x 0111	Quick stop active
xxxx xxxx x0xx 1111	Fault reaction active
xxxx xxxx x0xx 1000	Fault

Description of the status word:

• Bit0~Bit9 has the same meaning in each control mode. When the master station sends the control word 6040h, the drive will feedback a certain state;

• Bit10, Bit11, Bit12 and Bit13 are related to each control mode;

• Bit14 and Bit15 are defined by the manufacturer.

7.3.4 Common conversion factor

User units and motor units internally controlled by the drive are often inconsistent. To facilitate the unification of units, the CiA 402 device specification provides a set of conversion factors for converting user units and motor units.

The default motor units of the M6-N drive are as follows:

• Motor displacement unit: p

• Motor speed unit: pps (pulses per second)

The actual units commonly used by users are as follows:

• Load displacement unit: mm

• Load speed unit: mm/s

7.3.4.1 Gear ratio factor (6091h)

The conversion factor refers to the motor displacement (unit: p) corresponding to the load displacement of one user unit.

The gear ratio is composed of the numerator 6091-1h and the denominator 6091-2h, through which a relation between the load displacement (user unit) and the motor displacement (motor unit) can be formulated as below:

$$\text{Gear ratio factor (6091h)} = \frac{\text{Motor encoder resolution (6091 - 1h)}}{\text{Load shaft resolution (6091 - 2h)}}$$

$$\text{Motor displacement} = \text{Load displacement (user)} \times \text{Gear ratio factor}$$

$$\text{Load feedback displacement (user)} = \frac{\text{Motor feedback displacement}}{\text{Gear ratio factor}}$$

[Example]

For ball screw:

- Each feed of load: 40 mm
- Lead pB=10 mm/r
- 23-bit motor encoder, resolution: P = 8388608 (p/r)

Thus, the position factor is calculated as follows:

Each feed of load shaft:

$$\text{Position factor: Each feed of load shaft} = \frac{\text{Feed of load}}{\text{pB}} = \frac{40}{10\ \text{mm/r}} = 4\ \text{(r)}$$

$$\text{Position factor} = \frac{\text{Each feed of load shaft} \times \text{Motor resolution}}{\text{Each feed of load}} = \frac{4\ \text{r} \times 8388608\ \text{p/r}}{40} = \frac{8388608}{10}$$

It indicates that 10 mm of load displacement corresponds to 83888608 pulses of motor displacement.

Thus, the numerator 6091-1h can be set to 83888608, and the denominator 6091-2h can be set to 10.

7.4 Bus operation mode

M6-N supports the following bus operation modes in the CoE:

Profile Position Mode;

Profile Velocity Mode;

Profile Torque Mode;

Homing Mode;

Cyclic Synchronous Position Mode;

Cyclic Synchronous Velocity Mode;

Cyclic Synchronous Torque Mode;

Operation mode related objects are shown in the following table below, where 6060h is used to set the operation mode of the drive and 6061h is used to display the current operation mode of the drive.

Index	Object Code	Name	Type	Attr.
6060h	VAR	Modes of operation	INT8	RW
6061h	VAR	Modes of operation display	INT8	RO

The following table lists the values and meanings of the two objects.

Value	Description
1	Profile Position Mode
3	Profile Velocity Mode
4	Profile Torque Mode
6	Homing Mode
8	Cyclic Synchronous Position Mode
9	Cyclic Synchronous Velocity Mode
10	Cyclic Synchronous Torque Mode

7.4.1 Profile Position Mode

This mode is mainly used for point-to-point positioning. In this mode, the master station gives the target position (absolute or relative), the speed, acceleration/deceleration and deceleration of the position curve, and the drive generates the target position curve command according to the settings, and completes the positioning control.

7.4.1.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	p
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
						unit
6065h	VAR	Following error window	UINT32	RW	RPDO	Reference unit
6066h	VAR	Following error window time	UINT16	RW	RPDO	ms
6067h	VAR	Position window	UINT32	RW	RPDO	Reference unit
6068h	VAR	Position window time	UINT16	RW	RPDO	ms
607Ah	VAR	Target position	INT32	RW	RPDO	Reference unit
607Dh	ARRAY	Software position limit	INT32	RW	RPDO	Reference unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	Reference unit/s
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6081h	VAR	Profile velocity	UINT32	RW	RPDO	Reference unit/s
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	Reference unit/s^2
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	Reference unit/s^2
6091h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
60F4h	VAR	Following error actual value	INT32	RO	TPDO	Reference unit

Note: The drive has defaulted the profile speed, acceleration/deceleration, deceleration, maximum profile speed and gear ratio of the position curve through the functional parameters. If the master does not set these parameters, the default values will take effect. When you change these default values, the drive needs to be powered off and restarted.

7.4.1.2 Control word and status word

Control word under Profile Position Mode (PP) :

Bit15~Bit7	Bit6	Bit5	Bit4	Bit3~Bit0
*	Abs/Rel	Change set immediately	New set-point	*

Note: "*" means the bit definition is the same as the standard definition, the same below.

Description of control word bits in Profile Position Mode (PP) :

Bit	Value	Description
New set-point	0	No set position
	1	New set position, start positioning
Change set immediately	0	The position is not updated immediately
	1	The position is updated immediately
Abs/Rel	0	Absolute position setting
	1	Relative position setting

Status word in Profile Position Mode (PP) :

Bit15~Bit14	Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Following error	Set-point acknowledge	*	Target reached	*

Status word description in Profile Position Mode (PP) :

Bit	Value	Description
Target reached	0	Target position not reached
	1	Target position reached
Set-point acknowledge	0	The target position can be updated
	1	The target position cannot be updated
Following error	0	No position deviation
	1	There is position deviation

7.4.1.3 Function description

• Running mode: Set 6060h=1;

• Target position: Use 607Ah to set the target position of the user unit, if necessary, set the gear ratio 6091h;

• Positioning mode: Set the positioning mode through the control word 6040h (absolute position/relative position, immediate update/non-immediate update, etc.);

• Positioning speed setting: Use 6081h to set the positioning speed of the user unit. If necessary, set the gear ratio 6091h, profile acceleration time 6083h, profile deceleration time 6084h;

• Positioning enable: Enable drive operation through object 6040h and enable positioning through Bit4;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero;

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time from the maximum speed of speed limit value to zero Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value);

• Positioning arrival judgment: When the position deviation of the user unit is less than 6067h and the time reaches 6068h, the position is reached, and the bit10 of the status word 6041h is set to 1;

• The position deviation is too large: When the position deviation 60F4h of the user unit is greater than 6065h, the fault is set, and the bit13 of the status word 6041h is set to 1;

• Instruction polarity 0x607E: Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E;

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

7.4.1.4 Basic configuration

The following table describes the basic configuration of objects in Profile Position Mode (PP).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target position 607Ah	Position feedback 6064h	Required
Profile velocity 6081h		Required
Other object		Optional, you can configure it as an SDO

		parameter, or use the default parameters of the drive.

7.4.2 Profile Velocity Mode

In this mode, the master station gives the target speed, acceleration/deceleration and deceleration, and the drive generates the target speed curve command according to the setting, and completes the acceleration and deceleration control.

7.4.2.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	p
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
6069h	VAR	Velocity sensor actual value	INT32	RO	TPDO	rpm
606Bh	VAR	Velocity demand value	INT32	RO	TPDO	rpm
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	Reference unit/s
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms
606Fh	VAR	Velocity threshold	UINT16	RW	RPDO	rpm
6070h	VAR	Velocity threshold time	UINT16	RW	RPDO	ms
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	Reference unit/s
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	Reference unit/s^2
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	Reference unit/s^2

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
6091h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
60FFh	VAR	Target velocity	INT32	RW	RPDO	Reference unit/s

Note:

The drive has defaulted the acceleration/deceleration, deceleration, maximum speed and gear ratio of the speed curve through the functional parameters. If the master station does not set these parameters, the default values will take effect. When you change these default values, the drive needs to be powered off and restarted.

7.4.2.2 Control word and status word

The control word in Profile Velocity Mode (PV) is the same as the standard definition.

Status word in Profile Velocity Mode (PV) :

Bit15~Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Speed	*	Target reached	*

Status word description in Profile Velocity Mode (PV) :

Bit	Value	Description
Target reached	0	Target speed not reached
	1	Target speed reached
Speed	0	Speed is not equal to 0
	1	Speed is equal to 0

7.4.2.3 Function description

• Control mode: set P02.00 = 8;

• Running mode: Set 6060h = 3;

• Target speed setting: Use 60FFh to set the target speed of the user unit, if necessary, set the gear ratio 6091h;

• Acceleration curve setting: If necessary, set the profile acceleration time 6083h and profile deceleration time 6084h;

• Running enable: Enable the drive to run through the control word 6040h;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero;

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time from the maximum speed of speed limit value to zero Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value);

• Speed arrival judgment: When the deviation between the feedback speed 606Ch and the target speed 60FFh is less than 606Dh, and the time reaches 606Eh, it indicates that the speed has arrived, and the bit10 of the status word 6041h is set to 1;

• Zero-speed operation judgment: When the speed feedback 606Ch of the user unit is less than 606Fh, and the time reaches 6070h, it indicates that the zero speed has arrived, and the bit12 of the status word 6041h is set to 1.

• Instruction polarity 0x607E: Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E;

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

7.4.2.4 Basic configuration

The following table describes the basic object configurations in Profile Velocity Mode (PV).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target speed 60FFh		Required

RPDO object	TPDO object	Note
	Speed actual value 606Ch	Optional
Other object		Optional, you can configure it as an SDO parameter, or use the default parameters of the drive.

7.4.3 Profile Torque Mode

The servo drive (slave station) receives the torque instruction from the host computer (master station) for torque control.

7.4.3.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	Encoder unit
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
6069h	VAR	Velocity sensor actual value	INT32	RO	TPDO	rpm
606Bh	VAR	Velocity demand value	INT32	RO	TPDO	rpm
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	Reference unit/s
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms
606Fh	VAR	Velocity threshold	UINT16	RW	RPDO	rpm
6070h	VAR	Velocity threshold time	UINT16	RW	RPDO	ms
6071h	VAR	Target torque	INT16	RW	RPDO	0.1%
6072h	VAR	Max torque	UINT16	RW	RPDO	0.1%
6074h	VAR	Torque demand	INT16	RO	TPDO	0.1%
6077h	VAR	Torque actual value	INT16	RO	TPDO	0.1%

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	Reference unit/s
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6087h	VAR	Torque slope	UINT16	RW	RPDO	0.1%/s
60E0h	VAR	FWD torque limit	UINT16	RW	RPDO	0.1%
60E1h	VAR	REV torque limit	UINT16	RW	RPDO	0.1%

7.4.3.2 Control word and status word

The control word under Profile Torque Mode (PT) is the same as the standard definition.

Status word in Profile Torque Mode (PT) :

Bit15~Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	*	*	Target reached	*

Status word description in Profile Torque Mode (PT) :

Bit	Value	Description
Target reached	0	Target torque not reached
	1	Target torque reached

7.4.3.3 Function description

• Control mode: Set P02.00 = 8;

• Running mode: Set 6060h = 4;

• Target torque setting: 6071h is used to set the target torque of the user unit, unit 0.1%;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero;

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time from the maximum speed of speed limit value to zero

							Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value);

• Running enable: Enable the drive to run through the control word 6040h;

• Instruction polarity 0x607E: Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E;

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

• Torque arrival function:

This function defines whether the actual torque feedback has reached the torque window. If the difference between the actual torque feedback of the drive (6077h) and the torque reference value (2007.0Eh) reaches the effective value (2007.0Fh), the bit10(target_reached) of the status word is set to 1. The bit10(target_reached) of the status word is immediately cleared when the difference between the actual torque feedback (6077h) and the torque reference value (2007.0Eh) is less than the torque reached invalid value (2007.10h).

7.4.3.4 Basic configuration

The following table describes the basic configuration of objects in Profile Torque Mode (PT).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target torque 6071h		Required
	Torque actual value 6077h	Optional
Other object		Optional, you can configure it as an SDO parameter, or use the default parameters of the drive.

7.4.4 Homing Mode

The M6-N drive supports Homing Mode. In this mode, the drive returns to the specified position according to the set homing mode, homing speed, and homing offset.

7.4.4.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6098h	VAR	Homing method	INT8	RW	RPDO	-
607Ch	VAR	Homing offset	INT32	RW	RPDO	Reference unit
6099h	ARRAY	Homing speeds	UINT32	RW	RPDO	Reference unit/s
609Ah	VAR	Homing acceleration	UINT32	RW	RPDO	Reference unit/s^2

Object description:

• Homing method (6098h)

M6-N drives support standard CiA 402 Mode 1-Mode 35.

• Homing offset (607Ch)

Number of offset pulses after the M6-N drive finds the origin.

• Homing speeds (6099h)

Sub-index	Description	Unit
0	Number of subindexes (2)	-
1	Homing high speed	rpm
2	Homing low speed	rpm

7.4.4.2 Control word and status word

Control word in Homing :

Bit15~Bit5	Bit4	Bit3~Bit0
*	Homing start	*

Control word bit description in Homing :

Bit	Value	Description
Homing start	0->1	Start the Homing
	1	Homing in progress
	1->0	End the Homing

Status word in Homing:

Bit15~Bit14	Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Homing error	Homing attained	*	Target reached	*

Status word bit description in Homing :

Bit	Value	Description
Target reached	0	Target position not reached
	1	Target position reached
Homing attained	0	Unsuccessful Homing
	1	Successful Homing
Homing error	0	Homing error free
	1	Homing error occurred

7.4.4.3 Function description

- Running mode: Set 6060h=6;
- Homing method setting: Select the Homing method from object 6098h;
- Homing offset setting: Select the Homing offset value from object 607Ch;

P12.11 = 0 After finding the origin, position feedback 6064h = 607Ch

P12.11 = 1 After finding the origin, position feedback 6064h = current position + incremental displacement 607Ch

P12.11 = 2 After finding the origin, continue to execute the origin offset position segment. After the execution is completed, the position feedback 6064h = 0

P12.11 = 3 After finding the origin, continue to execute the origin offset position segment. After the execution is completed, the position feedback 6064h = 607Ch

Note: When P12.11 = 0/1, the drive does not actually perform position offset displacement.

- Homing speed setting: Set the speed of the drive during Homing using the subindexes 01h and 02h of object 6099h;
- Homing enable: Enable the drive Homing using the control word 6040h.

7.4.4.4 Basic configuration

The following table describes the basic configuration of objects in Homing Mode (Homing).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required

RPDO object	TPDO object	Note
Homing method 6098h		Optional, you can configure it as an SDO parameter.
Homing offset 607Ch		Optional, you can configure it as an SDO parameter.
Homing speed 6099-01h		Optional, you can configure it as an SDO parameter.
Homing speed 6099-02h		Optional, you can configure it as an SDO parameter.
Other object		Optional, you can configure it as an SDO parameter.

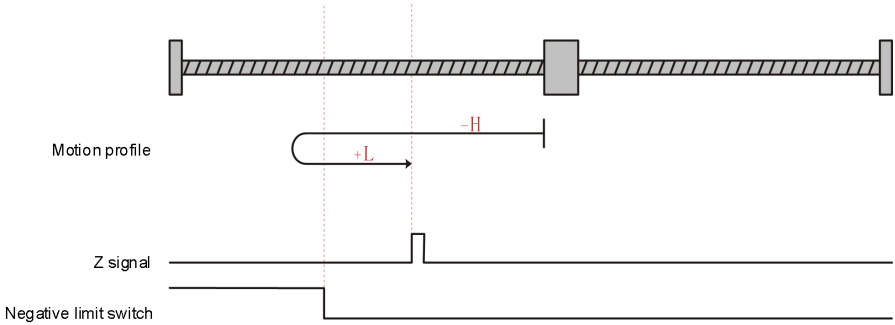
7.4.4.5 Homing Mode

To support more applications, the M6-N series servo system supports CANopen CiA402 Homing Mode -4 to 35.

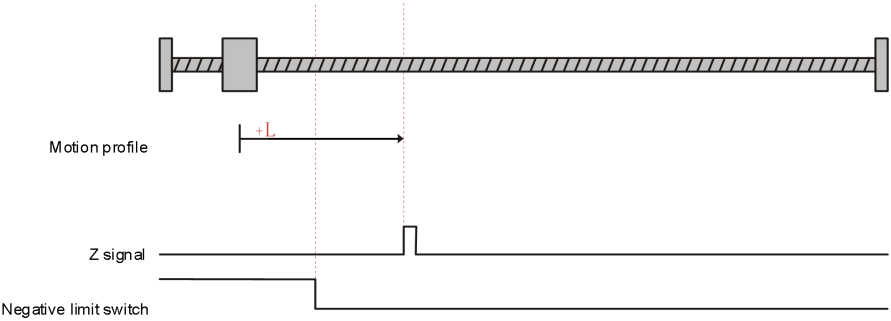
- 0x6098 = 1

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 home. After encountering the rising edge of the negative limit switch, it runs at a low-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.



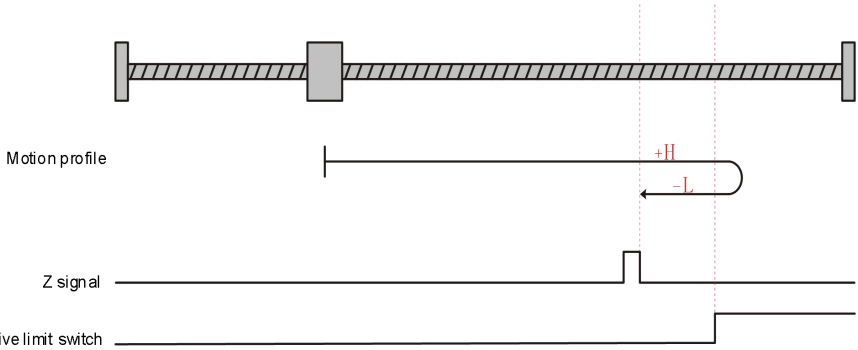
The current position of the motor is at the negative limit switch. When the homing is started, the negative limit switch is at a high level, and forward low-speed returns to home. After encountering the falling edge of the negative limit switch, it runs at a low speed in the forward direction, and stop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



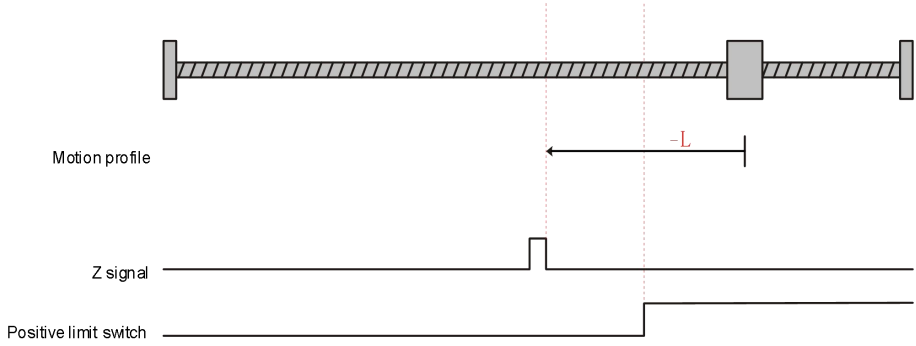
- 0x6098 = 2

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 home. After encountering the rising edge of the positive limit switch, it runs at a low-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.



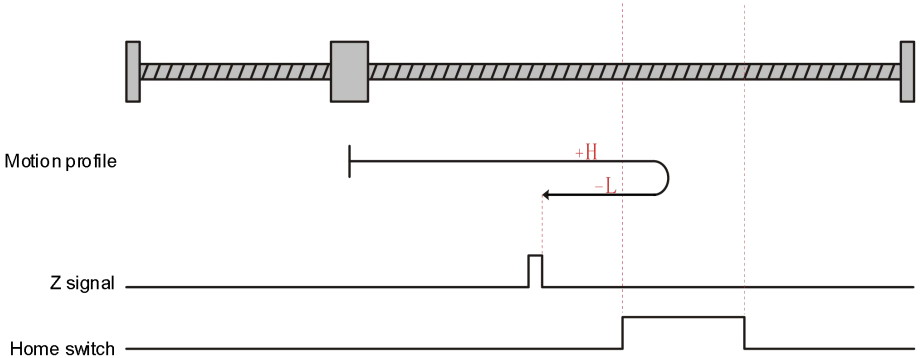
The current position of the motor is at the positive limit switch. When the homing is started, the positive limit switch is at a high level, and reverse low-speed returns to home. After encountering the falling edge of the positive limit switch, it runs at a low speed in the reverse direction, and stop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



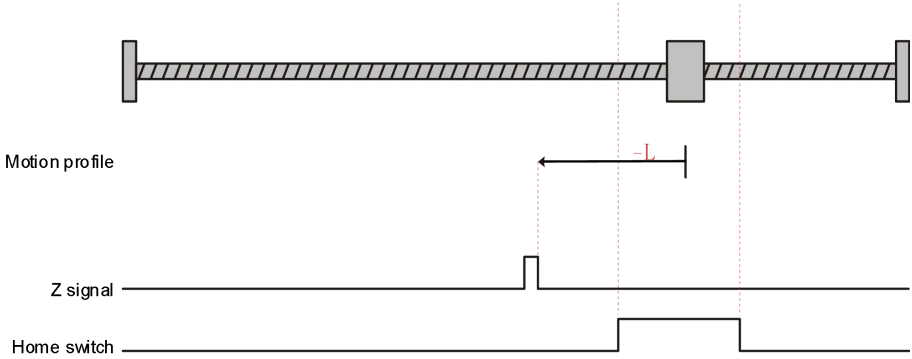
- 0x6098 = 3

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 forward high-speed returns to home. After encountering the rising edge of the home switch, it runs at a low-speed in the reverse direction, when it encounters the falling edge of the home switch, and then run at low speed in the reverse direction, and stop at the rising edge of the Z signal.



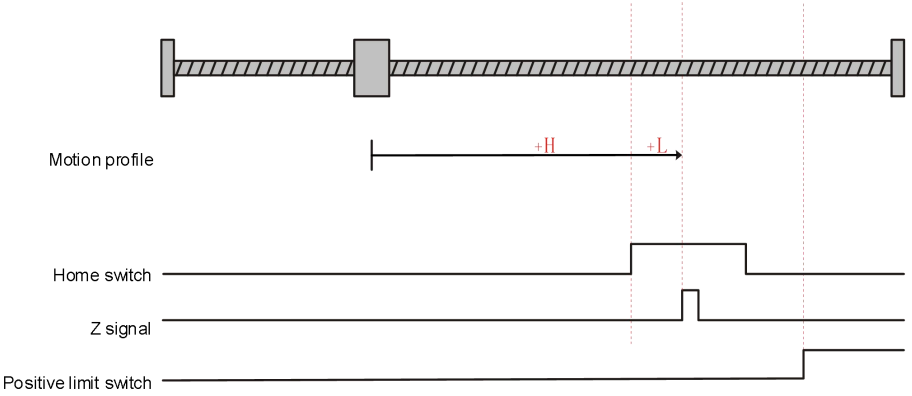
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse low-speed returns to home. After encountering the falling edge of the home switch, it runs at a low-speed in the reverse direction, and stop at the rising edge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



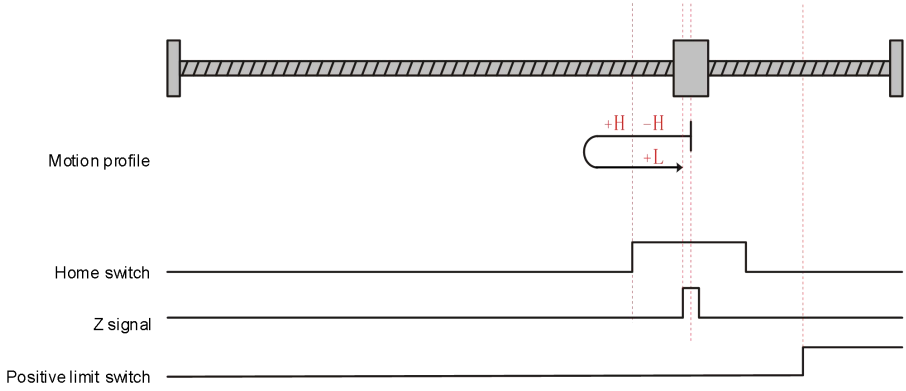
- 0x6098 = 4

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

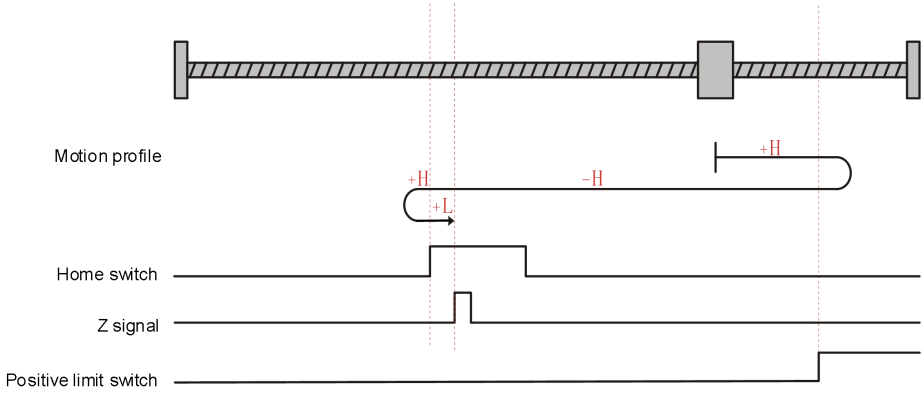
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the home switch, it runs at a low speed in the forward direction, and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



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 home. 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.



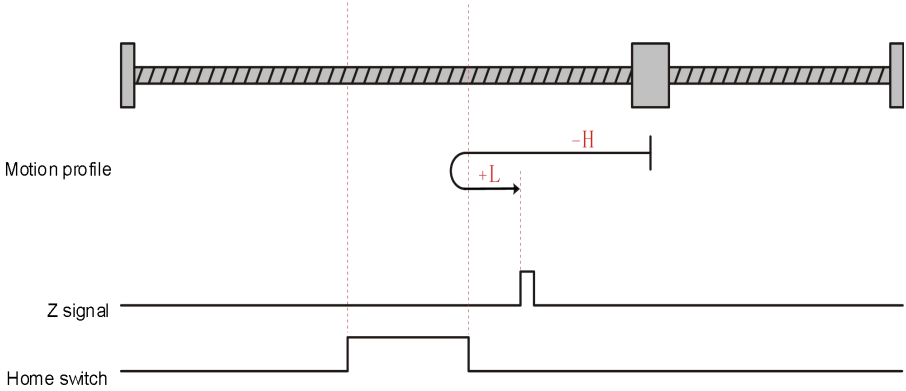
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the positive limit switch, and then run at high speed in the reverse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



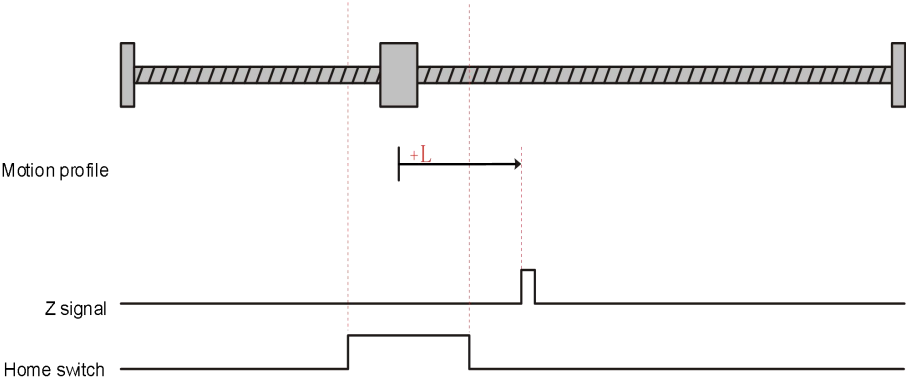
- 0x6098 = 5

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

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 reverse high-speed returns to home. After encountering the rising edge of the home switch, it will run forward at low speed. After encountering the falling edge of the home switch, it will run forward at low speed, and stop when encountering the rising edge of Z signal.



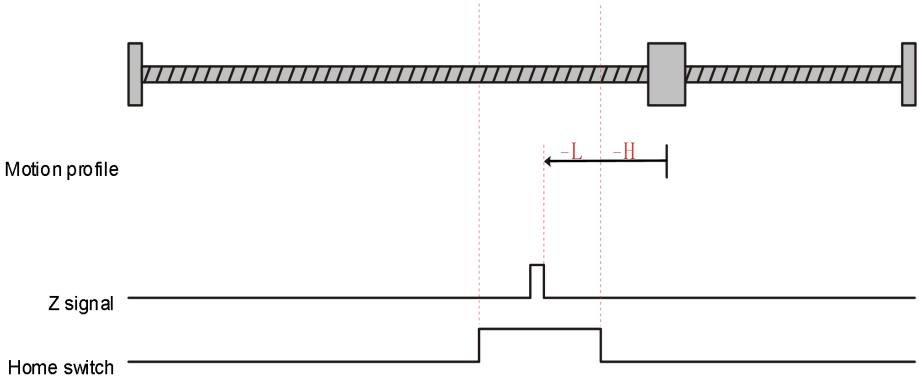
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward low-speed returns to home. After encountering the falling edge of the home switch, it runs at a low-speed in the forward direction, and stop when encountering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



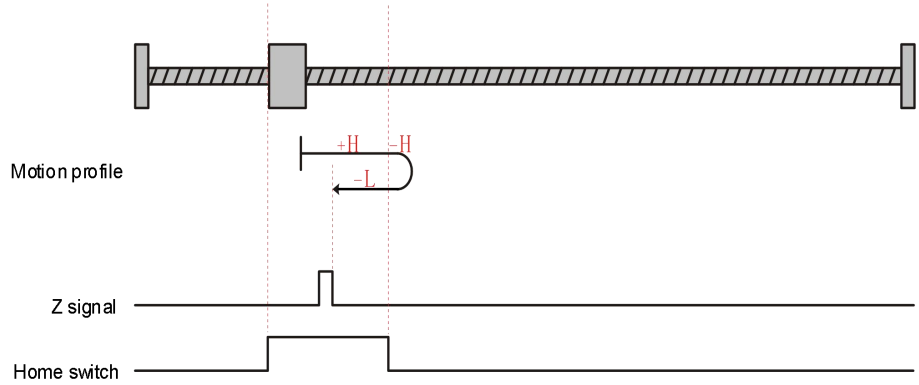
- 0x6098 = 6

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

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 reverse high-speed returns to home. 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.



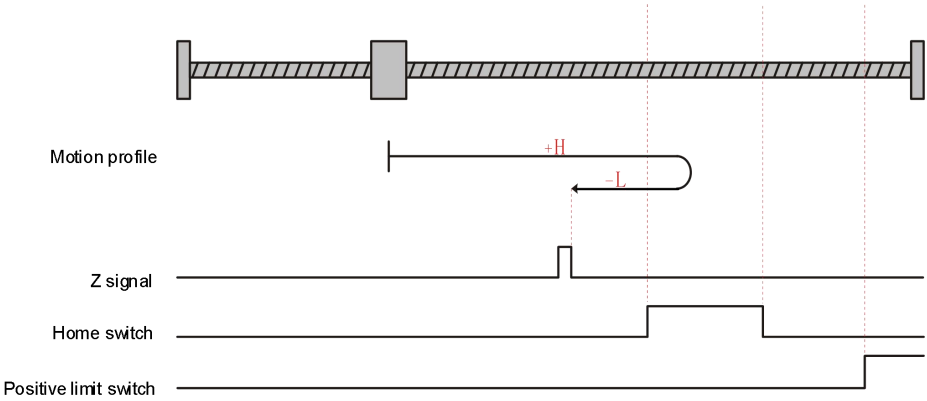
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to home. After encountering the falling edge of the home switch, it runs at a high-speed in the reverse direction, after encountering the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



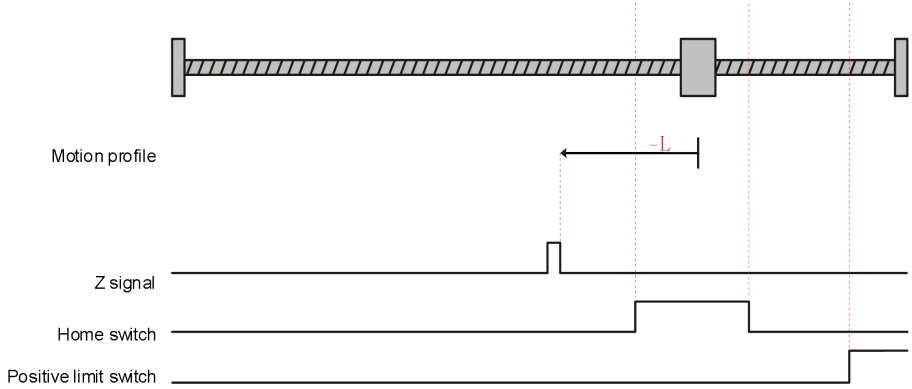
- 0x6098 = 7

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

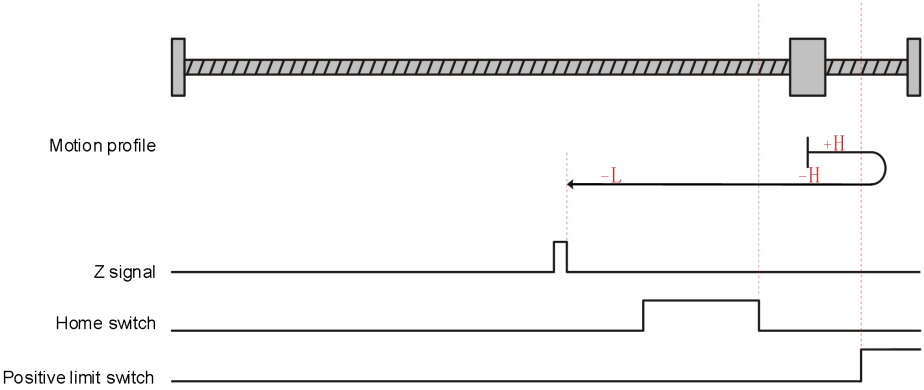
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the home switch, it will run reverse at low speed, and when it encounters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



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 low-speed returns to home. After encountering the falling edge of the home switch, it runs at a low-speed in the reverse direction, and stop at the rising edge of the Z signal.



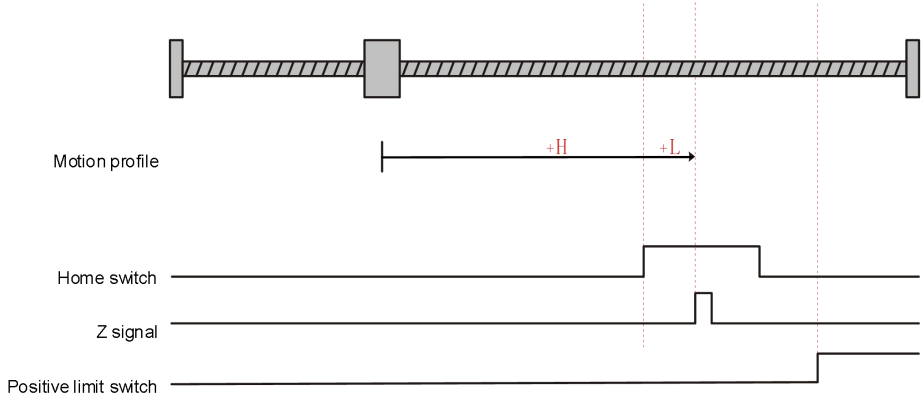
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the positive limit switch, it will run reverse at high speed. After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



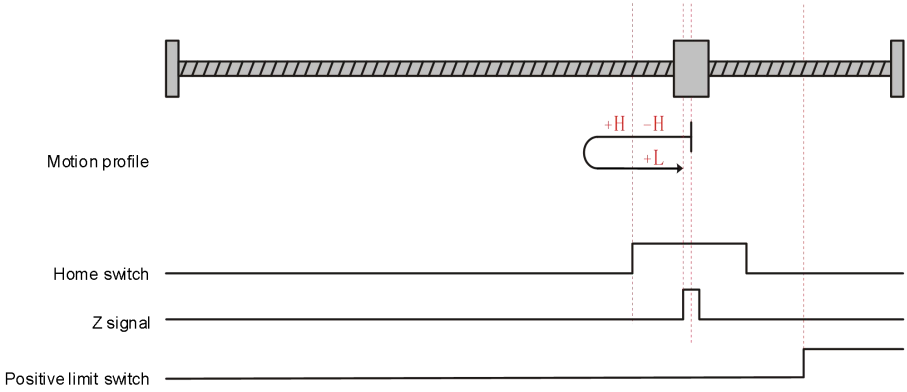
- 0x6098 = 8

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

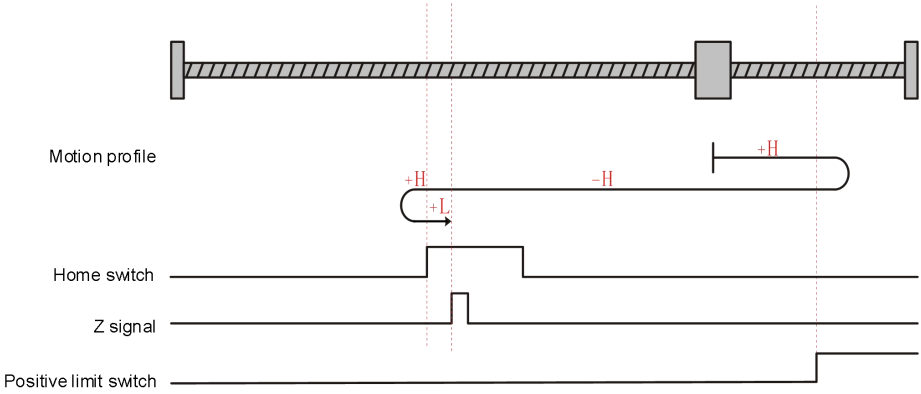
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the home switch, it will run at low speed in the forward direction,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



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 home. 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.



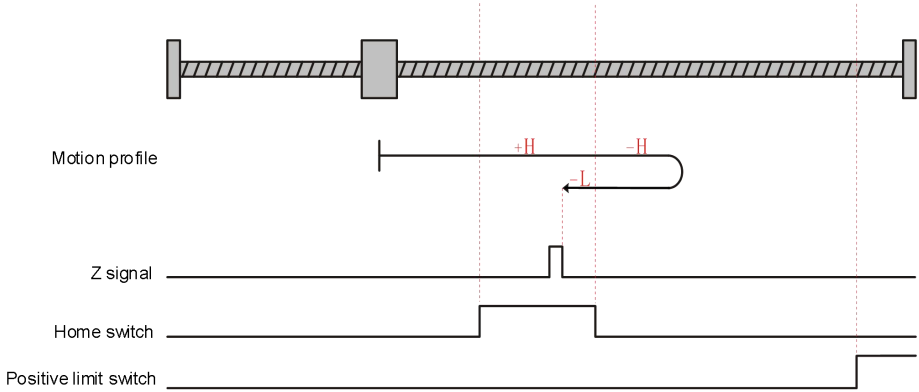
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the positive limit switch, it will run at high speed in the reverse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



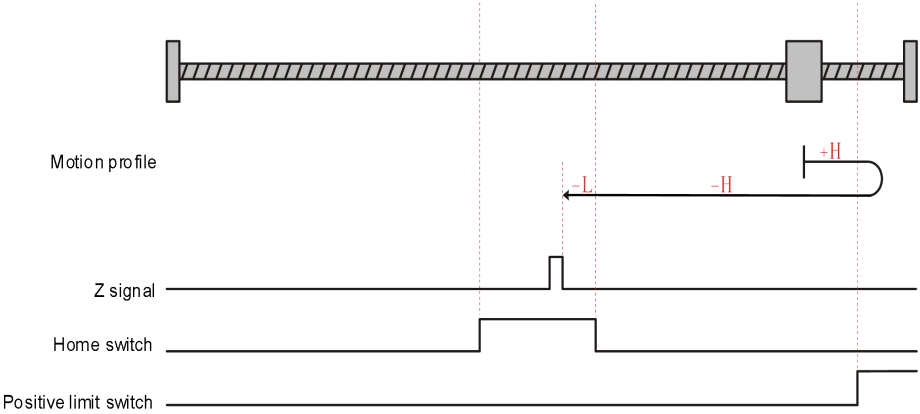
- 0x6098 = 9

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

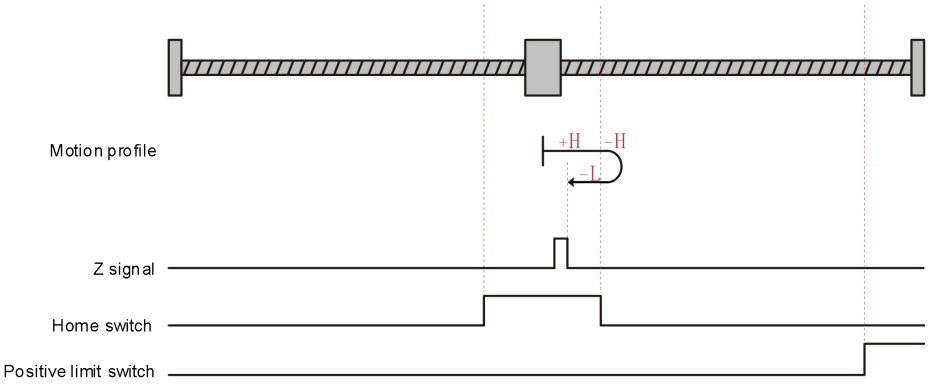
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the falling edge of the home switch, it will run reverse at high speed, and when it encounters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



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 forward high-speed returns to home. After encountering the rising edge of the positive limit switch, it will run reverse at high speed, and when it encounters the rising edge of the home switch, it will run reverse at low speed, and stop at the rising edge of the Z signal.



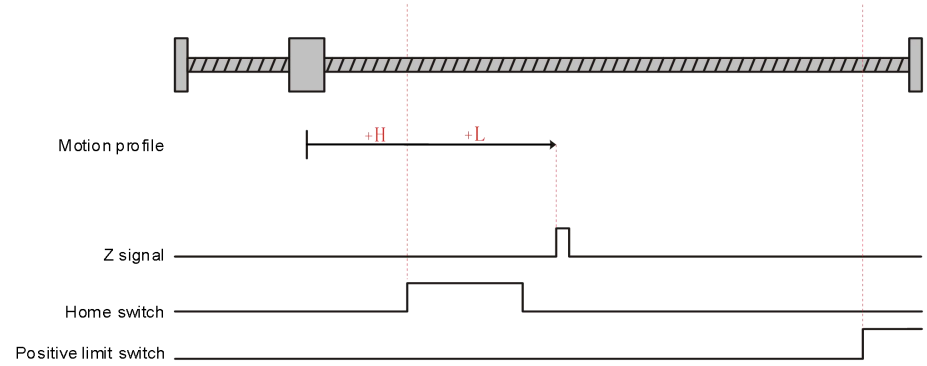
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to home. After encountering the falling edge of the home switch, it runs at a high-speed in the reverse direction, after encountering the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



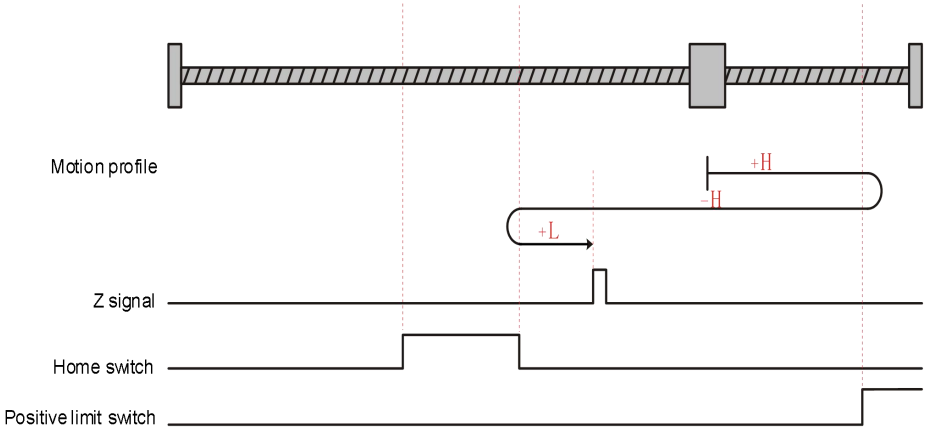
- 0x6098 = 10

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

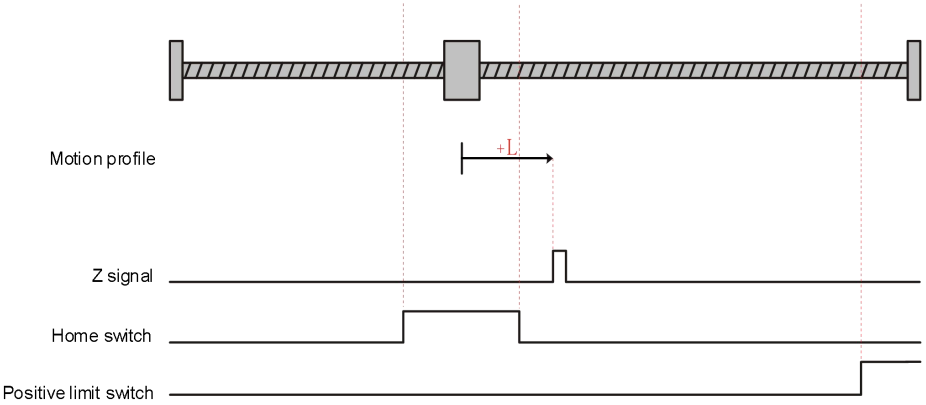
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and forward high-speed returns to home. After encountering the rising edge of the home switch, it runs at a low speed in the forward direction, and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



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 forward high-speed returns to home. After encountering the rising edge of the positive limit switch, and it will run at high speed in the reverse direction. After encountering the rising edge of the home switch, the motor will run forward at low speed, and stop at the rising edge of the Z signal.



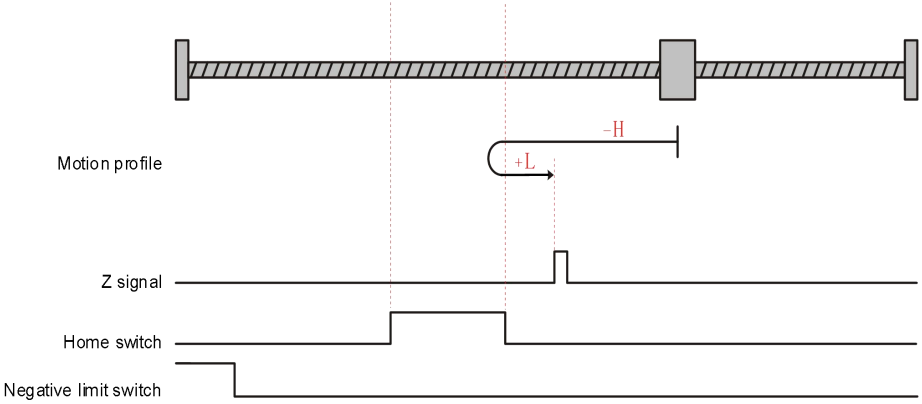
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and the motor returns to the home forward at low speed, and stops at the rising edge of the Z signal.



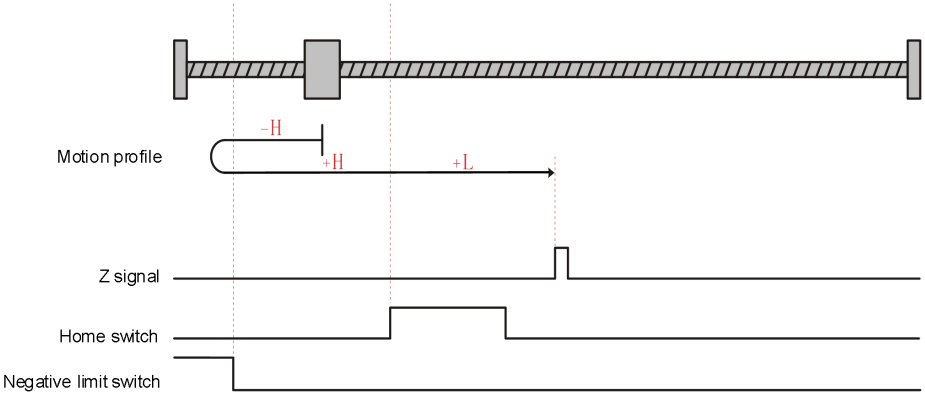
- 0x6098 = 11

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

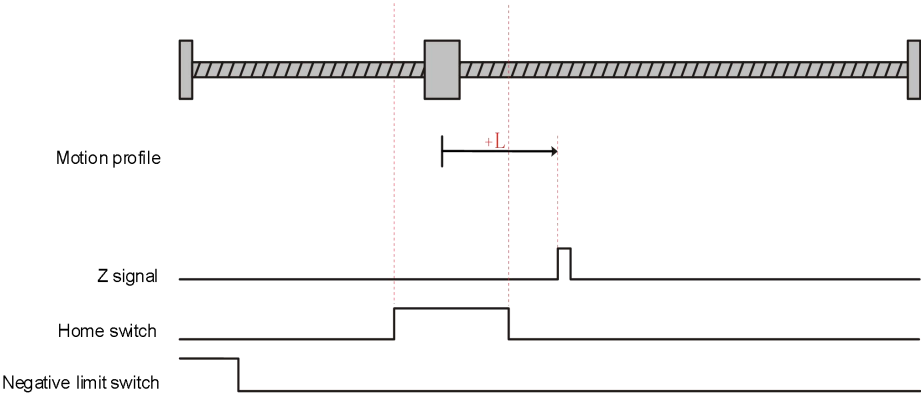
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and reverse high-speed returns to home. After encountering the rising edge of the home switch, the motor runs forward at low speed, and stops at the rising edge of the Z signal.



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 reverse high-speed returns to home. After encountering the rising edge of the negative limit switch , it will run at high speed in the forward direction. After encountering the rising edge of the home switch, it will run forward at low speed, and stop at the rising edge of the Z signal.



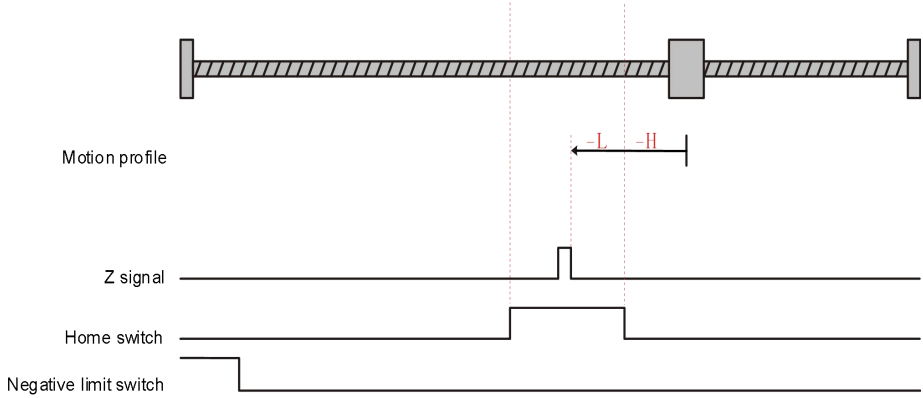
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and the motor runs forward at low speed, and stops at the rising edge of the Z signal.



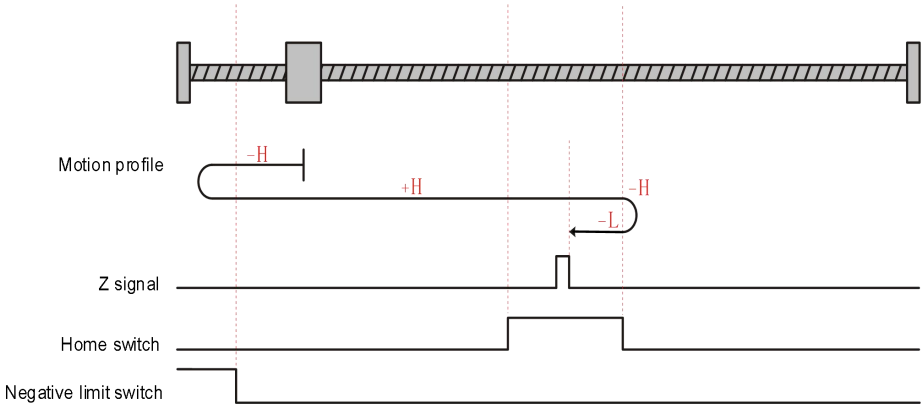
- 0x6098 = 12

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

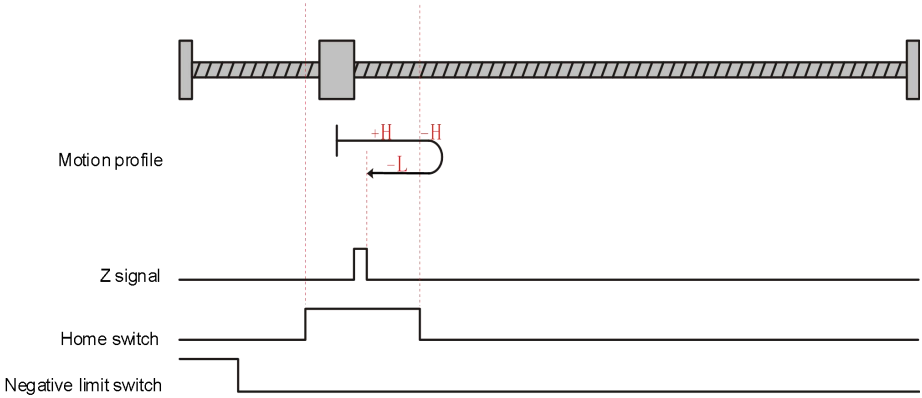
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and reverse high-speed returns to home. After encountering the rising edge of the home switch, it will run reverse at low speed, and stop at the rising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



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 reverse high-speed returns to home. After encountering the rising edge of the negative limit switch, it will run at high speed in the forward direction. After encountering the falling edge of the home switch, it will run reverse at high speed, when it encounters the rising edge of the home switch, it will run reverse at low speed, and stop at the rising edge of the Z signal.



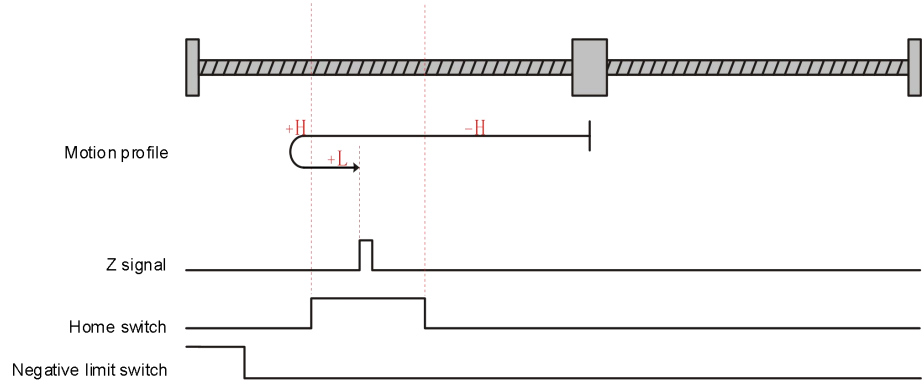
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to home. After encountering the falling edge of the home switch, it runs at a high-speed in the reverse direction, after encountering the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



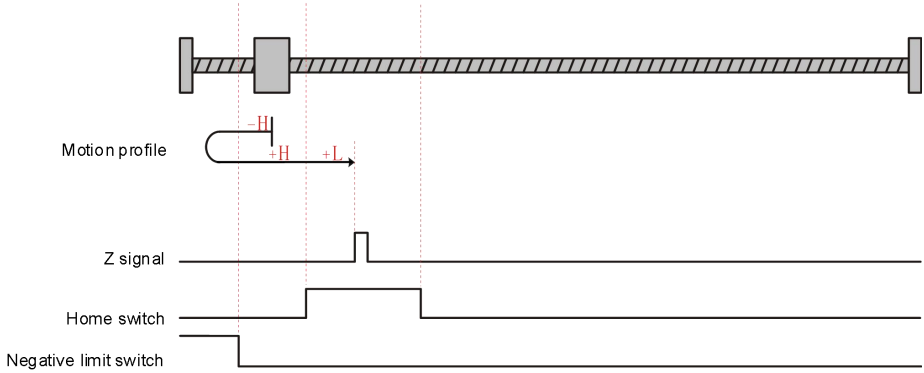
- 0x6098 = 13

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

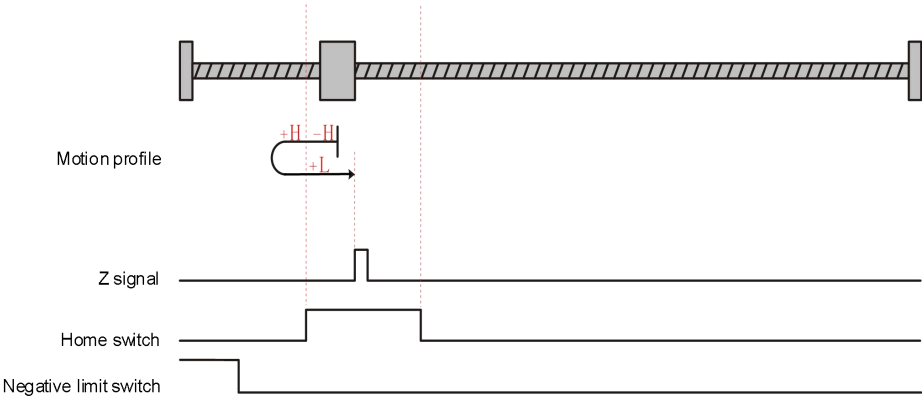
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and reverse high-speed returns to home. After encountering the falling edge of the home switch, it will run at high speed in the forward direction.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



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 reverse high-speed returns to home. After encountering the rising edge of the negative limit switch, it will run at 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 low speed in the forward direction and stop.



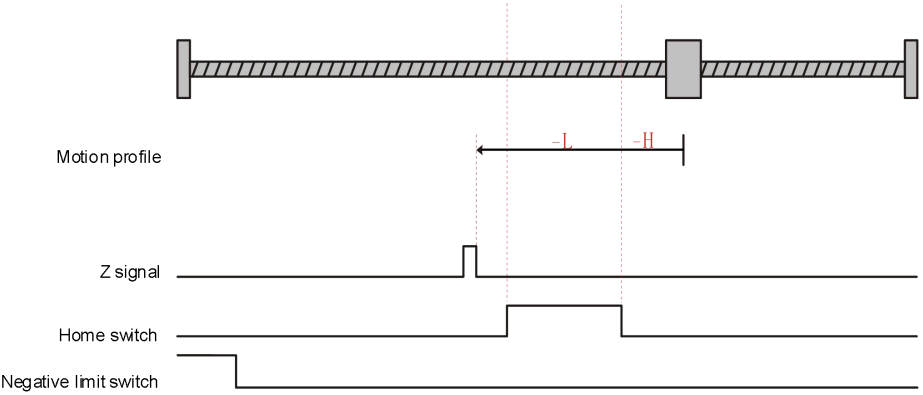
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse high-speed returns to home. After encountering the falling edge of the home switch, it runs at a high-speed in the forward direction, after encountering the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



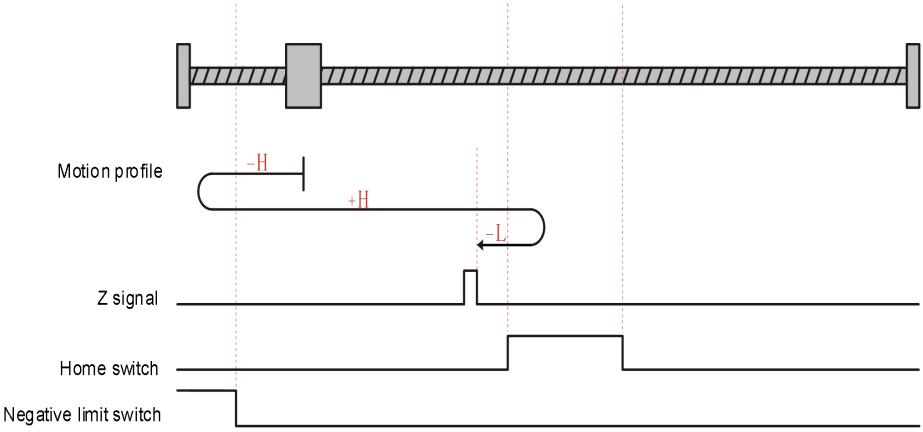
- 0x6098 = 14

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

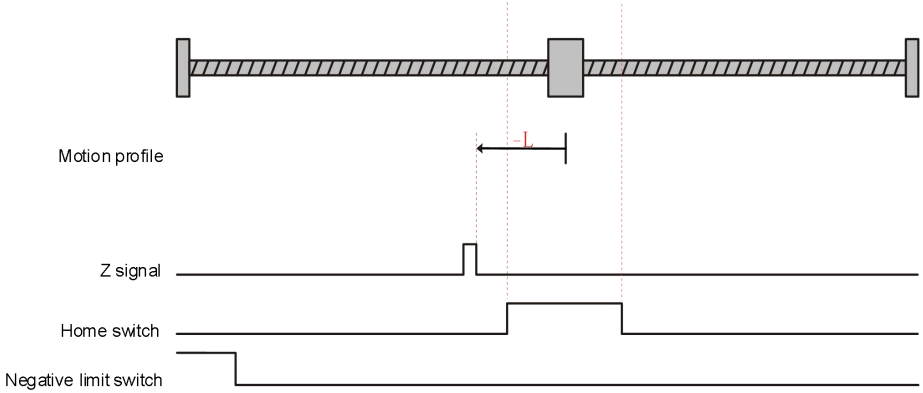
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, and reverse high-speed returns to home. After encountering the rising edge of the home switch, it will find the rising edge of the Z signal at a low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



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 reverse high-speed returns to home. After encountering the rising edge of the negative limit switch , it will run at high speed in the forward direction. After encountering the rising edge of the home switch, the motor runs reversely at low speed, and stops at the rising edge of the Z signal.



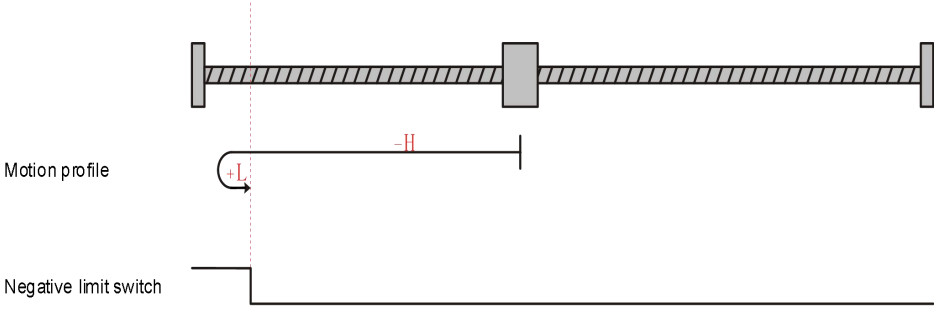
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and the motor runs reversely at low speed, and stops at the rising edge of the Z signal.



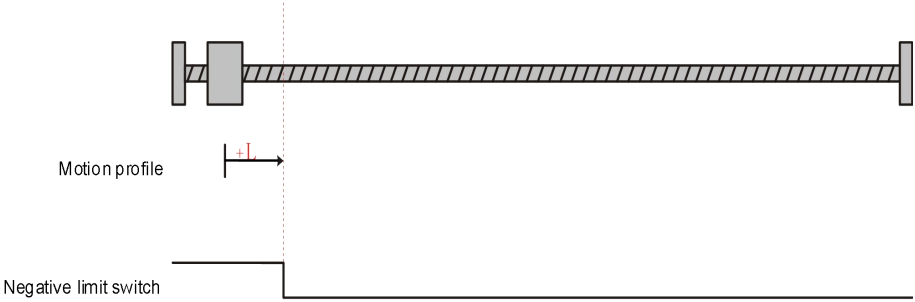
- 0x6098 = 17

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 home. After encountering the rising edge of the negative limit switch, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the negative limit switch.



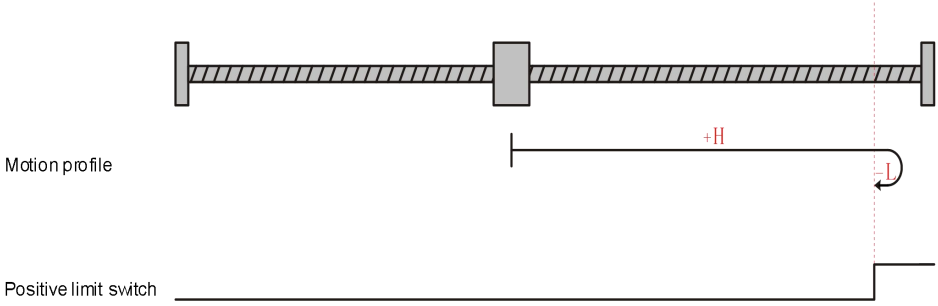
The current position of the motor is where the negative limit switch is valid. When the homing is started, the negative limit switch is at a high level, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the negative limit switch.



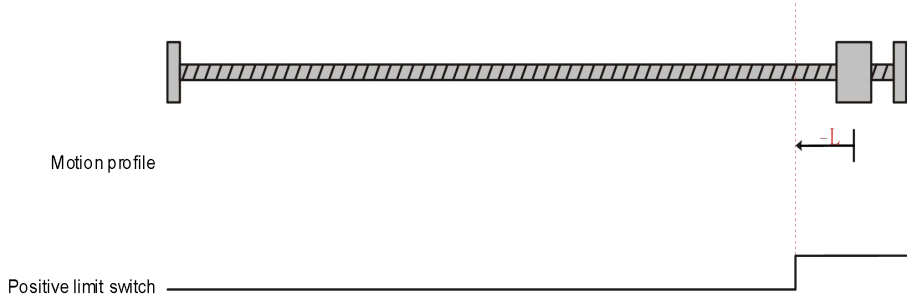
- 0x6098 = 18

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 home. After encountering the rising edge of the positive limit switch, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the positive limit switch.



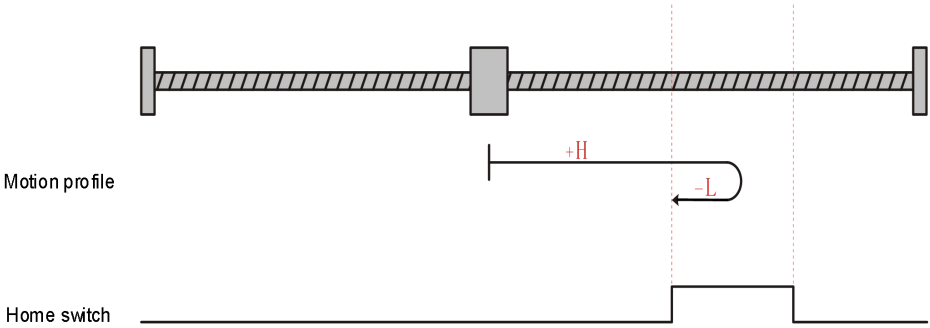
The current position of the motor is where the positive limit switch is valid. When the homing is started, the positive limit switch is at a high level, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the positive limit switch.



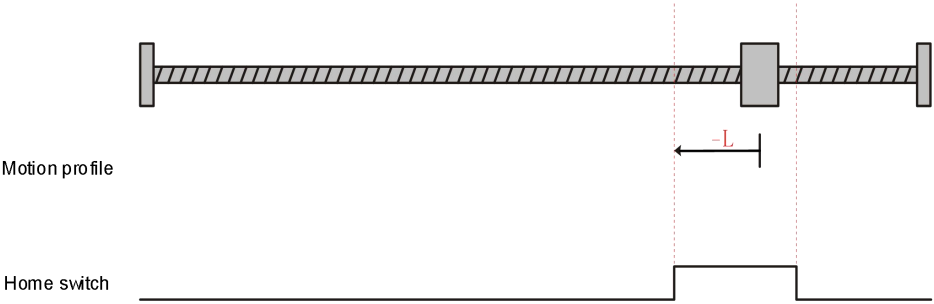
- 0x6098 = 19

Forward, home switch as deceleration point and home

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



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, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the home switch.

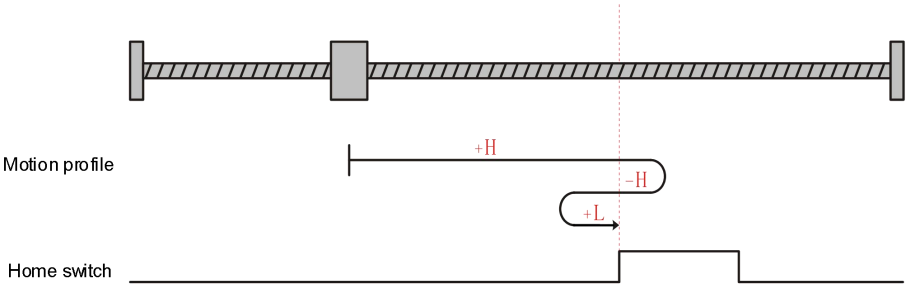


- 0x6098 = 20

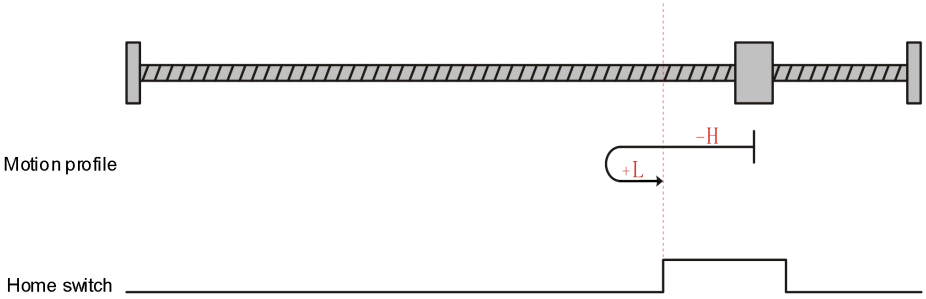
Forward, home switch as deceleration point and home

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 runs, and encountering the falling edge of the home switch, and then runs at low speed in the forward direction, and stops when encountering the rising edge of the home switch.



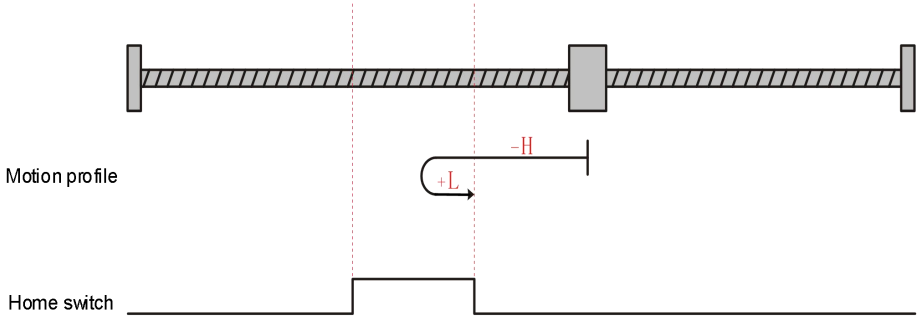
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the forward direction, and stops when it encounters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



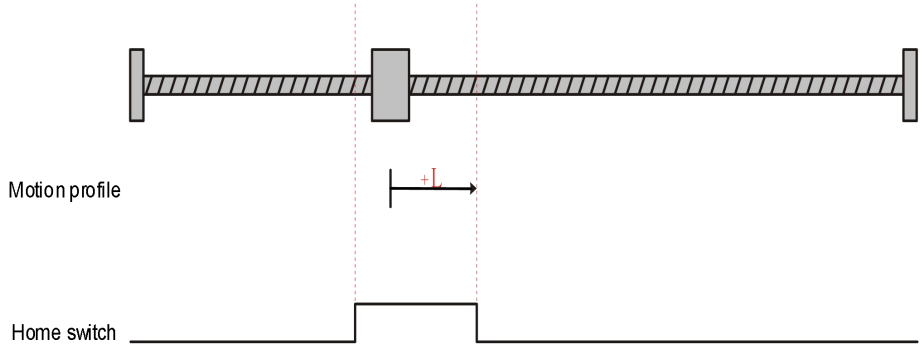
- 0x6098 = 21

Reverse, home switch as deceleration point and home

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



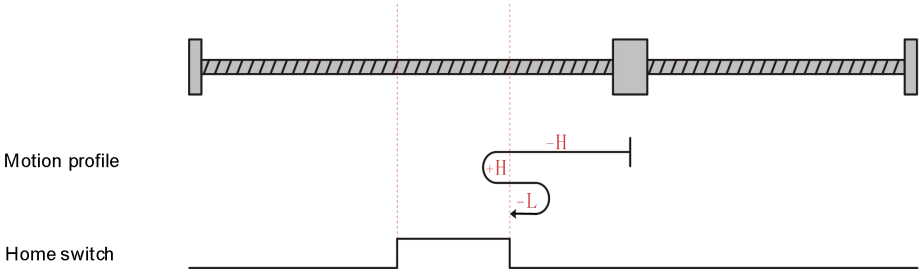
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the home switch.



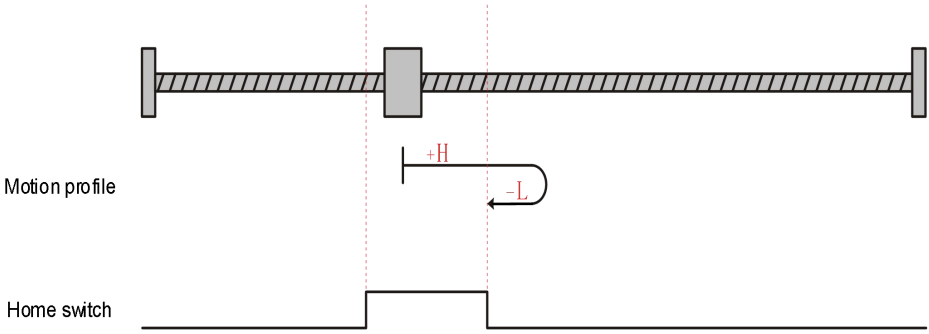
- 0x6098 = 22

Reverse, home switch as deceleration point and home

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 runs, and encountering the falling edge of the home switch, and then runs at low speed in the reverse direction, and stops when encountering the rising edge of the home switch.



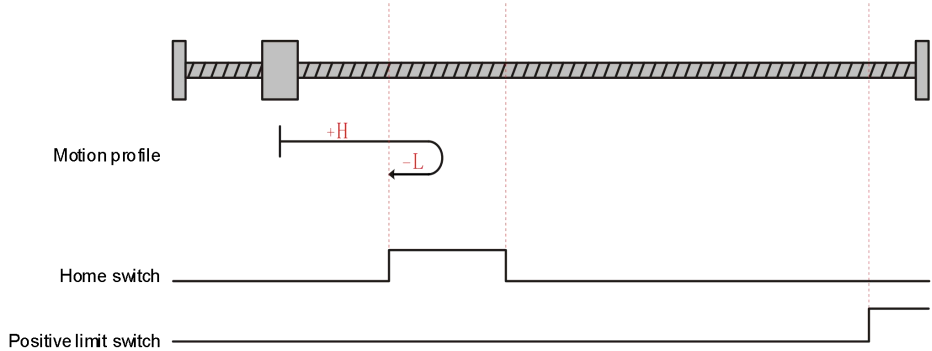
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the reverse direction, and stops when it encounters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



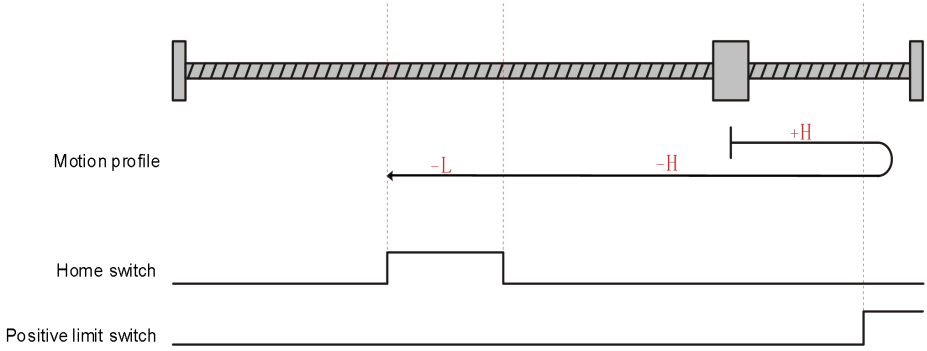
- 0x6098 = 23

Forward, home switch as deceleration point and home

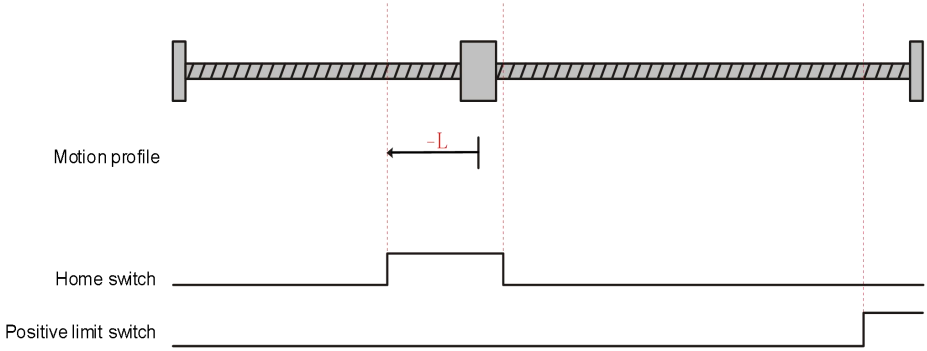
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, it runs at a high-speed in the forward direction. After encountering the rising edge of the home switch, it runs at a low-speed in the reverse direction,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



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, it runs at a high-speed in the forward direction. After encountering the rising edge of the positive limit switch, it runs at a high-speed in the reverse direction, when encountering the rising edge of the home switch, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the home switch.



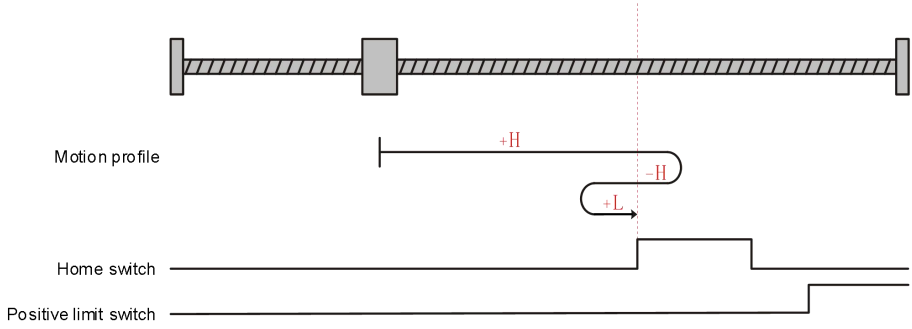
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the home switch.



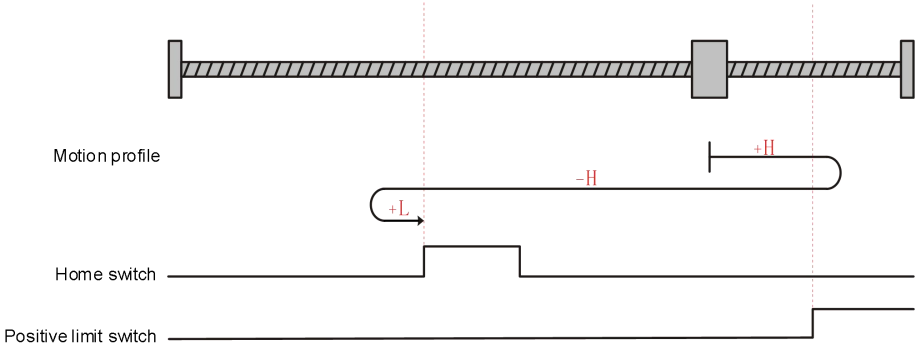
- 0x6098 = 24

Forward, home switch as deceleration point and home

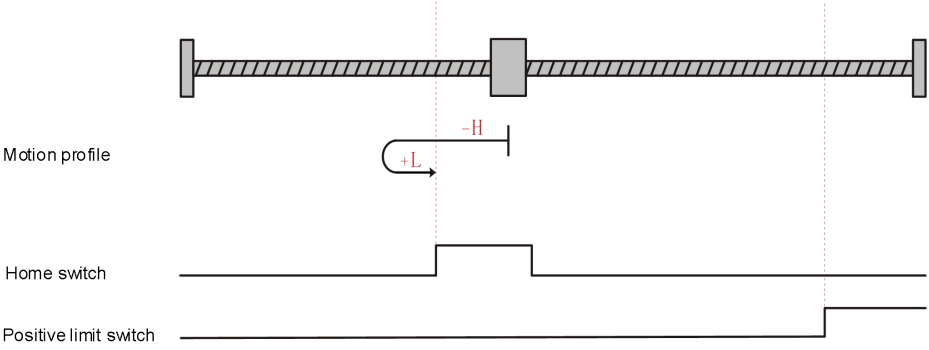
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, and the forward high-speed returns to zero. After encountering the rising edge of the home switch, the reverse high-speed runs, and encountering the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



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 runs at low speed in the forward direction, and stops when encountering the rising edge of the home switch.



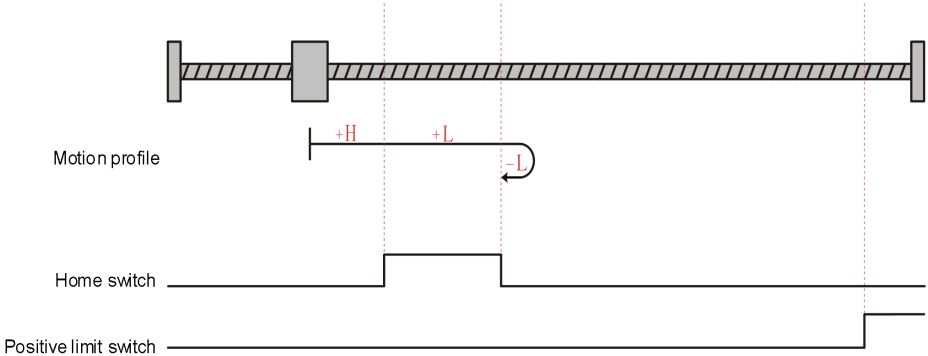
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and reverse high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the forward direction, and stops when it encounters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



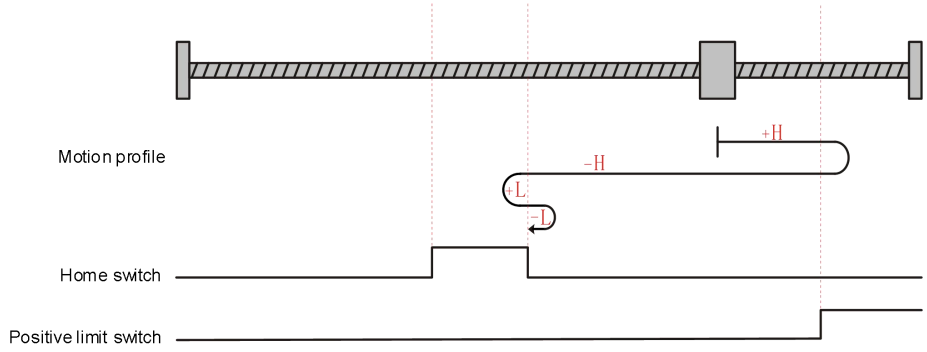
- 0x6098 = 25

Forward, home switch as deceleration point and home

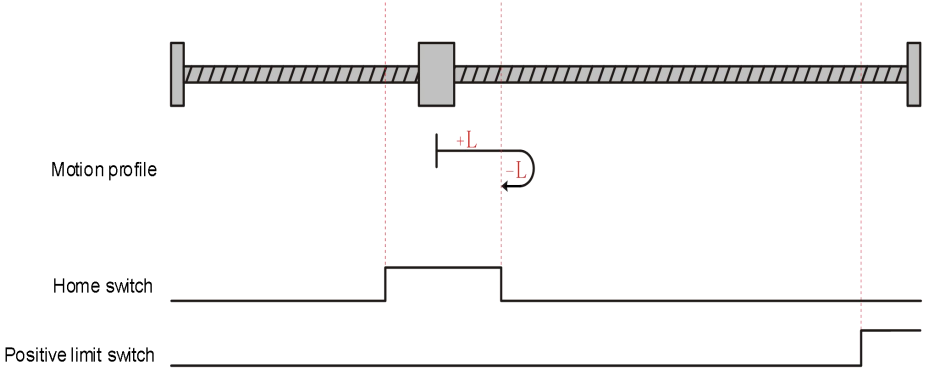
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs forward at high speed. After encountering the rising edge of the home switch, the motor runs forward at low speed. Then, after encountering the falling edge of the home switch, the motor runs reversely at low speed. Finally, the motor stops at the rising edge of the home switch.



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 low level, and the motor runs forward at high speed. After encountering the rising edge of the positive limit switch, the motor runs reversely at high speed. Then, after encountering the rising edge of the home switch, the motor runs forward at low speed. After encountering the falling edge of the home switch, the motor runs reversely at low speed. Finally, the motor stops at the rising edge of the home switch.



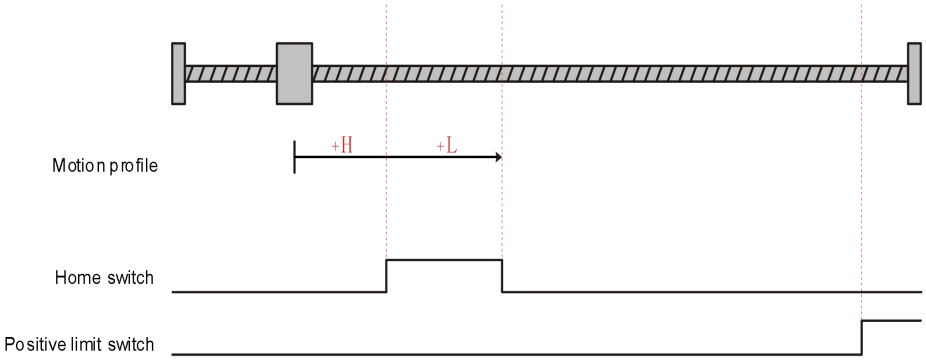
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at high level, and the motor runs forward at low speed. After encountering the falling edge of the home switch, the motor runs reversely at low speed, and stops at the rising edge of the home switch.



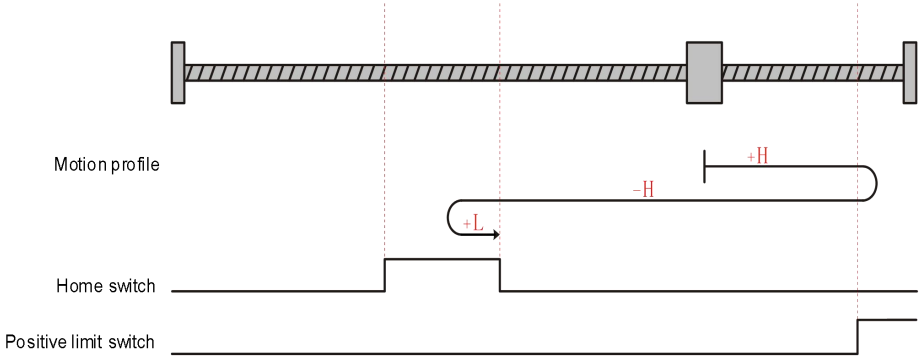
- 0x6098 = 26

Forward, home switch as deceleration point and home

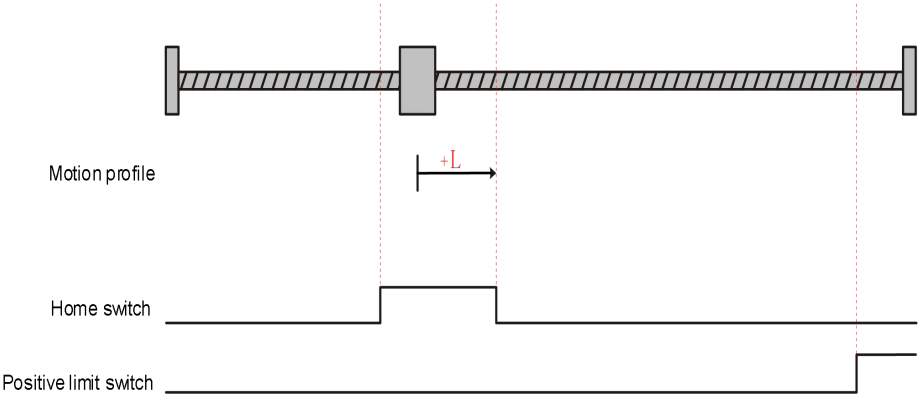
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at a low level, it runs at a high-speed in the forward direction. After encountering the rising edge of the home switch, it runs at a low-speed in the forward direction,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



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, it runs at a high-speed in the forward direction. After encountering the rising edge of the positive limit switch, it runs at a high-speed in the reverse direction, when encountering the rising edge of the home switch, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the home switch.



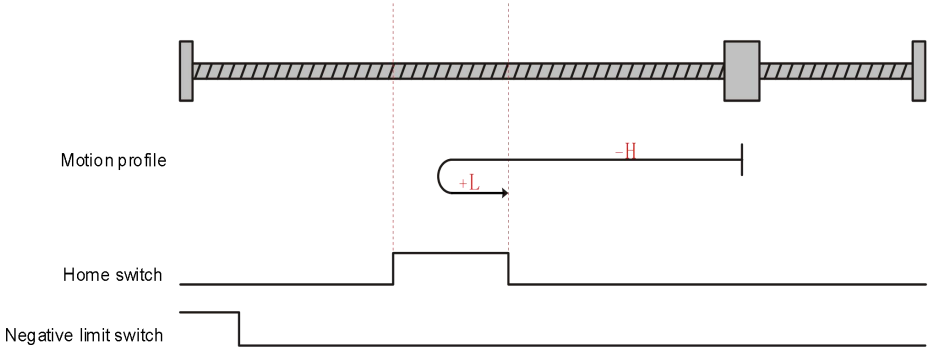
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the home switch.



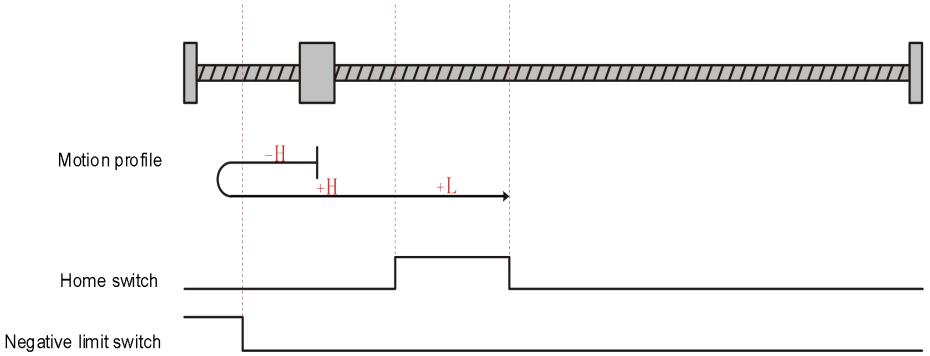
- 0x6098 = 27

Reverse, home switch as deceleration point and home

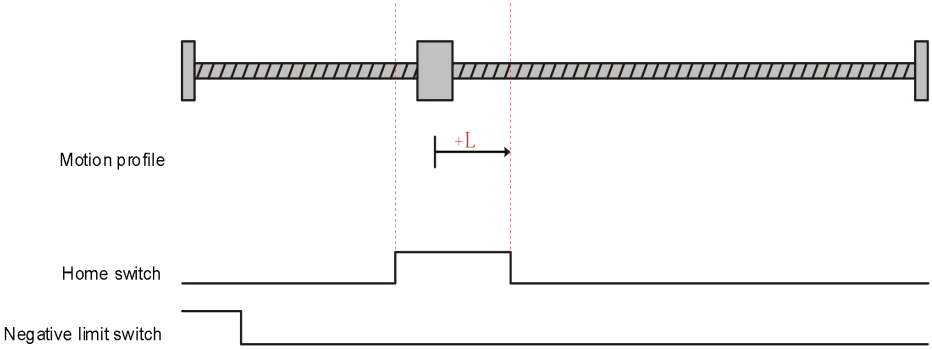
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, it runs at a high-speed in the reverse direction. After encountering the rising edge of the home switch, it runs at a low-speed in the forward direction,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



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, it runs at a high-speed in the reverse direction. After encountering the rising edge of the negative limit switch, it runs at a high-speed in the forward direction, when encountering the rising edge of the home switch, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the home switch.



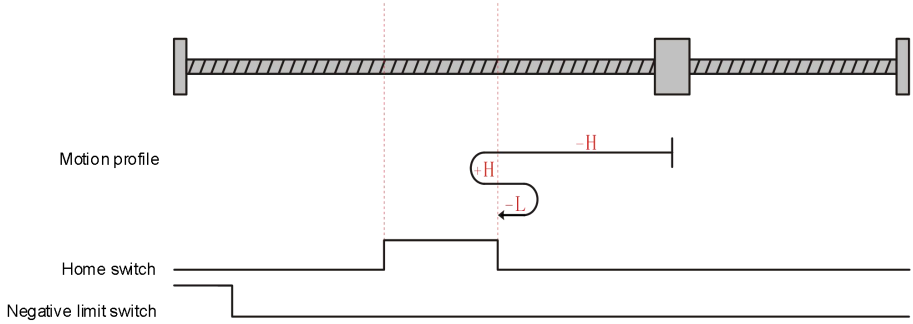
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the forward direction, and stops when encountering the falling edge of the home switch.



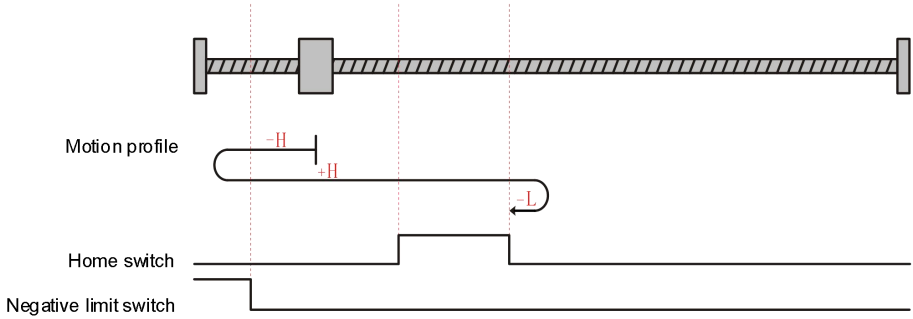
- 0x6098 = 28

Reverse, home switch as deceleration point and home

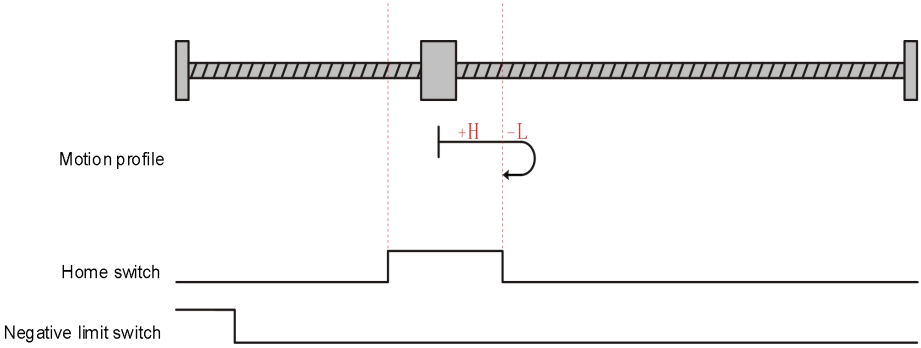
The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at a low level, and the reverse high-speed returns to zero. After encountering the rising edge of the home switch, the forward high-speed runs, and encountering the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



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 runs at low speed in the reverse direction, and stops when encountering the rising edge of the home switch.



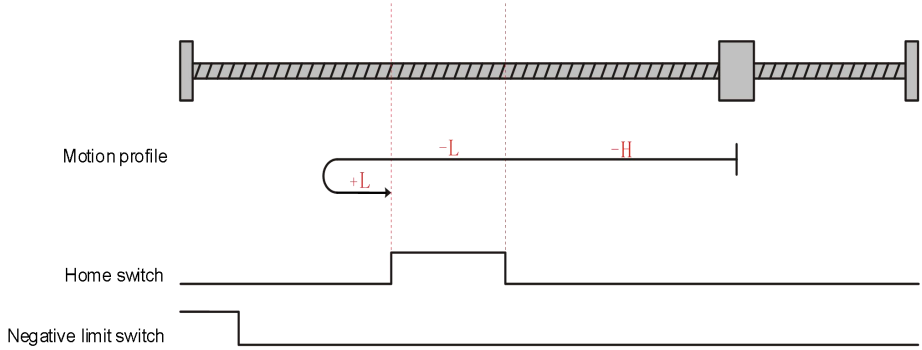
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, and forward high-speed returns to zero. After encountering the falling edge of the home switch, it runs at a low speed in the reverse direction, and stops when it encounters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



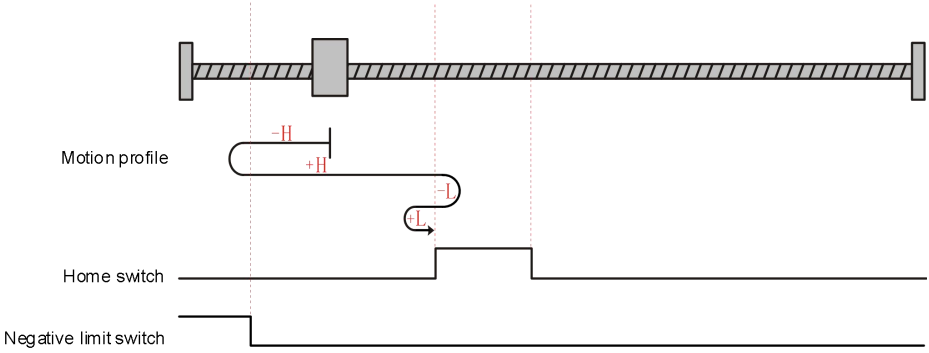
- 0x6098 = 29

Reverse, home switch as deceleration point and home

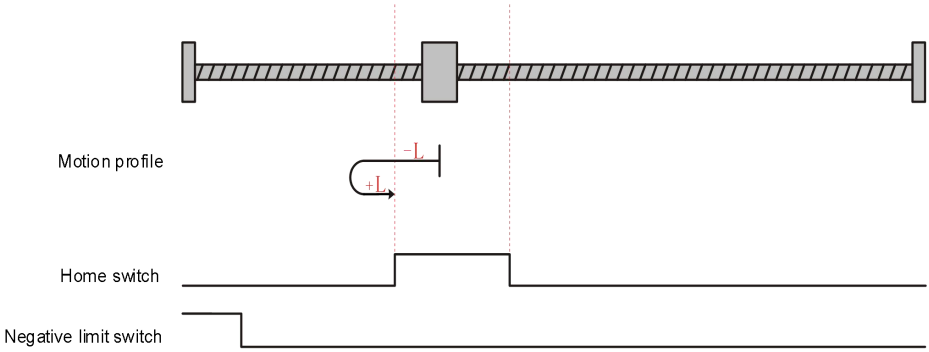
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs reversely at high speed. After encountering the rising edge of the home switch, the motor runs reversely at low speed. Then, after encountering the falling edge of the home switch, the motor runs forward at low speed. Finally, the motor stops at the rising edge of the home switch.



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 low level, and the motor runs reversely at high speed. After encountering the rising edge of the negative limit switch, the motor runs forward at high speed. Then, after encountering the rising edge of the home switch, the motor runs reversely at low speed. After encountering the falling edge of the home switch, the motor runs forward at low speed. Finally, the motor stops at the rising edge of the home switch.



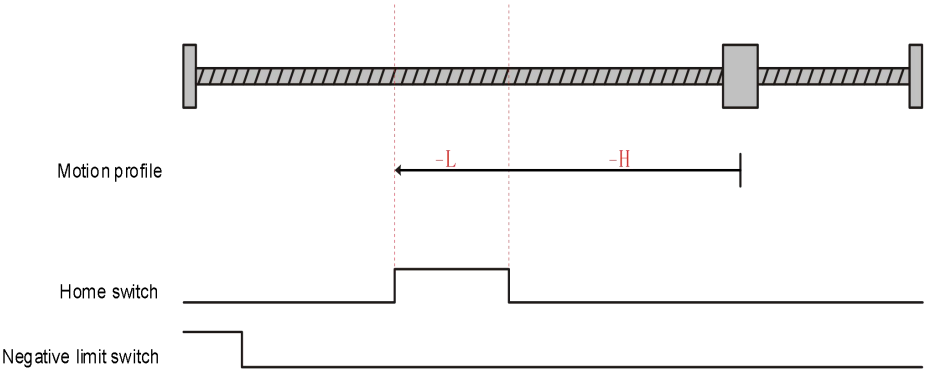
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the reverse direction, when encountering the falling edge of the home switch, it runs at a low-speed in the forward direction, and stops when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



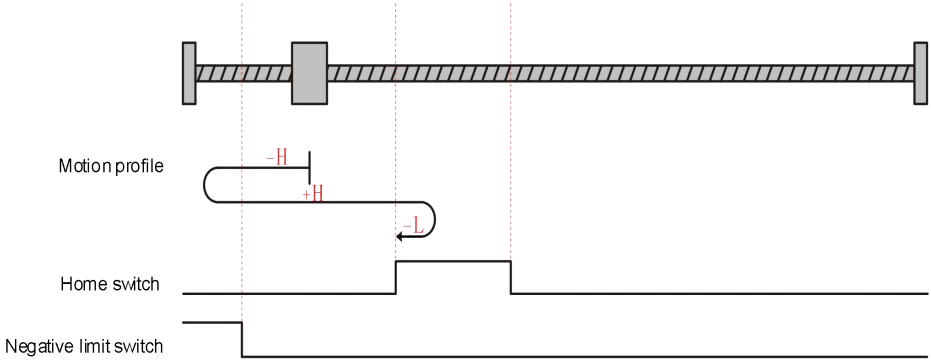
- 0x6098 = 30

Reverse, home switch as deceleration point and home

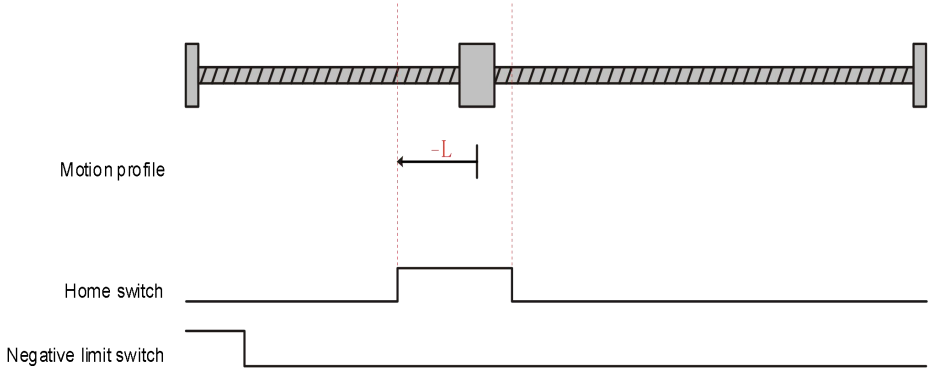
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at a low level, it runs at a high-speed in the reverse direction. After encountering the rising edge of the home switch, it runs at a low-speed in the reverse direction,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



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, it runs at a high-speed in the reverse direction. After encountering the rising edge of the negative limit switch, it runs at a high-speed in the forward direction, when encountering the rising edge of the home switch, it runs at a low-speed in the reverse direction, and stops when encountering the falling edge of the home switch.



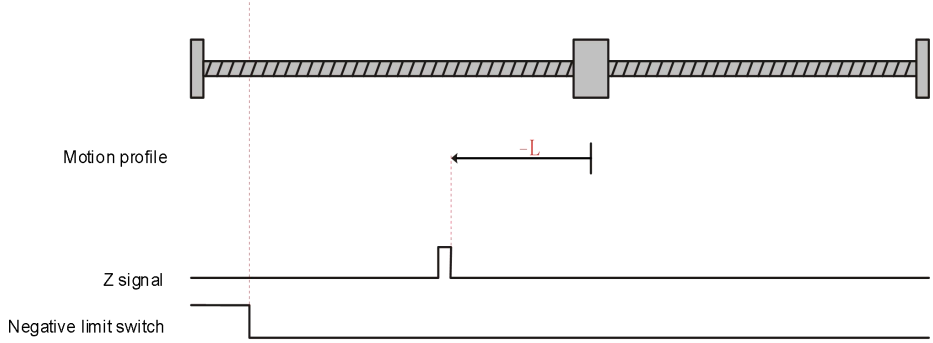
The current position of the motor is where the home switch is valid. When the homing is started, the home switch is at a high level, it runs at a low-speed in the reverse direction, and stop when encountering the falling edge of the home switch.



- 0x6098 = 33

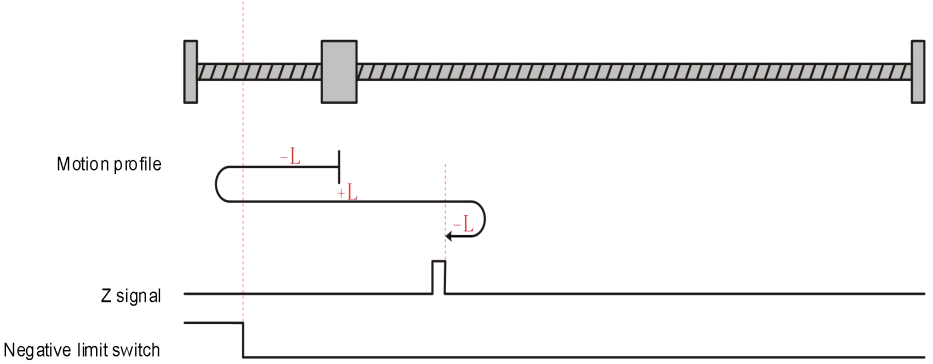
Reverse, motor Z signal as deceleration point and home

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 home at low speed in the reverse direction and stop at the rising edge of the Z signal.



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.

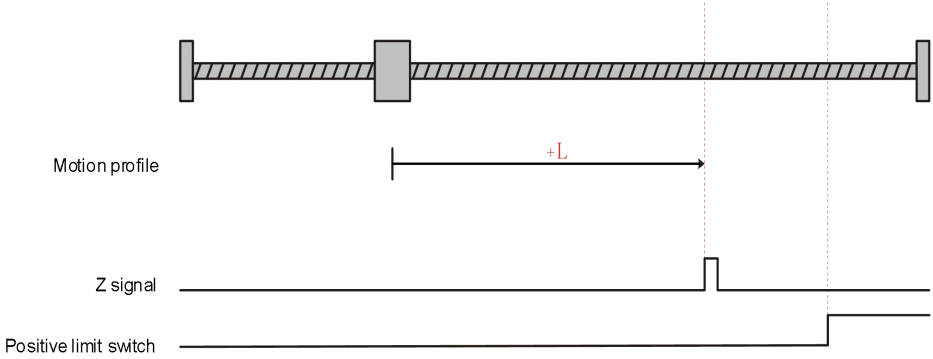
When there is no Z signal between the current position of the motor and the negative limit switch, reverse low speed returns to home, after encountering the rising edge of the negative limit switch, it runs at a low-speed in the forward direction. After encountering the falling edge of the Z signal, it will find the Z signal at a reverse low speed and stop.



- 0x6098 = 34

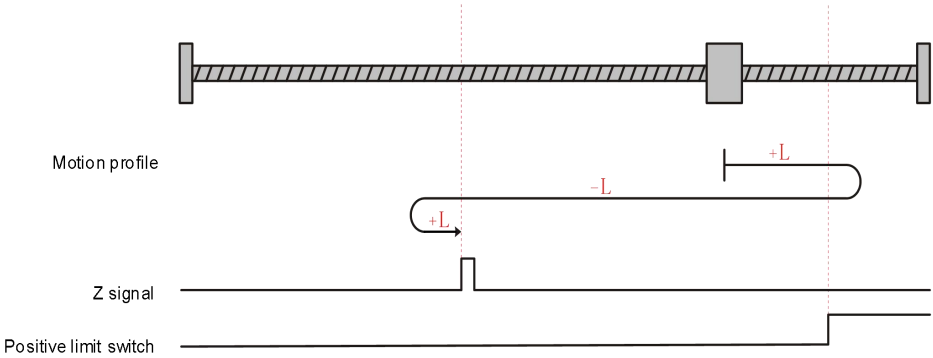
Forward, motor Z signal as deceleration point and home

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 home at low speed in the forward direction and stop at the rising edge of the Z signal.



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, forward low speed returns to home, after encountering the rising edge of the positive limit switch, it runs at a low-speed in the reverse direction. After encountering the falling edge of the Z signal, it will find the Z signal at a forward low speed and stop.



- 0x6098 = 35

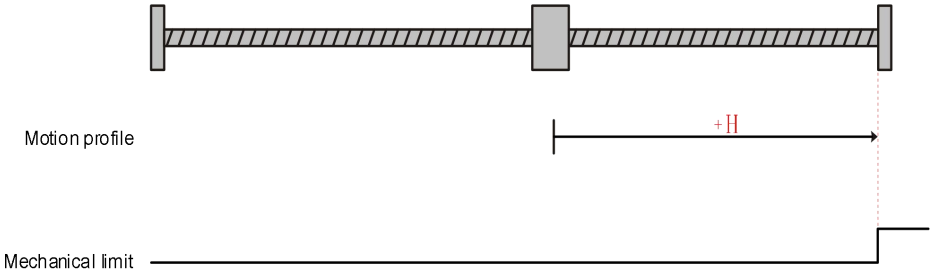
Take the current position as the home

- 0x6098 = -1

Forward, mechanical limit as deceleration point and home

The motor performs forward homing at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reach time), the motor stops.

Function code	Name	Value	Min. unit	Default	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reach time	0 to 65535 ms	1 ms	1	Immediately	At stop	

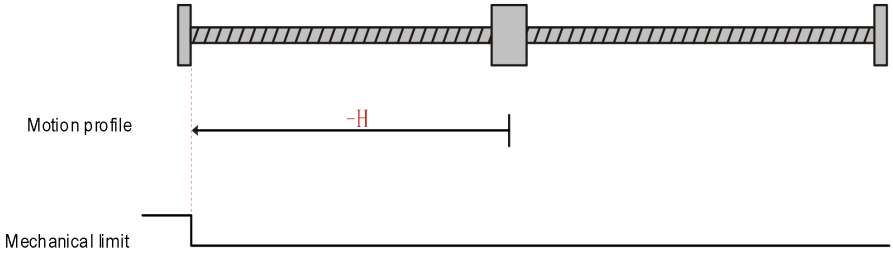


- 0x6098 = -2

Reverse, mechanical limit as deceleration point and home

The motor performs reverse homing at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reach time), the motor stops.

Function code	Name	Value	Min. unit	Default	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reach time	0 to 65535 ms	1 ms	1	Immediately	At stop	

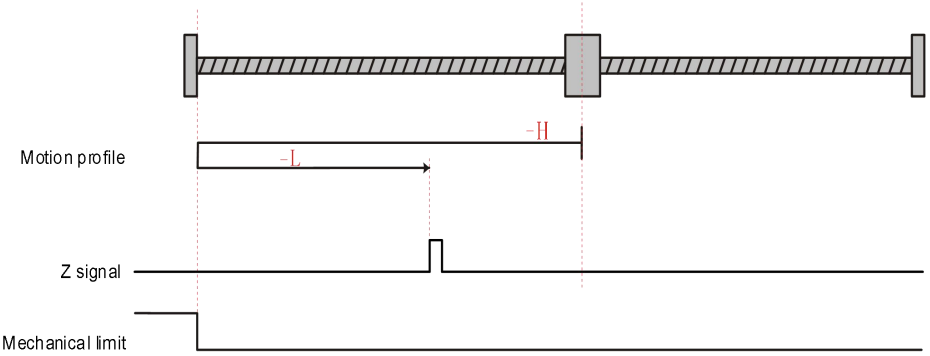


- 0x6098 = -3

Reverse, mechanical limit as deceleration point, and motor Z signal as home

The motor performs reverse homing at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reach time), the motor searches for the Z signal at low speed in the forward direction and then stops.

Function code	Name	Value	Min. unit	Default	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reach time	0 to 65535 ms	1 ms	1	Immediately	At stop	

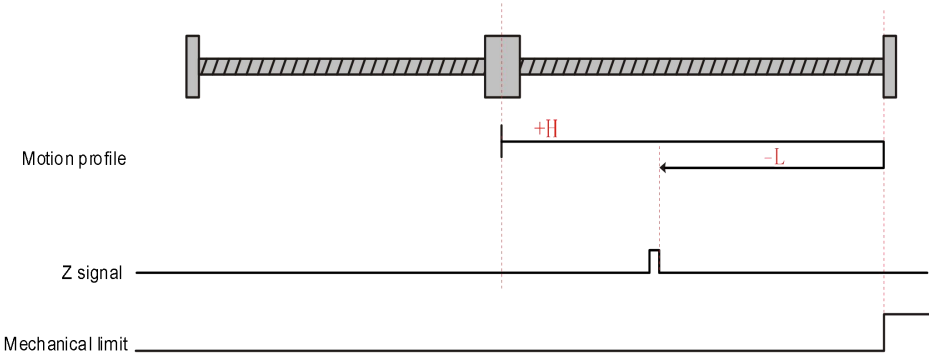


- 0x6098 = -4

Forward, mechanical limit as deceleration point, and motor Z signal as home

The motor performs forward homing at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reach time), the motor searches for the Z signal at low speed in the reverse direction and then stops.

Function code	Name	Value	Min. unit	Default	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reach time	0 to 65535 ms	1 ms	1	Immediately	At stop	



7.4.5 Cyclic Synchronous Position Mode

The principle of the Cyclic Synchronous Position Mode is similar to that of the interpolated position mode. In this mode, the master station completes the position command planning, and sends the planned target position to the slave station drive in a periodic synchronous manner. In this mode, the target position object is 607Ah.

The Cyclic Synchronous Position Mode (CSP) supports only absolute position instructions, and the M6-N supports only linear interpolation.

7.4.5.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	p
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
6065h	VAR	Following error window	UINT32	RW	RPDO	Reference unit
6066h	VAR	Following error window time	UINT16	RW	RPDO	ms
6067h	VAR	Position window	UINT32	RW	RPDO	Reference unit
6068h	VAR	Position window time	UINT16	RW	RPDO	ms
607Ah	VAR	Target position	INT32	RW	RPDO	Reference unit

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
607Dh	ARRAY	Software position limit	INT32	RW	RPDO	Reference unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
6091h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
60F4h	VAR	Following error actual value	INT32	RO	TPDO	Reference unit
2014.0bh	VAR	Data interpolation cycle	UINT16	RW	RPDO	us

Note: P20.10 (2014.0bh) interpolation cycle is used only when the synchronous cycle is inconsistent with the data cycle, which is set as the data cycle in the unit of us.

7.4.5.2 Control word and status word

The control word in Cyclic Synchronous Position Mode (CSP) is the same as the standard definition.

Status word in Cyclic Synchronous Position Mode (CSP) :

Bit15~Bit14	Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Following error	Target position ignored	*	Target reached	*

Description of status word bits in Cyclic Synchronous Position Mode (CSP) :

Bit	Value	Description
Target reached	0	Target position not reached
	1	Target position reached
Target position ignored	0	Position instruction not followed
	1	Position instruction followed
Following error	0	No position deviation
	1	There is position deviation

7.4.5.3 Function description

• Running mode: Set 6060h=8;

• Target position: Use 607Ah to set the target position of the user unit, if necessary, set the gear ratio 6091h;

• Running enable: Enable the drive to run by the control word 6040h;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero;

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time from the maximum speed of speed limit value to zero Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value);

• The position deviation is too large: When the position deviation 60F4h of the user unit is greater than 6065h, the fault is set, and the bit13 of the status word 6041h is set to 1.

• When the synchronous cycle is inconsistent with the data cycle, the data interpolation cycle 2014.0bh shall be set.

• Instruction polarity 0x607E: Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E.

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

7.4.5.4 Basic configuration

The following table describes the basic configuration of objects in Cyclic Synchronous Position Mode (CSP).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target position 607Ah	Position feedback 6064h	Required
Other object		Optional, you can configure it as an SDO parameter.

7.4.6 Cyclic Synchronous Velocity Mode

In this mode, the master station periodically synchronizes the calculated target speed to the slave station drive, and the slave station drive executes the target speed given by the master station. The interpolation period is the same as the synchronization signal period.

7.4.6.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	Reference unit/s
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
6095h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
60FFh	VAR	Target velocity	INT32	RW	RPDO	Reference unit/s

7.4.6.2 Control word and status word

The control word in Cyclic Synchronous Velocity Mode (CSV) is the same as the standard definition.

Status word in Cyclic Synchronous Velocity Mode (CSV) :

Bit15~Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Target velocity ignored	*	Target reached	*

Status word description in Cyclic Synchronous Velocity Mode (CSV) :

Bit	Value	Description
Target reached	0	Target speed not reached
	1	Target speed reached
Target velocity ignored	0	Speed instruction not followed
	1	Speed instruction followed

7.4.6.3 Function description

• Running mode: Set 6060h = 9;

• Target speed setting: Use 60FFh to set the target speed of the user unit, if necessary, set the gear ratio 6091h;

• Running enable: Enable the drive to run through the control word 6040h;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero.

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time for the speed limit value from the maximum speed to zero Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value).

• Instruction polarity 0x607E: Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E;

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

7.4.6.4 Basic configuration

The following table describes the basic object configurations in Cyclic Synchronous Velocity Mode (CSV).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target velocity 60FFh		Required
	Speed actual value 606Ch	Optional
Other object		Optional, you can configure it as an SDO parameter.

7.4.7 Cyclic Synchronous Torque Mode

In this mode, the master station periodically synchronizes the calculated target torque to the slave station drive, and the slave station drive executes the target torque given by the master station. The interpolation period is the same as the synchronization signal period.

7.4.7.1 Common object

The following table lists the objects related to this mode.

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	Encoder unit
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	Reference unit/s
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
6071h	VAR	Target torque	INT16	RW	RPDO	0.1%
6072h	VAR	Max torque	UINT16	RW	RPDO	0.1%
6074h	VAR	Torque demand	INT16	RO	TPDO	0.1%
6077h	VAR	Torque actual value	INT16	RO	TPDO	0.1%

Index	Object Code	Name	Type	Attr.	PDO mapping	Unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	Reference unit/s
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
60E0h	VAR	FWD torque limit	UINT16	RW	RPDO	0.1%
60E1h	VAR	REV torque limit	UINT16	RW	RPDO	0.1%

7.4.7.2 Control word and status word

The control word under Cyclic Synchronous Torque Mode (CST) is the same as the standard definition.

Status word in Cyclic Synchronous Torque Mode (CST) :

Bit15~Bit13	Bit12	Bit11	Bit10	Bit9~Bit0
*	Target torque ignored	*	Target reached	*

Status word description in Cyclic Synchronous Torque Mode (CST) :

Bit	Value	Description
Target reached	0	Target torque not reached
	1	Target torque reached
Target torque ignored	0	Torque instruction not followed
	1	Torque instruction followed

7.4.7.3 Function description

• Control mode: Set P02.00 = 8;

• Running mode: Set 6060h = 10;

• Target torque setting: 6071h is used to set the target torque of the user unit, unit 0.1%;

• Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah(P07.09 forward speed limit channel) and 2007.0Ch(P07.11 reverse speed limit channel), the default bus speed limiting, using the maximum profile speed 607Fh and the maximum motor speed 6080h setting, or set the internal speed limiting channel, then the speed limit is set according to the function code object dictionary 2007.0Bh(P07.10 forward speed limit) and 2007.0Dh(P07.12 reverse speed limit). In addition, you can set P20.19 (2014.14h) to specify the time during which the speed limit value is decelerated to zero.

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
P20.19	Deceleration time for bus speed limit	0 to 65535	1	0	Immediately	At stop	The deceleration time for the speed limit value from

Function code	Name	Setting range	Minimum unit	Default value	Effective time	Property	Function
							the maximum speed to zero Unit: ms

• Torque limiting setting: Select the torque limiting channel according to the function code object dictionary 2006.0Dh(P06.12 positive torque limiting channel) and 2006.0Eh(P06.13 negative torque limiting channel), the default bus torque limiting channel, use the maximum torque 6072h, positive torque limiting 60E0h, negative torque limiting 60E1h smaller value to set the positive and negative torque limiting value, or set the internal torque limiting channel, then the torque limiting is set according to the function code object dictionary 2006.0Fh(P06.14 positive torque limit value) and 2006.10h(P06.15 reverse torque limit value).

• Running enable: Enable the drive to run through the control word 6040h;

• Instruction polarity 0x607E:Torque, speed, position instruction logic is set according to the bit corresponding to the object dictionary 0x607E;

Bit	Value	Description	Bit
BIT5	Torque instruction polarity	0	Torque instruction positive logic
		1	Torque instruction inverse logic
BIT6	Speed instruction polarity	0	Speed instruction positive logic
		1	Speed instruction inverse logic
BIT7	Position instruction polarity	0	Position instruction positive logic
		1	Position instruction inverse logic

• Torque arrival function:

This function defines whether the actual torque feedback has reached the torque window. If the difference between the actual torque feedback of the drive (6077h) and the torque reference value (2007.0Eh) is greater than the torque arrival effective value (2007.0Fh), the bit10(target_reached) of the status word is set to 1. The bit10(target_reached) of the status word is immediately cleared when the difference between the actual torque feedback (6077h) and the torque reference value (2007.0Eh) is less than the torque arrival invalid value (2007.10h).

• Torque reference slope function:

This function defines the acceleration and deceleration time for target torque. If the controller can not plan the slope for the target torque (6071h), you can set P20.20 (2014.15h) to plan the acceleration and deceleration of the servo's internal torque, in the unit of 0.01%/1ms. If it is only required to plan the slope when the target torque is down to zero, you can set P20.18(2014.13h) to plan the deceleration of the servo's internal torque.

If you set P20.18 and P20.20 at the same time, P20.18 is effective only when the target torque is down to zero while in other situations P20.20 is effective.

If there is already a slope planned by the controller, P20.18 and P20.20 can not be set.

Function code	Name	Setting range	Min. unit	Default value	Effective time	Property	Function
P20.18	Rapid deceleration slope for bus torque reference	0 to 65535	1	0	Immediately	At stop	Slope for torque down to 0 Unit: 0.01%/1ms
P20.20	Acceleration and deceleration slope for bus torque reference	0 to 65535	1	0	Immediately	At stop	Torque acceleration /deceleration slope Unit: 0.01%/1ms Can be used together with P20.18

7.4.7.4 Basic configuration

The following table describes the basic configuration of objects in Cyclic Synchronous Torque Mode (CST).

RPDO object	TPDO object	Note
Control word 6040h	Status word 6041h	Required
Target torque 6071h		Required
	Torque actual value 6077h	Optional
Other object		Optional, you can configure it as an SDO parameter, or use the default parameters of the drive.

7.5 Servo drive stop

The stop mode includes coasting to stop and ramping to stop.

In the running status, when the control word receives the “Shutdown” command, the drive will be stopped according to 605Bh.

In the running status, when the control word receives the “Disable operation” command, the drive will be stopped according to 605Ch.

In the running status, when the control word receives the “Quick stop” command, the drive will be stopped according to 605Ah.

When the DI (FunIN.34) emergency stop terminal is used, the drive will be stopped according to 605Ah.

Object dictionary	Name	Data type	Attr.	Mapping type	Unit	Function
605Ah	Quick stop option code	INT16	RW	RPDO	-	0-Coast to stop 1-6084h/609Ah(HM)/6087h(PT/CST) 2-6085h/6087h(PT/CST) 5-6084h/609Ah(HM)/6087h(PT/CST), drive position lock 6-6085h/6087h(PT/CST), drive position lock Note: The torque mode does not support position lock currently
605Dh	Halt option code	INT16	RW	RPDO	-	1-6084h/609Ah(HM)/6087h(PT/CST) 2-6085h/6087h(PT/CST)
605Bh	Shutdown option code	INT16	RW	RPDO	-	0-Coast to stop 1-6084h/609Ah(HM)/6087h(PT/CST)
605Ch	Disable operation option code	INT16	RW	RPDO	-	0-Coast to stop 1-6084h/609Ah(HM)/6087h(PT/CST)
6084h	Profile deceleration	UINT32	RW	RPDO	Reference unit/s^2	
6085h	Quick stop deceleration	UINT32	RW	RPDO	Reference unit/s^2	
6087h	Torque slope	UINT16	RW	RPDO	0.1%/s	
609Ah	Homing acceleration	UINT32	RW	RPDO	Reference unit/s^2	

7.6 Application functions of servo drive

7.6.1 Touch probe function

The M6 servo provides 2 touch probes, and records the position information of the positive edges and negative edges of the two probes.

When the DI terminal is used as the probe triggering signal, DI3/DI4 can be chosen for high-speed input. Set P03.02 (DI3) to the No.49 function (touch probe 1), and P03.03 (DI4) to the No.50 function (touch probe 2).

The Z signal can also be used as the probe triggering signal.

Object dictionary	Name	Data type	Attr.	Mapping type	Unit
60B8h	Touch Probe function	INT16	RW	RPDO	-
60B9h	Touch probe status	UINT16	RO	TPDO	-
60BAh	Touch probe Pos1 pos value	INT32	RO	TPDO	Reference unit
60BBh	Touch probe Pos1 neg value	INT32	RO	TPDO	Reference unit
60BCh	Touch probe Pos2 pos value	INT32	RO	TPDO	Reference unit
60BDh	Touch probe Pos2 neg value	INT32	RO	TPDO	Reference unit

	Bit	Function
60B8h Touch Probe function	0	0 - Disable touch probe 1 1 - Enable touch probe 1
	1	0 - Touch probe 1 single latching 1 - Touch probe 1 continuous latching
	2	0 - DI terminal to trigger touch probe 1 1 - Z signal to trigger touch probe 1
	3	Reserved
	4	0 - Disable latching of touch probe 1 position at the positive edge 1 - Enable latching of touch probe 1 position at the positive edge
	5	0 - Disable latching of touch probe 1 position at the negative edge 1 - Enable latching of touch probe 1 position at the negative edge
	6–7	Reserved
	8	0 - Disable touch probe 2 1 - Enable touch probe 2
	9	0 - Touch probe 2 single latching 1 - Touch probe 2 continuous latching
	10	0 - DI terminal to trigger touch probe 2 1 - Z signal to trigger touch probe 2
	11	Reserved
	12	0 - Disable latching of touch probe 2 position at the positive edge 1 - Enable latching of touch probe 2 position at the positive edge

	13	0 - Disable latching of touch probe 2 position at the negative edge 1 - Enable latching of touch probe 2 position at the negative edge
	14–15	Reserved

	Bit	Definition
60B9h Touch probe status	0	0 - Touch probe 1 disabled 1 - Touch probe 1 enabled
	1	0 - No positive edge value latched for touch probe 1 1 - Positive edge value latched for touch probe 1
	2	0 - No negative edge value latched for touch probe 1 1 - Negative edge value latched for touch probe 1
	3–7	Reserved
	8	0 - Touch probe 2 disabled 1 - Touch probe 2 enabled
	9	0 - No positive edge value latched for touch probe 2 1 - Positive edge value latched for touch probe 2
	10	0 - No negative edge value latched for touch probe 2 1 - Negative edge value latched for touch probe 2
	11–15	Reserved

7.6.2 Input and output terminal 60FDh/60FEh

The M6 servo drive supports 60FDh, which is used to indicate the input status of each terminal.

	Bit	Function
60FDh DI status (Digital inputs)	0	1 - Negative limit switch valid 0 - Negative limit switch invalid
	1	1 - Positive limit switch valid 0 - Positive limit switch invalid
	2	1 - Home signal valid 0 - Home signal invalid
	3–15	Reserved
	16	1 - DI1 input valid 0 - DI1 input invalid
	17	1 - DI2 input valid 0 - DI2 input invalid
	18	1 - DI3 input valid 0 - DI3 input invalid
	19	1 - DI4 input valid 0 - DI4 input invalid
	20	1 - DI5 input valid 0 - DI5 input invalid
	21	1 - DI6 input valid

		0 - DI6 input invalid
	22	1 - DI7 input valid 0 - DI7 input invalid
	23	1 - DI8 input valid 0 - DI8 input invalid
	24	1 - DI9 input valid 0 - DI9 input invalid
	25	1 - Z signal valid 0 - Z signal invalid
	26	1 - Touch probe 1 valid 0 - Touch probe 1 invalid
	27	1 - Touch probe 2 valid 0 - Touch probe 2 invalid
	28–31	Reserved

The M6 servo drive supports 60FEh, using EtherCAT bus to control the forced output of DO signals.

Before the drive enters OP, the DO terminal does not output.

After the drive entered OP, the DO output is controlled by the corresponding bit of 60FESUB1 after the 60FESUB2 terminal is enabled.

After the drive exited OP, namely disconnection, the DO output status is controlled by P20.27.

	Bit	Function
60FEh sub1 DO forced output control	0 to 15	Reserved
	16	1 - DO1 Switch on 0 - DO1 Switch off
	17	1 - DO2 Switch on 0 - DO2 Switch off
	18	1 - DO3 Switch on 0 - DO3 Switch off
	19	1 - DO4 Switch on 0 - DO4 Switch off
	20	1 - DO5 Switch on 0 - DO5 Switch off
	21 to 31	Reserved
60FEh sub2 DO forced output enable	0 to 15	Reserved
	16	1 - DO1 output enabled 0 - DO1 output disabled
	17	1 - DO2 output enabled 0 - DO2 output disabled
	18	1 - DO3 output enabled

		0 - DO3 output disabled
	19	1 - DO4 output enabled 0 - DO4 output disabled
	20	1 - DO5 output enabled 0 - DO5 output disabled
	21 to 31	Reserved
P20.27 Forced DO output selection	0	0 - DO1 status unchanged after disconnection 1 - DO1 no output
	1	0- DO2 status unchanged after disconnection 1 - DO2 no output
	2	0 - DO3 status unchanged after disconnection 1 - DO3 no output
	3	0 - DO4 status unchanged after disconnection 1 - DO4 no output
	4	0 - DO5 status unchanged after disconnection 1 - DO5 no output
	5 to 15	Reserved

7.6.3 Slave address allocation

When the master station allocates the slave address automatically, P20.09(2014.0Ah) will display the allocated address. When it is required to set the slave address, you can set P20.08(2014.09h).

7.6.4 User unit selection

7.6.4.1 Position user unit

Users can set the pulses for one motor revolution (8388608 P/r by default) through P05.05(2005.06h) to match the controller position reference. Also, you can set the gear ratio factor (6091h).

7.6.4.2 Speed user unit

Users can set the speed user unit through P20.15(2014.10h). The default user unit for bus speed is reference unit/s.

7.6.4.3 Torque user unit

Users can set the torque user unit through P20.14(2014.0Fh). The default user unit for bus torque is 0.1% (rated torque P01.04(2001.05h)).

Chapter 8 Troubleshooting

The drive has two protection levels: Fault and Alarm. When the drive fault or alarm occurs, the high byte of 0x603f is 0xff, and the low byte is the drive fault code or alarm code. For details, see P10.18. please refer to the bit7 of 0x6041 to determine whether it is a fault or alarm, bit7=1 indicates an alarm, otherwise fault.

603Fh	VAR	Error Code	UINT16	RW	TPDO	-

All possible fault types, fault cause and solutions for M6-N 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	Confirm the braking resistor value.	Select the appropriate braking resistor value according to operating conditions and load.

Fault code	Fault type	Fault cause	Confirming method	Solutions
		large, and the energy absorption during braking is insufficient.)		
		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 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

Fault code	Fault type	Fault cause	Confirming method	Solutions
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/	View inertia ratio, confirm	Increase the acceleration and

Fault code	Fault type	Fault cause	Confirming method	Solutions
		deceleration is too frequent or the load inertia is too large.	start-stop cycle	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.	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=2), 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	Confirm the host system	Check whether the host device is

Fault code	Fault type	Fault cause	Confirming method	Solutions
		work.	signal	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
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.
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.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.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	The initial angle of the	See P01.22 to check and	Retune the encoder angle

Fault code	Fault type	Fault cause	Confirming method	Solutions
	overspeed	encoder is wrong	confirm the initial angle of the encoder	
		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.
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	Check whether the position deviation detection range P05.21 is	Increase the position loop gain P08.02.

Fault code	Fault type	Fault cause	Confirming method	Solutions
		P05.21.	too small or whether the position gain P08.02 is too small.	
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	EtherCAT communication interrupted	Communication interruption between controller and servo timed out	Check the connection between the controller 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.

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.039	Positive overtravel	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	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.
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.050	ASIC initialization error	Abnormal ASIC communication	Restart the drive	Restart the drive, the fault cannot be reset, replace the drive.
Er.051	Internal fault 51	----------	----------	Seek for service support
Er.052	Incorrect interpolation period	P20.10 sets an invalid interpolation period	Query master station synchronization period and interpolation period	When the synchronization period of the master station is consistent with the interpolation period, P20.10 is set to zero. When it is inconsistent, P20.10 is the same as the interpolation period of the master station.
Er.053	The given position instruction of the controller is too	The given position instruction of the controller is too large.	Confirm controller position instruction given	Reduce the given deviation of the controller position instruction.

Fault code	Fault type	Fault cause	Confirming method	Solutions
	large.			
Er.054 Er.055 Er.056 Er.057 Er.058 Er.059	Internal fault	----------	----------	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.063 Er.064	Internal fault	----------	----------	Seek for service support
Er.065	The ASIC EEPROM was not programmed	The controller is not programmed ASIC EEPROM	The controller programs the EEPROM according to the description file	The fault cannot be reset, and the controller programs the EEPROM according to the description file.
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

Fault code	Fault type	Fault cause	Confirming method	Solutions
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.074	STO fault	----------	----------	Seek for service support
Er.075	Absolute encoder battery undervoltage	Absolute encoder battery voltage is lower than 3.1V during drive power-up.	Measure whether the battery voltage is lower than 3.1V.	Replace the encoder cable or encoder battery.
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
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.
Er.081 Er.082 Er.083 Er.084	Internal fault	----------	----------	Seek for service support

Fault code	Fault type	Fault cause	Confirming method	Solutions
Er.085				

All the possible alarm types for M6-N 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.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	Given by normal logic

Alarm code	Alarm type	Alarm cause	Confirming method	Solutions
			terminal is activated, it will alarm.	
AL.039	Positive overtravel warning	When P10.04=0 or 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=0 or 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.

Chapter 9 Drive parameter object

9.1 M6-N Drive parameters

The M6-N drive parameter object index is shown in the following table:

Parameter group	Index	Sub-index	Note
P00	2000h	01h~ Number of parameters in this group	Index of drive parameter =(2000h+ group number); Sub-index of the drive parameter = (the offset of the parameter within this group + 1). [Example]: The first parameter of P00 group P00.00: Index = 2000h, sub-index = 01h. The 11th parameter of P12 group P12.10: Index = 200Ch, sub-index = 0Bh
P01	2001h	01h~ Number of parameters in this group	
……			

Drive parameters are listed as follows:

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
Index 2000h (P00): Drive parameters							
P00.00	01h	Serial No.	0~FFFF	1	Manufacturer setting	–	At display
P00.01	02h	DSP software version No.	0.00~99.99	0.01	Manufacturer setting	–	At display
P00.02	03h	User-customized version No.	0~9999	1	Manufacturer setting	–	At display
P00.03	04h	FPGA software version No.	0.00~99.99	0.01	Manufacturer setting	–	At display
P00.04	05h	Voltage class of servo drive	0：220V 1：380V	1	Manufacturer setting	–	At display
P00.05	06h	Rated current of servo drive	0~999.9A	0.1A	Manufacturer setting	–	At display
P00.06	07h	Maximum current of servo drive	0~999.9A	0.1A	Manufacturer setting	–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
Index 2001h (P01): Servo motor parameters							
P01.00	01h	Motor SN	0: Motor parameters can be set 0x0001~0xFFFF: Motor parameters are automatically set according to the number	1	0	Immediate	At stop
P01.01	02h	Rated power	0.04~99.99kW	0.01kW	Model dependent	Power-on again	At stop
P01.02	03h	Rated voltage	0~ rated voltage of servo drive	1V	0	Power-on again	At stop
P01.03	04h	Rated current	0.1~999.9A	0.1A	Model dependent	Power-on again	At stop
P01.04	05h	Rated torque	0.1~655.35Nm	0.01Nm	Model dependent	Power-on again	At stop
P01.05	06h	Maximum torque	0.1~655.35Nm	0.01Nm	Model dependent	Power-on again	At stop
P01.06	07h	Rated speed	0.1~6000.0rpm	0.1rpm	Model dependent	Power-on again	At stop
P01.07	08h	Maximum speed	0.1~6000.0rpm	0.1rpm	Model dependent	Power-on again	At stop
P01.08	09h	Rotor inertia Jm	0.01~655.35kg*cm^2	0.01kg*cm^2	Model dependent	Power-on again	At stop
P01.09	0Ah	Number of pole pairs	1~72 pairs of poles	1 pair of poles	Model dependent	Power-on again	At stop
P01.10	0Bh	Stator resistance R1	0.000~65.000Ω	0.001Ω	Model dependent	Power-on again	At stop
P01.11	0Ch	Direct axis inductance Ld	0.00~200.00mH	0.01mH	Model dependent	Power-on again	At stop
P01.12	0Dh	Q-axis inductance Lq	0.00~200.00mH	0.01mH	Model dependent	Power-on again	At stop
P01.13	0Eh	Back-EMF constant	1~600.0V/krpm	0.1V/krpm	Model dependent	Power-on again	At stop
P01.14	0Fh	Torque coefficient Kt	0.001~65.000N·M/A	0.01 N·M/A	Model dependent	Power-on again	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P01.15	10h	Electrical constant Te	0.01~650.00ms	0.01ms	Model dependent	Power-on again	At stop
P01.16	11h	Mechanical constant Tm	0.01~650.00ms	0.01ms	Model dependent	Power-on again	At stop
P01.17	12h	Brake function	0: Without brake 1: With brake	1	Model dependent	Immediate	At stop
P01.18	13h	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
P01.19	14h	Number of encoder lines	1~4194304	1	2097152	Immediate	At stop
P01.20	15h	Encoder installation initial angle tuning	0: Disabled 1: Enabled (motor in static status) 2: Enabled (motor in rotating status)	1	0	Immediate	At stop
P01.21	16h	Rotation direction	0: A before B 1: B before A	1	0	Immediate	At stop
P01.22	17h	Initial angle for installing encoder	0.0~359.9°	0.1°	180.0	Immediate	At stop
P01.23	18h	Absolute encoder mode	0: Absolute position multi-turn mode 1: Absolute position single-turn mode 2: Incremental position mode Others: Reserved	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
Index 2002h (P02): Basic control parameters							
P02.00	01h	Control mode selection	0: Speed mode 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 same time, and it remains in the speed mode) 8: EtherCAT mode	1	8	Immediate	At stop
P02.01	02h	Internal servo enable	0: Disable 1: Enable	1	0	Immediate	During running
P02.02	03h	Absolute value system mode selection	0: Absolute position linear mode 1: Absolute position rotation mode	1	0	Immediate	At stop
P02.03	04h	Rotation direction selection	0: Take the CCW direction as the forward direction (A before B) 1: Take the CW direction as the forward direction	1	0	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			(reverse mode, B before A)				
P02.04	05h	Encoder frequency dividing output pulses	1~32768 P/r	1	2500 P/r	Immediate	During running
P02.05	06h	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
P02.06	07h	Output pulse direction selection	0: A before B 1: B before A	1	0	Immediate	During running
P02.07	08h	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
P02.08	09h	Stop mode	0: Decelerate to stop 1: Coast to stop	1	0	Immediate	During running
P02.09	0Ah	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
P02.10	0Bh	Delay from brake outputting ON signal to command received	20~500ms	1ms	250	Immediate	During running
P02.11	0Ch	Delay from brake outputting OFF signal to motor power-off in the	1~1000ms	1ms	150	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		standstill state					
P02.12	0Dh	Brake command output speed limit value	0~3000.0rpm	1rpm	10.0	Immediate	During running
P02.13	0Eh	Servo OFF brake command waiting time	1~30000ms	1ms	500	Immediate	During running
P02.14	0Fh	Minimum energy consumption resistor allowed by drive	_	1	Model dependent	_	At display
P02.15	10h	Internal energy consumption resistor power	_	1	Model dependent	_	At display
P02.16	11h	Internal energy consumption resistor value	_	1	Model dependent	_	At display
P02.17	12h	Resistor heat dissipation coefficient	0: 0% 1: 25% 2: 50% 3: 75% 4: 100%	1	2	Immediate	During running
P02.18	13h	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
P02.19	14h	External energy consumption resistor power	1~65535W	1W	Model dependent	Immediate	At stop
P02.20	15h	External energy consumption resistor value	1~65535Ω	1Ω	Model dependent	Immediate	At stop
P02.21	16h	Parameter protection setting	0: All the data can be changed;	1	0	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			1: Only P06.01 and this function code can be changed 2: Only this function code can be changed				
P02.22	17h	Parameter initialization	0: Parameter changing status 1: Clear fault memory information 2: Restore to leave-factory value	1	0	Immediate	At stop
P02.23	18h	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
Index 2003h (P03): Digital input and output terminal parameters							
P03.00	01h	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	1	1	Immediate	At stop
P03.01	02h	DI2 terminal function selection		1	2	Immediate	At stop
P03.02	03h	DI3 terminal function selection		1	5	Immediate	At stop
P03.03	04h	DI4 terminal function selection		1	6	Immediate	At stop
P03.04	05h	DI5 terminal function selection		1	3	Immediate	At stop
P03.05	06h	DI6 terminal function		1	9	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		selection	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				
P03.06	07h	DI7 terminal function selection		1	10	Immediate	At stop
P03.07	08h	DI8 terminal function selection		1	35	Immediate	At stop
P03.08	09h	DI9 terminal function selection		1	36	Immediate	At stop
P03.09	0Ah	Reserved					

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			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 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 39 to 48: Reserved 49: Touch probe 1 50: Touch probe 2				
P03.10	0Bh	DI1~DI8 terminal filtering time	1~500ms	1ms	10	Immediate	During running
P03.11	0Ch	DI9 terminal filtering time	0~127 (filter time = set value x 100ns)	100ns	50	Immediate	During running
P03.12	0Dh	Reserved					
P03.13	0Eh	Input terminal enabled status	Binary setting: 0: Normal logical, enabled upon connection 1: Inverted logical, enabled upon	1	000	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			disconnection Unit place of LED: BIT0~BIT3: DI1~DI4 Tens place of LED: BIT0~BIT3: DI5~DI8 Hundreds place of LED: BIT0: DI9				
P03.14	0Fh	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: DI9	1	000	Immediate	During running
P03.15	10h	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 8: Torque limit 9: Speed limit 10: Zero servo completed 11: Positioning completed 12: Positioning close to 13: Position tolerance	1	0	Immediate	At stop
P03.16	11h	DO2 function selection		1	1	Immediate	At stop
P03.17	12h	DO3 function selection		1	3	Immediate	At stop
P03.18	13h	DO4 function selection		1	11	Immediate	At stop
P03.19	14h	DO5 function selection		1	5	Immediate	At stop
P03.20	15h	Reserved					

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			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: Reserved 28: ECAT forced DO output 29: Reserved 30: Reserved				
P03.21	16h	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: DO5	1	00	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
Index 2005h (P05): Position control parameters							
P05.00	01h	Position reference mode	0: Pulse reference 1: Single point position reference 2: Multi-segment position reference	1	0	Immediate	At stop
P05.01 to P05.04	02h to 05h	Reserved					
P05.05	06h	Pulses for one motor revolution	0 to 8388608 P/r	1 P/r	10000	Immediate	At stop
P05.06	07h	Position command first-order low-pass filter time	0.0~2000.0ms	0.1ms	0	Immediate	During running
P05.07	08h	Position command moving average filter time	0.0~12.8ms	0.1ms	0	Immediate	During running
P05.08	09h	Electronic gear ratio numerator	1~1073741824	1	8388608	Immediate	At stop
P05.09	0Ah	Electronic gear ratio denominator 1	1~1073741824	1	10000	Immediate	At stop
P05.10	0Bh	Electronic gear ratio denominator 2	1~1073741824	1	10000	Immediate	At stop
P05.11	0Ch	Electronic gear ratio denominator 3	1~1073741824	1	10000	Immediate	At stop
P05.12	0Dh	Electronic gear ratio denominator 4	1~1073741824	1	10000	Immediate	At stop
P05.13	0Eh	Electronic gear ratio switching conditions	0: Position command is 0, switch after 3ms duration 1: Real-time switching	1	0	Immediate	At stop
P05.14	0Fh	Position deviation clearing method selection	0: Clear position deviation when servo enable is OFF or	1	00	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			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				
P05.15	10h	Position deviation clear DI signal type	0: Pulse mode 1: Level mode	0	0	Immediate	At stop
P05.16	11h	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 to 3: Reserved	1	1	Immediate	At stop
P05.17	12h	Position controller output limiter	0~maximum speed	0.1rpm	6000.0	Immediate	During running
P05.18	13h	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	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			2: Position deviation absolute value smaller than amplitude of positioning completed and position reference being 0				
P05.19	14h	Position positioning completed range	0~10000	1 command unit	100	Immediate	During running
P05.20	15h	Position close to signal width	1~32767	1 command unit	100	Immediate	During running
P05.21	16h	Position error detection range	0~32767	1 encoder unit	20000	Immediate	During running
P05.22	17h	Position error alarm selection	0: Valid 1: Invalid	1	0	Immediate	During running
P05.23	18h	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
P05.24	19h	Servo downtime	0~3000ms When the PL (CCWL), NL (.CWL) occurs, according to the time to slow down	1	0	Immediate	During running
P05.25	1Ah	Absolute position rotation mode mechanical gear ratio numerator	1~65535	1	1	Immediate	At stop
P05.26	1Bh	Absolute position rotation mode mechanical gear ratio denominator	1~65535	1	1	Immediate	At stop
P05.27	1Ch	Absolute position linear mode position	0~ 4294967295	1 encoder unit	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		offset (lower 32 bits)					
P05.28	1Dh	Absolute position linear mode position offset (upper 32 bits)	0~ 4294967295	1 encoder unit	0	Immediate	At stop
P05.29	1Eh	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
P05.30	1Fh	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
P05.31	20h	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
P05.32	21h	Software limit maximum point	-2147483647~2147483647	1 command unit	2147483647	Immediate	At stop
P05.33	22h	Software limit minimum point	-2147483647~2147483647	1 command unit	-2147483648	Immediate	At stop
Index 2006h (P06): Speed control parameters							
P06.00	01h	Main reference source selection	0: Digital reference (P06.01) 1 to 4: Reserved	1	0	Immediate	During running
P06.01	02h	Main reference speed setting	-6000.0~6000.0rpm	0.1rpm	0.0	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P06.02	03h	Auxiliary speed source selection	0: No auxiliary reference 1: Digital reference 2 to 4: Reserved	1	0	Immediate	During running
P06.03	04h	Auxiliary reference speed setting	-6000.0~6000.0rpm	0.1rpm	0	Immediate	During running
P06.04	05h	Main/auxiliary reference calculation	0: Main+Auxiliary 1: Main-Auxiliary 2: Terminal switching main and auxiliary reference 3: MAX (main reference, auxiliary reference) 4: MIN (main reference, auxiliary reference)	1	0	Immediate	During running
P06.05	06h	Jog speed	0.0~6000.0rpm	0.1rpm	100.0	Immediate	At stop
P06.06	07h	Jog operation					
P06.07	08h	Speed command acceleration time 1	0~65535ms	1ms	1000	Immediate	During running
P06.08	09h	Speed command deceleration time 1	0~65535ms	1ms	1000	Immediate	During running
P06.09	0Ah	Maximum speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running
P06.10	0Bh	Forward speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running
P06.11	0Ch	Reverse speed threshold	0.0~6000.0rpm	0.1rpm	6000.0	Immediate	During running
P06.12	0Dh	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	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P06.13	0Eh	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) 3: External negative torque limit value	1	0	Immediate	At stop
P06.14	0Fh	Internal positive torque limit value	0.0%~+400.0%	0.1%	Model dependent	Immediate	During running
P06.15	10h	Internal negative torque limit value	0.0%~+400.0%	0.1%	Model dependent	Immediate	During running
P06.16	11h	External positive torque limit value	0.0%~+400.0%	0.1%	100.0	Immediate	During running
P06.17	12h	External negative torque limit value	0.0%~+400.0%	0.1%	100.0	Immediate	During running
P06.18	13h	Torque feedforward control selection	0: No torque feedforward 1: Internal torque feedforward (Use the speed instruction as a source of torque feedforward signals. In position control mode, the speed instruction comes from the output of the position controller.)	1	1	Immediate	During running
P06.19	14h	Zero clamp function	0: Disabled 1: Always enabled 2: Enabled under conditions (terminal enabled)	1	0	Immediate	At stop
P06.20	15h	Zero clamp gain	0~6.000	0.001	1.000	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P06.21	16h	Zero clamp starting speed	0.0~1000.0rpm	0.1 rpm	2.0	Immediate	During running
P06.22	17h	Speed arrival detection width	0.0~5000.0rpm	0.1 rpm	20.0	Immediate	During running
P06.23	18h	Zero speed threshold	0.0%~100.0% maximum speed	0.1%	1.0	Immediate	During running
P06.24	19h	Speed consistency threshold	0.0~100.0rpm	0.1rpm	10.0	Immediate	During running
Index 2007h (P07): Torque control parameters							
P07.00	01h	Torque reference selection	0: Digital reference 1 to 3: Reserved	1	0	Immediate	At stop
P07.01	02h	Torque positive direction selection	0: Forward drive is positive 1: Reverse drive is positive	1	0	Immediate	At stop
P07.02	03h	Speed/torque switching mode selection	0: Switching directly 1: Switching once over the torque switching point	1	0	Immediate	At stop
P07.03	04h	Torque digital reference value	-400.0%~+400.0%	0.1%	0.0	Immediate	During running
P07.04	05h	Torque reference acceleration/deceleration time	0~6553.5ms	0.1ms	0	Immediate	At stop
P07.05	06h	Torque command filter time constant	0~30.0ms	0.1ms	1.0	Immediate	At stop
P07.06	07h	Second torque command filter time constant	0~30.0ms	0.1ms	1.0	Immediate	At stop
P07.07	08h	Speed/torque switching point	0.0%~400.0% initial torque	0.1%	100.0	Immediate	At stop
P07.08	09h	Speed/torque switching delay	0~1000.0ms	0.1ms	0.0	Immediate	At stop
P07.09	0Ah	FWD speed limit channel	0: FWD speed limit value	1	1	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			1: Bus speed limit value 2: MIN (FWD speed limit value, bus speed limit value)				
P07.10	0Bh	FWD speed limit value	0.0%~100.0%	0.1%	100.0	Immediate	During running
P07.11	0Ch	REV speed limit channel	0: REV speed limit value 1: Bus speed limit value 2: MIN (REV speed limit value, bus speed limit value)	1	1	Immediate	At stop
P07.12	0Dh	REV speed limit value	0.0%~100.0%	0.1%	100.0	Immediate	During running
P07.13	0Eh	Torque reached reference value	0.0~400.0%	0.1%	0.0	Immediate	During running
P07.14	0Fh	Torque reached valid value	0.0~400.0%	0.1%	20.0	Immediate	During running
P07.15	10h	Torque reached invalid value	0.0~400.0%	0.1%	10.0	Immediate	During running
Index 2008h (P08): Gain parameters							
P08.00	01h	Speed loop proportional gain 1	0.1~5000.0Hz	0.1Hz	20.0	Immediate	During running
P08.01	02h	Speed loop integral time 1	0.00~10.000ms	0.01ms	5.00	Immediate	During running
P08.02	03h	Position loop gain 1	1~8000rad/s	1rad/s	100	Immediate	During running
P08.03	04h	Speed regulator output filter time 1	0~32.0ms	0.1ms	0.8	Immediate	During running
P08.04	05h	Speed loop proportional gain 2	0.1~5000.0Hz	0.1Hz	20.0	Immediate	During running
P08.05	06h	Speed loop integral time 2	0.00~10.000ms	0.01ms	1.00	Immediate	During running
P08.06	07h	Position loop gain 2	1~8000rad/s	1rad/s	100	Immediate	During running
P08.07	08h	Speed regulator	0~32.0ms	0.1ms	0.8	Immediate	During

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		output filter time 2					running
P08.08	09h	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	0	0	Immediate	During running
P08.09	0Ah	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
P08.10	0Bh	Gain switching delay time	0~1000ms	1ms	5	Immediate	During running
P08.11	0Ch	Gain switching level	0~20000	Switch according to conditions	50	Immediate	During running
P08.12	0Dh	Gain switching hysteresis	0~20000	Switch according to conditions	30	Immediate	During running
P08.13	0Eh	Position gain switching time	0~1000ms	1ms	5	Immediate	During running
P08.14	0Fh	Speed	0.00~64.00ms	0.01ms	0.5	Immediate	During

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		feedforward filter time					running
P08.15	10h	Speed feedforward gain	0.0~100.0%	0.01%	0.0	Immediate	During running
P08.16	11h	Torque feedforward filter time	0.00~64.00ms	0.01	0.5	Immediate	During running
P08.17	12h	Torque feedforward gain	0.0~200.0%	0.1%	0.0	Immediate	During running
P08.18	13h	Encoder filter time	0.0 to 40.0 ms	0.0	40.0	Immediate	During running
P08.19	14h	PDFF (pseudo-differential feedforward) control coefficient (in non-torque control mode, reserved)	0.0~100.0%	0.1%	100.0	Immediate	During running
Index 2009h (P09): Adjustment parameters							
P09.00	01h	Offline inertia identification function		0.01	0.00	Immediate	At stop
P09.01	02h	Inertia identification maximum speed	200~2000rpm	1rpm	800	Immediate	At stop
P09.02	03h	Inertia identification acceleration time	10~1000ms	1ms	60	Immediate	At stop
P09.03	04h	Motor revolutions for inertia identification	0.00~655.35r	0.01r	0.00	Immediate	At stop
P09.04	05h	Waiting time after single inertia identification	50~10000	1ms	800	Immediate	At stop
P09.05	06h	Online inertia identification mode	0: Disabled 1: Enabled, change slowly 2: Enabled, change generally 3: Enabled, change	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			quickly				
P09.06	07h	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
P09.07	08h	Rigidity level	0~31	1	0	Immediate	At stop
P09.08	09h	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
P09.09	0Ah	Automatic suppression vibration sensitivity setting	1~100	1	1	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P09.10	0Bh	Notch filter 1 frequency	0~4000Hz	1Hz	0	Immediate	At stop
P09.11	0Ch	Notch filter 1 width	10~1000Hz	1Hz	100	Immediate	At stop
P09.12	0Dh	Notch filter 2 frequency	0~4000Hz	1Hz	0	Immediate	At stop
P09.13	0Eh	Notch filter 2 width	10~1000Hz	1Hz	100	Immediate	At stop
P09.14	0Fh	Notch filter 3 frequency	0~4000Hz	1Hz	0	Immediate	At stop
P09.15	10h	Notch filter 3 width	10~1000Hz	1Hz	100	Immediate	At stop
P09.16	11h	Notch filter 4 frequency	0~4000Hz	1Hz	0	Immediate	At stop
P09.17	12h	Notch filter 4 width	10~1000Hz	1Hz	100	Immediate	At stop
P09.18	13h	Speed loop low pass filter time constant	0~65536us	1us	0	Immediate	At stop
P09.19	14h	Speed reference notch filter frequency	0~1000Hz	1Hz	0	Immediate	At stop
P09.20	15h	Speed reference notch filter width	10~500Hz	1Hz	100	Immediate	At stop
P09.21	16h	Reserved					
P09.22	17h	Resonance frequency identification result	0~2000Hz	1Hz	-	Immediate	At stop
P09.23	18h	Disturbance torque compensation gain	0.0%~100.0%	0.1%	0	Immediate	At stop
P09.24	19h	Disturbance observer filter time	0.0~25.0ms	0.1ms	0	Immediate	At stop
P09.25	1Ah	Low frequency resonance suppression mode selection	0: Manually set vibration suppression parameters 1: Automatically set vibration suppression parameters	1	0	Immediate	During running
P09.26	1Bh	Low frequency resonance	0.0 to 100.0 Hz	0.1 Hz	0	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		frequency					
P09.27	1Ch	Low frequency resonance frequency filter setting	0 to 20	1	0	Immediate	During running
P09.28	1Dh	Low frequency resonance position deviation judgment threshold	1~1000P	1P	10	Immediate	At stop
P09.29	1Eh	Torque command offset (vertical axis mode)	-300.00% ~ 300.00%	0.01%	0.00	Immediate	During running
P09.30	1Fh	Viscous friction compensation gain	0~1000.0	0.1%/ 10000rpm	0	Immediate	At stop
P09.31	20h	Positive friction compensation	0~50.0%	0.1	0	Immediate	At stop
P09.32	21h	Negative friction compensation	0~50.0%	0.1%	0	Immediate	At stop
P09.33	22h	Quadrant protrusion positive direction compensation value	-100.00%~100.00%	0.01%	0.00	Immediate	At stop
P09.34	23h	Quadrant protrusion opposite direction compensation value	-100.00%~100.00%	0.01%	0.00	Immediate	At stop
P09.35	24h	Quadrant protrusion compensation delay time	0~1000.0	0. 1ms	0.0	Immediate	At stop
P09.36	25h	Quadrant protrusion compensation filter	0~1000.0	0. 1ms	0.0	Immediate	At stop
P09.37	26h	Quadrant protrusion compensation effective position	0~65535	1	1	Immediate	At stop
P09.38	27h	Load moment of inertia ratio	0.00~120.00	0.01	1.00	Immediate	At stop
Index 200Ah (P10): Fault and protection parameters							
P10.00	01h	Action upon phase	0: Activate protection	1	0	Immediate	During

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		loss	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				running
P10.01	02h	Action upon communication fault	0: Activate protection and coast to stop 1: Alarm and keep running 2: Alarm and stop according to the stop mode	1	0	Immediate	During running
P10.02	03h	Action upon temperature sampling disconnection	0: Activate protection and coast to stop 1: Alarm and keep running 2: Alarm and stop according to the stop mode	1	0	Immediate	During running
P10.03	04h	Action upon analog input fault	0: Activate protection and coast to stop 1: Alarm and keep running 2: Alarm and stop according to the stop mode	1	0	Immediate	During running
P10.04	05h	Overtravel stop mode selection	0: Activate protection and coast to stop 1: Alarm, decelerate to zero, keep position locked	1	2	Immediate	During running
P10.05	06h	Action upon output disconnection	0: Decelerate to stop 1: Coast to stop 2: Decelerate to zero,	1	0	Immediate	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			and keep position locked				
P10.06	07h	Overload protection setting for motor	0: Activate protection and coast to stop 1: Alarm and keep running 2: Alarm and stop according to the stop mode	1	1	Immediate	At stop
P10.07	08h	Motor overload protection gain	20.0%~300.0%	0.1%	100.0	Immediate	During running
P10.08	09h	Drive fan control	0: Temperature control (if module temperature > 35℃, the fan runs; if < 30℃, the fan stops.) 1: Always runs 2: Control based on drive status (when the drive is enabled, the fan runs. when the drive is stopped: if the module temperature > 35℃, the fan runs; if < 30℃, the fan stops.) 3: Does not run	1	0	Immediate	At stop
P10.09	0Ah	Stall over temperature protection enable (reserved)	0: Shielded motor stall over-temperature protection detection 1: Enable motor stall over-temperature protection detection	1	0	Immediate	At stop
P10.10	0Bh	Stall over temperature protection time window (reserved)	10 to 800 ms	1 ms	200	Immediate	At stop
P10.11	0Ch	Encoder multi-turn overflow fault	0: Not shielded 1: Shielded	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		selection					
P10.12	0Dh	Overspeed fault threshold	0~10000rpm	1rpm	6000	Immediate	At stop
P10.13	0Eh	Maximum position pulse frequency	100~4000kHz	1kHz	4000	Immediate	At stop
P10.14	0Fh	Absolute encoder battery undervoltage fault handling	0: Set the battery low voltage to fault, monitor the battery voltage every time the driver is powered on or reset, undervoltage will report the undervoltage alarm, and no detection over time; 1: Set the battery low voltage to warning: battery undervoltage (below 3V) will warn, always detect the battery voltage.	1	0	Immediate	At stop
P10.15	10h	Main circuit undervoltage function selection	0: The main circuit undervoltage warning is not detected; 1: Detect the main circuit undervoltage warning; 2: Detect the main circuit undervoltage warning, and conduct torque limit.	1	0	Immediate	At stop
P10.16	11h	Torque limit value during main circuit undervoltage	0~100%	1%	100	Immediate	At stop
P10.17	12h	Main circuit undervoltage torque limit release time	0~1000ms	1ms	10	Immediate	At stop
P10.18	13h	Last fault type	0: No abnormal record	1	0	_	At

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			1: Over-current 2: Main circuit overvoltage 3: Control circuit overvoltage 4: Motor blocked 5: The parameter is modified without power off 6: Phase loss on the 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: The external brake resistance is too small (reserved) 16: Abnormal current detection circuit 17: Reserved 18: Poor auto-tuning 19: Encoder fault 20: Undervoltage during main circuit operation 21: Reserved 22: Parameter setting				display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			error 23: Reserved 24: Reserved 25: Inverter module sampling disconnection protection 26: Reserved 27: Overspeed (the actual speed of the servo motor exceeds the overspeed fault threshold) 28: Reserved 29: Main circuit undervoltage 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 (alarm only) 39: Forward overtravel 40: Reverse overtravel 41: Encoder battery				

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			failure 42: Reserved 43: External fault 44: Reserved 45: Reserved 46: Short circuit to ground at power-on 47: The parameter is incorrect 48: Internal logic error 1 49: Internal logic error 2 50: ASIC initialization error 51: Internal fault 51 52: Interpolation cycle error 53: Reserved 54: Internal fault 54 55: Internal fault 55 56: Internal fault 56 57: Internal fault 57 58: Internal fault 58 59: Internal fault 59 60: Reserved 61: Abnormal electronic gear ratio 62: Interrupt positioning alarm 63: Internal fault 63 64: Internal fault 64 65: ECAT initialization fault 66: Homing logic error 70: Matching motor number setting error 71: Incremental encoder				

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			UVW error 72: Program programming error 73: BOOT fault 74: Reserved 75: Absolute encoder battery undervoltage 76: Encoder battery fault 77: PG type fault 78: PG unsaved parameters 79: PG write error 80: Control circuit undervoltage 81: Encoder seeking origin error 82: Internal fault 82 83: Internal fault 83 84: Absolute encoder EEPROM parameter read error 85: Drive output disconnection				
P10.19	14h	The second fault type	The same as P10.18	1	0	–	At display
P10.20	15h	The first fault type	The same as P10.18	1	0	–	At display
P10.21	16h	The bus voltage at the last fault	0 to 999 V	1 V	0	–	At display
P10.22	17h	V-phase current at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.23	18h	W-phase current at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.24	19h	D-axis current reference value at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P10.25	1Ah	Q-axis current reference value at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.26	1Bh	D-axis current feedback value at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.27	1Ch	Q-axis current feedback value at the last fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.28	1Dh	Speed at the last fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display
P10.29	1Eh	Encoder position feedback at the last fault (PUU unit)	-2147483648~2147483647	1	0	–	At display
P10.30	1Fh	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: DI9	1	0	–	At display
P10.31	20h	DO status at the last fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0: DO5	1	0	–	At display
P10.32	21h	Drive status at the last fault	0~FFFFH (the same as P11.11)	1	0	–	At display
P10.33	22h	Temperature at the last fault	-40.0℃ to 150.0℃	0.1℃	0.0	–	At display
P10.34	23h	The bus voltage at the second fault	0 to 999 V	1 V	0	–	At display
P10.35	24h	V-phase current at the second fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.36	25h	W-phase current at the second fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.37	26h	D-axis current reference value at	-1000.0 to 1000.0 A	0.1 A	0.0	–	At

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		the second fault					display
P10.38	27h	Q-axis current reference value at the second fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.39	28h	D-axis current feedback value at the second fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.40	29h	Q-axis current feedback value at the second fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.41	2Ah	Speed at the second fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display
P10.42	2Bh	Encoder position feedback at the second fault (PUU unit)	-2147483648~2147483647	1	0	–	At display
P10.43	2Ch	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: DI9	1	0	–	At display
P10.44	2Dh	DO status at the second fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0: DO5	1	0	–	At display
P10.45	2Eh	Drive status at the second fault	0~FFFFH (the same as P11.11)	1	0	–	At display
P10.46	2Fh	Temperature at the second fault	-40.0℃ to 150.0℃	0.1℃	0.0	–	At display
P10.47	30h	The bus voltage at the first fault	0 to 999 V	1 V	0	–	At display
P10.48	31h	V-phase current at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.49	32h	W-phase current at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P10.50	33h	D-axis current reference value at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.51	34h	Q-axis current reference value at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.52	35h	D-axis current feedback value at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.53	36h	Q-axis current feedback value at the first fault	-1000.0 to 1000.0 A	0.1 A	0.0	–	At display
P10.54	37h	Speed at the first fault	-6000.0~6000.0rpm	0.1rpm	0.0	–	At display
P10.55	38h	Encoder position feedback at the first fault (PUU unit)	-2147483648~2147483647	1	0	–	At display
P10.56	39h	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: DI9	1	0	–	At display
P10.57	3Ah	DO status at the first fault	Unit place of LED: BIT0~BIT3: DO1~DO4 Tens place of LED: BIT0: DO5	1	0	–	At display
P10.58	3Bh	Drive status at the first fault	0~FFFFH (the same as P11.11)	1	0	–	At display
P10.59	3Ch	Temperature at the first fault	-40.0℃ to 150.0℃	0.1℃	0.0	–	At display
Index 200Bh (P11): Display parameters							
P11.00	01h	Speed command	-6000.0~6000.0rpm	0.1rpm		–	At display
P11.01	02h	Actual motor speed	-6000.0~6000.0rpm	0.1rpm		–	At

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
							display
P11.02	03h	Output voltage	0~480V	1V		–	At display
P11.03	04h	Output current	0.0~4Ie A	0.1A		–	At display
P11.04	05h	Q-axis current	-400.0~+400.0%Ie	0.1%		–	At display
P11.05	06h	D-axis current	-100.0~+100.0%Ie	0.1%		–	At display
P11.06	07h	Output torque	-300.00~+300.00 Nm	0.01Nm		–	At display
P11.07	08h	Reserved					
P11.08	09h	Average load rate	0.0~400.0% Te	0.1%		–	At display
P11.09	0Ah	Bus voltage	0~900V	1V		–	At display
P11.10	0Bh	Control voltage	0~450V	1V		–	At display
P11.11	0Ch	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	1		–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			Bit 12: Drive in fault Bit 13: Speed control Bit 14: Torque control Bit 15: Position control				
P11.12	0Dh	DI terminal state	0 to 1FFH, 0: open; 1: closed The high-speed pulse reference will not be refreshed synchronously	1		–	At display
P11.13	0Eh	DO terminal state	0 to 1FH, 0: open; 1: closed The high-speed pulse output will not be refreshed synchronously	1		–	At display
P11.14 to P11.17	0Fh to 12h	Reserved					
P11.18	13h	Motor encoder counter value	0~4 times motor encoder lines -1	1		–	At display
P11.19	14h	Motor encoder Z pulse position	0~4 times motor encoder lines -1	1		–	At display
P11.20	15h	Number of input pulses	-2147483648~2147483647			–	At display
P11.21	16h	Position reference point position	-2147483648~2147483647	1		–	At display
P11.22	17h	Position reference	-2147483648~2147483647	1		–	At display
P11.23	18h	Position feedback	-2147483648~2147483647	1		–	At display
P11.24	19h	Position error pulse	-2147483648~2147483647	1		–	At display
P11.25	1Ah	Position reference point position	-2147483648~2147483647	1		–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		(PUU unit)					
P11.26	1Bh	Position reference (PUU unit)	-2147483648~2147483647	1		–	At display
P11.27	1Ch	Position feedback (PUU unit)	-2147483648~2147483647	1		–	At display
P11.28	1Dh	Position error pulse (PUU unit)	-2147483648~2147483647	1		–	At display
P11.29	1Eh	Accumulated power-on hours	0 ~ maximum 65535 hours	1 hour		–	At display
P11.30	1Fh	Accumulated work hours	0 ~ maximum 65535 hours	1 hour		–	At display
P11.31	20h	Module temperature	-40.0℃~150.0℃	0.1℃		–	At display
P11.32	21h	Absolute encoder single-turn position	0~8388608	1		–	At display
P11.33	22h	Absolute encoder rotation data	0~65535r	1r		–	At display
P11.34	23h	Load moment of inertia ratio	0.00~120.00	0.01		–	At display
P11.35	24h	Absolute position PUU value	Machine current absolute position (command unit) = mechanical absolute position / mechanical gear ratio -2147483648~2147483647	Command unit		–	At display
P11.36	25h	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	Encoder unit		–	At display
P11.37	26h	Mechanical absolute position (upper 32 bits)		Encoder unit		–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			absolute position - origin offset				
P11.38	27h	Absolute encoder absolute position (lower 32 bits)	The absolute position of the absolute encoder feedback. Encoder unit	Encoder unit		–	At display
P11.39	28h	Absolute encoder absolute position (upper 32 bits)		Encoder unit		–	At display
P11.40	29h	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
P11.41	2Ah	Rotating load single-turn position (upper 32 bits)		Encoder unit		–	At display
P11.42	2Bh	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
P11.43	2Ch	Mechanical angle (number of pulses from origin)		Encoder unit		–	At display
P11.44	2Dh	Electrical angle	0.00~360.00°	0.01°		–	At display
P11.45	2Eh	Encoder multi-turn overflow value	-2147483648 to 2147483647	1		–	At display
P11.46	2Fh	High 32 bits of position reference point position (PUU unit)	-2147483648 to 2147483647	1		–	At display
P11.47	30h	Reserved					
P11.48	31h	High 32 bits of position reference point position (encoder unit)	-2147483648 to 2147483647	1		–	At display
P11.49 to	32h to 37h	Reserved					

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P11.54							
Index 200Ch (P12): Servo positioning parameters							
P12.00	01h	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	Immediate	During running
P12.01	02h	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	1	9	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
			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 100+X: CiA402 homing mode X				
P12.02	03h	Homing command terminal mode	0: Level mode 1: Pulse mode	1	0	Immediate	At stop
P12.03	04h	Reserved					
P12.04	05h	Positioning acceleration and deceleration curve selection	0: T-shaped curve 1: S-shaped curve	1	0	Immediate	At stop
P12.05	06h	High speed home searching speed	0.0~1000.0rpm	0.1rpm	100.0	Immediate	At stop
P12.06	07h	Low speed home searching speed	0.0~1000.0rpm	0.1rpm	10.0	Immediate	At stop
P12.07	08h	Home position offset	-1073741824~1073741824	1	0	Immediate	At stop
P12.08	09h	Home searching acceleration/ deceleration time	0~65535ms	1	200	Immediate	At stop
P12.09	0Ah	Homing time limit	0~65535ms	1	60000	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P12.10	0Bh	Positioning mode selection	0: Relative position 1: Absolute position	1	0	Immediate	At stop
P12.11	0Ch	Home offset mode	0: After finding the home, position feedback 6064h = 607Ch 1: After finding the home, position feedback 6064h = current position + incremental displacement 607Ch 2: After finding the home, continue to execute the home offset position segment. After the execution is completed, the position feedback 6064h = 0 3: After finding the home, continue to execute the home offset position segment. After the execution is completed, the position feedback 6064h = 607Ch	1	0	Immediate	At stop
P12.85	56h	Mechanical position offset	-2147483648~2147483647			–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
Index 200Dh (P13): Fully closed-loop control parameters							
P13.00	01h	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 3: Reserved 4: Reserved 5：Reagle 17-bit absolute encoder (invalid when P01.18 = 1, 5, 6) 6: Reserved 7: BiSS-C encoder	1	1	Immediately	At stop
P13.01	02h	Second encoder pulses per motor revolution	1 to 1073741824	1	10000	Immediately	At stop
P13.02	03h	Second encoder counting direction	0: Same as the first encoder direction 1: Opposite to the first encoder direction	1	0	Immediately	At stop
P13.03	04h	Encoder feedback mode	0: First encoder feedback 1: Second encoder feedback 2: First/Second encoder switchover at electronic gear ratio switchover	1	0	Immediately	During running
P13.04	05h	Threshold of excessive position deviation in fully closed-loop mode	0 to 1073741824	1 external encoder unit	10000	Immediately	During running
P13.05	06h	Position deviation clear in fully closed-loop mode	0 to 100 r	1r	0	Immediately	During running

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P13.06	07h	Filter time constant of hybrid vibration suppression	0 to 6553.5 ms	1 ms	0	Immediately	During running
P13.07	08h	Position deviation counter in fully closed-loop mode	-1073741824 to 1073741824	1 external encoder unit	0	–	At display
P13.08	09h	Feedback pulse counter of internal encoder	-1073741824 to 1073741824	1 external encoder unit	0	–	At display
P13.09	0Ah	Feedback pulse counter of external encoder	-1073741824 to 1073741824	1 external encoder unit	0	–	At display
Index 2011h (P17): EtherCAT communication parameters							
P17.00	01h	EtherCAT software version number	000~FFF	1		–	At display
P17.01	02h	EtherCAT bus subprotocol	101: COE 102: SOE (reserved) Other: Reserved	1	-	–	At display
P17.02	03h	EtherCAT bus status	1: INIT 2: PRE-OPERATIONAL 3: SAFE-OPERATIONAL 4: OPERATIONAL	1	-	–	At display
P17.03	04h	Bus operating mode	Drive operating mode when controlled by COE bus: 1: Profile Position Mode 3: Profile Velocity Mode 4: Profile Torque Mode 6: Homing Mode 8: Cyclic Synchronous Position Mode 9: Cyclic Synchronous Velocity Mode 10: Cyclic Synchronous Torque Mode	1	-	–	At display

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P17.04	05h	0x6040 Control word	0~65535	1	-	_	At display
P17.05	06h	0x6060 Control mode	0~65535	1	-	_	At display
P17.06	07h	0x607A Position reference	-2147483648~2147483647	1	-	_	At display
P17.07	08h	0x60FF Speed reference	-2147483648~2147483647	1	-	_	At display
P17.08	09h	0x6071 Torque reference	-32768～32767	1	-	_	At display
P17.09	0Ah	0x60E0 Positive torque limiting	0~65535	1	-	_	At display
P17.10	0Bh	0x60E1 Negative torque limiting	0~65535	1	-	_	At display
P17.11	0Ch	0x6072 Maximum torque	0~65535	1	-	_	At display
P17.12	0Dh	0x607F Speed Limiting	0 to 4294967295	1	-	_	At display
P17.13	0Eh	0x6080 Speed limiting	0 to 4294967295	1	-	_	At display
P17.14	0Fh	0x6098 Homing mode	0~65535	1	-	_	At display
P17.15	10h	0x607E Polarity	0~65535	1	-	_	At display
P17.16	11h	0x6081 Profile speed	0 to 4294967295	1	-	_	At display
P17.17	12h	0x6041 Status word	0~65535	1	-	_	At display
P17.18	13h	0x6061 Control mode	0~65535	1	-	_	At display
P17.19	14h	0x6064 Position feedback	-2147483648~2147483647	1	-	_	At display
P17.20	15h	0x606C Speed feedback	-2147483648~2147483647	1	-	_	At display
P17.21	16h	0x6077 Torque	-32768~32767	1	-	_	At

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
		feedback					display
P17.22	17h	Reserved		1	-	_	At display
P17.23	18h	Reserved		1	-	_	At display
P17.24	19h	Whether the EtherCAT communication write function code parameters are stored in the EEPROM	0: Do not store 1: Data written through the EtherCAT bus is stored to the EEPROM of the drive	1	1	Immediate	At stop
P17.25	1Ah	EtherCAT communication disconnection detection time	0.0~1000.0s (When the parameter is set to 0, no disconnection detection is performed)	0.1 s	0.1	Power-on again	At stop
P17.26	1Bh	EtherCAT bus parameter initialization	0: No action 1: Restore to default value 2: Parameter saving	1	0	Immediate	At stop
Index 2012h (P18): Advanced parameters							
P18.00	01h	User password					
P18.01	02h	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
P18.02	03h	Current loop gain	0.01 to 500.00	0.01	10.00	Immediate	At stop
P18.03	04h	Current loop integral	0.5 to 100.0 ms	0.1 ms	10.0	Immediate	At stop
P18.04 to P18.15	05h to 10h	Advanced parameters					
P18.16 to	11h to 1Dh	Reserved					

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P18.28							
Index 2014h (P20): Bus configuration group parameter							
P20.00	01h	Synchronization coefficient	0 to 65535	1	0	Power-on again	At stop
P20.01	02h	Upper limit of synchronization coefficient	0 to 65535	1	-	–	At display
P20.02 to P20.07	03h to 08h	Reserved					
P20.08	09h	Slave station axis address	0 to 65535	1	0	Power-on again	At stop
P20.09	0Ah	Master station configuration address	0 to 65535	1	-	–	At display
P20.10	0Bh	Data interpolation cycle	0 to 65535	1	0	Power-on again	At stop
P20.11	0Ch	Zero speed torque limiter	0 to 65535	1	0	Immediate	At stop
P20.12	0Dh	Reserved					
P20.13	0Eh	Er.076 Fault reset selection	0: The bus cannot reset 76 fault 1: The bus can reset 76 fault	1	0	Immediate	At stop
P20.14	0Fh	Torque unit	0–1	1	0	Immediate	At stop
P20.15	10h	Speed unit	0–1	1	0	Immediate	At stop
P20.16	11h	Interpolation setting for reference	0: Interpolation enabled 1: Interpolation disabled	1	0	Immediate	At stop
P20.17	12h	Bus torque reference filtering	0 to 65535	1	0	Immediate	At stop
P20.18	13h	Rapid deceleration slope for bus torque reference	0 to 65535	1	0	Immediate	At stop
P20.19	14h	Deceleration time for bus speed limit	0 to 65535	1	0	Immediate	At stop

Function code	Sub-index	Name	Setting range	Minimum unit	Default value	Effective time	Property
P20.20	15h	Acceleration and deceleration slope for bus torque reference	0 to 65535	1	0	Immediate	At stop
P20.21 to P20.26	16h to 1Bh	Reserved					
P20.27	1Ch	Forced DO output selection	0 to 65535	1	0	Immediate	At stop
P20.28 to P20.29	1Dh to 1Eh	Reserved					
Index 2017h (P23): Special function parameters							
P23.00 to P23.05	01h to 06h	Reserved					
P23.06	07h	Output torque filter time constant	0 to 100.0 ms	0.1 ms	0.0	Immediate	At stop
P23.07	08h	Whether to save encoder multi-turn overflow value on power failure	0: Saved on power failure 1: Not saved on power failure	1	0	Immediate	At stop
P23.08 to P23.10	09h to 0Bh	Reserved					
P23.11	0Ch	Accumulated position errors of absolute encoder	0 to 65535	1	0	-	At display
P23.12	0Dh	Pulse range for homing completed	0: 100 pulses Other: Self-defined pulses	1	0	Immediate	At stop
P23.13 to P23.39	0Eh to 28h	Reserved					

9.2 CiA402 object dictionary list

Index	Data structure	Name	Data type	Permission	Mapping type	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
605Ah	VAR	Quick stop option code	INT16	RW	RPDO	-
605Bh	VAR	Shutdown option code	INT16	RW	RPDO	-
605Ch	VAR	Disable operation option code	INT16	RW	RPDO	-
605DH	VAR	Halt option code	INT16	RW	RPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	p
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
6065h	VAR	Following error window	UINT32	RW	RPDO	Reference unit
6066h	VAR	Following error window time	UINT16	RW	RPDO	ms
6067h	VAR	Position window	UINT32	RW	RPDO	Reference unit
6068h	VAR	Position window time	UINT16	RW	RPDO	ms
6069h	VAR	Velocity sensor actual value	INT32	RO	TPDO	rpm
606Bh	VAR	Velocity demand value	INT32	RO	TPDO	rpm
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	Reference unit/s
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms
606Fh	VAR	Velocity threshold	UINT16	RW	RPDO	rpm
6070h	VAR	Velocity threshold time	UINT16	RW	RPDO	ms
6071h	VAR	Target torque	INT16	RW	RPDO	0.1%
6072h	VAR	Max torque	UINT16	RW	RPDO	0.1%
6074h	VAR	Torque demand	INT16	RO	TPDO	0.1%
6077h	VAR	Torque actual value	INT16	RO	TPDO	0.1%

Index	Data structure	Name	Data type	Permission	Mapping type	Unit
607Ah	VAR	Target position	INT32	RW	RPDO	Reference unit
607Ch	VAR	Home offset	INT32	RW	RPDO	Reference unit
607Dh	ARRAY	Software position limit	INT32	RW	RPDO	Reference unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	Reference unit/s
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6081h	VAR	Profile velocity	UINT32	RW	RPDO	Reference unit/s
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	Reference unit/s^2
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	Reference unit/s^2
6085h	VAR	Quick stop deceleration	UINT32	RW	RPDO	Reference unit/s^2
6087h	VAR	Torque slope	UINT16	RW	RPDO	0.1%/s
6091h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
6098h	VAR	Homing method	INT8	RW	RPDO	-
6099h	ARRAY	Homing speeds	UINT32	RW	RPDO	
609Ah	VAR	Homing acceleration	UINT32	RW	RPDO	
60B8h	VAR	Touch probe function	INT16	RW	RPDO	-
60B9h	VAR	Touch probe status	UINT16	RO	TPDO	-
60BAh	VAR	Touch probe Pos1 pos value	INT32	RO	TPDO	Reference unit
60BBh	VAR	Touch probe Pos1 neg value	INT32	RO	TPDO	Reference unit
60BCh	VAR	Touch probe Pos2 pos value	INT32	RO	TPDO	Reference unit
60BDh	VAR	Touch probe Pos2 neg value	INT32	RO	TPDO	Reference unit

Index	Data structure	Name	Data type	Permission	Mapping type	Unit
60E0h	VAR	FWD torque limit	UINT16	RW	RPDO	0.1%
60E1h	VAR	REV torque limit	UINT16	RW	RPDO	0.1%
60F4h	VAR	Following error actual value	INT32	RO	TPDO	Reference unit
60FDh	VAR	Digital inputs	UINT32	RO	TPDO	-
60FEh	ARRAY	Digital outputs	UINT32	RW	RPDO	-
60FFh	VAR	Target velocity	INT32	RW	RPDO	Reference unit/s

Chapter 10 Motor Number Quick Lookup Table

The M6-N 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.

10.1 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-M	1251	SPM-SD61308MBK-M	1259
			SPM-SD11308MAK-M	1254	SPM-SD11308MBK-M	125C
			SPM-SD51308MAK-M	1255	SPM-SD51308MBK-M	125D
		1300	SPM-SD61313MAK-M	1261	SPM-SD61313MBK-M	1269
			SPM-SD11313MAK-M	1264	SPM-SD11313MBK-M	126C
			SPM-SD51313MAK-M	1265	SPM-SD51313MBK-M	126D
	380V	850	SPM-TD61308MAK-M	2211	SPM-TD61308MBK-M	2219
			SPM-TD11308MAK-M	2214	SPM-TD11308MBK-M	221C
			SPM-TD51308MAK-M	2215	SPM-TD51308MBK-M	221D
		1300	SPM-TD61313MAK-M	2221	SPM-TD61313MBK-M	2229
			SPM-TD11313MAK-M	2224	SPM-TD11313MBK-M	222C
			SPM-TD51313MAK-M	2225	SPM-TD51313MBK-M	222D
		1800	SPM-TD61318MAK-M	2231	SPM-TD61318MBK-M	2239
			SPM-TD11318MAK-M	2234	SPM-TD11318MBK-M	223C
			SPM-TD51318MAK-M	2235	SPM-TD51318MBK-M	223D
		2200	SPM-TD61322MAK-M	2251	SPM-TD61322MBK-M	2259
			SPM-TD11322MAK-M	2254	SPM-TD11322MBK-M	225C
			SPM-TD51322MAK-M	2255	SPM-TD51322MBK-M	225D
		2900	SPM-TD61829MAK-M	2261	SPM-TD61829MBK-M	2269

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
			SPM-TD11829MAK-M	2264	SPM-TD11829MBK-M	226C
			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

10.2 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

10.3 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

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	Motor number
			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
			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

10.4 Small inertia series motor number

Inertia	Voltage	Power (W)	Without brake		With brake	
			Motor model	Motor number	Motor model	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
			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

10.5 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 1 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.

SHENZHEN MEGMEET ELECTRICAL CO., LTD.

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Fax: +86-755-86600562

Zip code: 518057

Website: https://www.megmeet.com

Parameter recording table

Shenzhen Megmeet Electrical Co., Ltd.

M6-N 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-N 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.