LC-E Series AC Servo Drive

EtherCAT Bus Servo User Manual

Shenzhen Xinlichuan Electric Co., Ltd.

Contents

Chapter I Safety Precautions

Before using the servo drive system, please read the related precautions carefully, and be sure to abide by the safety precautions and operating procedures for installation and commissioning. The company is not responsible for any equipment damage or personal injury caused by not operating in accordance with the requirements.

◆ This product is a general industrial product and is not intended for use in machines and systems that are related to human life.

◆ Only qualified personnel are allowed to perform wiring, running, maintenance, inspection and other operations.

◆ Safety devices must be equipped if it is used on devices that may cause serious accidents or losses.

◆ Although this product is perfectly sound in terms of quality control, the noise, static electricity, input power supply, wiring, parts and other factors may cause unexpected actions. Please fully consider mechanical safety measures to ensure safety within the possible range of motion.

Chapter II Electrical Specifications

2.1 Specifications

Input power	Single-phase 220V	
Working environment	Temperature	0～45℃
	Humidity	≤90%RH, no condensation
	Elevation	Altitude ≤1000m
	Installation environment	No corrosive gas, flammable gas, oil mist or dust.
	Installation mode	Vertical
Encoder		Support 17-bit incremental/absolute value encoder, 23-bit incremental/absolute value encoder
Output power	24V voltage output	100mA, supply power to DI port and pulse port.
Control signal	Digital input	5-channel common digital input, function can be configured.
	Digital output	3-channel digital output, function can be configured.
Communication function		EtherCAT communication.
Display panel and key operation		5 keys (Mode, Set, Left, Up, Down) and 6 nixie tubes
Braking resistor		Built-in 50W 40Ω braking resistor.For frequent braking occasions, an external braking resistor is required.

2.2 Drive model

LC - 10 E - 100
① ② ③ ④

① : Drive series
② : Driver power
10: 50W~750W
20: 1KW
30:1KW~2.6KW
50:3KW~3.8KW
③ : Control type
P: Pulse type
E: EtherCAT type

④ : Motor power
50:50w
100:100W
200:200W
400:400W
750:750W
1000:1KW
……
3800:3.8KW

2.3 Motor model

LCMT - 02 _ LB C17 N B - 60 M006 30B
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① : Motor series
② : Motor power
02:0.2KW
04:0.4KW
……
38:3.8KW
③ : Number of motor poles
□:4 pairs of poles
S:5 pairs of poles
④: Motor inertia
LB:220V low inertia
MB:220V Medium inertia
⑤: Encoder type
C17: 17 bit incremental magnetic encoding
R17: 17 bit magnetic encoder absolute value
C23: 23 bit incremental magnetic encoding
R23: 23 bit magnetic encoder absolute value

⑥ : Motor brake
N: Without brakes
Z: With brakes
⑦ : Motor oil seal and keyway
A: No oil seal, no keyway
B: With oil seal and keyway
C: With oil seal, without keyway
⑧ : Motor flange
60:60 flange
80:80 flange
130:130 flange
⑨: motor torque
⑩: motor speed
10:1000RPM
15:1500RPM
……
30:3000RPM

Chapter III Installation

Warning

- The storage and installation of the product must meet the environmental conditions.
- Damaged or incomplete products should not be installed and used.
- The product requires fireproof materials for installation, and must not be installed on or near flammable materials to prevent fire.
- The servo drive unit must be installed in the electric cabinet to prevent the intrusion of dust, corrosive gas, conductive objects, liquids, and inflammables.
- Servo drive unit and servo motor should be protected from vibration and shock.
- It is strictly forbidden to drag the servo motor wires and encoder lines.

3.1 Installation of servo drive unit

Note

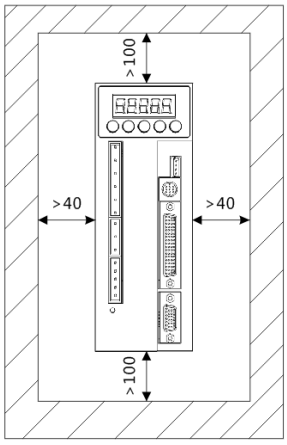
- The servo drive unit must be installed in a well-protected electric cabinet.
- The servo drive unit must be installed in the specified direction and interval, and ensure good heat dissipation conditions.
- Do not install on or near flammable objects to prevent fire.

3.1.1 Installation environment

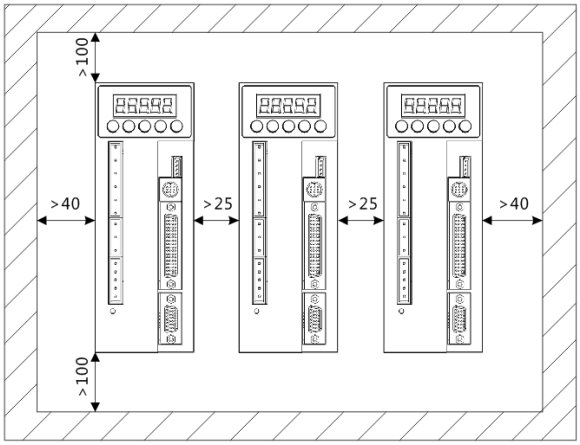
- Operating temperature/humidity: 0~55℃ (no frost), < 90%RH (no condensation).
- Storage temperature/humidity: -20~65℃ (no frost), < 90%RH (no condensation).
- Atmospheric environment: inside the control cabinet, without corrosive or flammable gas, oil mist, dust, etc.
- Elevation: below 1000m above sea level.
- Vibration: < 0.5G (4.9m/s2), 10~60 Hz (non-continuous operation).
- Protection: The servo drive itself has no protection, so it must be installed in a well-protected electrical cabinet, and protected from the intrusion of corrosive or flammable gases, conductive objects, metal dust, oil mist and liquids.

3.1.2 Installation method

- The servo drive of our company is in vertical structure, so please install it vertically. The installation direction should be upwards perpendicular to the installation surface.
- The installation layout of single or multiple servo drives is shown in the figure below.

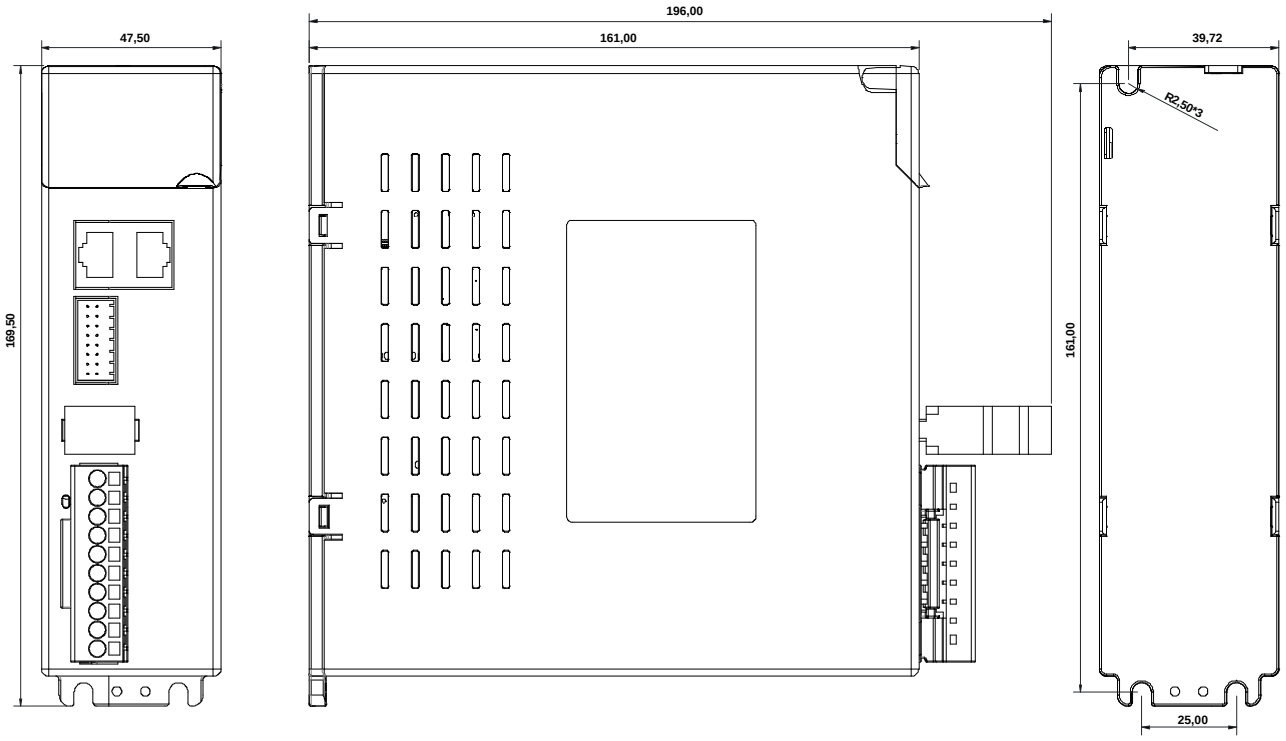


Installation interval of a single servo drive unit



Installation interval of multiple servo units

3.1.3 Installation dimensions

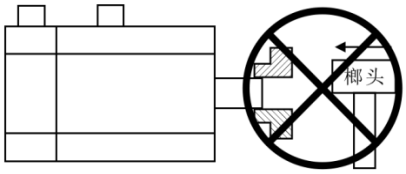


LC-10E/LC-20E Drive Dimensions

3.2 Servo motor installation

Warning

- It is strictly forbidden to knock the shaft end of the motor, or the motor encoder may be damaged.



3.2.1 Installation environment

- Operating temperature/humidity: 5~40℃ (no frost), < 90%RH (no condensation).
- Storage temperature/humidity: -20~55℃ (no frost), < 80%RH (no condensation).
- Atmospheric environment: indoor (no exposure), without corrosive or flammable gas, oil mist, dust, etc.
- Elevation: below 1000m above sea level.
- Vibration: < 0.5G (4.9m/s2), 10~60 Hz (non-continuous operation).
- Protection level: IP54

3.2.2 Installation method

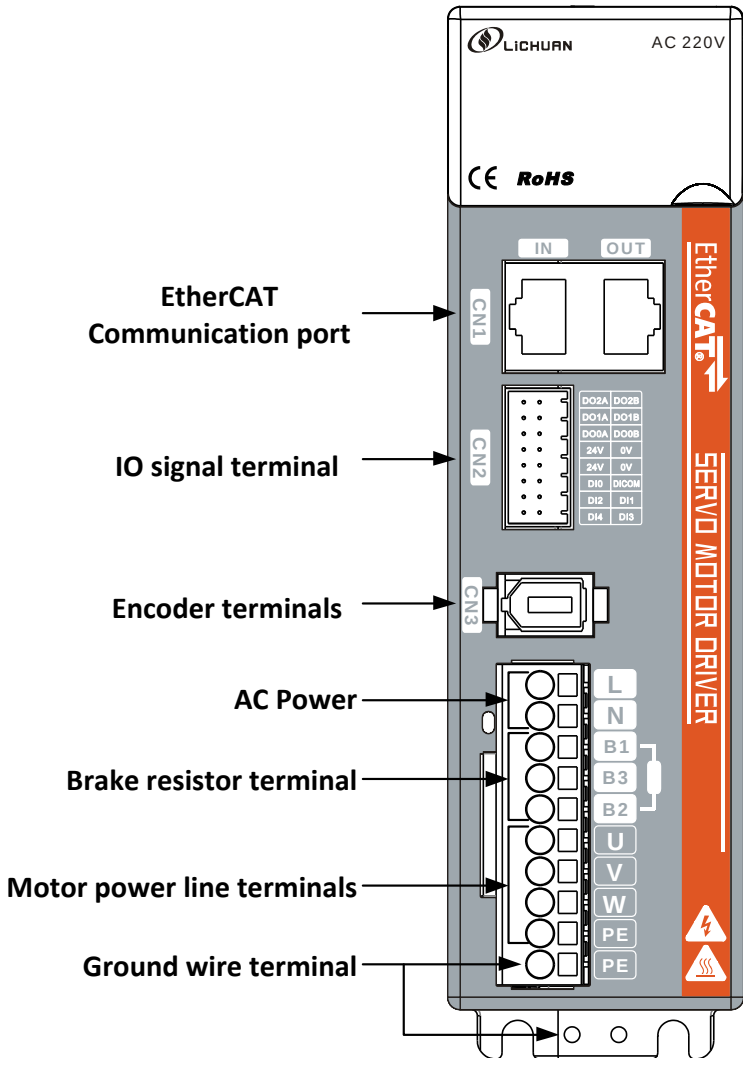
- Installation direction: To prevent water, oil and other liquids from flowing into the motor from the motor outlet, please place the cable outlet at the bottom. If the motor shaft is installed upwards and a reducer is attached, it is necessary to prevent oil stains in the reducer from penetrating into the motor from the motor shaft.
- Concentric: When connecting with the machine, please use the coupling, and keep the axle center of the servo motor and the axle center of the machine in a straight line.
- Cable: Do not "bend" or put "tension" on the cables, do not over-tension the cable when wiring (using).
- Fixing: The motor installation must be firm, and there should be anti-loosening measures.

Chapter IV Wiring

Warning

- The power supply of this series of drives is Single phase or three-phase 220V. The power supply must be identified when wiring.
- When using this product, the user must consider safety protection measures in the design and assembly to prevent accidents caused by wrong operations.
- The drive terminals U, V and W must correspond to the motor U, V and W, or it may cause a crash.
- The drive and motor must be well grounded.
- The power must be turned off at least 5 minutes before disassembling the drive.
- It is forbidden to turn on/off the power frequently. When the power is off, you need to wait for the nixie tube to go out before powering on again.
- When using the internal braking resistor, the short-circuit wire must be connected between terminals B2 and B3. It is forbidden to connect the wire between B1 and B2 directly.

4. 1 Terminal description



LC-10E/LC-20E driver

4.1 Main circuit wiring

4.2.1 Definition of main circuit terminals

◆ **Input power terminal of LC-10/LC-20 driver**

No.	Signal definition	Functions
1	L	Power terminal, can be connected to AC single-phase 220V
2	N	

◆ **制动电阻端子**

No.	Signal definition	Functions	Description
1	B1	DC bus positive terminal output DCP	The positive terminal of the built-in resistor is connected to B1. When using the built-in resistor, please short-circuit B2 and B3. When using external resistor, please connect the resistor between B1 and B2 (B2 and B3 must be disconnected).
2	B3	Built-in braking resistor negative output.	
3	B2	Brake transistor collector output	

◆ **Motor terminal**

No.	Signal definition	Functions
1	U	Connect to motor phase U
2	V	Connect to motor phase V
3	W	Connect to motor phase W
4	PE	Connect to motor housing

4.2.2 How to use the main circuit power terminal (spring type)

1. Strip the outer sheath of the wire to expose 8-9mm bare copper wire.
2. The pressing method is as follows:
   - Use the control bar provided with the servo drive to pry up the slot (as shown in Fig. A);
   - Insert a slotted screwdriver into the terminal opening (3.0~3.5mm width at the end), then press firmly to open the slot (as shown in Fig. B).
3. The pressing method is as follows:

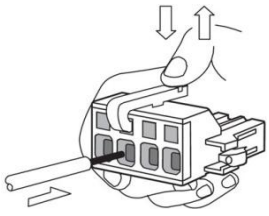


Fig. A

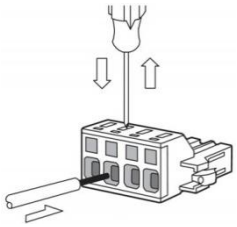
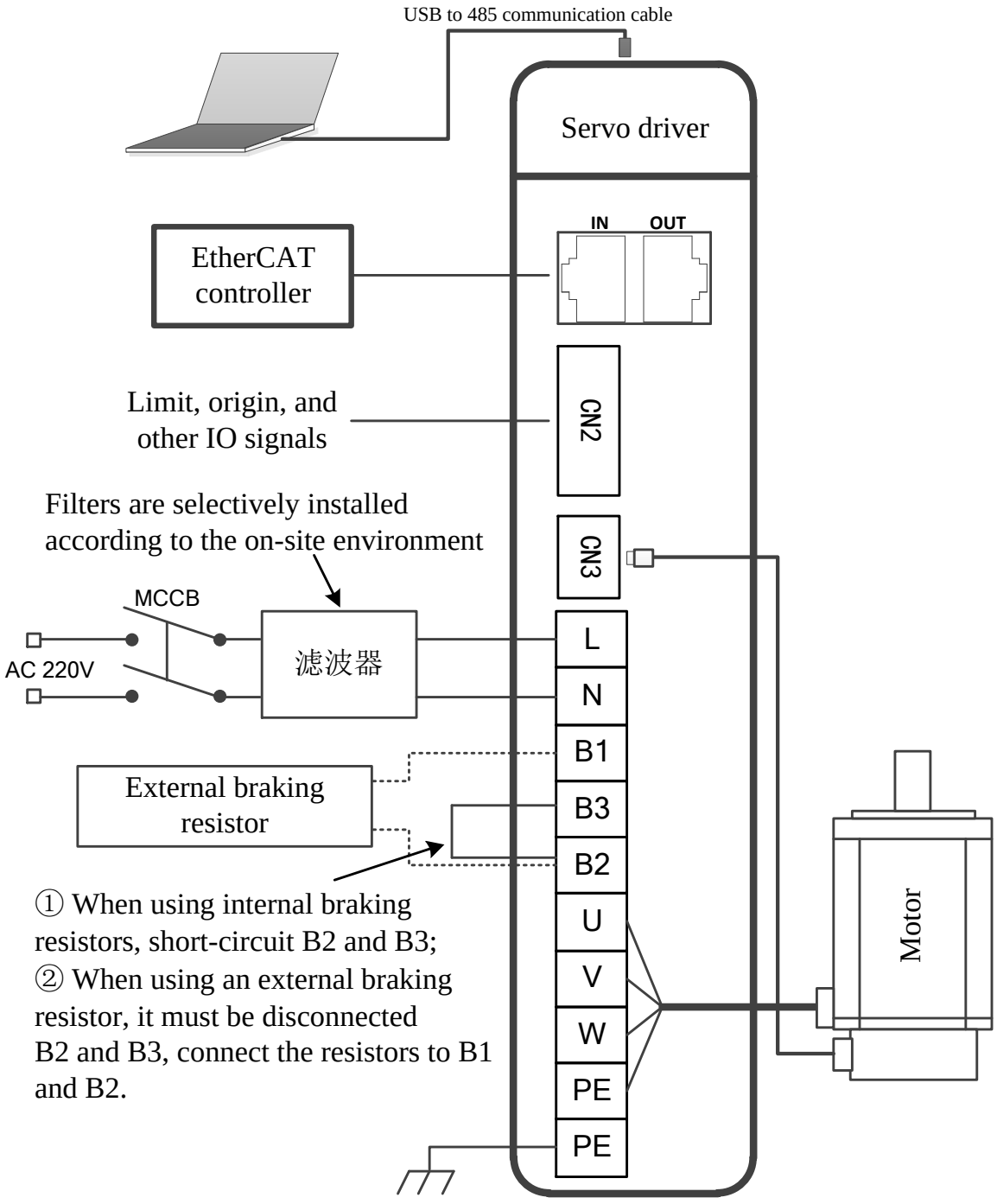


Fig. B

4.2.3 Drive wiring diagram

➢ LC-10E/LC-20E Driver Wiring Diagram

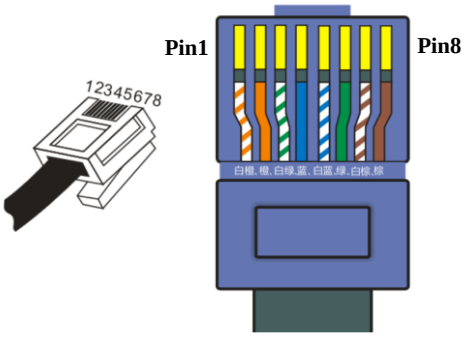


Note: When using the internal braking resistor, short-circuit B2 and B3 (connected at the factory); when using the external braking resistor, disconnect B2 and B3, and connect the external braking resistor between B1 and B2.

4.3 Definition of wiring terminal

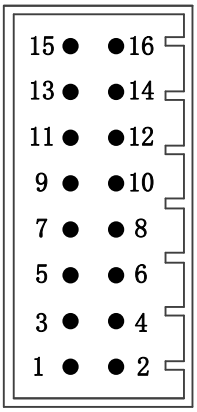
4.3.1 EtherCAT Terminal Definition（CN1）

Pin	color	definition	Description
1	White/orange	TX+	EtherCAT sending data+
2	Orange	TX-	EtherCAT sending data-
3	White/green	RX+	EtherCAT receive data+
4	Blue	/	/
5	White/blue	/	/
6	Green	RX-	EtherCAT receive data-
7	White/brown	/	/
8	Brown	/	/



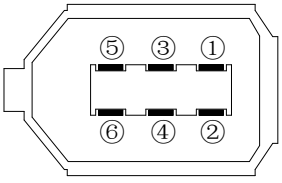
Registered jack pin order

4.3.2 Definition of control terminals（CN2）

Pin	Signal name	Function name	Notes or supplementary instructions	Pin definition image
11	DO0A	Digital output 0-A terminal	Detailed description of parameter configuration, as described in Chapter 4.5.2. Attention: The maximum allowable current for the output port is 200mA, and it cannot directly drive high current loads such as motor brake. An external relay needs to be added.	
12	DO0B	Digital output 0-B terminal		
13	DO1A	Digital output 1-A terminal		
14	DO1B	Digital output 1-B terminal		
15	DO2A	Digital output 2-A terminal		
16	DO2B	Digital output 2-B terminal		
7	24V	DC 24V power output positive terminal	The maximum current output of 24V is 100mA, which can only be used as a DI port and pulse signal power supply. **It is prohibited to use it to drive external loads.**	
9	24V			
8	0V	DC 24V power output negative terminal		
10	0V			
6	DICOM	DI port common terminal	DICOM can be connected to+24V or 0V, Please refer to Chapter 4.5.1 for instructions.	
5	DI0	Digital input 0	Detailed description of parameter configuration, as described in Chapter 4.5.1.	
4	DI1	Digital input 1		
3	DI2	Digital input 2		
2	DI3	Digital input 3		
1	DI4	Digital input 4		

4.3.3 Encoder terminal definition（CN3）

◆ Schematic diagram of drive encoder terminals

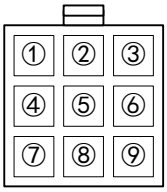


Encoder terminal pin diagram

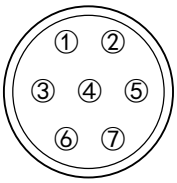
◆ Drive encoder pin definition

Servo side		Name	Wire color
1	VCC	Encoder power supply +5V	Red
2	GND	Encoder power ground	Yellow
3	/	/	/
4	/	/	/
5	SD+	Encoder signal+	Blue
6	SD-	Encoder signal-	Black

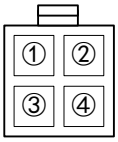
◆ Schematic diagram of motor terminals



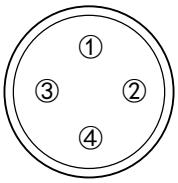
9-pin Amp plug male



7-pin aviation plug



4-pin Amp plug



4-pin aviation plug

◆ Motor encoder terminal pin definition (Amp plug is the same as the aviation plug)

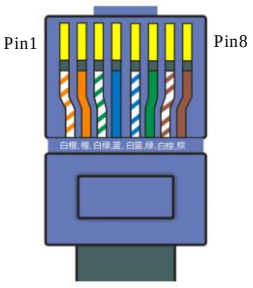
Motor side		Name	Wire color
1	PE	Shielded cable	
2	E-	Battery power supply negative	White
3	E+	Battery power supply positive	Green
4	SD-	Encoder signal-	Black
5	GND	Encoder power ground	Yellow
6	SD+	Encoder signal+	Blue
7	VCC	Encoder power supply +5V	Red

◆ Motor power line pin definition

Motor side (Amp plug)		Name	Wire color
1	U	Motor phase U	Brown
2	V	Motor phase V	Blue
3	W	Motor phase W	Yellow
4	PE	Motor housing	Green

4.3.4 RS485 Terminal Definition（CN4/CN5）

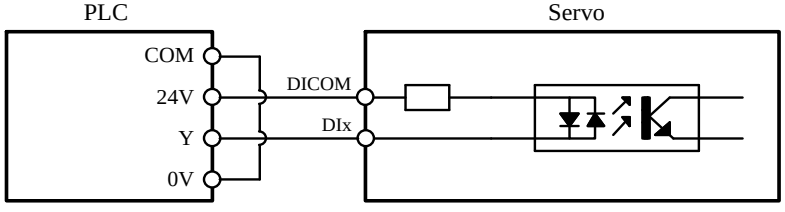
Pin	color	Signal definition
1	White/orange	GND
2	Orange	/
3	White/green	/
4	Blue	485+
5	White/blue	485-
6	Green	/
7	White/brown	/
8	Brown	/



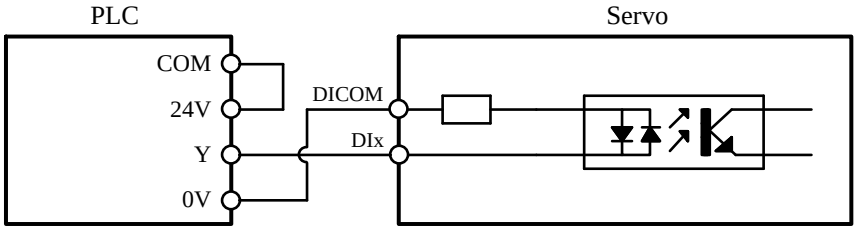
4.4 Control signal terminal wiring

4.4.1 DI input circuit

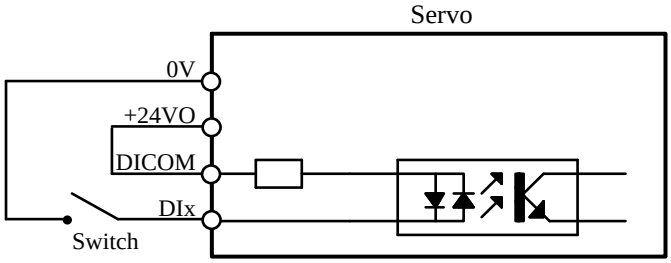
◆ NPN type input wiring



◆ PNP type input wiring

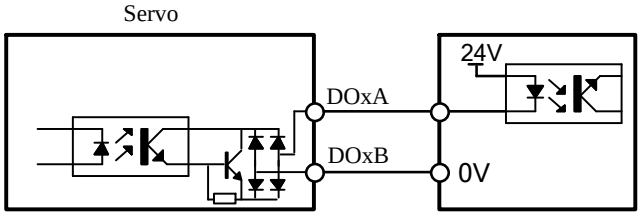


◆ Switch input wiring

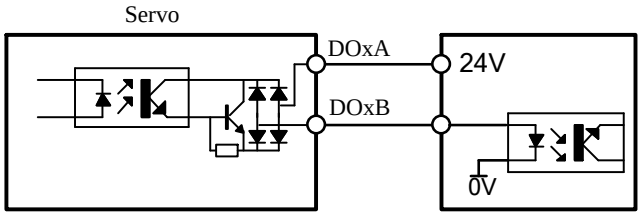


4. 4. 2 DO output circuit

◆ DO output wiring (connect to optocoupler)

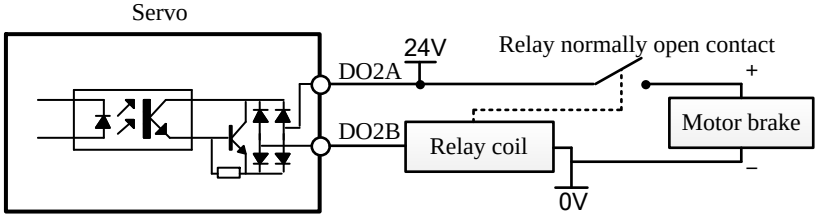


Low level output wiring



High level output wiring

◆ DO output wiring (connect to relay)



The brake output signal controls the motor brake through the relay

4.5 Detailed description of DI/DO port function configuration

4.5.1 DI function description

1. DI port configuration parameters

DI port	Function selection			Logic level	
	No.	Initial value	Function description	No.	Initial value
DI0	P03.02	14	Forward overtravel switch	P03.03	0
DI1	P03.04	15	Reverse overtravel switch	P03.05	0
DI2	P03.06	31	Origin switch	P03.07	0
DI3	P03.08	0	-	P03.09	0
DI4	P03.10	0	-	P03.11	0

2. DI port function command table

Code	Name	Function name	Description	Remarks
FunIN.14	P-OT	Forward overtravel switch	Effective - prohibit forward drive; Invalid - allows forward drive.	When the mechanical movement exceeds the movable range, enter the overtravel prevention function. The logical selection of the corresponding terminal is recommended to be set to: effective level.
FunIN.15	N-OT	Reverse overtravel switch	Effective - prohibit reverse drive; Invalid - reverse drive allowed.	
FunIN.31	HomeSwitch	Origin switch	Invalid - not triggered; Effective - triggered.	The logical selection of the corresponding terminal must be set to: effective level. If set to 2 (effective rising edge), the internal drive will be forcibly changed to 1 (effective high level); If set to 3 (effective falling edge), the internal drive will be forcibly changed to 0 (effective low-level); If set to 4 (both rising and falling edges are effective), the driver will be forced to change to 0 internally (low level is effective)
FunIN.34	Emergency Stop	Emergency stop	Effective - position lock after zero speed shutdown;	The logical selection of the corresponding terminal is recommended to be set to: effective level.
FunIN.38	TouchProbe1	Probe 1	Invalid - probe not triggered; Effective - Probe can trigger	The probe logic is only related to the probe function (60B8h) and is not related to the terminal logic selection.
FunIN.39	TouchProbe2	Probe 2	Invalid - probe not triggered; Effective - Probe can trigger	The probe logic is only related to the probe function (60B8h) and is not related to the terminal logic selection.

4.5.2 DO function description

1. DO port configuration parameters

DI port	**Function selection**			**Logic level**	
	No.	Initial value	Function description	No.	Initial value
DO0	P04.00	1	Servo ready	P04-01	0
DO1	P04.02	5	Positioning completed	P04-03	0
DO2	P04.04	3	Zero speed	P04-05	0

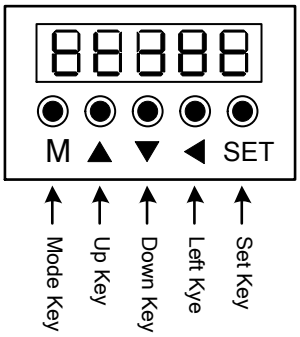
2. DO port function command table

Code	Name	Function name	Description
FunOUT.1	S-RDY	Servo ready	The servo status is ready and can receive S-ON valid signals: valid - the servo is ready; Invalid - servo not ready.
FunOUT.2	TGON	Motor rotation output	When the speed is higher than 2006-11h: valid - the motor rotation signal is valid; Invalid - The motor rotation signal is invalid.
FunOUT.5	COIN	Positioning completed	When controlling the position, the position deviation pulse reaches the positioning completion threshold of 6067 hours, and the time reaches 6068 hours, which is effective.
FunOUT.7	C-LT	Torque limitation	Confirmation signal for torque limitation: effective - motor torque limitation; Invalid - motor torque is not limited.
FunOUT.8	V-LT	Speed limit	Confirmation signal for speed limitation during torque control: effective - motor speed limitation; Invalid - motor speed not limited.
FunOUT.9	BK	brake output	Holding brake signal output: effective - closed, releasing the holding brake; Invalid - activate the brake.
FunOUT.10	WARN	Warning output	The warning output signal is valid. (Conduction).
FunOUT.11	ALM	Fault output	The status is valid when a fault is detected.
FunOUT.12	ALMO1	alarm code 1	Output a 3-digit alarm code.
FunOUT.13	ALMO2	alarm code 2	Output a 3-digit alarm code.
FunOUT.14	ALMO3	alarm code 3	Output a 3-digit alarm code.
FunOUT.18	ToqReach	Torque reaches output	Effective - the absolute torque value reaches the set value; Invalid - The absolute torque value is less than the set value reached.
FunOUT.19	V-Arr	Speed output reached	Effective - Speed feedback reaches the set value; Invalid - Speed feedback did not reach the set value.

Chapter V Panel Display and Operation

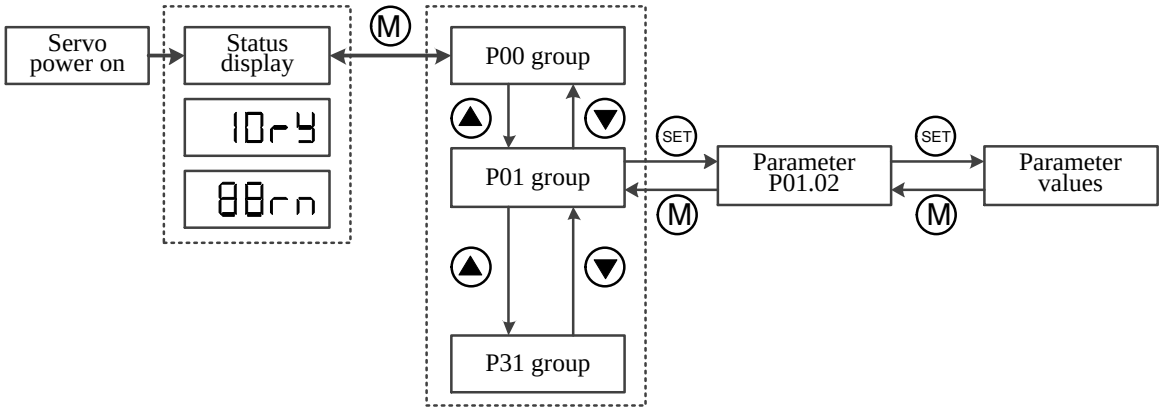
5.1 Panel introduction and description

5.1.1 Description of panel keys



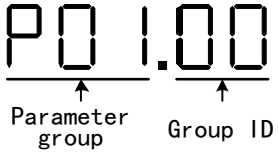
Name	General function
M	Switch between modes, return to the previous menu
▲	Increase the value of the blinking digit of the LED nixie tube
▼	Decrease the value of the blinking digit of the LED nixie tube
◄	Change the blinking position of the LED nixie tube, View the high-order value of data longer than 5 digits
SET	Go to next level menu, Execute commands such as storing parameter values

5. 1. 2 How to operate keys on the panel



5. 1. 3 Status display

The servo parameter number of this series consists of two parts: parameter group and internal parameter group number, as shown in the following figure:

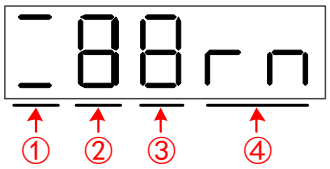


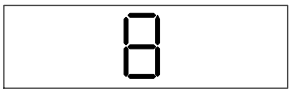
Object dictionary index = 0x2000 + parameter group number;

Object dictionary subindex = hexadecimal + 1 of the number within the parameter group;

For example：the object dictionary index for P02.03 is 2002-03h, and the object dictionary index for P0B.17 is 200b-12h.

5.1.4 Status display

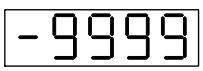


NO.	Display	Name	Display occasion	Explain
①		Port 1 connection indication	The drive is ready Servo enable signal effective	Long dark: No communication connection detected in the physical layer Changliang: The physical layer has established a communication connection
		Port 0 connection indication		
②		Communication status	The drive is ready Servo enable signal effective	The EtherCAT state machine status of the slave station. 1: Initialization status 2: Preoperational status 4: Safe operation status 8: Running status
③		control model	The drive is ready Servo enable signal effective	The current operating mode of the servo does not flash. 0: No Mode 1: Contour position control 3: Contour speed mode 4: Contour torque mode 6: Zero return mode 8: Periodic synchronization position mode 9: Periodic synchronization speed mode A: Periodic synchronous torque mode
④		Nr Servo not ready	Servo initialization completed, but the driver is not ready.	Due to the main circuit not being powered on, the servo is in an inoperable state.
		Ry Servo ready	The drive is ready.	The servo drive is in a operable state, waiting for the upper computer to provide a servo enable signal.
		Rn Servo is running	Servo enable signal effective	The servo drive is in operation.

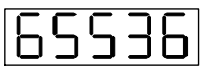
5.1.5 Parameter value display

- **Signed numbers up to 4 digits or unsigned numbers up to 5 digits**

Using a single page (5-digit digital tube) display, for signed numbers, the highest digit "-" in the data represents a negative sign. For example, -9999 displays as follows:

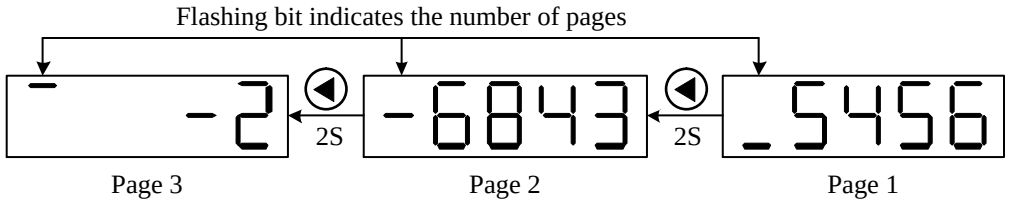


Example: 65535 displays as follows:

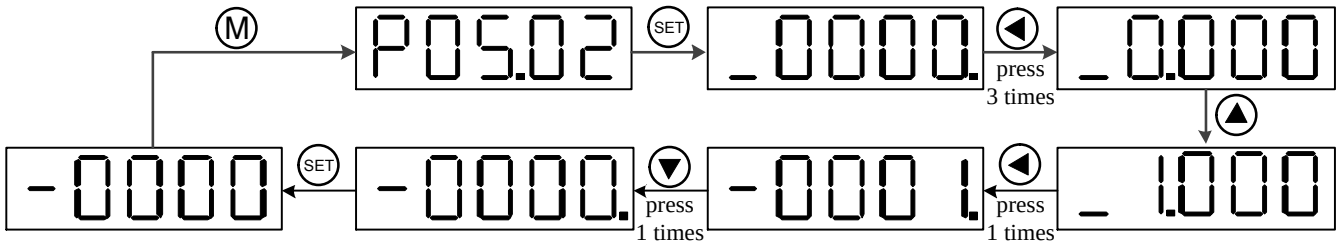


- **4 or more signed numbers or 5 or more unsigned numbers**

Page by page display from low to high, with every 5 digits representing one page. Display method: current page+current page value, as shown in the following figure. Press and hold the "" key for more than 2 seconds to switch to the current page. For example, -268435456 is displayed as follows:



- **Modify P05-02 to set the default number of pulses per cycle to 10000 and set it to 1000 (modify other numerical parameters with more than 4 digits in the same way as this step)**



5.1.6 Monitoring parameter display (P0B group parameters)

Function code	Name	Setting Range	Unit	Attribute	Type
P0B.00	Actual motor speed	The actual running speed of the servo motor, which is rounded to the nearest 1rpm	rpm	RO	Int16
P0B.01	Speed command	The current speed command of the drive	rpm	RO	Int16
P0B.02	Internal torque command	The percentage of the actual output torque of the servo motor to the rated torque of the motor	%	RO	Int16
P0B.03	DI signal monitoring	Corresponding level status of the 5 DI terminals: the upper half of the nixie tube lights up to indicate a high level; the lower half lights up to indicate a low level	-	RO	Int16
P0B.05	DO signal monitoring	Corresponding level status of the 3 DO terminals: the upper half of the nixie tube lights up to indicate a high level; the lower half lights up to indicate a low level	-	RO	Int16
P0B.07	Absolute position counter (32-bit decimal display)	Current absolute position of the motor (command unit)	command unit	RO	Int32
P0B.13	Input position command count	Display the number of input position commands	command unit	RO	Int32
P0B.15	Encoder position deviation value	Encoder position deviation = total number of input position commands - total number of encoder feedback pulses	encoder unit	RO	Int32
P0B.17	Feedback pulse counter	Count and display the number of pulses fed back by the servo motor encoder (encoder unit)	encoder unit	RO	Int32
P0B.24	Phase current rms value	Servo motor phase current rms value	A	RO	Uint16
P0B.26	Bus voltage value	The DC bus voltage value of the main circuit	V	RO	Uint16
P0B.33	Fault recording	Set the number of times to view historical faults 0. current fault 1. Last fault 2. Last two faults …… 9. Last 9 faults	-	RO	Uint16
P0B.34	Fault code of selected time	P0B-33 selected fault code When there is no fault, the displayed value of P0B-34 is "Er.000"	-	RO	Uint16
P0B.35	Selected fault timestamp	P0B-34 shows the total servo running time when the fault occurs When there is no fault, the displayed value of P0B-35 is "0"	s	RO	Int32
P0B.37	Motor speed at selected fault	The servo motor speed when the fault displayed by P0B-34 occurs When there is no fault, the displayed value of P0B-37 is "0"	rpm	RO	Int16
P0B.38	Motor U-phase current at the selected fault	The rms value of the U-phase winding current of the servo motor when the fault displayed by P0B-34 occurs When there is no fault, the displayed value of P0B-38 is "0"	A	RO	Int16

P0B.39	Motor V-phase current at the selected fault	The rms value of the V-phase winding current of the servo motor when the fault displayed by P0B-34 occurs When there is no fault, the displayed value of P0B-39 is "0"	A	RO	Int16
P0B.40	Bus voltage at selected fault	The DC bus voltage value of the main circuit when the fault displayed by P0B-34 occurs When there is no fault, the displayed value of P0B-40 is "0"	V	RO	Uint16
P0B.41	Input terminal status at selected fault	The corresponding high and low level status of 9 DI terminals when the fault displayed by P0B-34 occurs Viewing method is the same as P0B-03 When no fault occurs, P0B-41 shows that all DI terminals are low level, and the corresponding decimal value is "0"	-	RO	Uint16
P0B.42	Output terminal status at selected fault	The corresponding high and low level status of 5 DO terminals when the fault displayed by P0B-34 occurs Viewing method is the same as P0B-05 When no fault occurs, P0B-42 shows that all DO terminals are low level, and the corresponding decimal value is "0"	-	RO	Uint16
P0B.53	Position deviation counter	Position deviation=total number of input position instructions (instruction units) - total number of encoder feedback pulses (instruction units)	command unit	RO	Int32
P0B.55	Actual motor speed	The actual running speed of the servo motor, accurate to 0.1rpm	rpm	RO	Int32
P0B.57	Control power bus voltage	Control circuit DC bus voltage value	-	RO	Uint16
P0B.58	Mechanical absolute position(Low 32-bit)	Mechanical corresponding position feedback low 32 bit value	encoder unit	RO	Int32
P0B.60	Mechanical absolute position(High 32-bit)	Mechanical corresponding position feedback high 32 bit value	encoder unit	RO	Int32
P0B.64	Input position instruction count	Display position command counter before electronic gear ratio multiplication	command unit	RO	Int32
P0B.70	Absolute encoder rotation number	Display the number of rotations of the absolute value encoder	r	RO	Uint16
P0B.71	Absolute encoder position within 1 turn	Display the single loop position feedback value of the absolute value encoder	encoder unit	RO	Int32
P0B.77	Absolute encoder position (Low 32-bit)	Display the position feedback value of the absolute value encoder, with low 32-bit data	encoder unit	RO	Int32
P0B.79	Absolute encoder position (High 32-bit)	Display the position feedback value of the absolute value encoder, with high 32-bit data	encoder unit	RO	Int32
P0B.81	Rotating load single circle position (Low 32-bit)	Position feedback value of rotating load, low 32-bit data	encoder unit	RO	Uint32
P0B.83	Rotating load single circle position (High 32-bit)	Position feedback value of rotating load, high 32-bit data	encoder unit	RO	Uint32
P0B.85	Rotating load single circle position	Position feedback value of rotating load, high 32-bit data	command unit	RO	Uint32

5.2 Common operations

⚠Warning

- Please check whether the wiring of the drive is correct before powering on.
- Make sure that the motor is not loaded to prevent collision or other hazards.

5.2.1 Initialization parameters

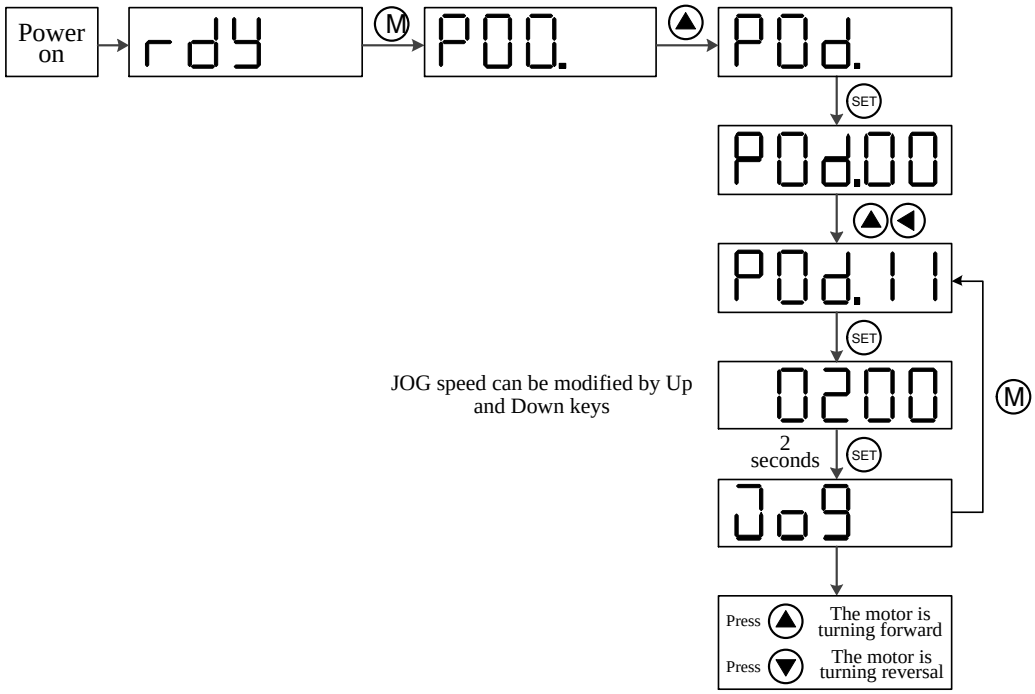
Set P02-31 to 1 to initialize the drive parameters, and the drive needs to be restarted after the setting is completed.

5.2.2 Manual reset alarm

- Set P0D-01 to 1 to clear the resettable alarms;
- For multi-turn absolute encoder power failure alarm (Er.731), first set P0D-20 to 2, and then set P0D-01 to 1 to clear the alarm.

5.2.3 JOG mode operation

When using the jog function, you need to cancel the servo enable first, or you can't enter the JOG state!



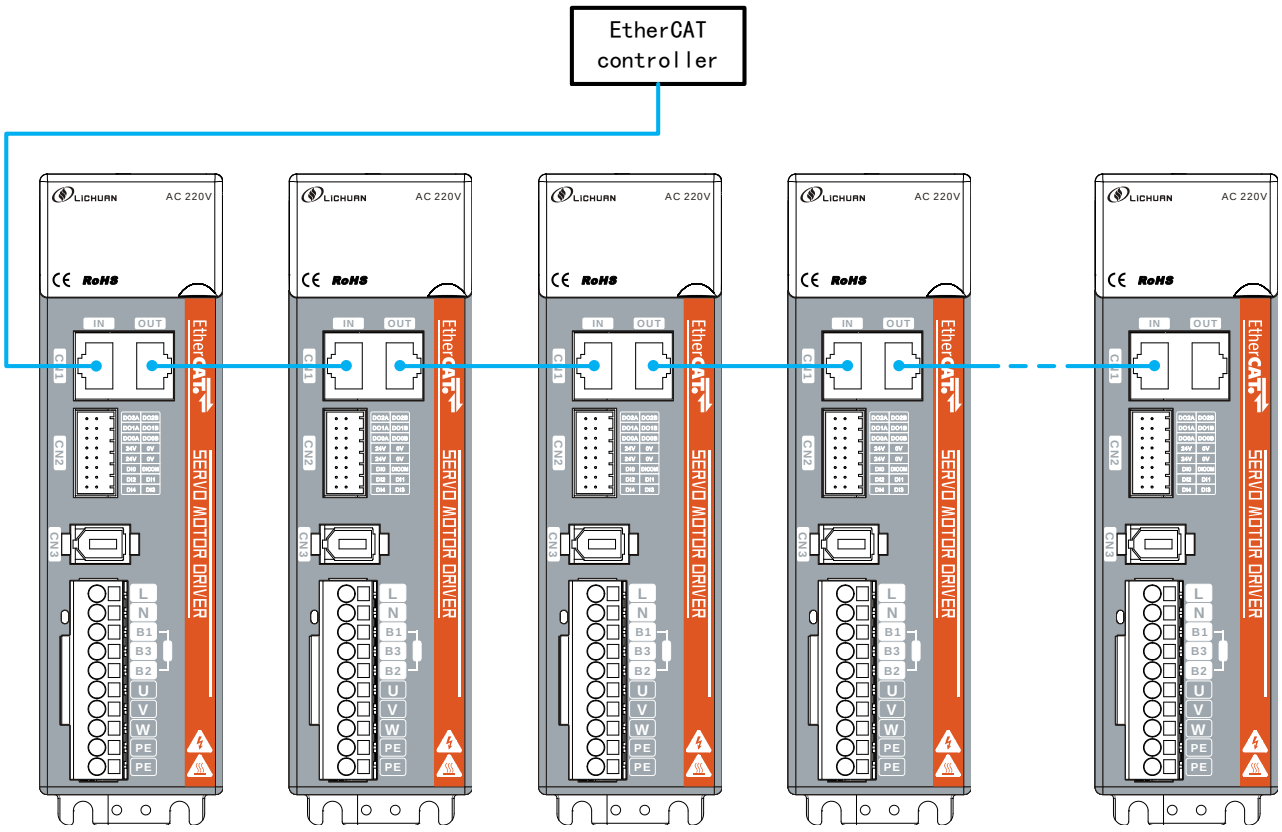
5.3 Description of Gain Parameter Setting

No.	Parameter name	Setting range	Functions
P08-00	Speed loop gain	0.1~ 2000.0	The larger this parameter is, the faster the response of the speed loop will be, but the setting too large may cause vibration; In position mode, to increase the gain of position loop, it is necessary to increase the gain of speed loop at the same time.
P08-01	Speed loop integral time constant	0.15~ 512.00	The smaller the value set, the stronger the integration effect, the faster the response, the large inertia load may cause jitter; The larger the setting value is, the slower the response will be. Increase this parameter appropriately with large inertia load.
P08-02	Position loop gain	0.0~ 2000.0	This parameter determines the responsiveness of the position loop, and a larger position loop gain can shorten the positioning time. However, setting too large may cause vibration.
P08-15	Load inertia ratio	0.00~ 120.00	Set the mechanical load inertia ratio relative to the motor's own moment of inertia. When the motor drives a large inertia load such as belt/rack and pinion/swing arm, this parameter can be increased if there is rocking back and forth.
P08-18	Speed feedforward filter time constant	0.00~ 64.00	Sets the filtering time constant for velocity feedforward.
P08-19	Speed feedforward gain	0.0~ 100.0	Increasing this parameter can improve the position command response and reduce the position deviation at fixed speed. When adjusting, first set P08-18 as a fixed value; Then the set value of P08-19 is gradually increased from 0 until a certain set value, the speed feedforward effect is achieved.
P08-20	Torque feedforward filter time constant	0.00~ 64.00	Set the filtering time constant for torque feedforward.
P08-21	Torque feedforward gain	0.0~ 200.0	Increasing this parameter improves responsiveness to changing speed instructions. Increasing this parameter can improve the position command response and reduce the position deviation at fixed speed.
P08-23	Speed feedback low-pass filter cutoff frequency	100~ 4000	The smaller the setting, the smaller the speed feedback fluctuation, but the larger the feedback delay.
P08-24	Pseudo-differential feedforward control coefficient	0.0~ 100.0	When the coefficient is set to 100.0, the speed loop adopts PI control (the default control mode of the speed loop), and the dynamic response is fast. When it is set to 0.0, the speed loop integration has an obvious effect and can filter out low-frequency interference, but the dynamic response is slow. By adjusting P08-24, the speed loop can not only have fast response, but also not increase the speed feedback overshoot, but also improve the immunity of low frequency band.

Chapter VI Communication configuration

6.1 EtherCAT networking diagram

EtherCAT is a high-performance, low-cost, easy-to-use, and topologically flexible industrial Ethernet technology that can be used for ultra high speed I/O networks at the industrial field level. It uses standard Ethernet physical layers and transmission media twisted pair or fiber optic (100Base TX or 100Base FX). The EtherCAT network diagram is as follows:



6.1.1 EtherCAT communication technology specifications

Item		specifications
EtherCAT Slave Station Performance	Communication protocol	EtherCAT protocol
	Support services	CoE （PDO、SDO）
	Synchronization method	DC Distributed Clock
	physical layer	100BASE-TX
	Baud rate	100 Mbit/s (100Base-TX)
	Duplex mode	full duplex
	topological structure	linear
	Transmission medium	Shielded Category 5 or Electrical Performance Specification Category 6 or above Ethernet cables
	transmission distance	The distance between two nodes is less than 100m (with good environment and excellent cables)
	Number of slave stations	Protocol supports up to 65535 units, but actual usage does not exceed 100 units
	EtherCAT frame length	44 bytes to 1498 bytes
	process data	A maximum of 1486 bytes per Ethernet frame
	Synchronous jitter between two slave stations	< 1us

6.2 Driver related parameter configuration

6.2.1 system parameter setting

In order to accurately connect this series of servo drives to the EtherCAT fieldbus network, it is necessary to set the relevant parameters of the servo drives. As shown in the table below:

Function code	Index	Subindex	Name	Set Range	Unit	Default settings	Effective method	Setting method	Related modes
P02.00	2002h	01	Control mode selection	9：EtherCAT	-	9	Effective immediately	No enable settings	-
P0C.13	200Ch	0E	Is the communication writing function code value updated to EEPROM	0: Do not save 1: 2000h series object dictionary communication written and stored in EEPROM 2: 6000h series object dictionary communication written and stored in EEPROM 3: 2000h series and 6000h series object dictionaries are stored in EEPROM after communication and writing	-	3	Effective immediately	Running settings	PST

Attention: The parameters that need to be saved in EEPROM must be set to the corresponding values of 200C-0Dh before setting. Otherwise, after re powering on, the parameters will return to their default values.

6.2.2 Rotation direction selection

By setting the rotation direction selection (2002-03h) or P02-02, the rotation direction of the motor can be changed without changing the polarity of the input command. The relevant parameters are shown in the table below

Function code	Index	Subindex	Name	Set Range	Unit	Default settings	Effective method	Setting method	Related modes
P02.02	2002h	03	Rotation direction selection	0: Using the CCW direction as the forward turning direction (A leads B) 1: Take CW direction as the forward rotation direction (A lags behind B)	-	0	Power on again	No enable settings	PST

When the rotation direction selection (2002-03h) is changed, the shape of the servo driver's output pulse and the positive or negative monitoring parameters will not change.

6.2.3 Holding brake setting

Band brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non operating state, keeping the motor position locked and preventing the moving parts of the machinery from moving due to self weight or external forces. Under relevant parameters:

Function code	Index	Subindex	Name	Set Range	Unit	Default settings	Effective method	Setting method	Related modes
P02.09	2002h	0A	Holding brake output ON to command reception delay	0～500	ms	250	Effective immediately	Running settings	PS
P02.10	2002h	0B	Static state, holding brake output OFF to motor power-off delay	1～1000	ms	150	Effective immediately	Running settings	PS
P02.11	2002h	0C	Rotating state, holding brake output OFF speed threshold	0～3000	rpm	30	Effective immediately	Running settings	PS
P02.12	2002h	0D	Rotation state, servo enable OFF to brake output OFF delay	1～1000	ms	500	Effective immediately	Running settings	PS

The output signal of the brake is controlled by a relay, and the wiring diagram of the brake is shown in Chapter 4.4.2.

6.3 Communication cycle of each mode

Cycle time	Profile position mode (PP)	Zero return mode (HM)	Periodic synchronous position mode (CSP)	Periodic Synchronous Speed Mode (CSV)	Profile Speed Mode (PV)	Contour torque mode (PT)	Periodic Synchronous Torque Mode (CST)
125us	×	×	×	×	×	√	√
250us	×	×	×	×	×	√	√
500us	×	×	×	√	√	√	√
1ms	√	√	√	√	√	√	√

The synchronization cycles supported by modes of 1ms and below are shown in the table above. When used outside of the specifications, it may cause operational errors;

A synchronization period that is an integer multiple of the position loop control cycle (position loop control cycle is 250us) and is greater than 1ms can also be supported.

6.4 Process Data PDO

6.4.1 Variable PDO mapping

This series of drivers provides 1 variable RPDO and 1 variable TPDO for users to use. As shown in the table below:

Variable PDO	Index	Maximum number of mappings	Longest Byte	Default mapping object
RPDO1	1600h	10	40	6040h (control word) 607Ah (target position) 60B8h (probe function)
TPDO1	1A00h	10	40	603Fh (error code) 6041h (status word) 6064h (position feedback) 60BCh (probe 2 rising edge position feedback) 60B9h (probe status) 60BAh (feedback on the rising edge position of probe 1) 60FDh (DI status)

6.4.2 Fixed PDO mapping

This series of drives provides 5 fixed RPDOs and 4 fixed TPDOs for use. As shown in the table below:

PDO group	Supported servo modes	PP/CSP	PDO group	Supported servo modes	PP/PV/PT/CSP/CSV/CST
1 group	1701h (RPDO258)	Mapping objects (3 x 8 bytes) 6040h (control word) 607Ah (target position) 60B8h (probe function)	2 group	1702h(RPDO259)	Mapping object (7 19 bytes) 6040h (control word) 607Ah (target position) 60FFh (target speed) 6071h (target torque) 6060h (mode selection) 60B8h (probe function) 607Fh (maximum speed)
	1B01h (TPDO258)	Mapping objects (8 24 bytes) 603Fh (error code) 6041h (status word) 6064h (position feedback) 6077h (torque feedback) 60F4 (positional deviation) 60B9 (probe status) 60BA (Probe 1 rising edge position feedback) 60FD (DI status)		1B02h(TPDO259)	Mapping objects (9 of 25 bytes) 603Fh (error code) 6041h (status word) 6064h (position feedback) 6077h (torque feedback) 6061h (mode display) 60B9 (probe status) 60BA (Probe 1 rising edge position feedback) 60BC (probe 2 rising edge position feedback) 60FD (DI status)

PDO group	Supported servo modes	PP/CSP	PDO group	Supported servo modes	PP/PV/PT/CSP/CSV/CST
3 group	1703h(RPDO260)	Mapping object (7 17 bytes) 6040h (control word) 607Ah (target position) 60FFh (target speed) 6060h (mode selection) 60B8h (probe function) 60E0h (forward torque limit) 60E1h (Negative torque limit)	4 group	1704h(RPDO261)	Mapping object (7 17 bytes) 6040h (control word) 607Ah (target position) 60FFh (target speed) 6071h (target torque) 6060h (mode selection) 607Fh (maximum speed) 60B8h (probe function) 60E0h (forward torque limit) 60E1h (Negative torque limit)
	1B03h(TPDO260)	Mapping objects (10 29 bytes) 603Fh (error code) 6041h (status word) 6064h (position feedback) 6077h (torque feedback) 60F4h (position deviation) 6061h (mode display) 60B9h (probe status) 60BAh (feedback on the rising edge position of probe 1) 60BCh (probe 2 rising edge position feedback) 60FD (DI status)		1B02h(TPDO259)	Mapping objects (9 of 25 bytes) 603Fh (error code) 6041h (status word) 6064h (position feedback) 6077h (torque feedback) 6061h (mode display) 60B9 (probe status) 60BA (Probe 1 rising edge position feedback) 60BC (probe 2 rising edge position feedback) 60FD (DI status)

PDO group	Supported servo modes	PP/CSP		
5 group	1705h(RPDO262)	Mapping objects (8 19 bytes) 6040h (control word) 607Ah (target position) 60FFh (target speed) 6060h (mode selection) 60B8h (probe function) 60E0h (forward torque limit) 60E1h (Negative torque limit) 60B2h (torque bias)	1B04h(TPDO261)	Mapping objects (10 29 bytes) 603Fh (error code) 6041h (status word) 6064h (position feedback) 6077h (torque feedback) 6061h (mode display) 60F4h (position deviation) 60B9h (probe status) 60BAh (feedback on the rising edge position of probe 1) 60BCh (probe 2 rising edge position feedback) 606Ch (speed feedback)

Chapter VII Control mode description

7.1 Introduction to Control

To use this series of drives, the servo drive must be guided according to the process specified in the standard 402 protocol in order to operate in the specified state. The description of each state is shown in the table below:

Initialization	Driver initialization and internal self check have been completed. The parameters of the driver cannot be set or the driver function cannot be executed.
Servo fault free	The servo drive has no faults or errors have been resolved. The drive parameters can be set.
Servo ready	The servo drive is ready. The drive parameters can be set.
Waiting to turn on servo enable	The servo driver is waiting to turn on the servo enable. The drive parameters can be set.
Servo operation	When the driver is running normally, a certain servo operating mode has been enabled, the motor is powered on, and the command is not 0, the motor rotates. The drive parameter attribute can be set to "Run Change", while others cannot.
Fast stop	The quick stop function has been activated, and the driver is executing the quick stop function. The drive parameter attribute can be set to "Run Change", while others cannot.
Fault shutdown	The drive has malfunctioned and is currently undergoing a fault shutdown process The drive parameter attribute can be set to "Run Change", while others cannot.
Fault	The fault shutdown is completed, and all drive functions are disabled. At the same time, it is allowed to change the drive parameters to troubleshoot

The switching between control commands and status words is shown in the table below:

CiA402 State switching		Control word 6040h value	Status word 6041h bit0～bit9
0	Power on → initialization	Natural transition without the need for control commands	0x0000
1	Initialize → Servo has no faults	Natural transition without the need for control commands If an error occurs during initialization, directly enter 13	0x0250
2	Servo fault free → Servo ready	6	0x0231
3	Servo ready → waiting to turn on servo enable	7	0x0233
4	Waiting to turn on servo enable → Servo running	F	0x0237
5	Servo operation → wait to turn on servo enable	7	0x0233
6	Waiting to turn on servo enable → servo ready	6	0x0231
7	Servo ready → Servo free from malfunction	0	0x0250
8	Servo operation → Servo ready	6	0x0231
9	Servo operation → Servo has no faults	0	0x0250
10	Waiting to turn on servo enable → Servo has no faults	0	0x0250
11	Servo operation → Quick stop	2	0x0217
12	Quick stop → Servo no fault	The fast shutdown mode 605A is selected as 0-3, and after the shutdown is completed, it will naturally transition without the need for control commands	0x0250
13	Fault shutdown	In any other state except for "fault", once the servo drive fails, it automatically switches to the fault shutdown state without the need for control commands	0x021F

14	Fault shutdown → Fault	After the fault shutdown is completed, it transitions naturally without the need for control commands	0x0218
15	Fault → No servo fault	0x80 Bit7 rising edge effective; Bit7 remains at 1, all other control instructions are invalid.	0x0250
16	Quick stop → servo operation	The fast shutdown mode 605A is selected as 5-7. After the shutdown is completed, send 0x0F	0x0237

7.1.1 Control word 6040h

Bit	function	describe
0	switch on	1: Valid, 0: Invalid
1	enable voltage	1: Valid, 0: Invalid
2	quick stop	1: Invalid, 0: Valid
3	enable operation	1: Valid, 0: Invalid
4～6	operation mode specific	Related to various servo operation modes
7	fault reset	For resettable faults and warnings, perform the fault reset function; Bit7 rising edge effective; Bit7 remains at 1, all other control instructions are invalid.
8	halt	Please refer to the object dictionary 605Dh for the pause methods in each mode
9	operation mode specific	Related to various servo operation modes
10	N/A	N/A
11～15	N/A	N/A

7.1.2 Status word 6041h

Bit 位	function	describe
0	ready to switch on	1: Valid, 0: Invalid
1	switch on	1: Valid, 0: Invalid
2	operation enabled	1: Valid, 0: Invalid
3	fault	1: Valid, 0: Invalid
4	voltage enabled	1: Valid, 0: Invalid
5	quick stop	1: Invalid, 0: Valid
6	switch on disabled	1: Valid, 0: Invalid
7	warning	1: Valid, 0: Invalid
8	N/A	N/A
9	remote	1: Valid, 0: Invalid
10	target reach	1: Valid, 0: Invalid
11	internal limit active	1: Valid, 0: Invalid
12～13	operation mode specific	Related to various servo operation modes
14	N/A	N/A
15	Home Find	1: Valid, 0: Invalid

7.2 Working mode

7.2.1 Introduction to servo mode

The control modes supported by this series of servo drives include:

Index	Subindex	Name	Set value	describe
6060h	00	Working mode	1	Profile position mode (pp)
			3	Profile Speed Mode (PV)
			4	Contour torque mode (pt)
			6	Zero return mode (hm)
			8	Periodic synchronous position mode (CSP)
			9	Periodic Synchronous Speed Mode (CSV)
			10	Periodic Synchronous Torque Mode (CST)

7.2.2 Servo mode switching

1. When the servo drive is in any state and switches from contour position mode or periodic synchronous position mode to other modes, unexecuted position commands will be discarded.

2. When the servo drive is in any state, after switching from contour speed mode, contour torque mode, periodic synchronous speed mode, and periodic synchronous torque mode to other modes, it first executes a ramp stop. After the stop is completed, it can switch to other modes.

3. When the servo is in zero return mode and running, it cannot switch to other modes; When the return to zero is completed or interrupted (due to malfunction or invalid enable), other modes can be switched on.

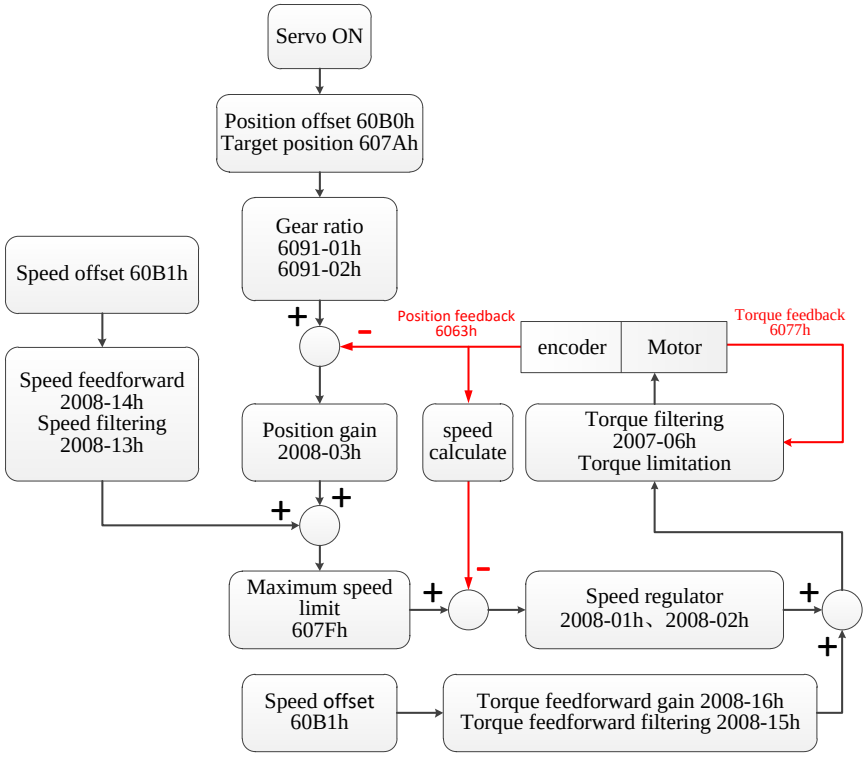
4. When switching from other modes to periodic synchronization mode during servo operation, please send instructions at least 1ms apart, otherwise command loss or error may occur.

7.3 Periodic synchronous position mode (CSP mode)

Set 6060h to 8 and put the drive in CSP mode. In the periodic synchronization position mode, the upper controller completes the position command planning, and then sends the planned target position 607Ah to the servo driver in a periodic synchronization manner. The position, speed, and torque control are completed internally by the servo driver. This mode is suitable for multi axis synchronous position control. The commonly used object dictionaries for using CSP mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
6062h	00	Position command	RO	INT32	Command Unit
6064h	00	Position feedback	RO	INT32	Command Unit
606Ch	00	Actual speed	RO	INT32	Command Unit /S
60F4h	00	Position deviation	RO	INT32	Command Unit
60FCh	00	Position command	RO	INT32	Encoder unit
60FDh	00	Input IO status	RO	UINT32	-
6040h	00	Control word	RW	UINT16	-
6060h	00	Control model	RW	INT8	-

607Ah	00	Target position	RW	INT32	Command Unit
607Fh	00	Maximum speed	RW	UDINT	Command Unit
6065h	00	Excessive position deviation alarm threshold	RW	UINT32	Command Unit
6067h	00	Position reaches threshold	RW	UINT32	Encoder unit
6068h	00	Position reaches window	RW	UINT16	ms
6091h	01	Motor resolution	RW	UINT32	-
	02	Axis resolution	RW	UINT32	-
60B0h	00	Position offset	RW	INT32	Command Unit
60B1h	00	Speed offset	RW	INT32	Command Unit /S
60B2h	00	Torque offset	RW	INT32	0.1%
6072h	00	Maximum torque	RW	UINT16	0.1%
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%



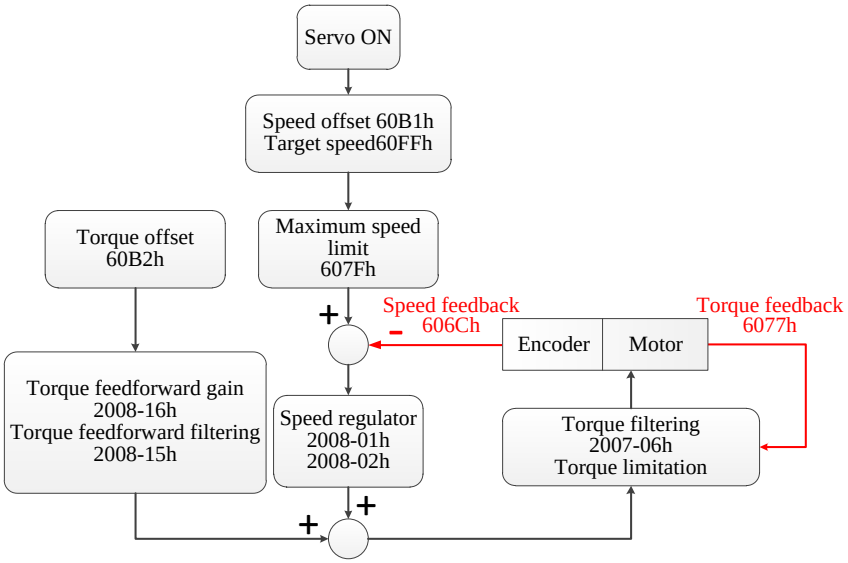
CSP Control mode diagram

7.4 Periodic synchronous speed mode (CSV mode)

Set 6060h to 9 and put the drive in CSV mode. In the periodic synchronization speed mode, the upper controller sends the calculated target speed of 60FF to the servo driver in periodic synchronization, and the speed and torque adjustment is performed internally by the servo. This mode is suitable for multi axis synchronous speed control. The commonly used object dictionaries for using CSV mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-

6064h	00	Position feedback	RO	INT32	Command Unit
606Ch	00	Actual speed	RO	INT32	Command Unit /S
6077h	00	Actual torque	RO	INT16	0.1%
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
60FFh	00	Target speed	RW	INT32	Command Unit /S
607Fh	00	Maximum speed	RW	UDINT32	Command Unit /S
60B1h	00	Speed offset	RW	INT32	Command Unit /S
60B2h	00	Torque offset	RW	INT32	0.1%
6072h	00	Maximum torque	RW	UINT16	0.1%
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%



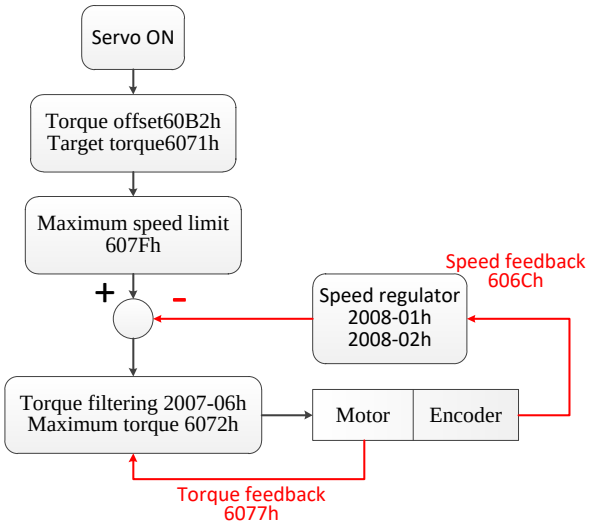
CSV Control mode diagram

7.5 Periodic synchronous torque mode (CST mode)

Set 6060h to 10, and the driver is in CST mode. In periodic synchronous torque mode, the upper controller will periodically synchronize the calculated target torque 6071h to the servo driver, and torque adjustment is performed internally by the servo. When the speed reaches the limit amplitude, it will enter the speed regulation stage. This mode is suitable for multi axis synchronous torque control, and the commonly used object dictionary for CST mode is as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
606Ch	00	Actual speed	RO	INT32	Command Unit /S
6074h	00	Torque command	RO	INT16	0.1%
6077h	00	Actual torque	RO	INT16	0.1%
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
6071h	00	Target torque	RW	INT16	0.1%
607Fh	00	Maximum speed	RW	UDINT32	Command Unit /S

60B2h	00	Torque offset	RW	INT32	0.1%
6072h	00	Maximum torque	RW	UINT16	0.1%
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%



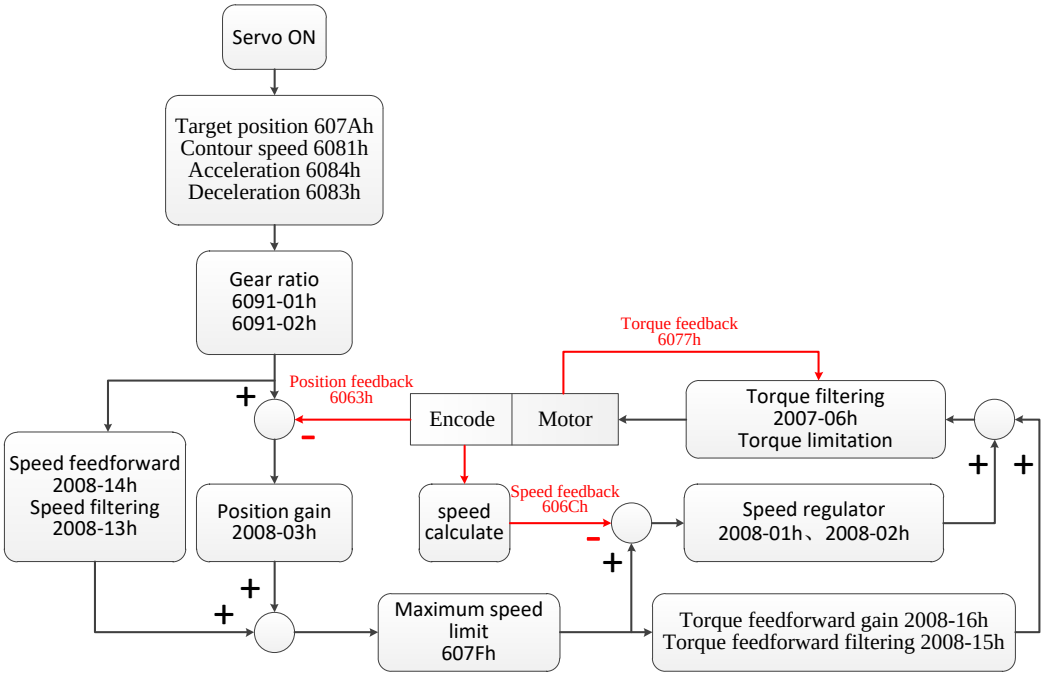
CST Control mode diagram

7.6 Profile position mode (PP mode)

Set 6060h to 1 and put the driver in PP mode, which is mainly used for point-to-point positioning applications. In this mode, the upper computer provides the target position (absolute or relative), the speed of the position curve, acceleration/deceleration, and deceleration. The trajectory generator inside the servo will generate target position curve instructions based on the settings, and the driver will complete position control, speed control, and torque control internally. The commonly used object dictionaries for using the PP mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
6062h	00	Position command	RO	INT32	Command Unit
6063h	00	Position feedback	RO	INT32	Encoder unit
6064h	00	Position feedback	RO	INT32	Command Unit
606Ch	00	Actual speed	RO	INT32	Command Unit /S
60F4h	00	Position deviation	RO	INT32	Command Unit
60FCh	00	Position command	RO	INT32	Encoder unit
60FDh	00	Input IO status	RO	UINT32	-
6077h	00	Actual torque	RO	INT16	0.1%
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
607Ah	00	Target position	RW	INT32	Command Unit
6081h	00	Target speed	RW	UDINT32	Command Unit /S
6083h	00	Acceleration	RW	UDINT32	Command Unit /S^2
6084h	00	Deceleration	RW	UDINT32	Command Unit /S^2
6065h	00	Excessive position deviation alarm threshold	RW	UINT32	Command Unit
6067h	00	Position reaches threshold	RW	UINT32	Encoder unit

6068h	00	Position reaches window	RW	UINT16	ms
6072h	00	Maximum torque	RW	UINT16	0.1%
6091h	01	Motor resolution	RW	UINT32	-
	02	Axis resolution	RW	UINT32	-
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%



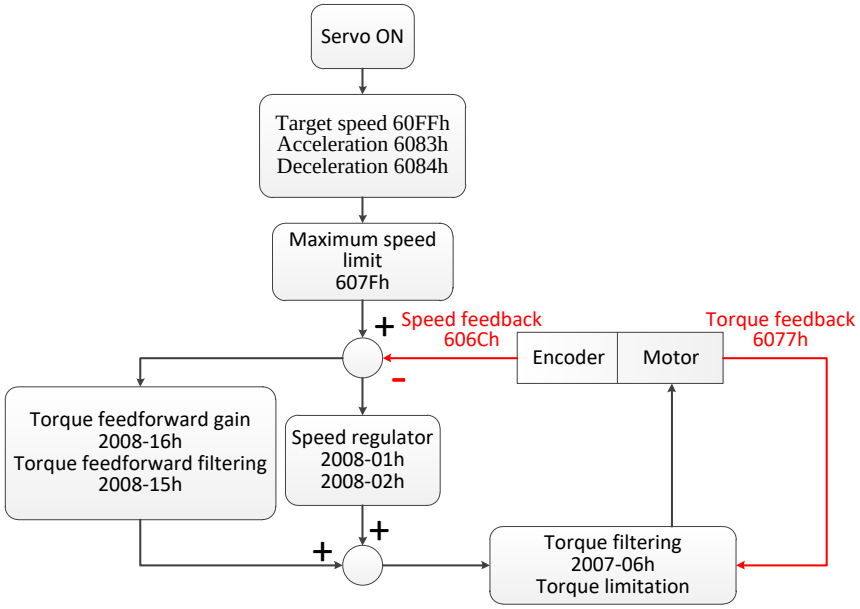
PP Control mode diagram

7.7 Profile speed mode (PV mode)

Set 6060h to 3 and put the drive in PV mode. In this mode, the upper controller sends the target speed, acceleration, and deceleration to the servo driver, and the speed and torque adjustment is performed internally by the servo. The commonly used object dictionaries for using PV mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
6063h	00	Position feedback	RO	INT32	Encoder unit
6064h	00	Position feedback	RO	INT32	Command Unit
606Ch	00	Actual speed	RO	INT32	Command Unit /S
6077h	00	Actual torque	RO	INT16	0.1%
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
60FFh	00	Target speed	RW	INT32	Command Unit /S
6083h	00	Acceleration	RW	UDINT32	Command Unit /S^2
6084h	00	Deceleration	RW	UDINT32	Command Unit /S^2
607Fh	00	Maximum speed	RW	UDINT32	Command Unit /S
606Dh	00	Speed reaches threshold	RW	INT32	Command Unit /S
606Eh	00	Speed reaches the window	RW	INT32	ms

60B1h	00	Speed offset	RW	INT32	Command Unit /S
60B2h	00	Torque offset	RW	INT32	0.1%
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%

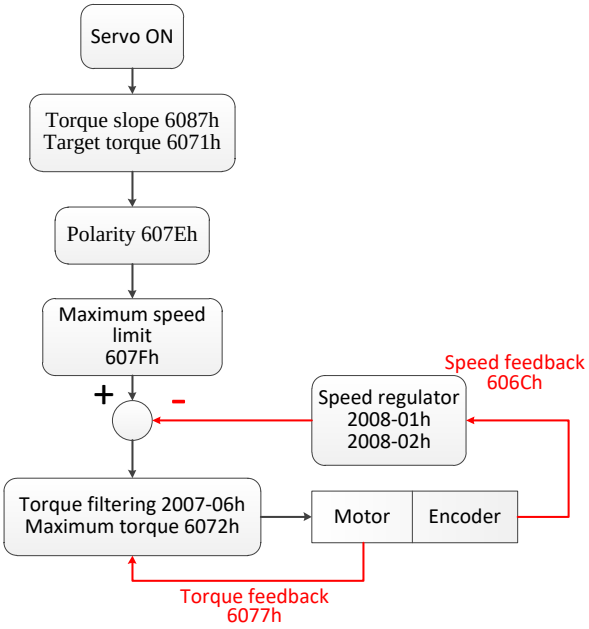


PV Control mode diagram

7.8 Contour torque mode (PT mode)

Set 6060h to 4 and put the driver in PT mode. In this mode, the upper controller sends the target torque of 6071h and the torque ramp constant of 6087h to the servo driver, and torque adjustment is performed internally by the servo. When the speed reaches the limit amplitude, it will enter the speed regulation stage. The commonly used object dictionaries for using PT mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
606Ch	00	Actual speed	RO	INT32	Command Unit /S
6074h	00	Torque command	RO	INT16	0.1%
6077h	00	Actual torque	RO	INT16	0.1%
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
6071h	00	Target torque	RW	INT16	0.1%
6087h	00	Torque slope	RW	UDINT32	0.1%/S
607Fh	00	Maximum speed	RW	UDINT32	Command Unit /S
6072h	00	Maximum torque	RW	UINT16	0.1%
60B2h	00	Torque offset	RW	INT32	0.1%
60E0h	00	Forward torque limit	RW	UINT16	0.1%
60E1h	00	Reverse torque limit	RW	UINT16	0.1%



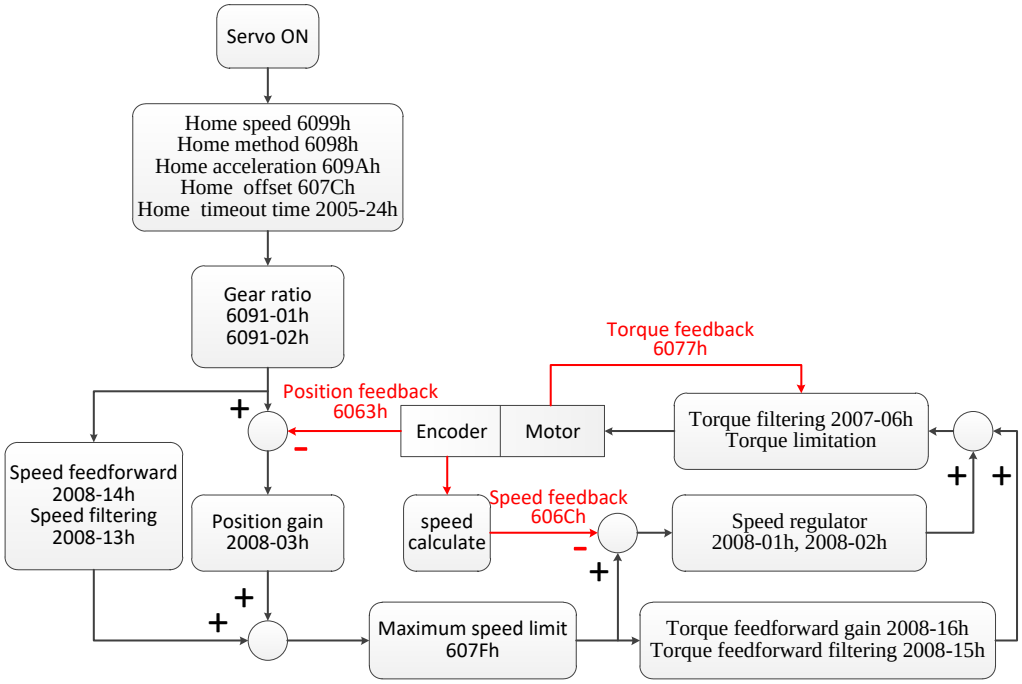
PT Control mode diagram

7.9 Return to Origin Mode(Home mode)

Set 6060h to 6 and put the drive in HOME mode. The origin return to zero mode is used to find the mechanical origin and locate the position relationship between the mechanical origin and the mechanical zero point. Mechanical origin: A fixed position on the machine that can correspond to a specific origin switch and the motor Z signal. Mechanical zero point: the absolute zero position on the machine. After returning to zero, the motor stops at the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero point can be set: mechanical origin=mechanical zero point+607Ch (origin offset). When 607Ch=0, the mechanical origin coincides with the mechanical zero point. Zero return method 6098h, please refer to the appendix. The commonly used object dictionaries for using the hm mode are as follows:

Index	Subindex	Name	type	data type	unit
603Fh	00	Error code	RO	UINT16	-
6041h	00	Status word	RO	UINT16	-
6061h	00	Mode display	RO	INT8	-
6064h	00	Position feedback	RO	INT32	Command Unit
606Ch	00	Actual speed	RO	INT32	Command Unit /S
6077h	00	Actual torque	RO	INT16	0.1%
60FDh	00	Input IO status	RO	UINT32	-
60F4h	00	Position deviation	RO	DINT32	Command Unit
6040h	00	Control word	RW	UINT16	-
6060h	00	control model	RW	INT8	-
6098h	00	Home method	RW	INT8	-
6099h	01	Home high speed	RW	UINT32	Command Unit /S
	02	Home low speed	RW	UINT32	Command Unit /S
609Ah	00	Home acceleration	RW	UDINT32	Command Unit /S^2
2005h	24	Home Timeout time	RW	UINT16	10ms

6065h	00	Excessive position deviation alarm threshold	RW	UINT32	Command Unit
6067h	00	Position reaches threshold	RW	UINT32	Encoder unit
6068h	00	Position reaches window	RW	UINT16	ms



HOME Control mode diagram

7.10 Probe Function Description

The probe function refers to the position locking function. It can lock the position information (instruction unit) when the external DI signal or motor Z signal changes. This series of servos supports the simultaneous activation of two probes, and can simultaneously record the position information corresponding to the rising and falling edges of each probe signal, allowing for the simultaneous locking of four position information. Probe 1 can choose DI3 or motor Z signal as the probe signal, while Probe 2 can choose DI4 or motor Z signal as the probe signal. When using DI8 or DI9 as the probe trigger signal, the logic setting of the DI terminal must be consistent with the 60B8 (probe function) setting, otherwise the probe function will be invalid. The relevant parameters for using the probe function are as follows:

Index	Subindex	Name	default value	Set value	Type	Data type	Unit
2003h	09	DI3 function selection	0	38	RW	UINT16	-
2003h	0A	DI3 logic selection	0	2	RW	UINT16	-
2003h	0B	DI4 function selection	0	39	RW	UINT16	-
2003h	0C	DI4 logic selection	0	2	RW	UINT16	-
60B8	00	Probe function	0	4883	RW	UINT16	-
60B9	00	Probe status	0	-	RO	UINT16	-
60BA	00	Probe 1 rising edge latch position	0	-	RO	INT32	command unit
60BB	00	Probe 1 falling edge latch position	0	-	RO	INT32	command unit
60BC	00	Probe 2 rising edge latch position	0	-	RO	INT32	command unit
60BD	00	Probe 2 falling edge latch position	0	-	RO	INT32	command unit

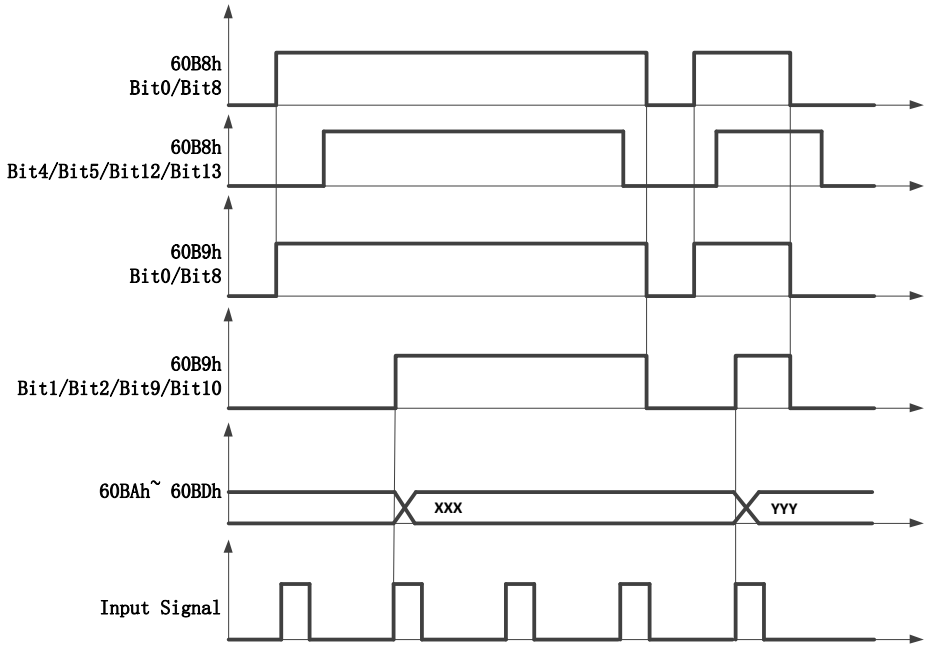
7.10.1 Function Description of 60B8h and 60B9h

Index	Subindex	Function Description	
60B8h	00h	Bit0	0: Probe 1 is disabled; 1: Probe 1 is enabled;
		Bit1	0: Probe 1 single mode; 1: Probe 1 continuous mode;
		Bit2	Probe 1 trigger signal selection: 0: DI3; 1: Z signal;
		Bit3	reserve
		Bit4	0: The rising edge of probe 1 is not enabled; 1: The rising edge of probe 1 is enabled;
		Bit5	0: The falling edge of probe 1 is not enabled; 1: The falling edge of probe 1 is enabled;
		Bit6～ Bit7	reserve;
		Bit8	0: Probe 2 is not enabled; 1: Probe 2 is enabled;
		Bit9	0: Probe 2 single mode; 1: Probe 2 continuous mode;
		Bit10	Probe 2 trigger signal selection: 0: DI4; 1: Z signal;
		Bit11	reserve;
		Bit12	0: The rising edge of probe 2 is not enabled; 1: The rising edge of probe 2 is enabled;
		Bit13	0: The falling edge of probe 2 is not enabled; 1: The falling edge of probe 2 is enabled;
		Bit14～ Bit15	reserve;
60B9h	00h	Bit0	0: Probe 1 is not in action; 1: Probe 1 is working;
		Bit1	0: The rising edge capture of probe 1 is not completed; 1: The rising edge capture of probe 1 is completed;
		Bit2	0: Probe 1 falling edge capture is not completed; 1: Probe 1 falling edge capture is completed;
		Bit3～Bit5	reserve;
		Bit6	Probe 1 trigger signal selection: 0: DI3; 1: Z signal;
		Bit7	Probe 1 trigger signal monitoring: 0: DI3 low level; 1: DI3 high level;
		Bit8	0: Probe 2 is not in action; 1: Probe 2 is working;
		Bit9	0: Probe 2 rising edge capture is not completed; 1: Probe 2 rising edge capture is completed;
		Bit10	0: Probe 2 falling edge capture is not completed; 1: Probe 2 falling edge capture is completed;
		Bit11～Bit13	reserve;
		Bit14	Probe 2 trigger signal selection: 0: DI4; 1: Z signal;
		Bit15	Probe 2 trigger signal monitoring: 0: DI4 low level; 1: DI4 high level;

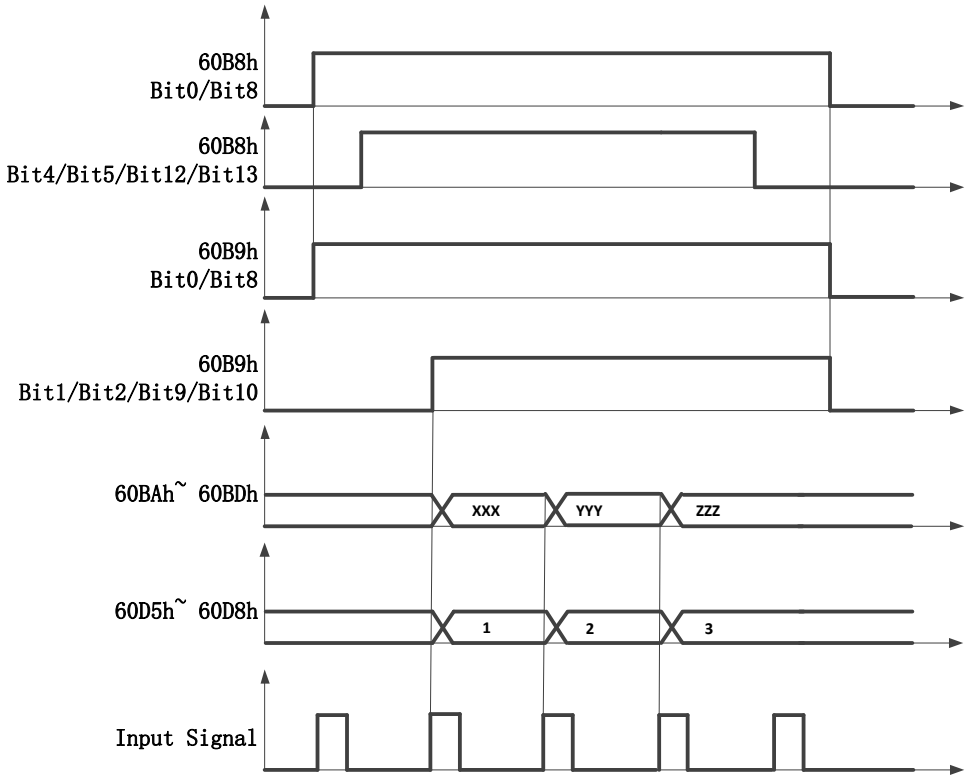
7.10.2 Read the probe latch position

The four position information of the probe are recorded in objects 0x60BA to 0x60BD, as shown in the following figure. The rising edge position latch function of probe 1 has been executed, and the position information can be read by reading 0x60BA (feedback latch value of rising edge position of probe 1, instruction unit).

The working mode of a single probe is as follows:



The working mode of the continuous probe is as follows:



Chapter VIII Parameter Description

8.1 1000h object dictionary

Index	Subindex	Name	Unit	Change method	Describe	attribute
1000	00	Equipment type	-	Unable modify	CIA standard	RO
1001	00	error register	-	Unable modify	CIA error register	RO
1008	00	Manufacturer equipment name	-	Unable modify	-	RO
1009	00	Manufacturer hardware version	-	Unable modify	-	RO
100A	00	Manufacturer software version	-	Unable modify	-	RO
1018	00	Number of sub-indexes	-	Unable modify	-	RO
	01	Vendor ID	-	Unable modify	-	RO
	02	Product Code	-	Unable modify	-	RO
	03	Modify encoding	-	Unable modify	-	RO
	04	serial number	-	Unable modify	-	RO
1C00	00	Synchronization management communication type maximum sub-index number	-	Unable modify	-	RO
	01	SM0 communication type	-	Unable modify	-	RO
	02	SM1 communication type	-	Unable modify	-	RO
	03	SM2 communication type	-	Unable modify	-	RO
	04	SM3 communication type	-	Unable modify	-	RO
1600	00	Number of mapping objects supported by RPDO1	-	Live changes	-	RW
	01～0A	RxPDO mapping object group 1	-	Live changes	Default RxPDO mapping group 1	RW
1701	00	Number of mapping objects supported by RPDO258	-	Unable modify	-	RO
	01～04	mapping object	-	Unable modify	-	RO
1702	00	Number of mapping objects supported by RPDO259	-	Unable modify	-	RO
	01～07	mapping object	-	Unable modify	-	RO
1703	00	Number of mapping objects supported by RPDO260	-	Unable modify	-	RO
	01～07	mapping object	-	Unable modify	-	RO
1704	00	Number of mapping objects supported by RPDO261	-	Unable modify	-	RO
	01～09	mapping object	-	Unable modify	-	RO
1705	00	Number of mapping objects supported by RPDO262	-	Unable modify	-	RO
	01～08	mapping object		Unable modify	-	RO
1A00	00	Number of mapping objects supported by TPDO1	-	Live changes	-	RW
	01～0A	TxPDO mapping object group 1	-	Live changes	Default TxPDO mapping group 1	RW
1B01	00	Number of mapping objects supported by TPDO258	-	Unable modify	-	RO
	01～08	mapping object	-	Unable modify	-	RO
1B02	00	Number of mapping objects supported by TPDO259	-	Unable modify	-	RO
	01～09	mapping object	-	Unable modify	-	RO
1B03	00	Number of mapping objects supported by TPDO260	-	Unable modify	-	RO
	01～0A	mapping object	-	Unable modify	-	RO
1B04	00	Number of mapping objects supported by TPDO261	-	Unable modify	-	RO
	01～0A	mapping object	-	Unable modify	-	RO
1C12	00～01	RxPDO allocation	-	Live changes	-	RW
1C13	00～01	TxPDO allocation	-	Live changes	-	RW
1C32	00～0A	RxPDO management parameters	-	Live changes	-	RO
1C33	00～0A	TxPDO management parameters	-	Live changes	-	RO

8.2 2000h Object Dictionary Parameters

8.2.1 2001 Group object dictionary (P01 group parameter)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P01.02	2001	03	Servo drive number	0～65535	-	-	Stop setting Restart effective	RW	Uint16
P01.50	2001	32	Software version number	-	-	-	-	RO	Uint16

8.2.2 2002 Group Object Dictionary (P02 Group Parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P02.00	2002	01	Control mode selection	9：EtherCAT Mode	-	9	Stop setting Effective immediately	RO	Uint16
P02.01	2002	02	Encoder type selection	0: Incremental encoder 1: Absolute encoder	-	0	Stop setting Restart effective	RW	Uint16
P02.02	2002	03	Rotation direction selection	0: Take the CCW direction as the forward direction 1: Take the CW direction as the forward direction	-	0	Stop setting Restart effective	RW	Uint16
P02.03	2002	04	Output pulse phase	0: Take the CCW direction as the forward direction (A leads B) 1: Take the CW direction as the forward direction (A lags B)	-	0	Stop setting Restart effective	RW	Uint16
P02.05	2002	06	Servo enable OFF shutdown mode selection	0: Coast to stop, maintain free running state 1: Stop at zero speed and maintain free running state	-	0	Stop setting Effective immediately	RW	Uint16
P02.07	2002	08	Overtravel stop mode selection	0: Coast to stop, maintain free running state 1: Stop at zero speed, the position remains locked 2: Stop at zero speed and maintain free running state	-	1	Stop setting Effective immediately	RW	Uint16
P02.08	2002	09	Fault No.1 shutdown mode selection	0: Coast to stop, maintain free running state	-	0	Stop setting Effective immediately	RW	Uint16
P02.09	2002	0A	Delay from brake output ON to command reception	0 ~ 500	ms	250	Running setting Effective immediately	RW	Uint16
P02.10	2002	0B	In static state, delay from brake output OFF to motor de-energization	1 ~ 1000	ms	150	Running setting Effective immediately	RW	Uint16
P02.11	2002	0C	Rotating state, speed threshold when brake output is OFF	0 ~ 3000	rpm	30	Running setting Effective immediately	RW	Uint16
P02.12	2002	0D	Rotating state, delay from servo enable OFF to brake output OFF	1 ~ 1000	ms	500	Running setting Effective immediately	RW	Uint16
P02.15	2002	10	LED warning display selection	0: Output warning information immediately 1: No warning message is output	-	0	Stop setting Effective immediately	RW	Uint16
P02.21	2002	16	The minimum value of the braking resistor allowed by the driver	-	Ω	40	-	RO	Uint16
P02.22	2002	17	Built-in braking resistor power	-	W	50	-	RO	Uint16
P02.23	2002	18	Built-in braking resistor resistance	-	Ω	50	-	RO	Uint16
P02.24	2002	19	Resistor heat dissipation coefficient	10 ~ 100	%	30	Stop setting Effective immediately	RW	Uint16
P02.25	2002	1A	Braking resistor settings	0: Use built-in braking resistor 1: Use external braking resistor and natural cooling 2: Use external braking resistor and forced air cooling 3: No braking resistor is needed, all depends on capacitor absorption.	-	0	Stop setting Effective immediately	RW	Uint16
P02.26	2002	1B	External braking resistor power	1 ~ 65535	W	-	Stop setting Effective immediately	RW	Uint16

P02.27	2002	1C	External braking resistor resistance	1 ~ 1000	Ω	-	Stop setting Effective immediately	RW	Uint16
P02.31	2002	20	System parameter initialization	0: No operation 1: Restore factory values (except P00/P01 group) 2: Clear fault records	-	0	Stop setting Effective immediately	RW	Uint16
P02.32	2002	21	Panel default display function	0~99, corresponding to the PB group parameter number, setting bit 0 corresponds to speed monitoring, setting bit 13 corresponds to pulse monitoring	-	50	Running setting Effective immediately	RW	Uint16

8.2.3 2003 Group Object Dictionary (P03 Group Parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P03.00	2003	01	Effective DI function allocation for power on 1	Set the hexadecimal encoding (0000 to FFFF) corresponding to the DI function (FunIN.1 to FunIN.16). After reconnecting the control power, the DI function becomes effective immediately.	-	0	Running setting Restart effective	RW	Uint16
P03.01	2003	02	Power on effective DI function allocation 2	Set the hexadecimal encoding (0000 to FFFF) corresponding to the DI function (FunIN.17 to FunIN.32). After reconnecting the control power, the DI function becomes effective immediately.	-	0	Running setting Restart effective	RW	Uint16
P03.02	2003	03	DI0 terminal function selection	0～39，Refer to Chapter 4.5.1	-	14	Running setting No enable effective	RW	Uint16
P03.03	2003	04	DI0 terminal logic selection	Input polarity: 0-4 0. Indicates that the low level is valid 1. Indicates that the high level is valid 2. Indicates that the rising edge is effective 3. Indicates that the falling edge is effective 4. Indicates that both the rising and falling edges are effective	-	0	Running setting No enable effective	RW	Uint16
P03.04	2003	05	DI1 terminal function selection	0～39，Refer to Chapter 4.5.1	-	15	Running setting No enable effective	RW	Uint16
P03.05	2003	06	DI1 terminal logic selection	Refer to P03.03 for instructions	-	0	Running setting No enable effective	RW	Uint16
P03.06	2003	07	DI2 terminal function selection	0～39，Refer to Chapter 4.5.1	-	31	Running setting No enable effective	RW	Uint16
P03.07	2003	08	DI2 terminal logic selection	Refer to P03.03 for instructions	-	0	Running setting No enable effective	RW	Uint16
P03.08	2003	09	DI3 terminal function selection	0～39，Refer to Chapter 4.5.1	-	0	Running setting No enable effective	RW	Uint16
P03.09	2003	0A	DI3 terminal logic selection	Refer to P03.03 for instructions	-	0	Running setting No enable effective	RW	Uint16
P03.10	2003	0B	DI4 terminal function selection	0～39，Refer to Chapter 4.5.1	-	0	Running setting No enable effective	RW	Uint16
P03.11	2003	0C	DI4 terminal logic selection	Refer to P03.03 for instructions	-	0	Running setting No enable effective	RW	Uint16
P03.34	2003	23	Effective DI function allocation for power on 3	Set the hexadecimal encoding (0000~FFFF) corresponding to the DI function (FunIN.33~FunIN.48). After reconnecting the control power, the DI function becomes effective immediately.	-	0	Running setting Restart effective	RW	Uint16

8.2.4 2004 Group Object Dictionary (P04 Group Parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P04.00	2004	01	DO0terminal function selection	0～20，Refer to Chapter 5.4.2	-	1	Running setting	RW	Uint16

							No enable effective		
P04.01	2004	02	DO0terminal logic selection	Output polarity reversal setting: 0 ~ 1 0. Indicates that the output is low level when it is valid (the optocoupler is turned on) 1. Indicates that the output is high level when valid (optocoupler is turned off)	-	0	Running setting No enable effective	RW	Uint16
P04.02	2004	03	DO1terminal function selection	0～20，Refer to Chapter 5.4.2	-	5	Running setting No enable effective	RW	Uint16
P04.03	2004	04	DO1terminal logic selection	Refer to P04.01 instructions	-	0	Running setting No enable effective	RW	Uint16
P04.04	2004	05	DO2 terminal function selection	0～20，Refer to Chapter 5.4.2	-	3	Running setting No enable effective	RW	Uint16
P04.05	2004	06	DO2 terminal logic selection	Refer to P04.01 instructions	-	0	Running setting No enable effective	RW	Uint16
P04.22	2004	17	DO source selection	Set whether the DO function logic selected by the hardware DO terminals (DO1~DO3) is determined by the actual status of the drive or communication settings.	-	0	Running setting Effective immediately	RW	Uint16

8.2.5 2005 Group Object Dictionary (P05 Group Parameters)

<table>
<tr><th>Function code</th><th>Index</th><th>Sub index</th><th>Name</th><th>Set Range</th><th>unit</th><th>Default</th><th>Setting effective</th><th>attribute</th><th>type</th></tr>
<tr><td>P05.04</td><td>2005</td><td>05</td><td>First-order low-pass filter time constant</td><td>0～6553.5</td><td>ms</td><td>0.0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.06</td><td>2005</td><td>07</td><td>Average filter time constant</td><td>0.0～128.0</td><td>ms</td><td>0.0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.16</td><td>2005</td><td>11</td><td>Clear position deviation action selection</td><td>0～2</td><td>-</td><td>0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.17</td><td>2005</td><td>12</td><td>Encoder frequency division pulse number</td><td>Set the number of pulses for one revolution of the motor.</td><td>Encoder unit</td><td>2500</td><td>Stop setting Restart effective</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.19</td><td>2005</td><td>14</td><td>Speed feed forward control selection</td><td>0. No speed feedforward
1. Internal speed feed forward
2. Use 60B1 as speed feed forward</td><td>-</td><td>1</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.31</td><td>2005</td><td>20</td><td>Return to origin mode</td><td>Set the default motor direction, deceleration point, and origin when returning to zero.
<table>
<tr><th></th><th>direction</th><th>Reference point</th><th>origin</th></tr>
<tr><td>0</td><td>forward</td><td>origin</td><td>origin</td></tr>
<tr><td>1</td><td>reverse</td><td>origin</td><td>origin</td></tr>
<tr><td>2</td><td>forward</td><td>Z signal</td><td>Z signal</td></tr>
<tr><td>3</td><td>reverse</td><td>Z signal</td><td>Z signal</td></tr>
<tr><td>4</td><td>forward</td><td>origin</td><td>Z signal</td></tr>
<tr><td>5</td><td>reverse</td><td>origin</td><td>Z signal</td></tr>
<tr><td>6</td><td>forward</td><td>Positive limit</td><td>Positive limit</td></tr>
<tr><td>7</td><td>reverse</td><td>Negative limit</td><td>Negative limit</td></tr>
<tr><td>8</td><td>forward</td><td>Positive limit</td><td>Z signal</td></tr>
<tr><td>9</td><td>reverse</td><td>Negative limit</td><td>Z signal</td></tr>
</table></td><td>Encoder unit</td><td>0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.35</td><td>2005</td><td>24</td><td>Limit the time to find the origin</td><td>0～65535</td><td>10ms</td><td>5000</td><td>Running setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.44</td><td>2005</td><td>2D</td><td>Encoder multi-turn data offset</td><td>0～65535</td><td>Encoder unit</td><td>0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Uint16</td></tr>
<tr><td>P05.46</td><td>2005</td><td>2F</td><td>absolute position linear mode positionBias low 32-bit</td><td>-2147483648～2147483647</td><td>Encoder unit</td><td>0</td><td>Stop setting Effective immediately</td><td>RW</td><td>Int32</td></tr>
</table>

P05.48	2005	31	absolute position linear mode positionBias low 32-bit	-2147483648～2147483647	Encoder unit	0	Stop setting Effective immediately	RW	Int32
P05.50	2005	33	Absolute position rotation mode Mechanical gear ratio (numerator)	1～65535	-	1	Stop setting Effective immediately	RW	Uint16
P05.51	2005	34	Absolute position rotation mode Mechanical gear ratio (denominator)	1～65535	-	1	Stop setting Effective immediately	RW	Uint16
P05.52	2005	35	Absolute position rotation mode, rotation The number of pulses in one circle is the lower 32 bits	0～2147483647	Encoder unit	0	Stop setting Effective immediately	RW	Uint32
P05.54	2005	37	Absolute position rotation mode, rotation The number of pulses in one circle is the lower 32 bits	0～127	Encoder unit	0	Stop setting Effective immediately	RW	Uint32
P05.61	2005	3E	Position arrival threshold unit selection	0. Encoder unit 1. Command Unit	-	1	Stop setting Effective immediately	RW	Uint16

8.2.6 2006 Group Object Dictionary (P06 Group Parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P06.04	2006	05	Jog speed setting value	0～6000	rpm	100	Running setting Effective immediately	RW	Uint16
P06.11	2006	0C	Torque feedforward control selection	1. Internal torque feedforward 2. Use 60B2 as external torque feedforward	-	1	Running setting Effective immediately	RW	Uint16
P06.15	2006	10	Zero position fixed speed threshold	0 ~ 6000；When the speed command amplitude is less than or equal to the 2006-10h setting value, the servo motor enters Zero position locked state	rpm	10	Running setting Effective immediately	RW	Uint16

8.2.7 2007 Group Object Dictionary (P07 Group torque control parameters)

Function code	Index	Subindex	Name	Set Range	unit	Default	Setting effective	attribute	type
P07.05	2007	06	Torque command filter time constant	0～30.00	ms	0.79	Running setting Effective immediately	RW	Uint16
P07.06	2007	07	Second torque command filter time constant	0～30.00	ms	0.79	Running setting Effective immediately	RW	Uint16
P07.07	2007	08	Torque limit source	0. Positive and negative internal torque limits 1. Positive and negative external torque limits 2. EtherCAT positive and negative external torque limits 3. The minimum value of the positive and negative external torque and the positive and negative external torque limit of ETherCAT is the torque limit (P-CL, N-CL) 4. Positive and negative internal torque and ETherCAT positive and negative external torqueSwitching between partial torque limit (P-CL, N-CL)	-	2	Running setting Effective immediately	RW	Uint16
P07.09	2007	0A	Positive internal torque limit	0.0～300.0	%	300.0	Running setting Effective immediately	RW	Uint16
P07.10	2007	0B	Negative internal torque limit	0.0～300.0	%	300.0	Running setting Effective immediately	RW	Uint16
P07.11	2007	0C	Positive external torque limit	0.0～300.0	%	300.0	Running setting Effective immediately	RW	Uint16
P07.12	2007	0D	Negative external torque limit	0.0～300.0	%	300.0	Running setting Effective immediately	RW	Uint16
P07.15	2007	10	emergency stop torque	0.0～300.0	%	300.0	Running setting Effective immediately	RW	Uint16

P07.17	2007	12	Speed limit source selection	0: Internal speed limit 1: EtherCAT external speed limit 2: Select via FunIN.36 2007-14h/2007-15h as internal speed limit	-	0	Running setting Effective immediately	RW	Uint16
P07.19	2007	14	Torque control forward speed limit / Torque control speed limit 1	0～6000	rpm	3000	Running setting Effective immediately	RW	Uint16
P07.20	2007	15	Torque control negative speed limit / Torque control speed limit 2	0～6000	rpm	3000	Running setting Effective immediately	RW	Uint16
P07.21	2007	16	Torque reaches reference value	0.0～300.0	%	0.0	Running setting Effective immediately	RW	Uint16
P07.22	2007	17	Torque reaches effective value	0.0～300.0	%	20.0	Running setting Effective immediately	RW	Uint16
P07.23	2007	18	Torque reaches invalid value	0.0～300.0	%	10.0	Running setting Effective immediately	RW	Uint16
P07.40	2007	29	Speed limited window in torque mode	0.5～30.0	ms	1.0	Running setting Effective immediately	RW	Uint16

8.2.8 2008 Group Object Dictionary (P08 Group gain class parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P08.00	2008	01	Speed loop gain	0.1～2000.0	Hz	25.0	Running setting Effective immediately	RW	Uint16
P08.01	2008	02	Speed loop integration time constant	0.15～512.00	ms	31.83	Running setting Effective immediately	RW	Uint16
P08.02	2008	03	Position loop gain	0.0～2000.0	Hz	40.0	Running setting Effective immediately	RW	Uint16
P08.03	2008	04	2nd speed loop gain	0.1～2000.0	Hz	40.0	Running setting Effective immediately	RW	Uint16
P08.04	2008	05	2nd speed loop integration time constant	0.15～512.00	ms	40.00	Running setting Effective immediately	RW	Uint16
P08.05	2008	06	2nd position loop gain	0.0～2000.0	Hz	64.0	Running setting Effective immediately	RW	Uint16
P08.08	2008	09	2nd gain mode setting	0. The first gain is fixed, use external DI for P/PI switching 1. Use gain switching according to the condition setting of P08.09	-	1	Running setting Effective immediately	RW	Uint16
P08.09	2008	0A	Gain switching condition selection	0.First gain fixed (PS) 1.Use external DI switching (PS) 2. Large torque command (PS) 3. Large speed command (PS) 4. Large change rate of speed command (PS) 5. Speed command high and low speed threshold (PS) 6. Large position deviation (P) 7.With position command (P) 8. Positioning completed (P) 9.High actual speed (P) 10. With position command + actual speed (P)	-	0	Running setting Effective immediately	RW	Uint16
P08.10	2008	0B	Gain switching delay time	0.0～1000.0	ms	5.0	Running setting Effective immediately	RW	Uint16
P08.11	2008	0C	Gain switching level	0～20000, Unit switching based on conditions	-	50	Running setting Effective immediately	RW	Uint16
P08.12	2008	0D	Gain switching time lag	0～20000, Unit switching based on conditions	-	30	Running setting Effective immediately	RW	Uint16
P08.13	2008	0E	Position gain switching time	0.0～1000.0	ms	3.0	Running setting Effective immediately	RW	Uint16

P08.15	2008	10	Load inertia ratio	0.00～120.00	倍	1.00	Running setting Effective immediately	RW	Uint16
P08.18	2008	13	Speed feedforward filter time constant	0.00～64.00	ms	0.50	Running setting Effective immediately	RW	Uint16
P08.19	2008	14	Speed feedforward gain	0.0～100.0	%	0.0	Running setting Effective immediately	RW	Uint16
P08.20	2008	15	Torque feedforward filter time constant	0.00～64.00	ms	0.50	Running setting Effective immediately	RW	Uint16
P08.21	2008	16	Torque feedforward gain	0.0～200.0	%	0.0	Running setting Effective immediately	RW	Uint16
P08.22	2008	17	Speed feedback filtering options	0. Disable speed feedback average filtering 1. Speed feedback 2 times average filtering 2. Speed feedback 4 times average filtering 3. Speed feedback 8 times average filtering 4.Speed feedback 16 times average filtering	-	0	Stop setting Effective immediately	RW	Uint16
P08.23	2008	18	Speed feedback low-pass filter cutoff frequency	100～4000	Hz	4000	Running setting Effective immediately	RW	Uint16
P08.24	2008	19	Pseudo-differential feedforward control coefficient	0.0～100.0	-	100.0	Running setting Effective immediately	RW	Uint16

8.2.9 2009 Group Object Dictionary (P09 Group self adjustment parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P09.00	2009	01	Self-adjusting mode selection	0. Parameter self-adjustment is invalid, manually adjust the gain parameters; 1. Parameter self-adjusting mode, using the rigidity table to automatically adjust the gain parameters; 2. Positioning mode, use the rigidity table to automatically adjust the gain parameters; 3. Parameter self-adjusting mode with friction compensation; 4. Positioning mode with friction compensation	-	0	Running setting Effective immediately	RW	Uint16
P09.01	2009	02	Group 1 rigidity level selection	0～31	-	12	Running setting Effective immediately	RW	Uint16
P09.02	2009	03	Adaptive notch mode selection	0. The adaptive notch filter is no longer updated 1. Adaptive notches are effective (the third group of notches) 2. 2 adaptive notches are effective (3rd and 4th set of notches) 3. Only test the resonance point, which is displayed in P09.24 4. Restore the values of the 3rd and 4th groups of notches to factory settings	-	0	Running setting Effective immediately	RW	Uint16
P09.03	2009	04	Online inertia identification mode	0. Turn off online inertia identification 1. Turn on online inertia identification and change slowly 2. Turn on online inertia identification, general changes 3.Turn on online inertia identification and change quickly				RW	Uint16
P09.04	2009	05	Low frequency resonance suppression mode selection	0. Manually set vibration frequency 1. Automatically identify vibration frequency	-	0	Running setting Effective immediately	RW	Uint16
P09.05	2009	06	Offline inertia identification mode selection	0. Positive and negative triangle wave mode 1.JOG jog mode	-	0	Stop setting Effective immediately	RW	Uint16
P09.06	2009	07	Inertia identification maximum speed	100～1000	rpm	500	Stop setting Effective immediately	RW	Uint16
P09.07	2009	08	Accelerate to the maximum during inertia identification speed time constant	20～800	ms	125	Stop setting Effective immediately	RW	Uint16
P09.08	2009	09	Waiting time after completion of single inertia identification	50～10000	ms	800	Stop setting Effective immediately	RW	Uint16

P09.09	2009	0A	Complete single inertia identification of motor Number of turns	0.00～2.00	r	-	-	RO	Uint16
P09.12	2009	0D	Group 1 notch frequency	50～4000	Hz	4000	Running setting Effective immediately	RW	Uint16
P09.13	2009	0E	Group 1 Notch Width Class	0～20	-	2	Running setting Effective immediately	RW	Uint16
P09.14	2009	0F	Group 1 Notch Depth Rating	0～99	-	0	Running setting Effective immediately	RW	Uint16
P09.15	2009	10	Group 2 notch frequency	50～4000	Hz	4000	Running setting Effective immediately	RW	Uint16
P09.16	2009	11	Group 2 Notch Width Class	0～20	-	2	Running setting Effective immediately	RW	Uint16
P09.17	2009	12	Group 2 Notch Depth Rating	0～99	-	0	Running setting Effective immediately	RW	Uint16
P09.18	2009	13	Group 3 notch frequency	50～4000	Hz	4000	Running setting Effective immediately	RW	Uint16
P09.19	2009	14	Group 3 Notch Width Class	0～20	-	2	Running setting Effective immediately	RW	Uint16
P09.20	2009	15	Group 3 Notch Depth Rating	0～99	-	0	Running setting Effective immediately	RW	Uint16
P09.21	2009	16	Group 4 notch frequency	50～4000	Hz	4000	Running setting Effective immediately	RW	Uint16
P09.22	2009	17	Group 4 Notch Width Class	0～20	-	2	Running setting Effective immediately	RW	Uint16
P09.23	2009	18	Group 4 Notch Depth Rating	0～99	-	0	Running setting Effective immediately	RW	Uint16
P09.24	2009	19	Resonance frequency identification results	0～2	Hz	0	-	RO	Uint16
P09.30	2009	1F	Torque disturbance compensation gain	0.0～100.0	%	0.0	Running setting Effective immediately	RW	Uint16
P09.31	2009	20	Torque disturbance observer filter time constant	0.00～25.00	ms	0.50	Running setting Effective immediately	RW	Uint16
P09.38	2009	27	low frequency resonance frequency	1.0～100.0	Hz	100.0	Running setting Effective immediately	RW	Uint16
P09.39	2009	28	Low frequency resonance frequency filter setting	0～10	-	2	Running setting Effective immediately	RW	Uint16

8.2.10 200A Group Object Dictionary (P0A Group Fault and Protection Parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P0A.00	200A	01	Power input phase loss protection selection	0. Enable fault prohibition warning 1. Enable faults and warnings 2. Disable faults and warnings	-	0	Running setting Effective immediately	RW	Uint16
P0A.01	200A	02	Absolute position limit settings	0. Disable absolute position limit 1. Enable absolute position limit 2. Enable absolute position limit after origin return	-	0	Stop setting Effective immediately	RW	Uint16
P0A.03	200A	04	Power-off save function enable selection	0. Do not perform power-off save 1. Execute power-off save	-	0	Running setting Effective immediately	RW	Uint16
P0A.04	200A	05	Motor overload protection gain	50～300	%	100	Stop setting Effective immediately	RW	Uint16
P0A.08	200A	09	Overspeed fault threshold	0：Max speed ×1.2； 1～10000：200A-09h～Max speed×1.2；	rpm	0	Running setting Effective immediately	RW	Uint16
P0A.12	200A	0D	Overrun protection function enabled	0. No speed protection 1. Turn on speed protection	-	1	Running setting Effective immediately	RW	Uint16

P0A.16	200A	11	Judgment of low frequency resonance position deviation threshold	1～1000	Encoder unit	5	Running setting Effective immediately	RW	Uint16
P0A.25	200A	1A	Speed Feedback display value filter time constant	0～5000	ms	50	Stop setting Effective immediately	RW	Uint16
P0A.26	200A	1B	Motor overload shield enable	0. Open motor overload detection 1. Shield motor overload warning and fault detection	-	0	Stop setting Effective immediately	RW	Uint16
P0A.27	200A	1C	Speed DO filter time constant	0～5000	ms	10	Stop setting Effective immediately	RW	Uint16
P0A.28	200A	1D	Quadrature encoder filter time constant	0～255	25ns	30	Stop setting Restart effective	RW	Uint16
P0A.32	200A	21	Locked rotor over-temperature protection time window	10～65535	ms	200	Running setting Effective immediately	RW	Uint16
P0A.33	200A	22	Stalled rotor over-temperature protection enabled	0. Shield motor stalled rotation over-temperature protection detection 1. Enable motor stall over-temperature protection detection	-	1	Running setting Effective immediately	RW	Uint16
P0A.36	200A	25	Encoder multi-turn overflow fault selection	0. No shielding 1. Shield	-	0	Stop setting Effective immediately	RW	Uint16

8.2.11 P0B Group monitoring parameters

For specific parameters, please refer to Chapter 5.1.6

8.2.12 200C Group Object Dictionary (P0C Group communication parameters)

Function code	Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
P0C.00	200C	01	drive address	1～247	-	1	Running setting Effective immediately	RW	Uint16
P0C.02	200C	03	Serial port baud rate setting	0.2400 Kbp/s 1.4800 Kbp/s 2.9600 Kbp/s 3.19200 Kbp/s 4.38400 Kbp/s 5.57600 Kbp/s	-	5	Running setting Effective immediately	RW	Uint16
P0C.03	200C	04	MODBUS data format	0. No parity, 2 end bits 1. Even parity, 1 end bit 2. Odd parity, 1 end bit 3. No parity, 1 end bit	-	0	Running setting Effective immediately	RW	Uint16
P0C.04	200C	05	Site name corrected	For the master station whose station number is automatically assigned, the station number assigned to the slave station when using EtherCAT communication is displayed.	-	-	-	RO	Uint16
P0C.05	200C	06	site alias	For a master station that cannot automatically assign a station number, when using EtherCAT communication, set the slave station number through this object.	-	0	Stop setting Effective immediately	RW	Uint16
P0C.13	200C	0E	Whether the communication write function code value is updated to EEPROM	0. Do not save 1. 2000h series object dictionary is written and stored in EEPROM after communication 2. 6000h series object dictionary is written and stored in EEPROM after communication 3. The object dictionary of 2000h series and 6000h series is written and stored in EEPROM after communication.	-	0	Running setting Effective immediately	RW	Uint16
P0C.35	200C	24	EtherCAT sync interrupt lost Disallowed times	4～20	1ms	9	Running setting Effective immediately	RW	Uint16
P0C.36	200C	25	Port0 port CRC check error	0～65535	W	0	-	RO	Uint16
P0C.37	200C	26	Port1 port CRC check error error	0～65535	W	0	-	RO	Uint16

P0C.38	200C	27	Port 0, 1 data forwarding error	0～65535	W	0	-	RO	Uint16
P0C.39	200C	28	Processing unit and PDI errors	0～65535	W	0	-	RO	Uint16
P0C.40	200C	29	Port 0, 1 link lost	0～65535	W	0	-	RO	Uint16
P0C.42	200C	2B	Synchronization error monitoring mode setting	0～1	-	0	Stop setting Effective immediately	RW	Uint16
P0C.43	200C	2C	Sync mode settings	0: The driver working sequence is asynchronous with the host computer synchronization clock. 1: Suitable for the host computer synchronization performance indicators to meet In the case of 1us jitter (standard performance index of EtherCAT master station). 2: Suitable for host computer synchronization performance indicators exceeding In the case of 1us jitter (standard performance indicator of EtherCAT master station)	-	2	Stop setting Effective immediately	RW	Uint16
P0C.44	200C	2D	Synchronization error threshold	0 ~ 2000: Used to set the jitter range of the synchronization signal allowed when the driver works in synchronization 1 mode (200C-2Ch=1).	1nm	500	Stop setting Effective immediately	RW	Uint16
P0C.45	200C	2E	Location cache settings	0: Disable location caching 1: Enable location cache	-	1	Stop setting Effective immediately	RW	Uint16
P0C.46	200C	2F	CSP position command increment excessive threshold	1 ~ 7; the counting threshold when the position command increment exceeds the maximum position command increment	-	3	Running setting Effective immediately	RW	Uint16
P0C.47	200C	30	CSP position command increment too large times	0~65535; the count value when the position command increment exceeds the maximum position command increment threshold	-	0	-	RO	Uint16

8.2.13 P0D Group auxiliary function parameters

Function code	Name	Set Range	unit	Default	Setting effective	attribute	type
P0D.00	software reset	0. No operation 1. Enable	-	0	Stop setting Effective immediately	RW	Uint16
P0D.01	Fault reset	0. No operation 1. Enable	-	0	Stop setting Effective immediately	RW	Uint16
P0D.02	Offline inertia identification function	-	-	-	Running setting Effective immediately	RW	Uint16
P0D.03	Initial angle recognition	1. Enable	-	-	-	RW	Uint16
P0D.05	Emergency shutdown	0. No operation 1. Enable emergency shutdown	-	0	Running setting Effective immediately	RW	Uint16
P0D.11	JOG trial operation function	(comes with filter)	-	-	-	RW	Uint16
P0D.17	DIDO forced input and output enable	0. No operation 1. Force DI to be enabled and force DO to be disabled. 2. Force DO to enable, force DI to disable 3. Force DIDO to be enabled 4. EtherCAT control forces DO to be enabled and forces DI to disable.	-	0	Running setting Effective immediately	RW	Uint16
P0D.18	DI forced input given	0 ~ 0x01FF	-	0x01FF	Running setting Effective immediately	RW	Uint16
P0D.19	DO forces output given	0 ~ 0x001F	-	0	Running setting Effective immediately	RW	Uint16
P0D.20	Absolute encoder reset enable	0. No operation 1. Reset fault 2. Reset fault and multi-turn data	-	0	Stop setting Effective immediately	RW	Uint16

8.3 6000 Group Object Dictionary

Index	Sub index	Name	Set Range	unit	Default	Setting effective	attribute	type
603F	00	error code	0～65535	-	0	-	RO	Uint16
6040	00	control word	0～65535	-	0	Running setting No enable effective	RW	Uint16
6041	00	status word	0～xFFFF	-	0	-	RO	Uint16
605A	00	Quick shutdown mode selection choose	0～7； Refer to section Appendix 1	-	2	Running setting No enable effective	RW	INT16
605D	00	Temporary shutdown method selection	1～3； Refer to section Appendix 1	-	1	Running setting No enable effective	RW	INT16
6060	00	Servo mode selection	0～10； Refer to section 7.2.1	-	0	Running setting No enable effective	RW	INT8
6061	00	Run mode display	0～10	-	0	-	RO	INT8
6062	00	position command	-	command unit	-	-	RO	Dint32
6063	00	position feedback	-	Encoder unit	-	-	RO	Dint32
6064	00	position feedback	-	command unit	-	-	RO	Dint32
6065	00	Position deviation excessive threshold	0～2147483647	command unit	1048576	Running setting No enable effective	RW	UDint32
6067	00	Position reaches threshold	0～2147483647	Encoder unit	734	Running setting Effective immediate ly	RW	UINT32
6068	00	Location arrival window time	0～65535	ms	16	Running setting Effective immediate ly	RW	UINT16
606C	00	actual speed	-	command unit /S	-	-	RO	INT32
606D	00	speed reaches threshold	0～65535	rpm	10	Running setting No enable effective	RW	UINT16
606E	00	Speed arrival window time	0～65535	ms	0	Running setting No enable effective	RW	UINT16
6071	00	target torque	-4000～4000	0.1%	0	Running setting No enable effective	RW	UINT16
6072	00	Maximum torque command	0～4000	0.1%	5000	Running setting No enable effective	RW	UINT16
6074	00	Torque command	-5000～5000	0.1%	0	-	RO	INT16
6077	00	actual torque	-5000～5000	0.1%	0	-	RO	INT16
607A	00	target location	-2147483648～2147483647	command unit	0	Running setting No enable effective	RW	INT32
607C	00	Origin offset	-2147483648～2147483647	command unit	0	Running setting No enable effective	RW	INT32
607D	01	Minimum location limit	-2147483648～2147483647	user unit	-2^{31}	Running setting	RW	INT32

						No enable effective		
607D	02	Maximum location limit	-2147483648～2147483647	user unit	2^{31}	Running setting No enable effective	RW	INT32
607E	00	Command polarity	Set the polarity of position command, speed command and torque command. Bit0~Bit4: Undefined; Bit5: Torque command polarity; Bit6: Speed command polarity; Bit7: Position command polarity; ON: Negate the command.	-	0	Running setting No enable effective	RW	UINT8
607F	00	Maximum speed	0～2147483647	command unit /S	104857600	Running setting No enable effective	RW	UINT32
6081	00	Contour running speed	0～2147483647	user unit	0	Running setting No enable effective	RW	UINT32
6083	00	Profile acceleration	0～2147483647	command unit /S^2	100000	Running setting No enable effective	RW	UINT32
6084	00	Profile deceleration	0～2147483647	command unit /S^2	100000	Running setting No enable effective	RW	UINT32
6085	00	Emergency stop deceleration	0～2147483647	command unit /S^2	100000	Running setting No enable effective	RW	UINT32
6086	00	Operating curve selection	0- linear	-	0	-	RW	INT16
6087	00	Torque ramp	0～2147483647	0.1%/S	2^{32}-1	Running setting No enable effective	RW	UINT32
6091	01	Motor resolution	1～2147483647	-	1	Running setting Effective immediately	RW	UINT32
6091	02	Axis resolution	1～2147483647	-	1	Running setting Effective immediately	RW	UINT32
6098	00	Zero return method	1～35；Reference zero return mode Appendix 2	-	0	Running setting No enable effective	RW	INT8
6099	01	Return to Zero Expressway	0～2147483647	command unit /S	131072	Running setting No enable effective	RW	UINT32
6099	02	Return to zero low speed	10～2147483647)	command unit /S	13107	Running setting No enable effective	RW	INT32
609A	00	Return to zero acceleration	0～2147483647	command unit /S^2	100000	Running setting No enable effective	RW	DUINT32
60B0	00	position offset	-2147483648～2147483647	command unit	0	Running setting No enable effective	RW	INT32
60B1	00	speed offset	-2147483648～2147483647	command unit /S	0	Running setting No enable effective	RW	INT32
60B2	00	Torque bias	-5000～5000	0.1%	0	Running setting No enable effective	RW	INT16

<table>
<tr><td>60B8</td><td>00</td><td>probe mode</td><td>0～65535</td><td>-</td><td>0</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT16</td></tr>
<tr><td>60B9</td><td>00</td><td>Probe status</td><td>0～65535</td><td>-</td><td>0</td><td>-</td><td>RO</td><td>UINT16</td></tr>
<tr><td>60BA</td><td>00</td><td>Probe 1 rising edge position value</td><td>-2147483648～2147483647</td><td>command unit</td><td>0</td><td>-</td><td>RO</td><td>INT32</td></tr>
<tr><td>60BB</td><td>00</td><td>Probe 1 falling edge position value</td><td>-2147483648～2147483647</td><td>command unit</td><td>0</td><td>-</td><td>RO</td><td>INT32</td></tr>
<tr><td>60BC</td><td>00</td><td>Probe 2 rising edge position value</td><td>-2147483648～2147483647</td><td>command unit</td><td>0</td><td>-</td><td>RO</td><td>INT32</td></tr>
<tr><td>60BD</td><td>00</td><td>Probe 2 falling edge position value</td><td>-2147483648～2147483647</td><td>command unit</td><td>0</td><td>-</td><td>RO</td><td>INT32</td></tr>
<tr><td>60E0</td><td>00</td><td>Forward torque limit</td><td>0～5000</td><td>0.1%</td><td>5000</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT16</td></tr>
<tr><td>60E1</td><td>00</td><td>Reverse torque limit</td><td>0～5000</td><td>0.1%</td><td>5000</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT16</td></tr>
<tr><td>60E3</td><td>01
～
1F</td><td>Supported zero return method 1~Supported zero return method 31</td><td>bit0~bit7: The lower 8 bits are used to display the supported zero return method. Bit8: Whether to support relative position zero return
Bit9: Whether to support absolute position zero return</td><td>-</td><td>-</td><td>-</td><td>RO</td><td>UINT16</td></tr>
<tr><td>60E6</td><td>00</td><td>Actual position calculation method</td><td>0: Absolute position return to zero. After the origin return is completed, position feedback 6064 is set to origin offset 607Ch;
1: Relative position return to zero. After the origin return is completed, the position feedback 6064 will superimpose the position offset 607Ch on the original basis.</td><td>-</td><td>0</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT8</td></tr>
<tr><td>60F4</td><td>00</td><td>position deviation</td><td>Display position deviation</td><td>command unit</td><td>-</td><td>-</td><td>RO</td><td>DINT32</td></tr>
<tr><td>60FC</td><td>00</td><td>position command</td><td>Position command 60FC (encoder unit) = position command 6062 (command unit) ×electronic gear ratio (6091)</td><td>Encoder unit</td><td>-</td><td>-</td><td>RO</td><td>DINT32</td></tr>
<tr><td>60FD</td><td>00</td><td>DI state</td><td><table><tr><th>Bit</th><th>explain</th></tr><tr><td>0</td><td>Reverse overtravel switch</td></tr><tr><td>1</td><td>Forward overtravel switch</td></tr><tr><td>2</td><td>Origin switch</td></tr><tr><td>16</td><td>ZSignal</td></tr><tr><td>17</td><td>probe1</td></tr><tr><td>18</td><td>probe2</td></tr><tr><td>20</td><td>DI0</td></tr><tr><td>21</td><td>DI1</td></tr><tr><td>22</td><td>DI2</td></tr><tr><td>23</td><td>DI3</td></tr><tr><td>24</td><td>DI4</td></tr></table></td><td>-</td><td>0</td><td>-</td><td>RO</td><td>DINT32</td></tr>
<tr><td>60FE</td><td>01</td><td>physical output</td><td rowspan="2">Bit0 of 60FE-01h: brake output; when 200D-12h=4, the DO output is controlled by the bits of 60FE-01h and 60FE-02h:<table><tr><td></td><td>60FE-01h</td><td>60FE-02h</td></tr><tr><td>DO 0</td><td>Bit16</td><td>Bit16</td></tr><tr><td>DO 1</td><td>Bit17</td><td>Bit17</td></tr><tr><td>DO 2</td><td>Bit18</td><td>Bit18</td></tr></table></td><td>-</td><td>0</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT32</td></tr>
<tr><td>60FE</td><td>02</td><td>Physical output enable</td><td>-</td><td>0</td><td>Running setting
No enable effective</td><td>RW</td><td>UINT32</td></tr>
<tr><td>60FF</td><td>00</td><td>target speed</td><td>-2147483648～2147483647</td><td>command unit /S</td><td>0</td><td>Running setting
No enable effective</td><td>RW</td><td>INT32</td></tr>
</table>

Chapter IX Troubleshooting

9.1 Fault and Warning Code List

9.1.1 Fault code table (to reset the fault, you need to cancel the enable first)

Display	Error code (603Fh)	Fault name	Reset	Fault and handling method
Er.101	0x6320	Parameters of P02 and above sets are abnormal	No	1. The function code parameter value of P02 and following sets exceeds the upper and lower limits, and the parameters are re-initialized; 2. Power off during the process of writing parameters, rewrite the parameters after power on; 3. Reset the motor model and drive model, and initialize the parameters; 4. The drive EEPROM is abnormal, replace the drive.
Er.102	0x7500	Programmable logic configuration failure	No	MCU related hardware is damaged, replace the drive.
Er.104	0x7500	Programmable logic interrupt failure	No	MCU related hardware is damaged, replace the drive.
Er.105	0x6320	Abnormal internal program	No	1. When EEPROM reads/writes function codes, the total number of function codes is abnormal, initialize the parameters; 2. The range of the set value of the function code is abnormal, initialize the parameters; 3. Initialize and power on again. If the alarm still occurs, replace the drive.
Er.108	0x5530	Parameter storage failure	No	1. The parameter value can't be written to the EEPROM, initialize the parameter; 2. Initialize and power on again. If the alarm still occurs, replace the drive.
Er.111	0x6320	Internal failure	No	Initialize and power on again. If the alarm still occurs, replace the drive.
Er.120	0x7122	Product matching failure	No	The motor model and drive model match incorrectly, please contact the after-sales personnel to check the motor model.
Er.121	0x5441	Servo ON command invalid fault	Yes	DI port parameter configuration fault, recheck DI function and VDI function configuration
Er.122	0x7122	Absolute position mode product matching failure	No	The absolute value motor model does not match, or the motor model is set incorrectly, please contact the after-sales personnel to check the motor model.
Er.130	0x6320	Duplicate assignment of DI function	Yes	DI port parameter configuration failure, recheck the DI function and VDI function configuration or initialize parameters.
Er.131	0x6320	DO function allocation overrun	Yes	DO function number exceeds DO function number, recheck DO function configuration or initialize parameters.
Er.136	0x7305	The data in motor ROM is incorrectly verified or the parameters are not saved	No	When the drive reads the parameters in the encoder ROM area, it finds that the parameters are not saved, or the parameters are inconsistent with the agreed values 1. Check the motor model and drive model; 2. Check whether the motor encoder cable is correct, and whether the connector is connected reliably; 3. Check if the encoder line is disturbed, and re-arrange the wires.
Er.201	0x2312	Overcurrent 2	No	Overcurrent detected by hardware; 1. Check whether the motor power lines U V W are correctly connected, and whether there is a reverse connection or phase loss; 2. There is a short circuit in the U V W lines, or there is leakage between the motor coil and the casing, replace the motor wire or test the motor; 3. The encoder line is in poor contact, check or replace the encoder cable; 4. The load is too heavy, first test whether the motor is normal with no load; 5. The acceleration and deceleration are too fast, increase the acceleration and deceleration time of the program; 6. If the gain parameter is adjusted, check whether the gain is set too large, and test after reducing the gain; 7. The braking resistor is too small or short-circuited, test with internal braking resistor first; 8. The drive is damaged, replace the drive;
Er.207	0x0FFF	D/Q axis current overflow fault	Yes	Abnormal current feedback causes the internal register of the drive to overflow, replace the drive;

Er.208	0x0FFF	System sampling operation timeout	No	1. MCU communication timeout, replace the drive 2. Encoder communication times out, check whether the encoder line is connected well, or replace the encoder and reconnect; 3. Motor encoder is faulty, replace the motor for test; 4. Current sampling times out, check whether there is interference from large equipment on site, increase the isolation transformer, and re-arrange the wires; 5. High-precision AD conversion times out, check the analog input wiring to see if there is interference, and connect with shielded wire; 6. The drive is damaged, replace the drive;
Er.210	0x2330	Output short circuit to ground	No	During the power-on self-test of the drive, the motor phase current or bus voltage is detected abnormal. 1. The power lines U V W are short-circuited to the ground, check the motor lines; 2. The motor coil is short-circuited to the casing, replace the motor; 3. Drive failure, replace the drive.
Er.220	0x0FFF	Phase sequence error	No	The drive performs angle identification, and it is identified that the phase sequence of the UVW of the drive and the UVW of the motor do not match. 1. The electrical angle of the motor encoder does not match, reset the motor parameters, and self-learn; 2. The U V W phase sequence is reversed, check the motor power lines;
Er.234	0x0FFF	Overspeed	No	In torque control mode, the direction of the torque command is opposite to the direction of the speed feedback or in the position or speed control mode, the direction of the speed feedback is opposite to the direction of the speed command; 1. The U V W phase sequence is reversed, check the motor power lines; 2. Initial phase detection error of the motor rotor is caused by the interference signal, re-power on, and check the wiring; 3. The encoder model is wrong or the wiring is wrong, replace the motor or encoder line; 4. Drive failure, replace the drive;
Er.400	0x3210	Main circuit overvoltage	Yes	DC bus voltage exceeds fault value 420V 1. Measure the power supply voltage. If the grid voltage is too high or unstable, a voltage stabilizer needs to be added; 2. The braking resistor fails, measure the resistance between B1 and B3 of the drive in the state of complete power failure. If it is infinite, the internal braking resistor is damaged and the drive needs to be replaced; 3. The resistance of the braking resistor is too large, replace it with a braking resistor of 40 ohms or 50 ohms, please contact the after-sales personnel; 4. The grid voltage is too high, and the motor accelerates and decelerates too fast, increase the acceleration and deceleration time; 5. Monitor P0B-26 to check whether the bus voltage is consistent with the grid voltage. If the difference is too large, the drive may be damaged and needs to be replaced. 220V AC corresponds to the bus voltage of 310V.
Er.410	0x3220	Main circuit undervoltage	Yes	DC bus voltage is lower than the fault value 200V 1. The main circuit power supply is unstable or power off, re-check the wiring, or add a voltage stabilizer; 2. Monitor P0B-26 to check whether the bus voltage is consistent with the grid voltage. If the difference is too large, the drive may be damaged and needs to be replaced. 220V AC corresponds to the bus voltage of 310V.
Er.420	0x3130	Main circuit power phase loss	Yes	Servo drive failure, replace the drive.
Er.430	0x3120	Control power undervoltage	Yes	Servo drive failure, replace the drive.
Er.500	0x8400	Overspeed alarm	Yes	The actual speed of the servo motor exceeds the overspeed fault threshold 1. The phase sequence of motor cable U V W is wrong, check the motor wiring; 2. The motor parameters are incorrect, reset the motor parameters and self-learn; 3. The input command exceeds the overspeed fault threshold; 4. The motor speed is overregulated, the gain parameter setting is unreasonable, initialize the drive parameters and test; 5. Drive failure, replace the drive.
Er.510	0x0FFF	Pulse output overspeed	Yes	The output pulse frequency exceeds the upper limit of the frequency allowed by the hardware; reduce P05-17 (number of pulses divided by the encoder frequency), so that the output pulse frequency is less than the upper limit of the allowable frequency.
Er.602	0x0FFF	Angle identification failed	Yes	Motor self-learning failed, check whether the encoder line is normal and the encoder type is correct.
Er.610	0x3230	Drive overload	Yes	1. The motor model or drive model is set incorrectly, please contact the after-sales personnel to check the parameters; 2. Monitor the drive load rate PB-02 to see if the overload causes an alarm; 3. The motor is stalled, first eliminate the motor stall and then test, or remove the motor for no-load test;
Er.620	0x3230	Motor overload	Yes	4. The gain parameter setting is too large, test after initializing the parameters; 5. Motor acceleration and deceleration is too fast, increase the acceleration and deceleration time; 6. The phase sequence of motor cable U V W is wrong, check the motor wiring; 7. The drive is damaged, replace the drive.

Er.630	0x7121	Motor stall	Yes	The actual speed of the motor is lower than 10rpm, but the torque command reaches the limit value, and the duration reaches the set value of P0A-32 1. The UVW output of the drive is out of phase, disconnected, and wrongly connected in phase sequence; 2. The motor parameters are incorrect, reset the motor parameters and self-learn; 3. The motor is stalled, first eliminate the motor stall and then test, or remove the motor for no-load test;
Er.650	0x4210	Heat sink overheating	Yes	The temperature of the power module of the drive is higher than the over-temperature protection point, the servo drive is faulty, replace the drive.
Er.731	0x7305	Encoder battery failure	Yes	The battery voltage of the absolute value encoder is lower than 3.0V 1. The encoder line is disconnected, set P0D-20=2, and then set P0D-01=1 to clear the fault; 2. The battery is dead, replace the battery.
Er.733	0x7305	Encoder multi-turn count error	Yes	Initialize the drive parameters, reset the motor parameters and drive parameters, set the encoder type, Then set P0D-20=2 and P0D-01=1 to clear the fault and power on again. If the alarm still occurs, replace the motor and test.
Er.735	0x7305	Encoder multi-turn count overflow	Yes	Initialize the drive parameters, reset the motor parameters and drive parameters, set the encoder type, Then set P0D-20=2 and P0D-01=1 to clear the fault and power on again. If the alarm still occurs, replace the motor and test.
Er.740	0x7305	Encoder interference	No	Encoder Z signal is interfered, causing the electrical angle corresponding to the Z signal to change too much 1. The encoder wiring is wrong or the connector is loose, check or replace the encoder line and test it; 2. Encoder Z signal is disturbed, re-wire and ensure a good grounding; 3. The encoder is faulty, replace the motor;
Er.A33	0x7305	Encoder data abnormal	No	The internal parameters of the encoder are abnormal 1. The serial encoder line is disconnected or loose, check or replace the encoder line and test; 2. The encoder is faulty, replace the motor;
Er.A34	0x7305	Encoder loopback verification abnormal	No	1. The driver and motor types do not match, reset the motor model; 2. The encoder line is broken, check the encoder line.
Er.A35	0x7305	Z signal loss	No	Encoder Z signal is lost or the AB signal edge transitions at the same time 1. The serial encoder line is disconnected or loose, check or replace the encoder line and test; 2. The encoder is faulty, replace the motor;
Er.B00	0x8611	Excessive position deviation	Yes	In position control mode, the position deviation is greater than the P0A-10 setting value 1. The driver U V W output phase is missing or the phase sequence is wrongly connected, check the motor wire; 2. If the motor is stalled, first rule out the motor stall condition before testing, or remove the motor and test without load; 3. The gain of the servo driver is low, so test after initializing the parameters; 4. The position command increment is too large; 5. Whether the position deviation fault value 6065h is set too small; 6. The torque limit value is set too small, test after initializing the parameters; 7. Servo driver/motor failure, replace the driver or motor.
Er.B01	0x0FFF	Position command too large	yes	1. Is the position deviation fault value 6065h set too small? 2. Before mode switching or when servo is enabled, the target position (607A target position) is not aligned with the current position; 3. Synchronization cycle phase crossover leads to excessive position command accumulation; 4. Motor speed limit error;
Er.B03	0x6320	Electronic gear ratio setting exceeds limit	yes	1. The gear ratio 6091-01h/6091-02h exceeds the limit value; 2. Parameter change order problem;
Er.D09	0x6320	Software position upper and lower limit setting error	yes	The software position upper and lower limit settings are wrong, check 0x607D-01h and 0x607D-02h
Er.D10	0x6320	Origin offset setting error	yes	The origin offset is outside the upper and lower limits of the software position, check 0x607D-01h, 0x607D-02h, 0x607Ch
Er.E07	0x0FFF	Abnormal network status switching	yes	Check whether the network port is normal and whether the communication line is normal;
Er.E08	0x0FFF	Sync lost	yes	1. The slave station receives abnormally, check whether the network port is normal and whether the communication line is normal; 2. The master station sends abnormally, and the upper computer synchronization clock error is too large. You can try increasing 200E-21h;
Er.E11	0x0FFF	XML configuration file not burned	yes	1. The device configuration file is not burned; 2. Drive failure;
Er.E12	0x0E12	Network initialization failed	yes	1. The device configuration file is not burned; 2. Drive failure;
Er.E13	0x0E13	Synchronization cycle setting error	yes	Check whether the synchronization period is 125us or an integer multiple of 250us

Er.E15	0x0E15	Synchronization cycle error is too large	yes	1.XML files do not match; 2. The controller synchronization cycle error is large;

9.1.2 Warning code table (warnings can be reset directly without canceling the enable)

Display	Error code (603Fh)	Fault name	Reset	Fault and handling method
Er.110	0x6320	Frequency division pulse output setting failure	yes	The number of encoder frequency-divided pulses does not meet the range, reset the encoder frequency-divided pulse number (2005-12h);
Er.601	0x0FFF	Failed to return to origin	yes	1. Origin switch failure; 2. The time limit for searching the origin is too short; 3. The speed of high-speed search for origin switch signal is too small; 4. The switch setting is unreasonable;
Er.730	0x7305	Encoder battery warning	yes	The encoder battery voltage of the absolute encoder is lower than 3.0V. Replace the battery with a new one with matching voltage while the power is on.
Er.900	0x5442	DI emergency brake	yes	The corresponding DI terminal of DI function 34 (FunIN.34: Brake, Emergency) is triggered (including hardware DI and virtual DI), check the DI wiring.
Er.909	0x3230	Motor overload warning	yes	The load rate is too high, causing a warning. Check whether the load is too heavy or blocked.
Er.920	0x3210	Braking resistor overload	yes	Warning of excessive braking resistor current, 1. If the bus voltage is too high, causing energy to be discharged too quickly, a warning will appear. Add a voltage regulator to reduce the voltage; 2. Whether the motor decelerates too fast, increase the deceleration time; 3. The internal braking resistor has insufficient power. Replace the external braking resistor. It is recommended that the resistance value should not be lower than 40 ohms; 4. When using an external resistor, check the parameter values of P02-25 ~ P2-27, and set the value of P2-27 to be consistent with the resistance value of the selected resistor; 4. The driver braking circuit is damaged, replace the driver;
Er.922	0x6320	External braking resistor is too small	yes	P02-27 (resistance value of external braking resistor) is smaller than P02-21 (minimum value of external braking resistor allowed by the driver)
Er.939	0x3331	Motor power line is broken	yes	The actual phase current of the motor is less than 10% of the rated current, and the actual speed is small, but the internal torque command is large. Check the motor power cable wiring, rewire it, and replace the cable if necessary.
Er.941	0x6320	Parameter changes need to be powered on again to take effect.	yes	When the function code attribute "validity time" of the servo drive is "power on again", after the function code parameter value is changed, the drive reminds the user that he needs to power on again.
Er.942	0x7600	Parameters are stored frequently	yes	If the number of function codes modified at the same time exceeds 200, check the operating mode. For parameters that do not need to be stored in EEPROM, set P0C-13 to 0 before the host computer writes the operation.
Er.950	0x5443	Forward overtravel warning	yes	The corresponding DI terminal of DI function 14 (FunIN.14: P-OT, forward overtravel switch) is triggered.
Er.952	0x5444	Reverse overtravel warning	yes	The corresponding DI terminal of DI function 15 (FunIN.15: N-OT, reverse overtravel switch) is triggered.
Er.980	0x7305	Encoder internal fault	yes	If a fault still occurs after turning on the power several times, the encoder is faulty.
Er.990	0x3130	Input phase loss warning	yes	Driver power supply circuit failure;
Er.998	0x0FFF	Zero return mode setting error	yes	When using the zero return mode, 6098h inputs non-existent zero return modes such as 15/16/31/32.
Er.A40	0x0FFF	Internal failure	yes	Motor self-learning failed, 1. Check the motor encoder line error; 2. The encoder model is incorrect. Reset the motor model and encoder type; 3. The motor encoder is faulty, replace the motor.

Appendix 1 Shutdown method

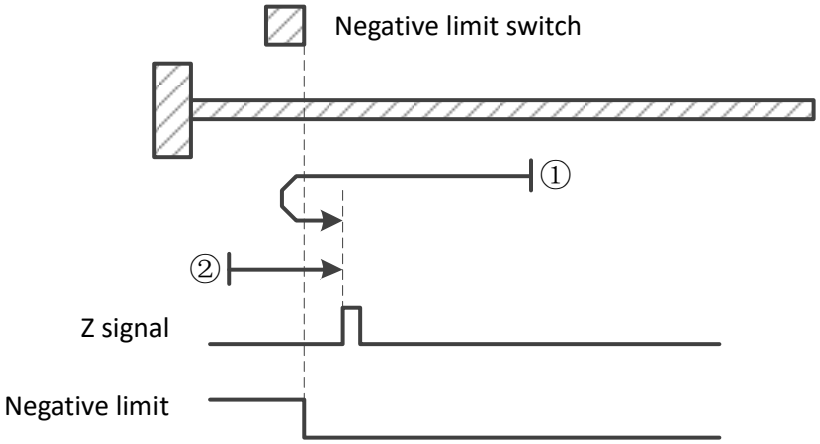
<table>
<tr><th>Object dictionary</th><th>Sub index</th><th>Name</th><th>Scope</th><th>Default</th><th>Setting takes effect</th><th>Attributes</th><th>type</th></tr>
<tr>
<td>605A</td><td>00</td><td>Quick Shut Down Mode selection</td>
<td>PPmodel：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td>Stop at 6084h ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>5</td><td>Stop at 6084h ramp and maintain position locked state</td></tr>
<tr><td>6</td><td>Stop at 6085h ramp and maintain position locked state</td></tr>
<tr><td>7</td><td>Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
</table>
CSPmodel：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td>5</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
</table>
CSV/PV/HM model：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td>Stop at 6084h (HM: 609Ah) ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Emergency stop torque to stop and maintain free running state</td></tr>
<tr><td>5</td><td>Stop at 6084h (HM: 609Ah) slope and maintain position locked state</td></tr>
<tr><td>6</td><td>Stop at 6085h ramp and maintain position locked state</td></tr>
<tr><td>7</td><td>Stop with 2007-10h emergency stop torque and maintain position locked state</td></tr>
</table>
CST/PT model:
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>0</td><td>Free stop and maintain free running status</td></tr>
<tr><td>1</td><td rowspan="2">Stop at 6087h ramp and maintain free running status</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Free stop and maintain free running status</td></tr>
<tr><td>5</td><td rowspan="2">Stop at 6087h ramp and maintain position locked state</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td>Coast to stop and maintain position lock state</td></tr>
</table>
</td>
<td>2</td><td>Running setting No enable effective</td><td>RW</td><td>INT16</td>
</tr>
<tr>
<td>605D</td><td>00</td><td>Temporary Shutdown Method selection</td>
<td>PP mode：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td>Stop at 6084h ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
</table>
CSP mode：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td rowspan="3">Stop with 2007-10h emergency stop torque and maintain free running state</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
</table>
CSV/PV/HM mode：
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td>Stop at 6084h (HM: 609Ah) ramp and maintain free running status</td></tr>
<tr><td>2</td><td>Stop at 6085h ramp and maintain free running status</td></tr>
<tr><td>3</td><td>Emergency stop torque to stop and maintain free running state</td></tr>
</table>
CST/PT mode:
<table>
<tr><th>set value</th><th>shutdown mode</th></tr>
<tr><td>1</td><td rowspan="2">Stop at 6087h ramp and maintain free running status</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td><td>Free stop and maintain free running status</td></tr>
</table>
</td>
<td>1</td><td>Running setting No enable effective</td><td>RW</td><td>INT16</td>
</tr>
</table>

Appendix 2 Servo home mode

6098=1: Reference negative limit and return-to-origin mode of Z-phase signal

Situation 1: The negative limit is invalid when starting to return to zero, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and runs in the positive direction at low speed. When encountering the negative limit, it decreases. The position of the first Z pulse after the edge is the origin position.

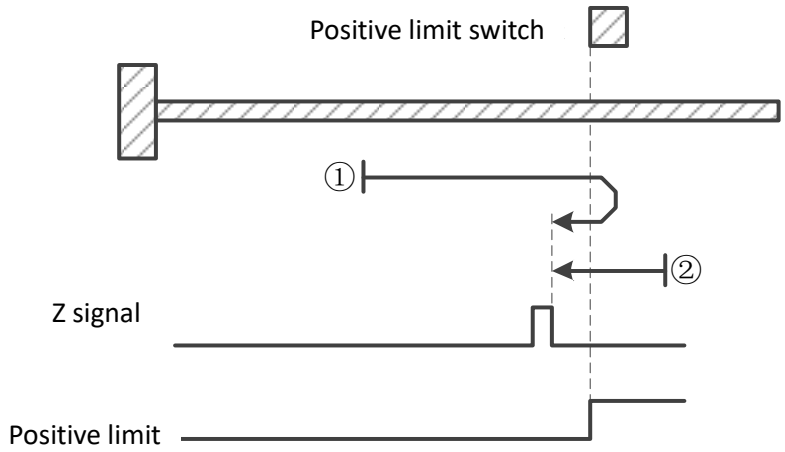
Situation 2: The negative limit is valid when starting to return to zero, and the axis begins to return to zero in the positive direction at low speed. When encountering the negative limit falling edge, the position of the first Z pulse is the origin position.



6098=2: Reference positive limit and Z-phase signal return-to-origin mode

Situation 1: The positive limit is invalid when starting to return to zero, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at low speed. When encountering the positive limit The position of the first Z pulse after the falling edge is the origin position.

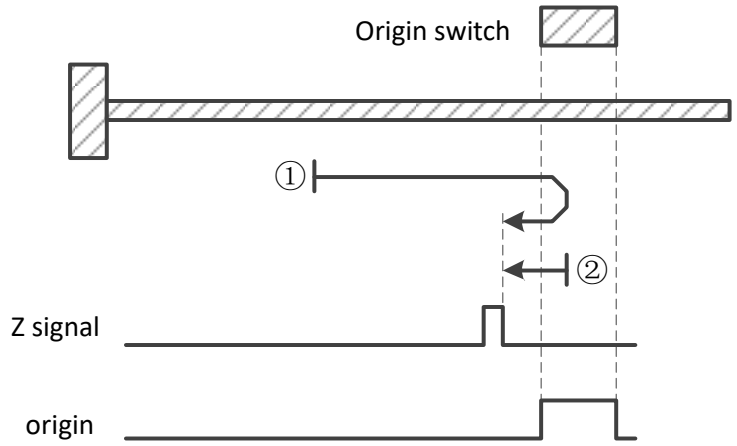
Scenario 2: The positive limit is valid when starting to return to zero, and the axis begins to return to zero in the negative direction at a low speed. When encountering the falling edge of the positive limit, the position of the firs Negative limit igin position.



6098=3: Reference origin switch and forward return-to-origin mode of Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

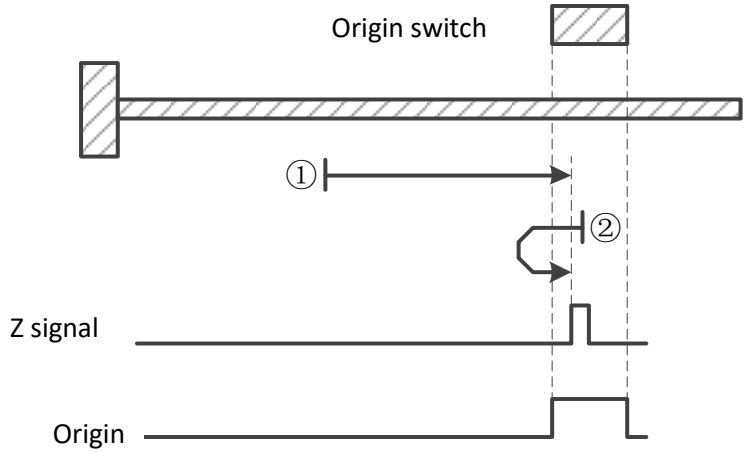
Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero in the negative direction at a low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.



6098=4: Reference origin switch and forward return-to-origin mode of Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero in the positive direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. The position when encountering the first Z pulse is the origin position.

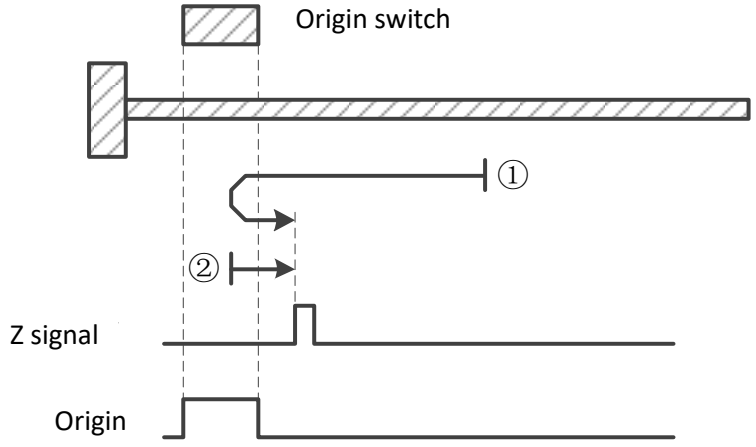
Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it decelerates and runs in the positive direction at a low speed. When it encounters the first rising edge of the origin, The position of the Z pulse is the origin position.



6098=5: Negative return-to-origin mode of reference origin switch and Z-phase signal

Situation 1: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the positive direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

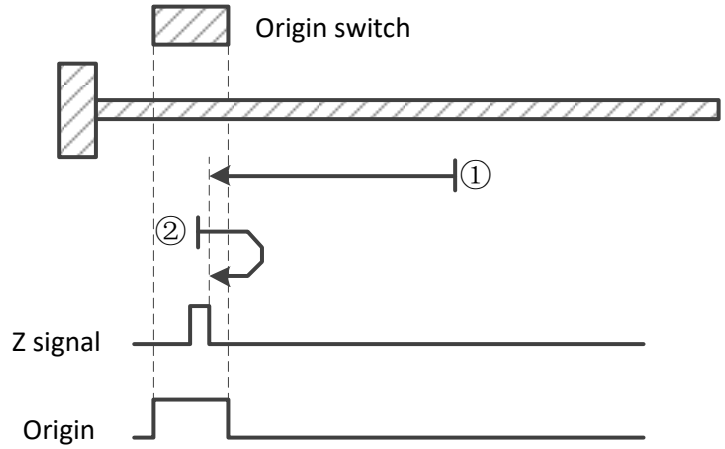
Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero at a low speed in the positive direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.



6098=6: Negative return-to-origin mode of reference origin switch and Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero in the negative direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. The position when encountering the first Z pulse is the origin position.

Situation 2: When starting the zero return, the origin signal is valid. The axis starts to return to zero at a low speed in the positive direction. When it encounters the falling edge of the origin, it decelerates and runs in the negative direction at a low speed. When it encounters the first Z after the origin signal The position of the pulse is the origin position.

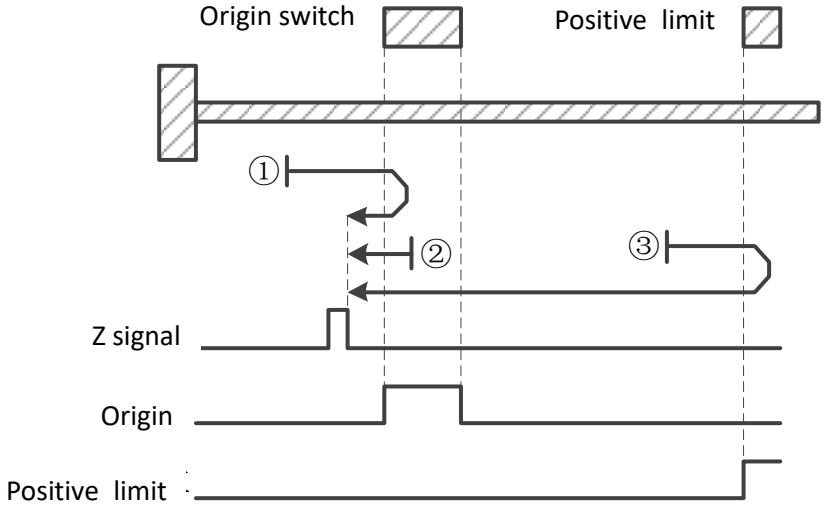


6098=7: Reference origin switch, positive limit and Z-phase signal return-to-origin mode 1

Situation 1: When starting the zero return, the origin signal is invalid, and the axis begins to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis begins to return to zero in the negative direction at a low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.

Situation 3: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor starts to decelerate and run at low speed. When encountering the falling edge of the origin, the position of the first Z pulse is the origin position.



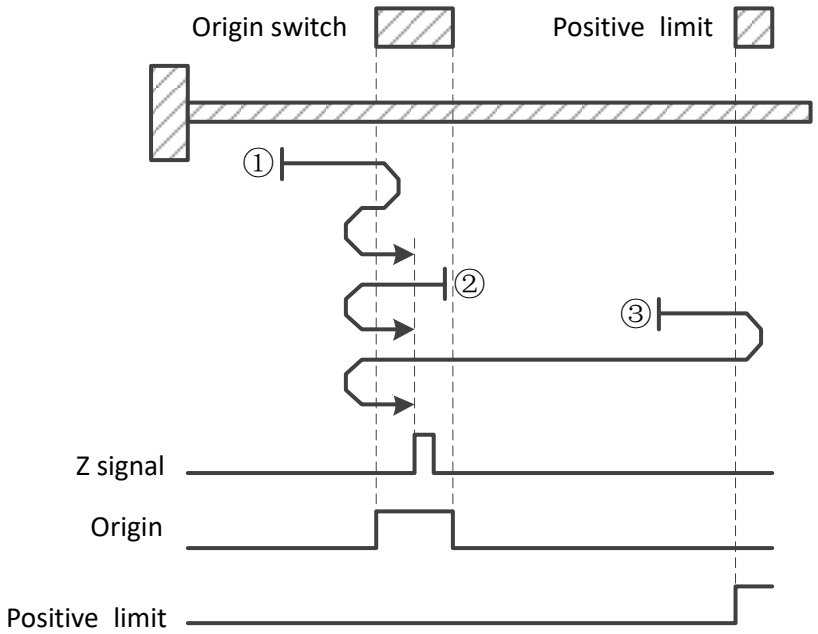
6098=8: Reference origin switch, positive limit and return-to-origin mode 2 of Z-phase signal

Situation 1: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, it decelerates again. Reverse direction, and then run in the forward direction at low speed. When encountering the rising edge of the origin, the position to the first Z pulse is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low

speed in the negative direction. When it encounters the falling edge of the origin, it decelerates and runs in the positive direction at a low speed. When it encounters the first rising edge of the origin, The position of the Z pulse is the origin position.

Situation 3: When the zero return is started, the origin signal is invalid, and the axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor starts to run at low speed. When it encounters the falling edge of the origin, the motor decelerates and reverses and runs toward the square at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.

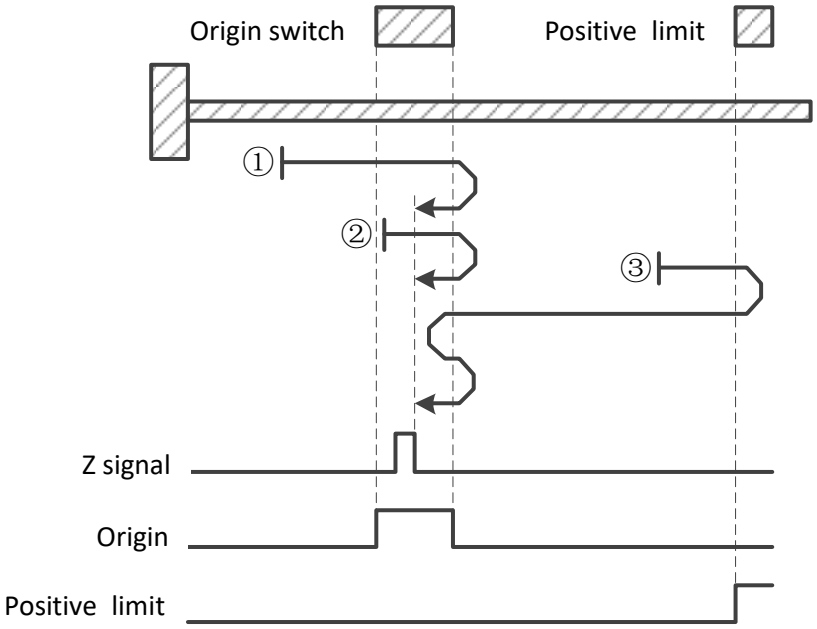


6098=9: Reference origin switch, positive limit and return-to-origin mode 3 of Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs forward at low speed. After encountering the falling edge of the origin, the motor reverses and runs at low speed. Running in the negative direction, the position of the first Z pulse after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. After encountering the first rising edge of the origin, The position of the first Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. After encountering the rising edge of the origin, the motor The deceleration reverse direction moves in the forward direction at a low speed. After encountering the falling edge of the origin, it reverses and then moves in the negative direction at a low speed. The position of the first Z pulse after encountering the rising edge of the origin is the origin position.

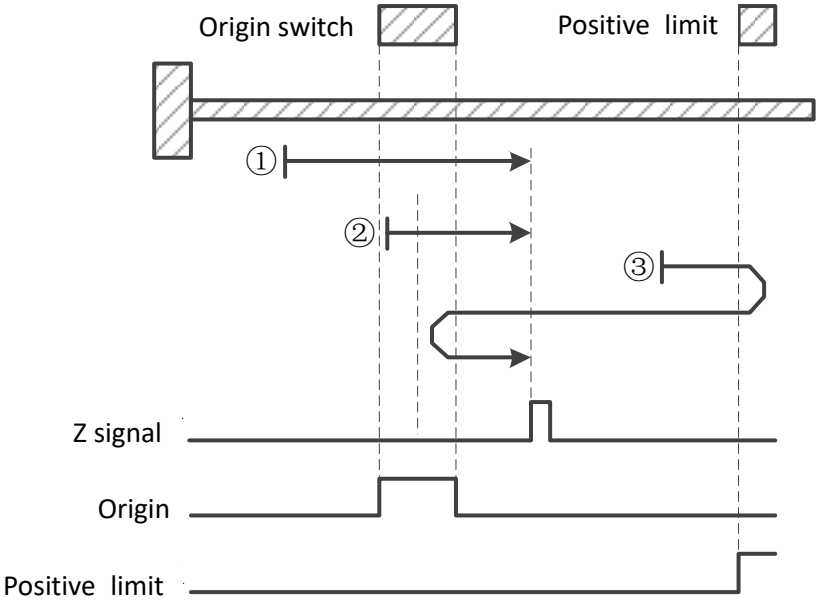


6098=10: Reference origin switch, positive limit and Z-phase signal return-to-origin mode 4

Situation 1: The origin signal is invalid when starting the zero return. The axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the first Z pulse The position is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the forward direction. The position of the first Z pulse when encountering the falling edge of the origin is the origin position.

Situation 3: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin opening, When , the motor decelerates and runs in the forward direction at low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.

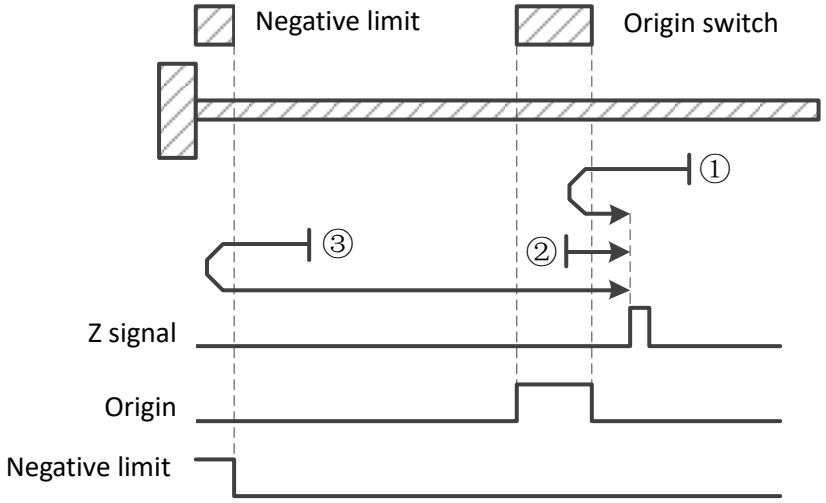


6098=11: Reference origin switch, negative limit and Z-phase signal return-to-origin mode 1

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The position of one Z pulse is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the forward direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position of the first Z pulse is the origin position.

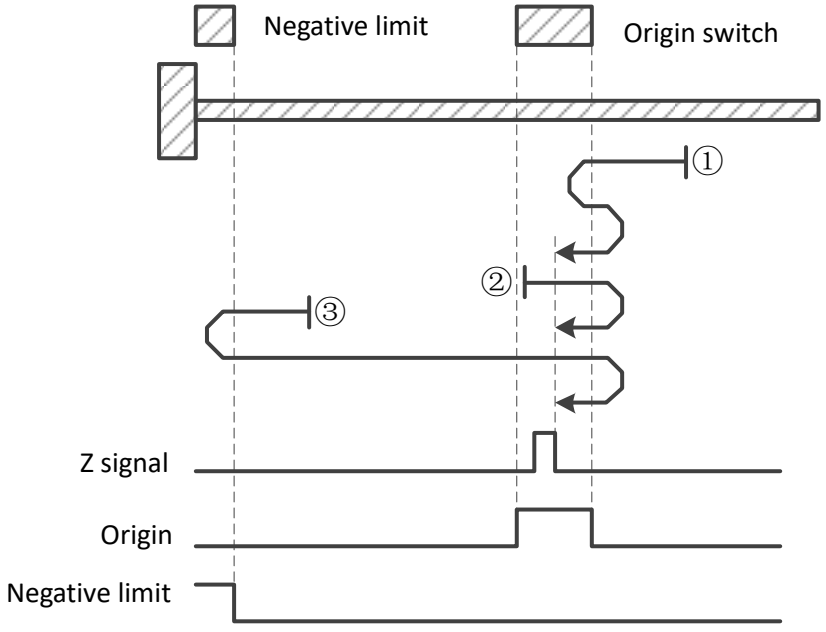


6098=12: Reference origin switch, negative limit and return-to-origin mode 2 of Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the negative direction at low speed. When encountering the rising edge of the origin, the position of the first Z pulse is the origin position.

Situation 2: When starting the zero return, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at a low speed. When it encounters the rising edge of the origin, the The position of one Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and moves in the positive direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.

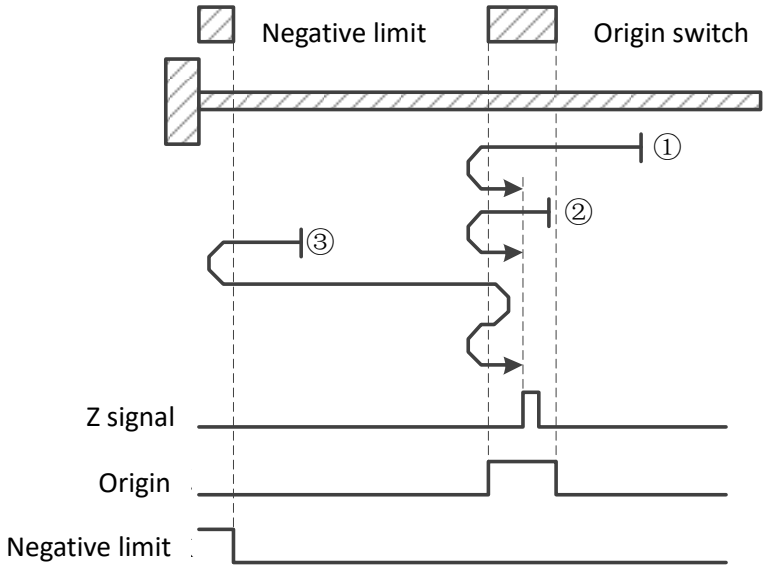


6098=13: Reference origin switch, negative limit and return-to-origin mode 3 of Z-phase signal

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the motor decelerates and reverses to low speed. Running in the forward direction, the position of the first Z pulse after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the The position of one Z pulse is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position of the first Z pulse is the origin position.

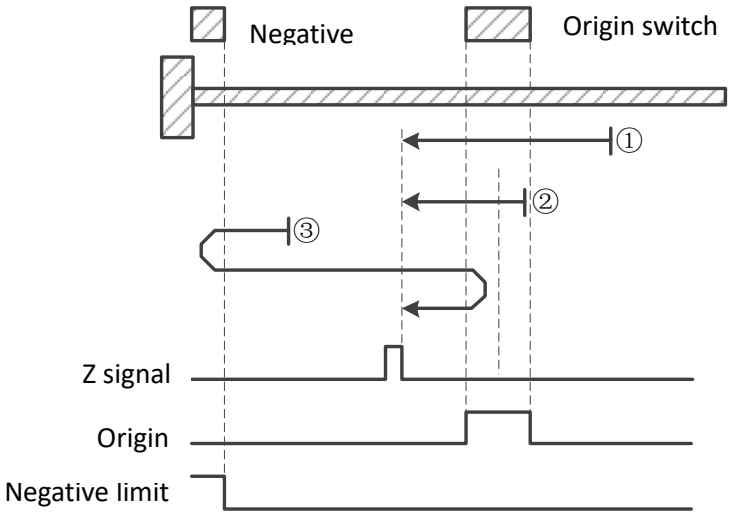


6098=14: Reference origin switch, negative limit and return-to-origin mode 4 of Z-phase signal

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the negative direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the first Z pulse The position is the origin position.

Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the negative direction. The position of the first Z pulse after encountering the falling edge of the origin is the origin position.

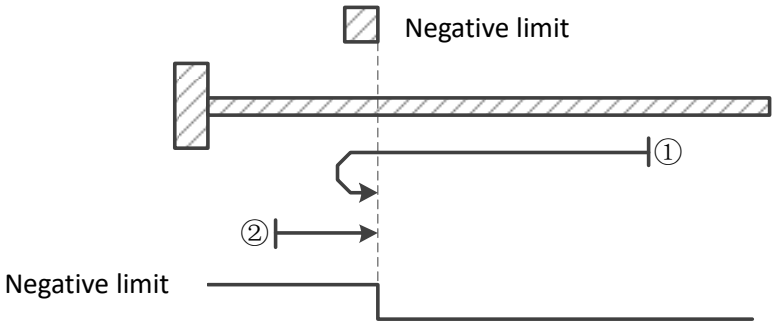
Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position of the first Z pulse is the origin position.



6098=17: Reference negative limit return-to-origin mode

Situation 1: The negative limit signal is invalid when starting to return to zero. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and runs in the forward direction. When encountering the falling edge of the negative limit, the motor decelerates and runs in the forward direction. The position at time is the origin position.

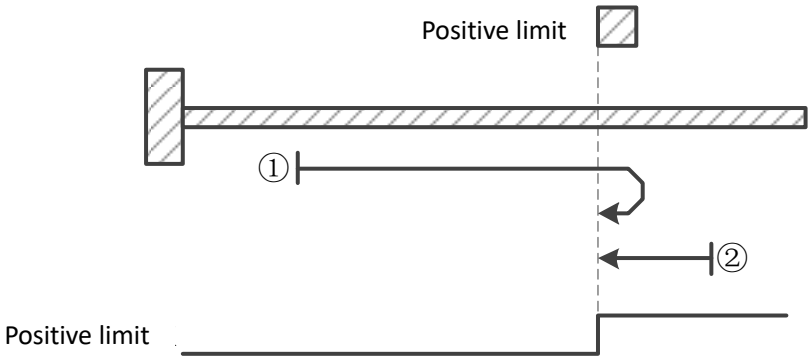
Situation 2: When starting the zero return, the negative limit signal is valid, and the axis starts to return to zero at a low speed in the positive direction. The position when it encounters the negative limit falling edge is the origin position.



6098=18: Reference positive limit return-to-origin mode

Situation 1: The positive limit signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction. When encountering the falling edge of the positive limit, the motor decelerates and runs in the negative direction. The position at time is the origin position.

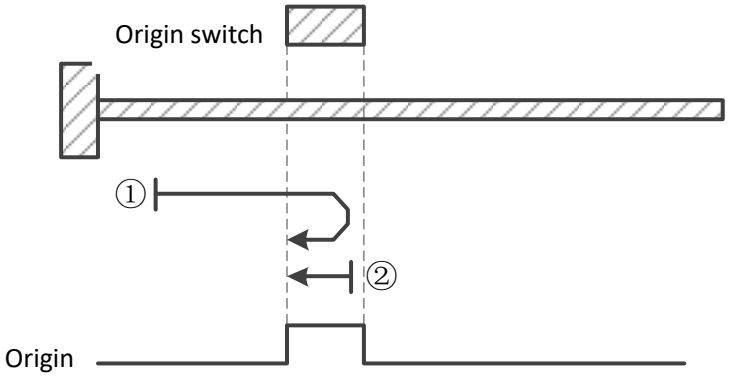
Situation 2: When starting the zero return, the positive limit signal is valid, and the axis starts to return to zero in the negative direction at low speed. The position when it encounters the falling edge of the positive limit is the origin position.



6098=19: Reference origin switch return-to-origin mode 1

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction. The position when encountering the falling edge of the origin is the origin position. .

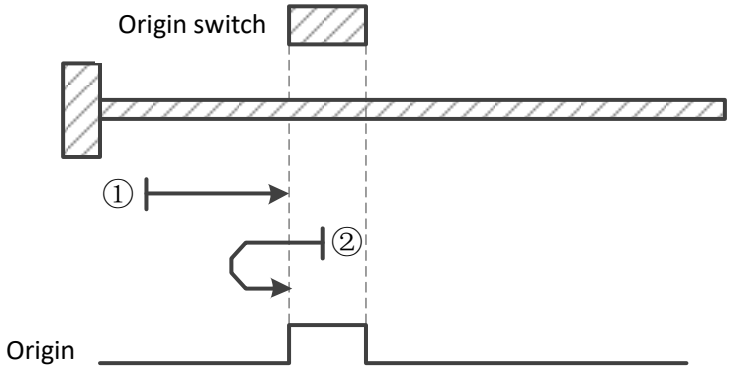
Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the negative direction. The position when it encounters the falling edge of the origin is the origin position.



6098=20: Reference origin switch return-to-origin mode 2

Situation 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at a low speed in the forward direction. The position when it encounters the rising edge of the origin is the origin position.

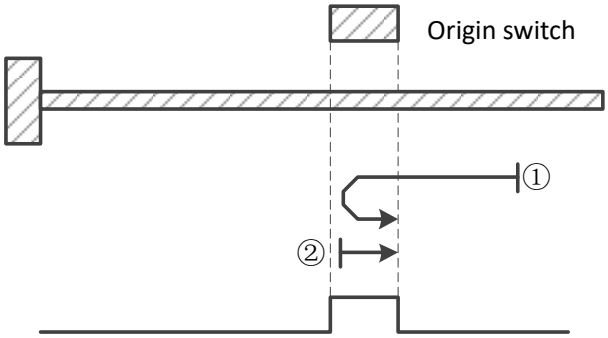
Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the forward direction. When it encounters the rising edge of the origin, the position is the origin position.



6098=21: Return to origin mode of reference origin switch

Situation 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the origin, the motor decelerates and runs in the forward direction. When it encounters the falling edge of the origin, the position is the origin position. .

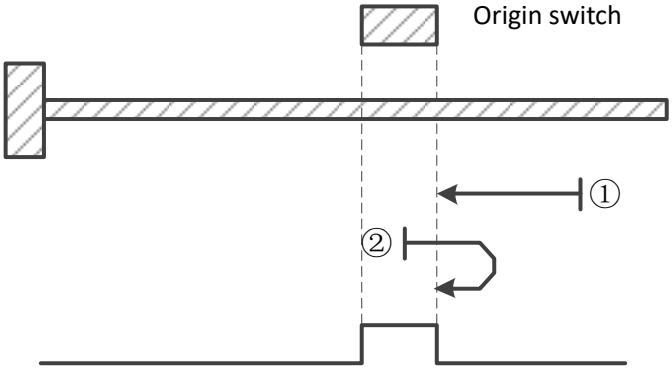
Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the forward direction. The position when it encounters the falling edge of the origin is the origin position.



6098=22: Reference origin switch return-to-origin mode

Scenario 1: The origin signal is invalid when the zero return is started. The axis starts to return to zero at a low speed in the negative direction. The position when it encounters the rising edge of the origin is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction. When it encounters the rising edge of the origin, the position is the origin position.

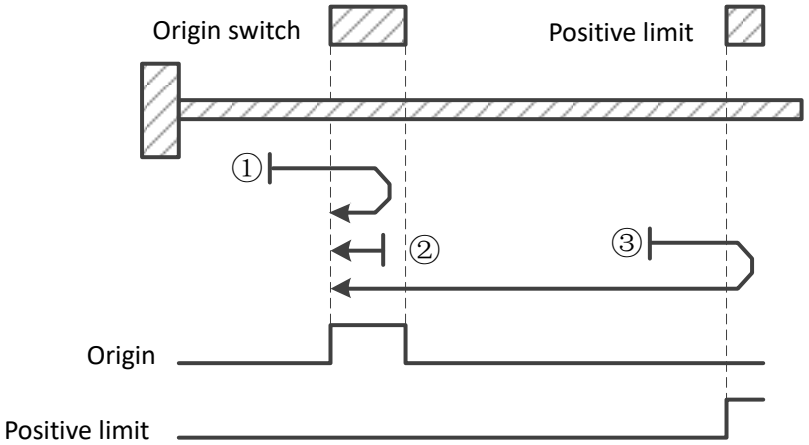


6098=23: Reference origin switch and positive limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position is origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. The position when it encounters the falling edge of the origin is the origin position.

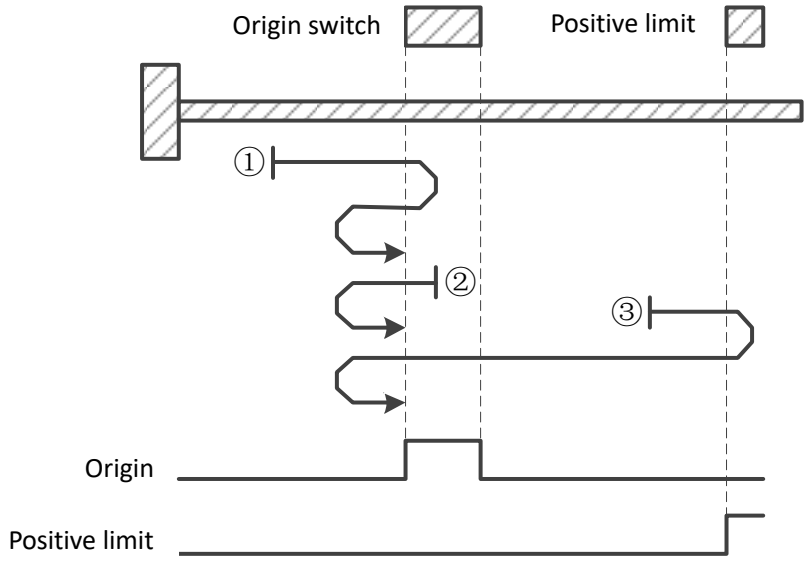


6098=24: Reference origin switch and positive limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the origin, the motor decelerates and runs in the negative direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the forward direction at low speed. The position after encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the positive direction at low speed. When it encounters the rising edge of the origin, the position is origin position.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.

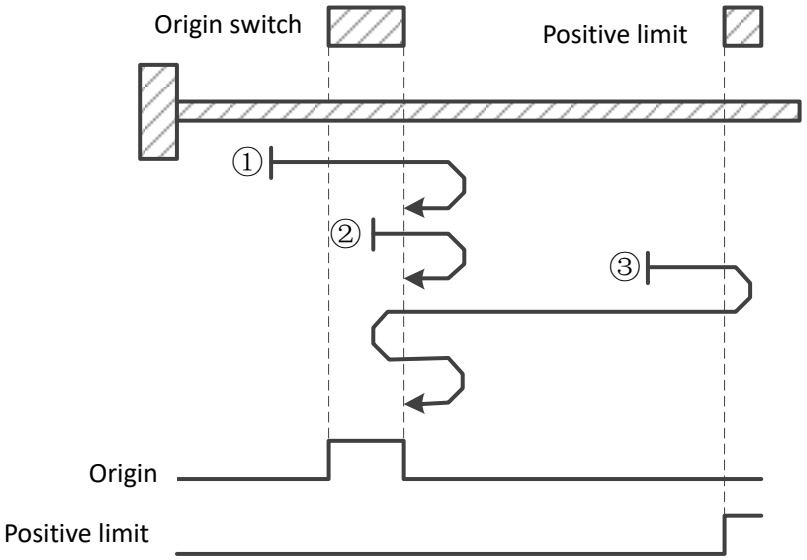


6098=25: Reference origin switch and positive limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs forward at low speed. After encountering the falling edge of the origin, the motor reverses and runs at low speed. Running in the negative direction, the position when encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. The position where it encounters the rising edge of the origin is the origin. Location.

Situation 3: When starting the zero return, the origin signal is invalid. The axis starts to return to zero at high speed in the positive direction. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. After encountering the rising edge of the origin, the motor The deceleration reverse direction moves in the positive direction at a low speed. When it encounters the falling edge of the origin, it reverses and then moves in the negative direction at a low speed. The position when it encounters the rising edge of the origin is the origin position.

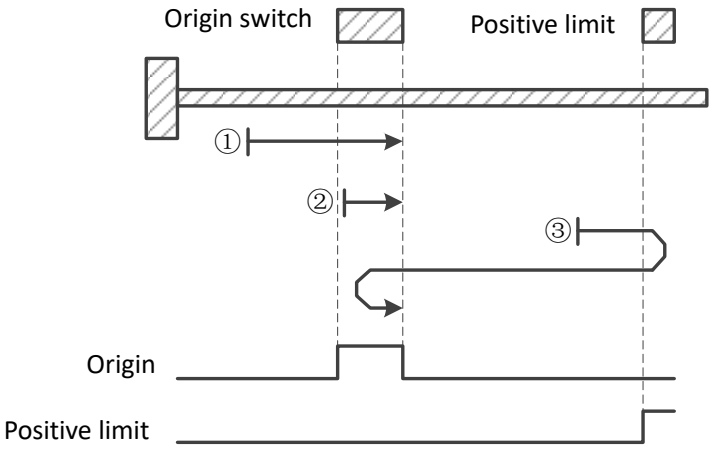


6098=26: Reference origin switch and positive limit return-to-origin mode

Situation 1: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the forward direction at high speed. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position is the origin position.

Situation 2: When the origin signal is valid when the zero return is started, the axis starts to return to zero at a low speed in the forward direction. The position when it encounters the falling edge of the origin is the origin position.

Situation 3: The origin signal is invalid when starting to return to zero. The axis starts to return to zero in the positive direction at high speed. When encountering the rising edge of the positive limit, the motor decelerates and runs in the negative direction at high speed. When encountering the rising edge of the origin opening, When , the motor decelerates and runs in the forward direction at low speed. When it encounters the falling edge of the origin, the position is the origin position.

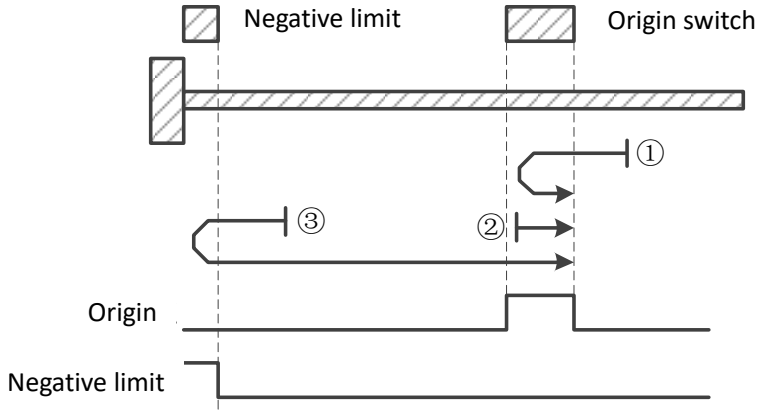


6098=27: Reference origin switch and negative limit return-to-origin mode

Situation 1: When starting to return to zero, the origin signal is invalid. The axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the position is origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero in the forward direction at a low speed. When it encounters the falling edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the position is the origin position.

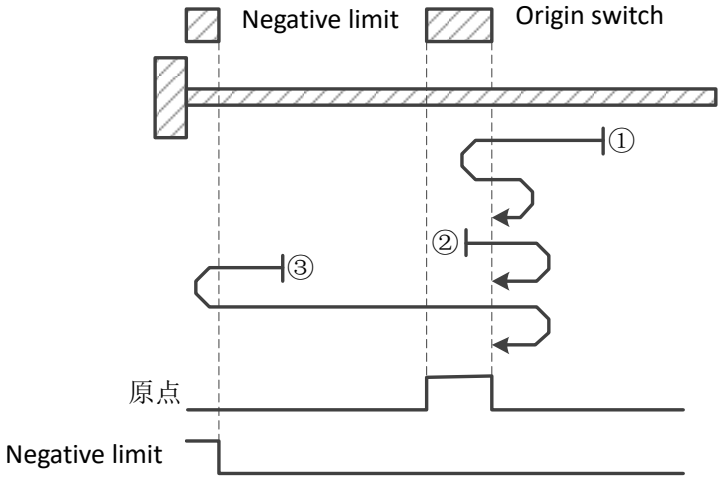


6098=28: Reference origin switch and negative limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs in the forward direction at low speed. When encountering the falling edge of the origin, the motor The deceleration reverse direction runs in the negative direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.

Situation 2: When the origin signal is valid when starting the zero return, the axis starts to return to zero at a low speed in the positive direction. When encountering the falling edge of the origin, the motor decelerates and runs in the negative direction at a low speed. When it reaches the rising edge of the origin, it is the origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the negative limit, the motor decelerates and moves in the positive direction at high speed. When encountering the rising edge of the origin, , the motor decelerates and runs at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the negative direction at low speed. When it encounters the rising edge of the origin, it is the origin position.

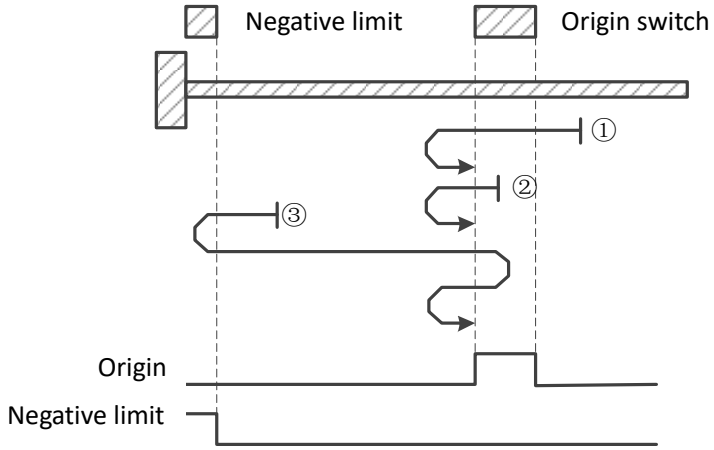


6098=29: Reference origin switch and negative limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the motor decelerates and reverses to low speed. Running in the forward direction, the position when encountering the rising edge of the origin is the origin position.

Situation 2: When the zero return starts, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When encountering the falling edge of the origin, the motor decelerates and runs in the positive direction at low speed. When it encounters the rising edge of the origin, the position is origin position.

Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the motor decelerates and runs in the forward direction at low speed. When it encounters the rising edge of the origin, the position is the origin position.

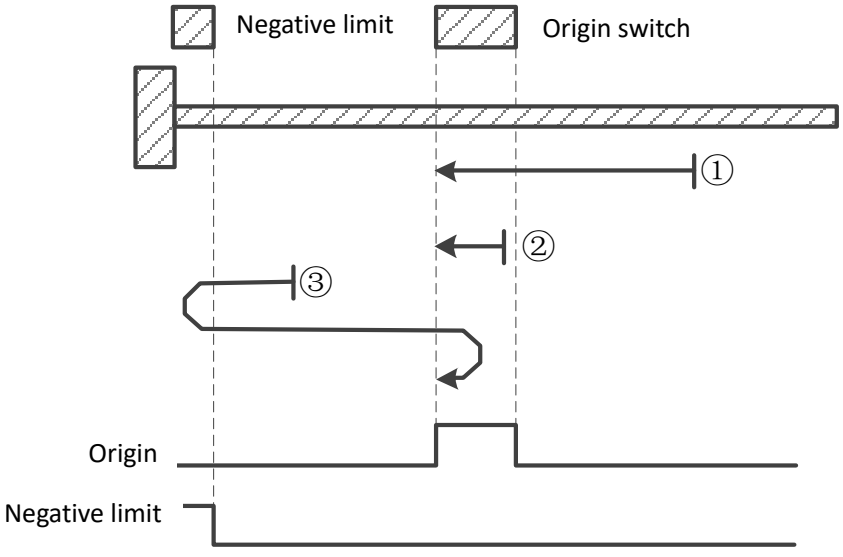


6098=30: Reference origin switch and negative limit return-to-origin mode

Situation 1: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When encountering the rising edge of the origin, the motor decelerates and runs at low speed. When encountering the falling edge of the origin, the position is the origin position.

Situation 2: When the zero return is started, the origin signal is valid, and the axis starts to return to zero at a low speed in the negative direction. When it encounters the falling edge of the origin, it is the origin position.

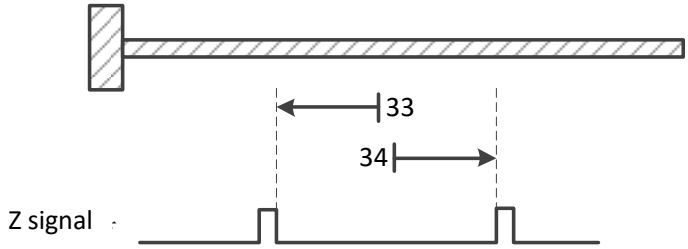
Situation 3: When starting the zero return, the origin signal is invalid, and the axis starts to return to zero at high speed in the negative direction. When it encounters the rising edge of the negative limit, the motor decelerates and runs in the positive direction at high speed. When it encounters the rising edge of the origin, , the motor decelerates and runs in the negative direction at low speed. When it encounters the falling edge of the origin, the position is the origin position.



6098=33/34: Reference Z signal return-to-origin mode

Zero return method 33: The axis starts to return to zero in the negative direction at low speed. The position of the first Z pulse encountered is the origin position.

Zero return mode 34: The axis starts to return to zero in the forward direction at low speed, and the position of the first Z pulse encountered is the origin position.



6098=35: Take the current position as the origin

Taking the current position as the mechanical origin, after triggering the origin return (6040 control word: 0x0F→ 0x1F):

1. When 60E6=0, set the current position 6064 to the value of the origin offset 606C;
2. When 60E6=1, the current position 6064 is superimposed on the original position offset 606C.