AD3 Servo System Instruction Manual

Servo Drives
AD3RE-□SA-E

Servo Motor
ASK□

Thank you very much for purchasing our servo products
Please read this instruction manual carefully before installing, wiring, using, maintaining, and inspecting the AD3 series Servo Drive.
Please keep this manual in a safe place and deliver it to the end user.

Change logs

Reversion	Change content	Originator	Date
V1.0	First Edition Release	sly	2019-01
V1.1	Section 8 was updated: Add ASK AC200V class motor list Add ASK AC400V class motor list Modify P50.02, P50.14, P50.16, P60.01, P60.02, P72.04, P72.05, P72.06, P72.0B, P72.0C, P72.0D, P73.02 parameters unit values	sly	2019-06
V1.2	Correction of errors: 4.5.3 Section DO output mapping address changed from 60FE.20~23 to 60FE.16~19. 5.3.2 Chapter LED panel user login chapter modification. Added: 4.5.3 The use of new renewal diodes Added Parameters	sly	2019-09
V1.3	7.1.7 Section Servo enable invalid stop 605Ch: VAR changed to 0-3; Unit16 changed to 2; add setting value meaning 2, 3 points 605Eh: VAR changed to 0-3; Unit16 changed to 2	sly	2021-01
V1.4	Section 2.1: added parameters 2. updated the new definition of the cables Chapter 4: added new parameters Chapter 8: added new function codes	sly	2021-08
V1.5	Update the relevant parameters of the entire ASK series	czm	2023-03
V1.6	Delete the comment of the motor size part	czm	2023-04

Contents

Section 1 Safety Precautions

■ Safety instructions

- Please read and follow these safety precautions when installing, operating, or maintaining the product.
- For personal and equipment safety, please follow the markings and manuals on the product when installing, operating and maintaining the product
- All safety precautions described in the
- The "Caution", "Warning" and "Danger" items in the manual do not represent all the safety matters to be observed, but only
- For the addition of all safety precautions.
- This product should be used in an environment that meets the design specifications, otherwise it may cause a malfunction due to failure to comply with the relevant
- The product quality warranty does not cover abnormal function or damage to parts caused by the regulations.
- We will not bear any legal responsibility for personal safety accidents and property damage caused by illegal operation of the product.

Security Level Definition	
⚠ **Danger**	Not used in accordance with the regulations can lead to fire, serious personal injury, or even death!
⚠ **Attention**	Not used in accordance with the regulations, may fire, serious personal injury, or even death!
⚠ **Warning**	Failure to use in accordance with the regulations may result in moderate personal injury or minor injury, as well as the occurrence of equipment damage!

When products arrive and are stored	
Warning ⚠	● If the product and product accessories are damaged when opening the box, please do not install them and contact our company or your supplier immediately. ● Check carefully whether the arriving product and the ordered product model match, and whether the product and product accessories are complete.
Attention ⚠	● Do not stack this product too much on top of each other as this may cause injury or malfunction. ● Do not store in places exposed to direct sunlight, places where the ambient temperature exceeds the temperature condition for storage, places where the relative humidity exceeds the humidity condition for storage, places where there is a large temperature difference, places where there is condensation, places near corrosive gases, places where there are flammable gases, places where there is a lot of dust, dirt, salt and metal dust, places where water, oil and medicine drip, places where vibration or shock can be delivered to the main body, otherwise it will lead to fire, Electric shock or machine damage. ● Do not hold the cable or motor shaft for handling, as this may result in injury or malfunction.

When designing the system	
⚠ **Danger**	● If the rated load current is exceeded or the load is short-circuited for a long time resulting in over-current, the product may smoke or catch fire, and safety devices such as fuses or circuit breakers should be set externally.
⚠ **Warning**	● Be sure to design the safety circuit to ensure that the product system will still work safely when the external power supply is lost, or the product fails. ● For safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents.
⚠ **Note intention**	● Be sure to provide an emergency brake circuit, a protection circuit, an interlock circuit for forward and reverse operation, and position upper and lower limit interlock switches to prevent damage to the machine in the external circuit of the product. ● The product may shut down all outputs after detecting abnormalities in its own system; when part of the controller circuit fails, it may cause its output to be uncontrolled. To ensure normal operation, a suitable external control circuit needs to be designed. ● If the output unit such as relay or transistor of the product is damaged, the output will not be controlled to ON or OFF state. ● The product is designed to be used in indoor, overvoltage class II electrical environment, and its power system level should have lightning protection devices to ensure that lightning overvoltage is not applied to the product's power input or signal input, control output and other ports to avoid damage to equipment.

When the product is installed	
⚠ **Danger**	● Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should install this product. ● For the product is open equipment, please install in the control cabinet with door lock (product cabinet shell protection > IP20), only operators with sufficient electrical knowledge and training related to electrical equipment can open the product cabinet.
⚠ **Warning**	● When disassembling the product, the external power supply used for the system must be completely disconnected before performing the operation. Failure to disconnect all power supplies may result in electric shock or product failure and malfunction! ● After the power is turned off for more than 5 minutes and the power indicator turns off, the control power is disconnected before disassembling the driver. Otherwise, the residual voltage may cause electric shock. ● Do not use the product in the following places: places with dust, oil fumes, conductive dust, corrosive gases, combustible gases; places exposed to high temperature, condensation, wind and rain; places with vibration and shock. Electric shock, fire, and misuse can also cause damage and deterioration of the product!
⚠ **Attention**	● Avoid metal shavings and wire tips falling into the ventilation holes of the product during installation, which may cause fire, malfunction, and misoperation. ● After installation, ensure that there is no foreign matter on its ventilation surface, otherwise it may lead to poor heat dissipation and cause fire, malfunction and misoperation. ● When installing, make a tight connection to the respective connector and lock the product connection hook firmly. If the products are not installed properly, it may lead to misoperation, malfunction and dislodgement.

When wiring products	
⚠ Danger	● Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should perform the wiring of this product.
⚠ Warning	● During wiring operations, the external supply power used by the system must be completely disconnected before operation. Failure to disconnect all of them may result in electric shock or equipment malfunction or misoperation. ● When powering up and running after the wiring operation, the terminal cover that comes with the product must be installed. Failure to install the terminal cover may result in electric shock. ● Check the type of interface to be connected before connecting the cable correctly. If the wrong interface is connected or the wiring is incorrect, it may cause the product or external equipment to malfunction. ● The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed to the terminal block. Otherwise, it will lead to electric shock or equipment damage. ● Avoid metal shavings and wire tips falling into the ventilation holes of the controller when wiring, which may cause fire, malfunction, and misoperation! ● The bolts on the terminal blocks should be tightened within the specified torque range. Untightened terminal bolts may result in short circuit, fire or malfunction. Over-tightening the bolts may damage the bolts and the product, resulting in dislodgement, short circuit, fire, or false operation.
⚠ Attention	● The specification and installation method of the external wiring of the equipment should meet the requirements of local power distribution regulations. ● To ensure the safety of the equipment and the operator, the equipment needs to be reliably grounded using cables of sufficient wire size. ● For connections using connectors and external devices, press fit, crimp or properly solder using the tool specified by the manufacturer. A poor connection may result in a short circuit, fire, or malfunction. ● If the product is labeled to prevent foreign objects from entering the product during wiring, such as the wiring head. Do not remove this label during wiring operations. Be sure to remove this label before starting system operation to facilitate heat dissipation. ● Please do not bundle the control and communication cables with the main circuit or power supply cables, etc. The alignment should be more than 100mm apart, otherwise the noise may lead to misoperation. ● For applications with serious interference, please use shielded cables for input or output of high frequency signals to improve the anti-interference capability of the system.

Before powering on the product	
⚠ Danger	● Before powering on, please make sure the product is well installed, wired firmly and the motor unit is allowed to restart. ● Before powering on, please confirm that the power supply meets the product requirements to avoid causing damage to the product or starting a fire. ● It is strictly forbidden to open the product cabinet door or product protective cover, touch any terminals of the product, disassemble any device or parts of the product in the energized state, otherwise there is a risk of electric shock. ● Make sure that no one is around the product, the motor, or the machinery before powering it on, as this may result in injury or death!
⚠ Warning	● After the wiring operation and parameter setting are completed, please conduct a test run of the machine to confirm that it can operate safely, otherwise it may lead to injury or equipment damage!

	● Before powering on, please make sure that the rated voltage of the product is the same as the power supply voltage. If the power supply voltage is used incorrectly, there is a risk of fire!

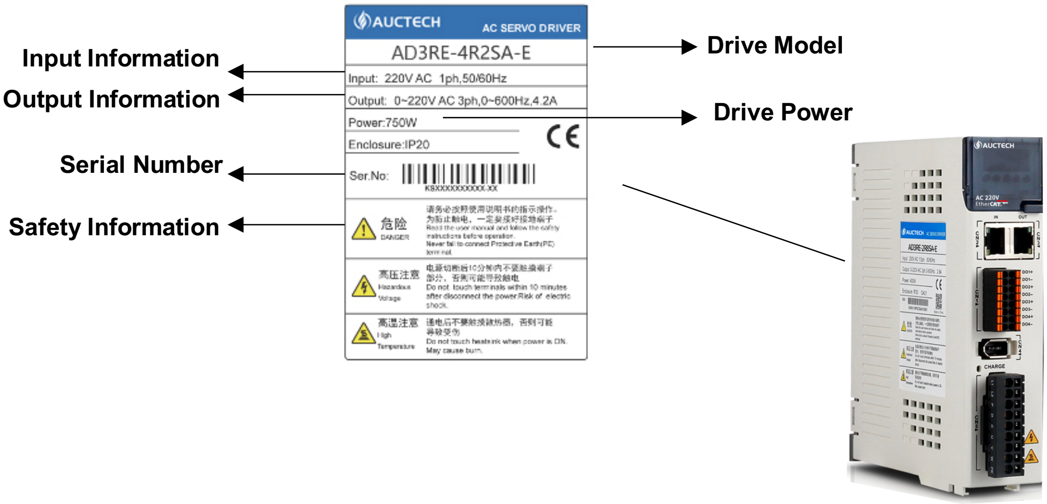
When operating and maintaining	
Danger	● Only maintenance professionals with adequate electrical knowledge and training on electrical equipment can perform the operation and maintenance of the products. ● Do not touch the terminals when the power is on, as this may cause electric shock or malfunction. ● When the motor or equipment is running, please never touch its rotating parts, otherwise it may lead to serious personal safety accidents.
Warning	● When cleaning the product or retightening the bolts on the terminal block or the connector mounting bolts, the external supply power used by the system must be completely disconnected. Failure to do so may result in electric shock. ● When disassembling the product or connecting or removing the communication cable, the external supply power used by the system must be completely disconnected first. Failure to disconnect all of them may result in electric shock or false operation. ● After the power is turned off for more than 5 minutes and the power indicator turns off, the control power is disconnected before disassembling the driver. Otherwise, the residual voltage may cause electric shock.
Attention	● For online modification, forced output, RUN, STOP, etc., you must read the user's manual and confirm its safety before performing the relevant operations. ● Be sure to disconnect the power before loading and unloading expansion cards, modules, and other components!

When the product is scrapped	
Attention	● Please dispose of them as industrial waste; when disposing of batteries, do so separately according to the ordinances established by each region to avoid property damage or human injury! ● End-of-life products should be treated and recycled in accordance with industrial waste treatment standards to avoid polluting the environment.

Section 2 Product Information

2.1 Introduction of Servo Drive

2.1.1 Nameplate and model description



AD3 R E - 4 R 2 S A - E - S

AD3 Series

Type of machine
R: Standard Servo

Control interface
E: EtherCAT bus control

Rated output current
1R8: 1.8Arms 2R8: 2.8Arms 3R5: 3.5Arms 4R2: 4.2Arms

Capacity Class
S: Standard capacity type
(P note): Capacity enhancement typ

Voltage Rating
A: Single-phase AC220V

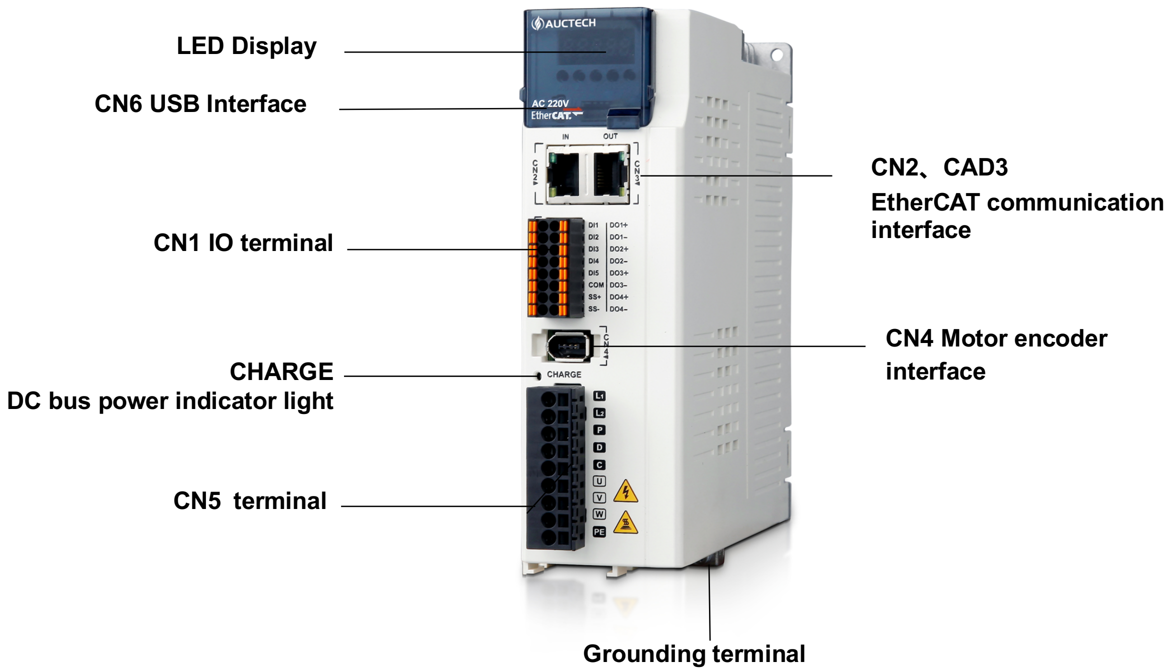
Encoder type
E: Communication type encoder

Manufacturer Definition
None: Standard
S: STO
T000~T999 : Customized

Note: 1) Naming rules used for model number analysis only and cannot used for ordering. Please consult AUCTECH before ordering.

(2) Under the same current capacity, increase the capacitor capacity to have stronger output power, suitable for more frequent current shock occasions.

2.1.2 Drive Composition



Name		Description
CN6 USB commissioning /burn-in interface		Servo commissioning or firmware burn-in interface.
CN2 communication bus input interface		Bus communication, input interface.
CAD3 communication bus output interface		Bus communication, output interface.
CN1 IO terminal		Signal connector for DI, DO, emergency stop, contracting brake etc.
CN4 motor body encoder interface		The encoder input interface of the servo motor body.
CN5 terminal	L1, L2 (power input terminals)	L1, L2 pins for AC220V power supply.
	P, D, C (braking resistor connection terminals)	P, D and C are braking resistor interfaces.
	U, V, W (motor power terminal interface)	Motor power connection terminal
	PE ground terminal	For servo driver body grounding, and servo motor power line grounding.
LED digital tube		8.8.8.8.8 5-bit 8-segment digital tube for displaying operation-related information, parameters, and functions
CHARGE DC bus indicator		The indicator light is on when the DC bus capacitor is charging. Do not touch the powered terminal part of the Servo Drive until the indicator light is completely off, and do not disassemble the Servo Drive.

危险

- CN5 interface has strong electricity, please do protective measures.
- In the default case (using the internal braking resistor), the P and D terminals of the CN5 interface need to short.
- When the DO output connected to a relay, please use a current-continuing diode, and pay attention to its polarity, otherwise it will not output properly or even damage the driver.
- The maximum withstand voltage of DO output is DC30V.
- The maximum continuous current of DO single output is DC 50mA.
- Please use current limiting resistors when connecting the DO circuit to the upper optocoupler signal.
- The COM terminal can only select one of PNP or NPN input methods and cannot mixed.
- The IO signal of CN1 port needs to connect with independent external DC24V.

2.1.3 Servo Drive Specifications

1) Electrical specifications

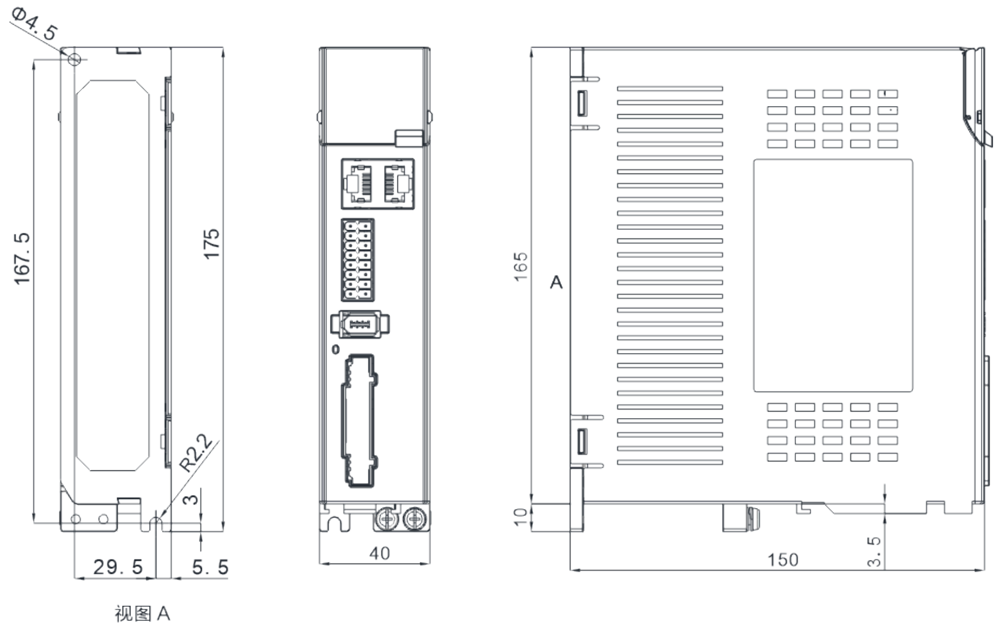
- Servo Drive Specifications

Model	1R8SA	2R8SA	3R5SA	4R2SA
Main power/control power	AC200V~AC240V ；50/60Hz			
Power	200W	400W	600W	750W
Single-phase input current	2.5A	4.1A	5.2A	6.1A
Output rated current	1.8A	2.8A	3.5A	4.2A
Maximum output current	7.2A	9.8A	10.5A	12.6A
Overload factor	400%	350%	300%	300%
IO	5 channels DI; 4 channels DO; 1 channel SS; 1 channel STO (*)			
Built-in braking resistor	×	×	40W, 80Ω	40W, 80Ω
Minimum resistance value of external braking resistor	50Ω	50Ω	50Ω	50Ω
Dimensional information W*H*D (mm)	40*175*150	40*175*150	50*175*150	50*175*150
Size specification	C1	C1	C2	C2

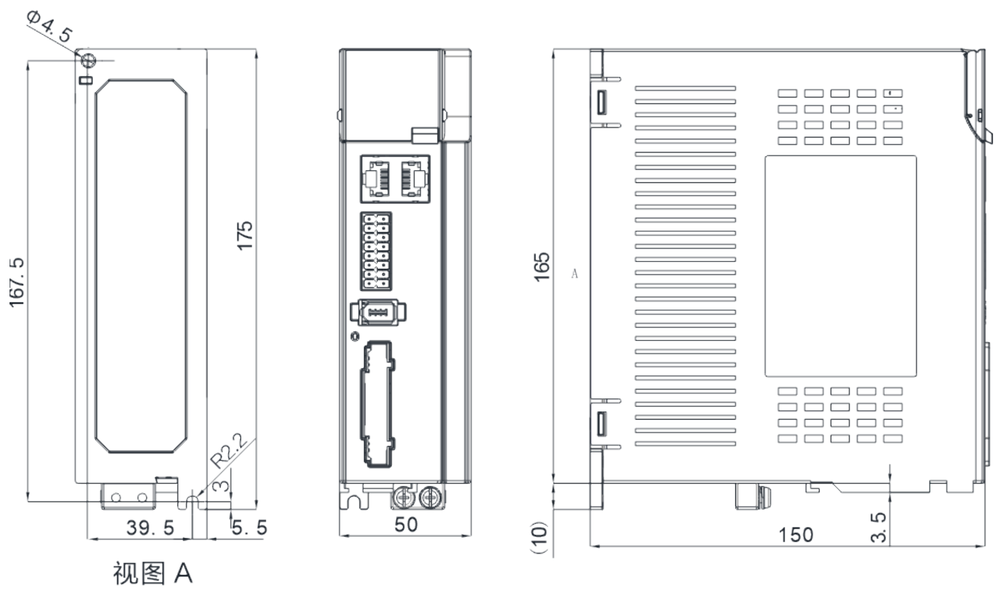
Note: * for custom models

2) Specification size chart

- AC220V class driver C1 specification (size W*H*D: 40*175*150mm)



- AC220V class driver C2 specification (size W*H*D: 50*175*150mm)



3) Basic specifications

<table>
<tr><th colspan="3">Projects</th><th>Description</th></tr>
<tr><td rowspan="14">Basic Specification</td><td colspan="2">Control method</td><td>IGBT PWM control, sine wave current drive mode</td></tr>
<tr><td colspan="2">Encoder feedback</td><td>Communication type encoder: Tamagawa protocol</td></tr>
<tr><td colspan="2" rowspan="5">Control Mode</td><td>Cyclic Synchronous Position Mode (CSP)</td></tr>
<tr><td>Cyclic Synchronous Velocity (CSV) mode</td></tr>
<tr><td>Cyclic Synchronous Torque Mode (CST)</td></tr>
<tr><td>Zero return mode (HM)</td></tr>
<tr><td>CSP/CSV/CST mode switching</td></tr>
<tr><td rowspan="7">Conditions of use</td><td>Operating temperature</td><td>0~45℃</td></tr>
<tr><td>Storage temperature</td><td>-20~65℃</td></tr>
<tr><td>Use/Storage Humidity</td><td>90%RH or less, no dew condensation</td></tr>
<tr><td>Vibration resistance strength</td><td>4.9m/s²</td></tr>
<tr><td>Impact strength</td><td>19.6m/s²</td></tr>
<tr><td>Protection level</td><td>IP20</td></tr>
<tr><td>Altitude</td><td>Below 1000m, above 1000m, 1.1% reduction for every 100m rise
Maximum use altitude is 2000m</td></tr>
<tr><td rowspan="9">Bus Communication</td><td rowspan="9">EtherCAT Slave Station Basic Performance</td><td>Communication protocols</td><td>EtherCAT Protocol</td></tr>
<tr><td>Support Services</td><td>CoE (PDO, SDO)</td></tr>
<tr><td>Synchronization method</td><td>DC-Distributed Clock</td></tr>
<tr><td>Physical Layer</td><td>100BASE-TX</td></tr>
<tr><td>Baud rate</td><td>100Mbit/s</td></tr>
<tr><td>Duplex method</td><td>Full Duplex</td></tr>
<tr><td>Topology</td><td>Circumferential, linear</td></tr>
<tr><td>Transmission medium</td><td>Super Category 5 or higher network cable with shielding</td></tr>
<tr><td>Transmission distance</td><td>Maximum 100m between two nodes (good environment, high quality cables)</td></tr>
<tr><td rowspan="2">IO signals</td><td colspan="2">DI</td><td>Five ways, hardware response 200μs, configurable bus DI or internal functions</td></tr>
<tr><td colspan="2">DO</td><td>4-channel, single-channel maximum withstands voltage DC30V, maximum continuous current DC50mA, configurable as bus DO or holding brake output control, or internal function</td></tr>
<tr><td>Built-in</td><td colspan="2">Overtravel (OT) prevention</td><td>Stop immediately when P-OT forward</td></tr>
</table>

Projects		Description
Function	function	overtravel and N-OT reverse overtravel action
	Protection function	Overcurrent, overvoltage, undervoltage, overload, main circuit detection abnormality, heat sink overheating, overload, overspeed, encoder abnormality, CPU abnormality, parameter abnormality, etc.
	Security Features	Emergency stop function
	LED display function	5-bit 8-segment LED display
	USB communication	Commission, diagnostics, monitoring and firmware burning operations
	Electronic nameplate function	Internal integration of drive and motor IDs for automatic identification of drive and motor information
	Other	Gain adjustment, filter, vibration suppression, probe latching and other functions

2.1.4 Braking energy absorption and braking resistor option calculation

The Servo Drive uses an internal capacitor to absorb the regenerative energy that occurs when the motor decelerates. If the internal capacitor cannot absorb all the regenerative energy, it can be absorbed by the internal braking resistor (note that individual models do not have an internal braking resistor). However, if the regenerative energy generated by the motor is too large, the internal braking resistor will be burned out and the regenerative action will stop, and the bus over-voltage alarm will occur. In this case, please change the operation mode to reduce the regenerative energy or install an external braking resistor to improve the regenerative energy handling capacity.

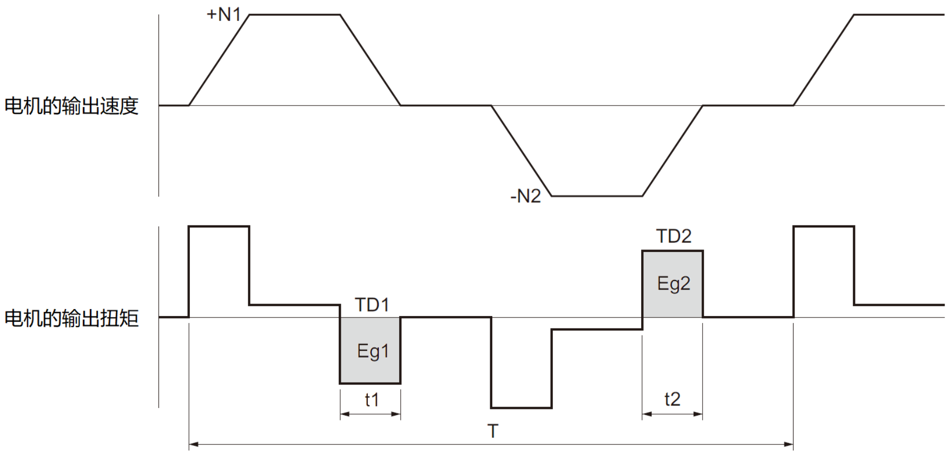
⚠ 注意

- Servo drives of 400W and below models do not have built-in braking resistors, please refer to the drive specification section for details.
- The regenerative absorption capacity of the servo driver varies with the random type.
- Please refer to the following table for the presence or absence of braking resistors inside the servo driver and the capacitor regeneration absorption capacity.

AD3 Regenerative absorption within the drive					
Drive Model	**Built-in braking resistor**	**External brake Resistor resistance value**	**Power**	**Braking resistor model**	**Maximum braking energy that can be absorbed by the driver capacitor Ec(J)**
AD3RE- 1R8SA (200W)	None	50Ω	100W	RXLG-100W 50RJ	20
AD3RE-2R8SA (400W)	None	50Ω	100W	RXLG-100W 50RJ	20
AD3RE-3R5SA (600W)	40W; 80Ω	50Ω	200W	RXLG-200W 50RJ	20
AD3RE-4R2SA (750W)	40W; 80Ω	50Ω	200W	RXLG-200W 50RJ	20

1) Calculation of regenerative energy

- Horizontal axis regeneration energy calculation method



$$Eg1 = \frac{1}{2} \times \frac{2\pi}{60} \times N1 \times TD1 \times t1 \quad [J]$$

$$Eg2 = \frac{1}{2} \times \frac{2\pi}{60} \times N2 \times TD2 \times t2 \quad [J]$$

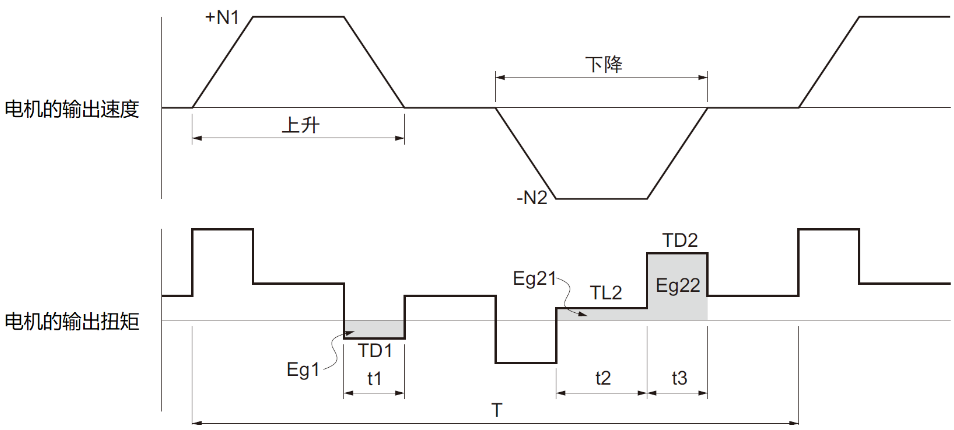
N1, N2: Speed at the start of deceleration (r/min)

TD1, TD2: Deceleration torque (N-m)

t1, t2: Deceleration time (s)

Note: The actual regenerative energy is only about 90% of the above calculated value due to motor coil resistance and drive losses.

- Vertical axis regeneration energy calculation method:



$$Eg1 = \frac{1}{2} \times \frac{2\pi}{60} \times N1 \times TD1 \times t1 \quad [J]$$

$$Eg21 = \frac{2\pi}{60} \times N2 \times TL2 \times t2 \quad [J]$$

$$Eg22 = \frac{1}{2} \times \frac{2\pi}{60} \times N2 \times TD2 \times t3 \quad [J]$$

$$Eg2 = Eg21 + Eg22 \quad [J]$$

N1, N2: Speed at the beginning of deceleration (r/min)

TD1, TD2: Deceleration torque (N-M)

TL2: Torque at descent (N-M)

t1, t3: Deceleration time (s)

t2: uniform running time during descent (s)

Note: The actual regenerative energy is only about 90% of the above calculated value due to motor coil resistance and drive losses.

2) Braking resistor selection

If either Eg1 or Eg2 is lower than the regenerative energy Ec that can be absorbed by the servo driver's internal capacitor, the regenerative energy can be managed by the internal capacitor alone.

If either Eg1 or Eg2 exceeds the regenerative energy Ec that can be absorbed by the capacitor inside the servo drive, a regenerative resistor is required for energy release, and the average regenerative energy Pr(W) of the regenerative resistor can be found by the following formula.

$$\mathrm{Eg} = (\mathrm{Eg1} - \mathrm{Ec}) + (\mathrm{Eg2} - \mathrm{Ec}) \qquad [\mathrm{J}]$$

$$\mathrm{Pr} = \mathrm{Eg} / \mathrm{T} \qquad [\mathrm{W}]$$

Pr: regenerative power that must be absorbed in one cycle of action (in W)

Eg: regenerative energy that must be absorbed in one cycle of action (in J)

Ec: Regenerative energy absorbed by the internal capacitor of the driver (in J)

T: Action cycle time (unit s)

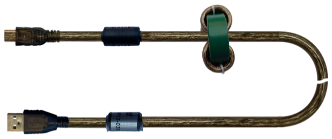
Notes: $\mathrm{Eg1} - \mathrm{Ec} < 0$, calculated as 0. $\mathrm{Eg2} - \mathrm{Ec} < 0$, calculated as 0

2.1.5 Drive Options

1) Commission Software

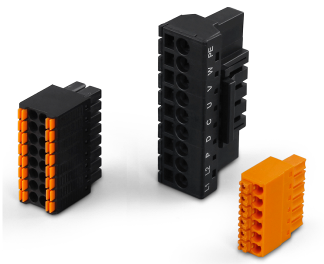
Model	Description
AD-Setup	Servo system commissioning software

2) Commission cables



Model	Description
AD-M13-030	AD3 series Mini USB commission cable 3m with magnetic ring

3) Terminal set

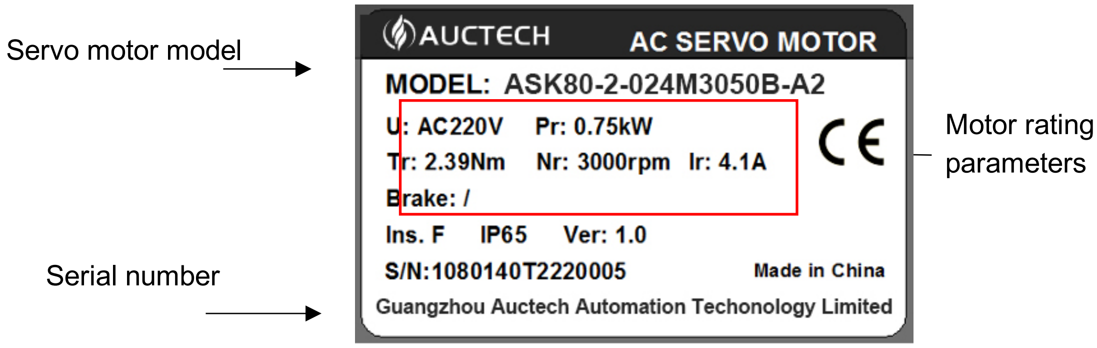


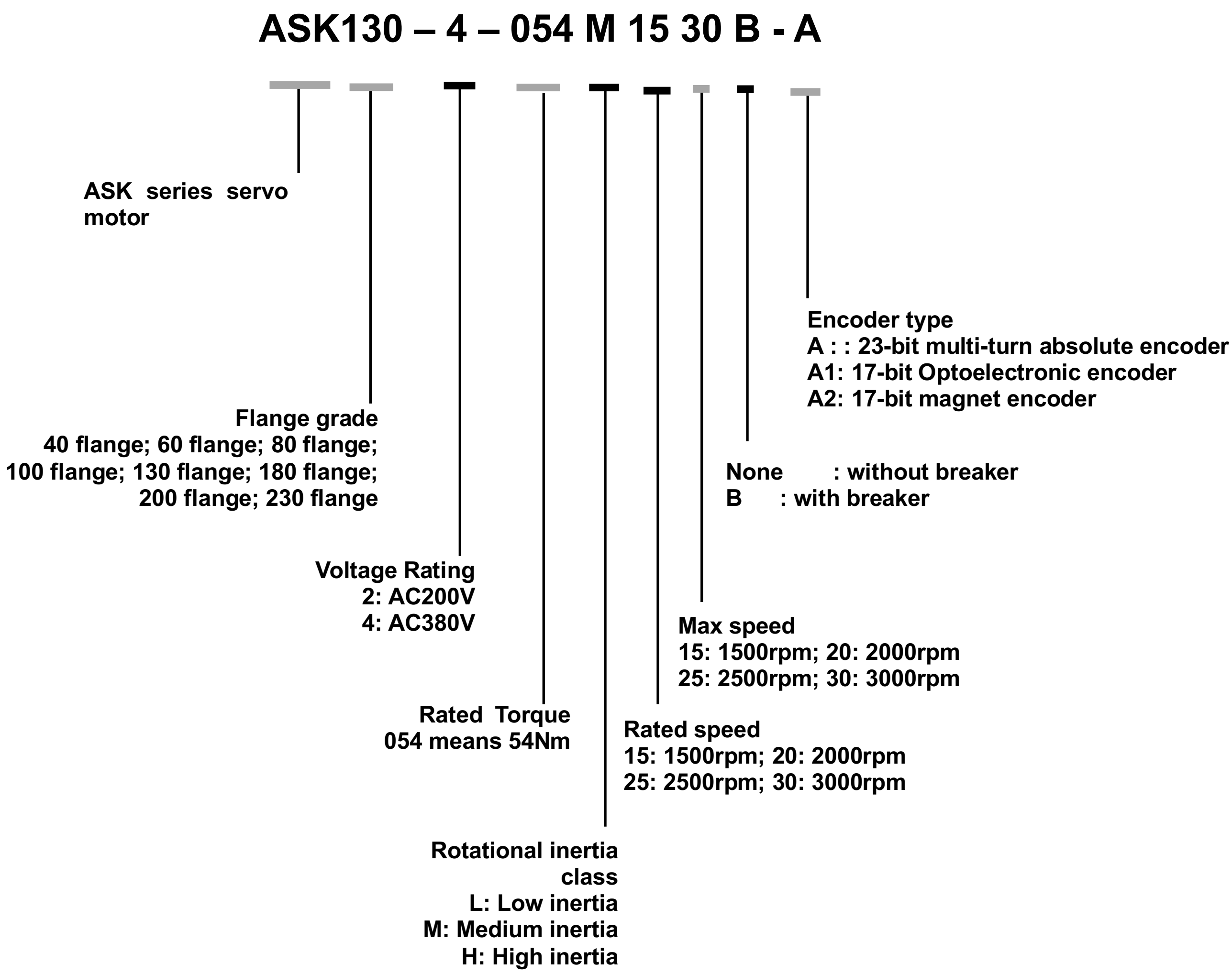
4) Communication network cable

Note: The standard cable lengths are 3m, 5m, 7m, 10m, 15m, 20m, and the rest of the length's cable can be customized according to actual demand.

2.2 Introduction of ASK servo motor

2.2.1 Nameplate and model description





Note: 1) Naming rule used for model number analysis only, and cannot used for ordering, please consult AUCTECH before ordering.

2) With or without oil seal, with or without brake, will cause different motor characteristics, please note.

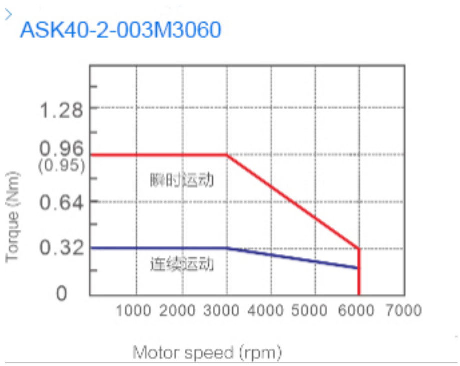
3) Motor data may be changed, please confirm with AUCTECH when using for design purposes.

2.2.2 Motor specifications

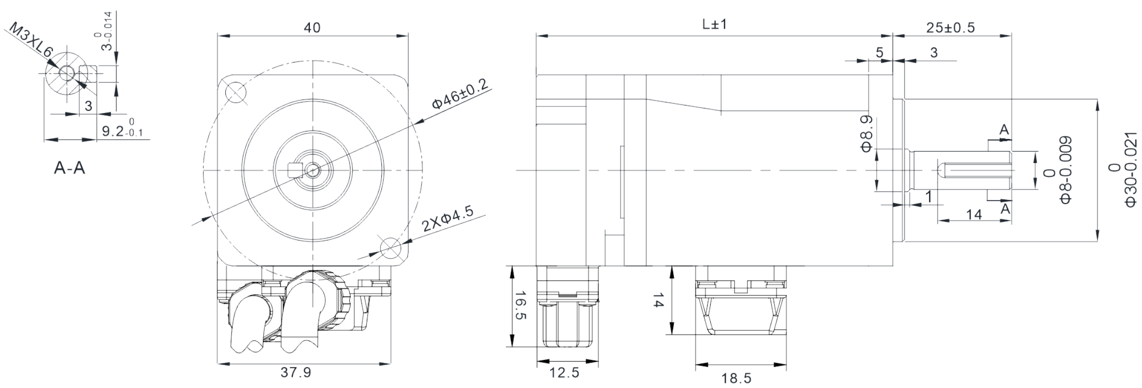
- 40 flange motor data

Motor Model / Projects	ASK40-2-003M3060
Voltage U(AC)	220V
Rated power P(kW)	0.1
Rated current Ir (Arms)	0.92
Rated torque Tr(N-M)	0.32
Rated speed Nr(rpm)	3000
Maximum current Imax (Arms)	2.85
Maximum torque Tmax(N-M)	0.95
Max. speed N-Max(rpm)	6000
Torque coefficient Kt(N-M/A)	0.38
Rotational inertia Jm(10-4kgm2)	0.062 (0.072)
Electrical time constant te(ms)	0.81
Mechanical time constant tm(ms)	1.128
Weight(kg)	0.43 (0.59)
Heat sink size(mm)	Aluminum 200X200X6
Holding voltage Ub (DC)	DC24V
Holding current Ib (A)	0.29
Holding torque Tb(N-M)	≥0.4
Recommended cable cross-sectional area (mm2)	0.5
Recommended driver models	AD3RE-1R8SA-E

- 40 flange torque speed characteristics chart



- 40 flange motor size drawing

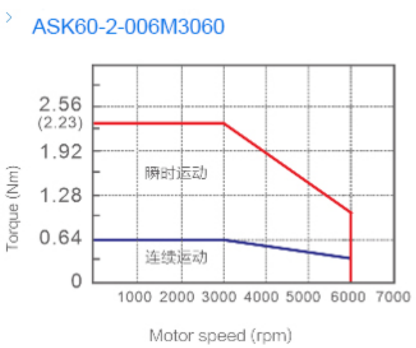


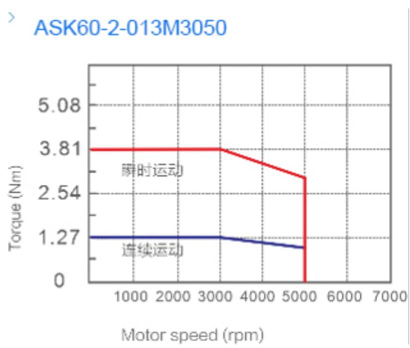
Motor Model	L without holding brake size(mm)	L with holding brake size(mm)
ASK40-2-003M3060A/A1/A2	67.7	95

- 60 flange motor data

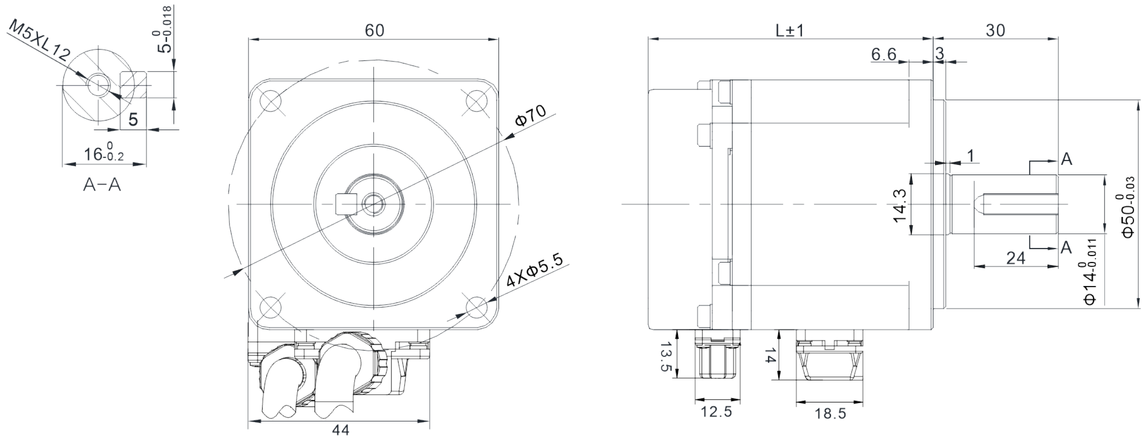
Motor Model / Projects	ASK60-2-006M3060	ASK60-2-013M3050
Voltage U(AC)	220V	
Rated power P(kW)	0.2	0.4
Rated current Ir (Arms)	1.5	2.1
Rated torque Tr(N-M)	0.64	1.27
Rated speed Nr(rpm)	3000	3000
Maximum current Imax (Arms)	5.5	6.5
Maximum torque Tmax(N-M)	2.23	3.81
Max. speed N-Max(rpm)	6000	5000
Torque coefficient Kt(N-M/A)	0.427	0.605
Rotational inertia Jm(10-4kgm2)	0.28 (0.30)	0.56 (0.58)
Electrical time constant te(ms)	2.46	2.11
Mechanical time constant tm(ms)	1.432	1.151
Weight(kg)	0.95(1.35)	1.3 (1.55)
Heat sink size(mm)	Aluminum 250X250X6	
Holding voltage Ub (DC)	DC24V	
Holding current Ib (A)	0.31	
Holding torque Tb (N-M)	≥1.5	
Recommended cable cross-sectional area (mm2)	0.5	0.5
Recommended driver models	AD3RE-1R8SA-E	AD3RE-2R8SA-E

- 60 flange torque speed characteristics chart





- 60 flange motor size drawing



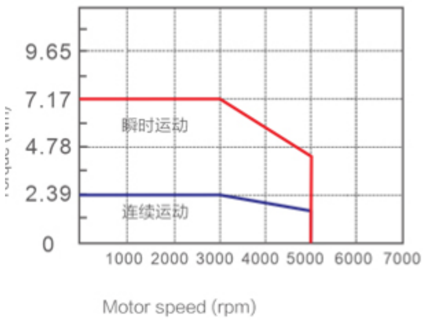
Motor Model	L without holding brake size(mm)	L with holding brake size(mm)
ASK60-2-006M3060A/A1/A2	71.8	101.1
ASK60-2-013M3050A/A1/A2	88.8	118.1

- 80 flange motor data

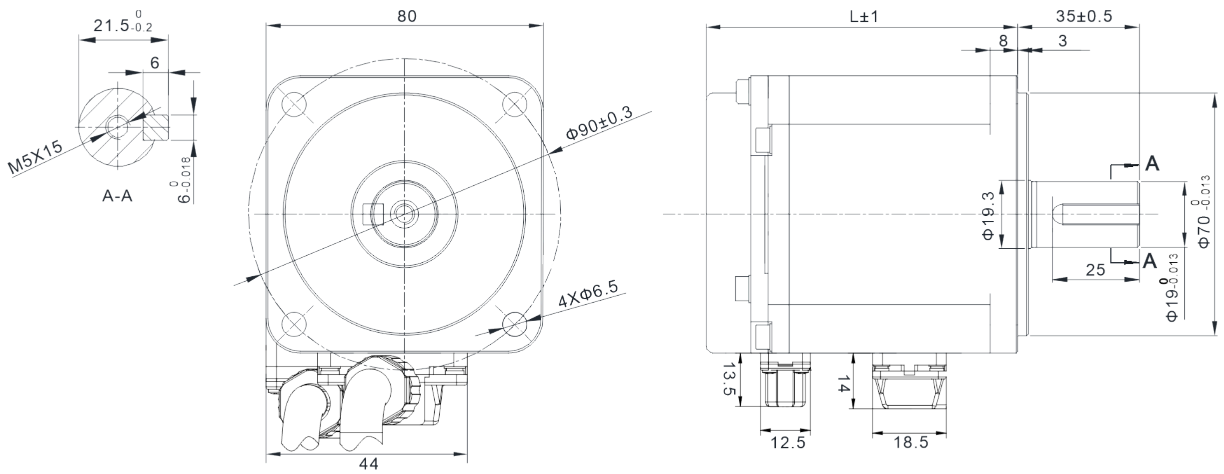
Motor Model / Projects	ASK80-2-024M3050
Voltage U(AC)	220V
Rated power P(kW)	0.75
Rated current Ir (Arms)	4.1
Rated torque Tr(N-M)	2.39
Rated speed Nr(rpm)	3000
Maximum current Imax (Arms)	13.4
Maximum torque Tmax(N-M)	7.17
Max. speed N-Max (rpm)	5000
Torque coefficient Kt (N-M/A)	0.645
Rotational inertia Jm (10-4kgm2)	1.5 (1.65)
Electrical time constant te(ms)	4.71
Mechanical time constant tm(ms)	0.919
Weight(kg)	2.12 (2.7)
Heat sink size(mm)	Aluminum 250X250X6
Holding voltage Ub (DC)	DC24V
Holding current Ib(A)	0.48
Holding torque Tb(N-M)	≥3.2
Recommended cable cross-sectional area (mm2)	0.5
Recommended driver models	AD3RE-4R2SA-E

- 80 flange torque speed characteristics chart

ASK80-2-024M3050B



- 80 flange motor size drawing



Motor Model	L without holding brake size(mm)	L with holding brake size(mm)
ASK80-2-024M3050A/A1/A2	90.9	121.9

2.3 Cables and Options

2.3.1 Power Cables

L M - 0 3 0 - B A 4 - 1 . □

Motor power cables

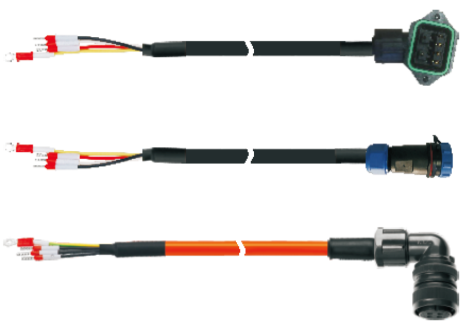
Cable length
Example: 3m = 030
Maximum support 60m = 600

Wire diameter specification
S = 0.5 mm², A = 0.75 mm², B = 1.5 mm².
C = 2.5 mm², D = 4.0 mm², E = 6.0 mm².

Manufacturer Definition
None = drive-side dump type, no connector connected
S = Adapted to AD3 Drive

Wire specifications
0 = PVC plain fixed cable (black)
2 = PVC highly flexible cable (10 million bending cycles)
3 = PUR waterproof, oil, and corrosion resistant flexible cable
4 = PVC fixed cable with shield (black)
5 = PVC with shield high flexibility cable (10 million times bending)

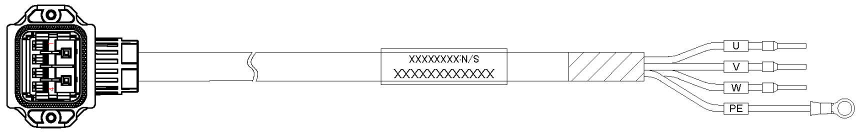
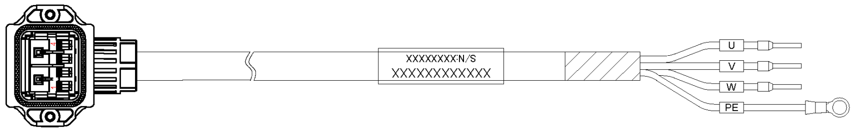
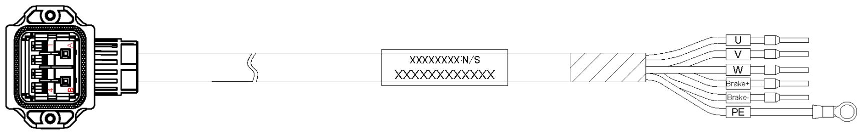
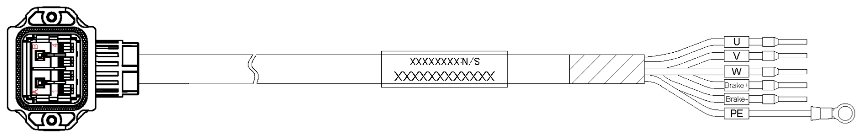
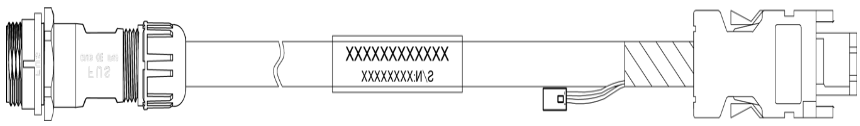
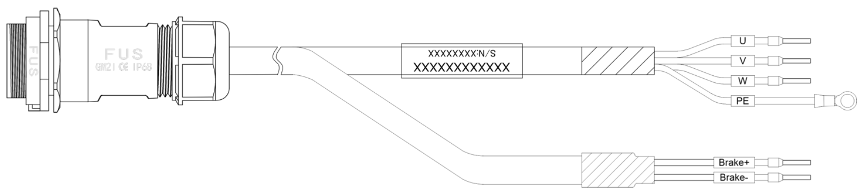
Motor side connector type
AF: For 40/60/80 flange motors without holding brake with plastic shell inline connector front outlet (AB for rear outlet) *
BF: For 40/60/80 flange with holding brake motor with plastic shell inline connector front outlet (AB for rear outlet) *
A2: Plastic housing aerospace connector for 40/60/80 flange motors without holding brake
B2: Plastic-shell aerospace connector for 40/60/80 flange motors with holding brake
A4: Metal aerospace connector for 100/130 flange without holding brake motor
B4: Metal aerospace connector for 100/130 flange with holding brake motor
A7: Metal aerospace connector for 180 flange motors



Motor side connector type	Cable side connector type
AF/AB	SC-MC6S-AE20-01
BF/BB	SC-MC6S-AE20-01
A2	CP-GM1311//S-4B
B2	CE-GM2111/S-6B
A4	CMS3108A20-4SI
B4	CMS3108A20-18SI
A7	YD32-4

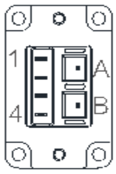
Note: 1) Standard cable lengths are 3m, 5m, 7m, 10m, 15m, 20m, the rest of the lengths need to be customized.

1) Power Cable Specifications

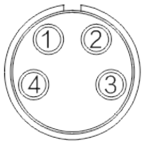
Model	Content
LM-***-SAF-□.	 Connector Type: SC-MC6S-AE20-01 Terminals: E0508(3PCS) +RVS1.25-4(1PCS)
LM-***-SAB-□.S	 Connector Type: SC-MC6S-AE20-01 Terminals: E0508(3PCS) +RVS1.25-4(1PCS)
LM-***-SBF-□.	 Connector Type: SC-MC6S-AE20-01 Terminals: E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SBB-□.S	 Connector Type: SC-MC6S-AE20-01 Terminals: E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SA2-□.S	 Connector Type: CP-GM1311/S-4B Terminals: E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SB2-□.	 Connector Type: CP-GM2111/S-6B Terminals: E0508(5PCS) + RVS1.25-4(1PCS)

2) Power Cable Pin Definition

40/60/80 flange



Pins	1	2	3	4	A	B
Signal	U	V	W	PE	Brake+	Brake-



Pins	1	2	3	4
Signal	V	U	W	PE

Pins	1	2	3	4	5	6
Signal	V	U	W	PE	Brake+	Brake-

2.3.2 Encoder cables

L E - 0 3 0 - 1 P 2 - 1 . □

Motor encoder cables

Cable length
Example: 3m = 030
Maximum support 60m = 600

Encoder specifications
Fill in according to the selected motor encoder type
1: Single-turn absolute (4 cores)
(Used when the encoder is incremental)
4: Multi-turn absolute type (6-cell, with battery dump 2,
without battery)
(Used when the encoder is absolute)

Manufacturer Definition
None = drive-side dump type, no connector connected
S = Adapted to N2 series drives
V = Adapted to AD3 series drives

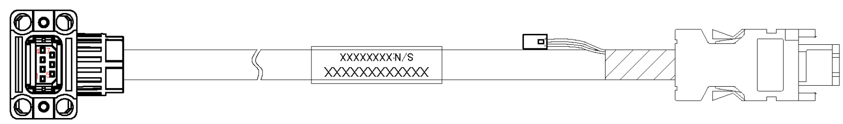
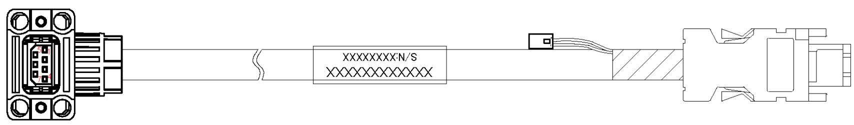
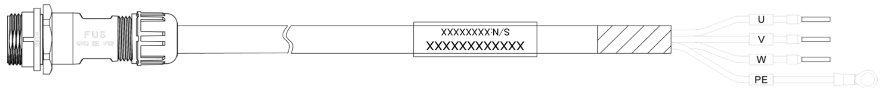
Special Requirements
0 = PVC plain fixed cable (black)
2 = PVC highly flexible cable (10 million bending cycles)
3 = PUR waterproof, oil, and corrosion resistant flexible cable
4 = PVC fixed cable with shield (black)
5 = PVC with shielding layer highly flexible cable (10 million times bending)

Motor side connector type
PF: Plastic housing inline connector front exit for 40/60/80 flange motors (PB for rear exit) *
P2: Plastic shell avionics connector for 40/60/80 flange motors
P4: Metal aerial plug connector for 100/130 flange motors
P6: Metal aerial plug connector for 180/200/230 flange motors

Motor side connector type	Cable side connector type
PF/PB	SC-MC7S-A820-P1
P2	CP-GM1311/S-9
P4	CMS3108A20-29SI
P6	YD28-7

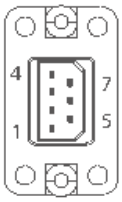
Note: 1) Standard cable lengths are 3m, 5m, 7m, 10m, 15m, 20m, and the remaining lengths need to be customized.
2) Plastic case straight plug adaptable cable length supports up to 40 meters.

1) Encoder cable specifications

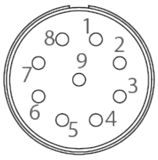
Model	Content
LE-***-4PF-*.V	 Connector Type : SC-MC7S-A820-P1 Connector Type : KSA-1394a6P.01 Battery box leads
LE-***-4PB-*0.V	 Connector Type : SC-MC7S-A820-P1 Connector Type : KSA-1394a6P.01 Battery box leads
LE-***-4P2-□.V	 Connector Type: CP-GM1311/S-9 Connector Type:KSA-1394a6P.01 Battery box leads

2) Encoder Cable Pin Definition

40/60/80 flange

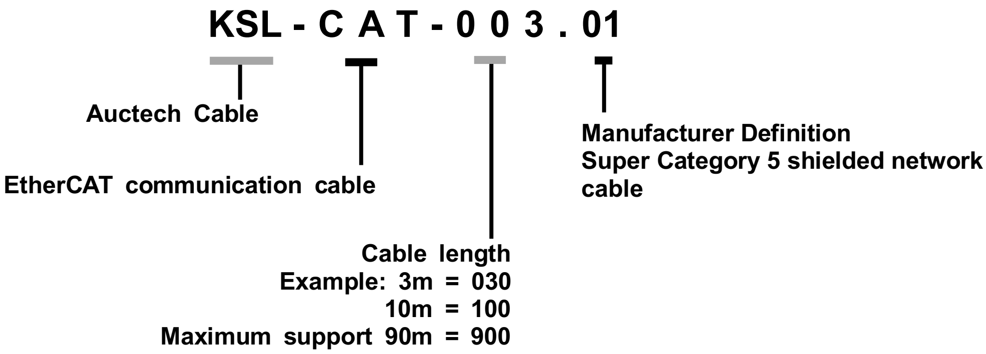


Pins	1	2	3	4	5	6	7
Signal	PE	5V	0V	SD+	SD-	BAT+	BAT-

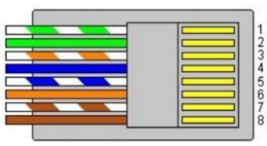


Pins	1	2	3	6	7	8	9
Signal	SD+	SD-	BAT+	5V	0V	BAT-	PE

2.3.3 Communication cables

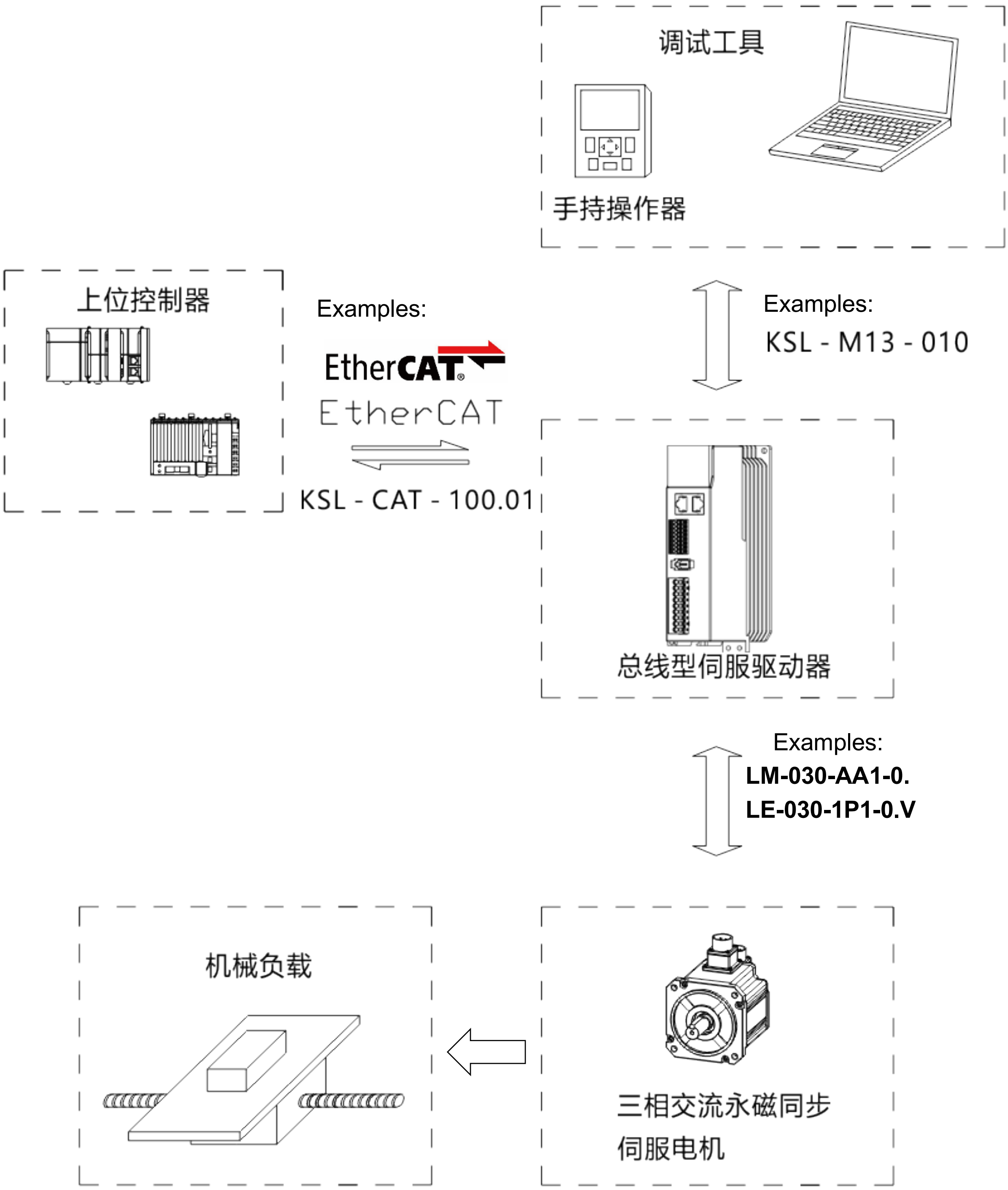


1) Bus communication cable pin definition



Pins	1	2	3	4	5	6	7	8	Housing
Signal	TD+	TD-	RD+	/	/	RD-	/	/	Shielding

2.4 Servo system composition



2.5 Recommended model comparison table

<table>
<tr><th colspan="2">Motor</th><th colspan="2">Wires and Cables</th><th>AD3 drive</th></tr>
<tr><th>Flange</th><th>Motor Model</th><th>Power cable type</th><th>Encoder cable type</th><th>Drive Model</th></tr>
<tr><td rowspan="4">40</td><td>ASK40-2-003M3060</td><td>LM-□□□□□-SAF/SAB-□.</td><td rowspan="2">LE-□□□□□-4PF/4PB-□.V</td><td rowspan="2">AD3RE-1R8SA-E</td></tr>
<tr><td>ASK40-2-003M3060B</td><td>LM-□□□□□-SBF/SBB-□.S</td></tr>
<tr><td>ASK40-2-003M3060</td><td>LM-□□□□□-SA2-□.</td><td rowspan="2">LE-□□□□□-4P2-□.V</td><td rowspan="2">AD3RE-1R8SA-E</td></tr>
<tr><td>ASK40-2-003M3060B</td><td>LM-□□□□□-SB2-□.</td></tr>
<tr><td rowspan="8">60</td><td>ASK60-2-006M3060</td><td>LM-□□□□□-SAF/SAB-□.</td><td rowspan="2">LE-□□□□□-4PF/4PB-□.V</td><td rowspan="2">AD3RE-1R8SA-E</td></tr>
<tr><td>ASK60-2-006M3060B</td><td>LM-□□□□□-SBF/SBB-□.S</td></tr>
<tr><td>ASK60-2-013M3050</td><td>LM-□□□□□-SAF/SAB-□.</td><td rowspan="2">LE-□□□□□-4PF/4PB-□.V</td><td rowspan="2">AD3RE-2R8SA-E</td></tr>
<tr><td>ASK60-2-013M3050B</td><td>LM-□□□□□-SBF/SBB-□.S</td></tr>
<tr><td>ASK60-2-006M3060</td><td>LM-□□□□□-SA2-□.</td><td rowspan="2">LE-□□□□□-4P2-□.V</td><td rowspan="2">AD3RE-1R8SA-E</td></tr>
<tr><td>ASK60-2-006M3060B</td><td>LM-□□□□□-SB2-□.</td></tr>
<tr><td>ASK60-2-013M3050</td><td>LM-□□□□□-SA2-□.</td><td rowspan="2">LE-□□□□□-4P2-□.V</td><td rowspan="2">AD3RE-2R8SA-E</td></tr>
<tr><td>ASK60-2-013M3050B</td><td>LM-□□□□□-SB2-□.</td></tr>
<tr><td rowspan="4">80</td><td>ASK80-2-024M3050</td><td>LM-□□□□□-SAF/SAB-□.</td><td rowspan="2">LE-□□□□□-4PF/4PB-□.V</td><td rowspan="2">AD3RE-4R2SA-E</td></tr>
<tr><td>ASK80-2-024M3050B</td><td>LM-□□□□□-SBF/SBB-□.S</td></tr>
<tr><td>ASK80-2-024M3050</td><td>LM-□□□□□-SA2-□.</td><td rowspan="2">LE-□□□□□-4P2-□.V</td><td rowspan="2">AD3RE-4R2SA-E</td></tr>
<tr><td>ASK80-2-024M3050B</td><td>LM-□□□□□-SB2-□.</td></tr>
</table>

Section 3 Installation Instructions

3.1 Installation of Servo Drive

3.1.1 Installation site

- Please install in a mounting cabinet that is free from sun and rain.
- Do not use in an environment with corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, salts, etc.,
- Use of this product near combustible materials, etc.
- Do not install in high temperature, humid, dusty or metal dusty environments;
- Vibration-free sites;
- Installation site pollution level: PD2.

3.1.2 Installation Environment

Projects	Description
Operating ambient temperature	0 ~ +45°C (no freezing)
Operating ambient humidity	Below 90%RH (no condensation)
Storage temperature	-20~65℃ (no freezing)
Storage humidity	Below 90%RH (no condensation)
Vibration	Below 4.9m/s2
Impact	Below 19.6m/s2
Protection level	IP20
Elevation	1000m or less (above 1000m, 1.1% reduction for every 100m of elevation, maximum use poster 2000m)

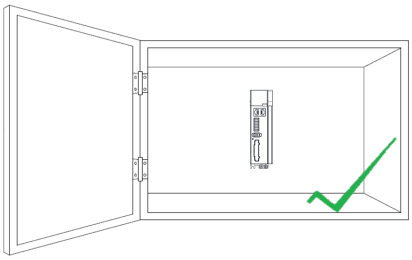
3.1.3 Installation Notes

- Make sure the mounting direction is perpendicular to the wall. Use natural convection or fan to cool the Servo Drive. By 2~4 places (depending on

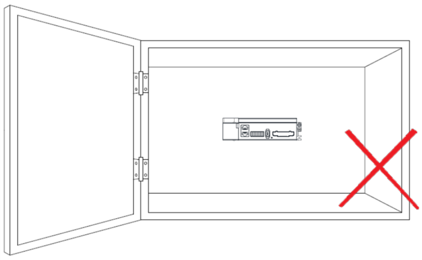
The number of mounting holes varies by capacity) mounting holes to securely fix the servo drive to the mounting surface.

When mounting the Servo Drive, face the operator with the front of the Servo Drive facing the wall and make it perpendicular to the wall.

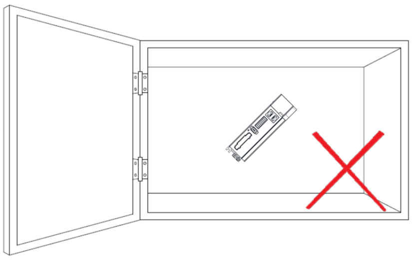
Vertical installation



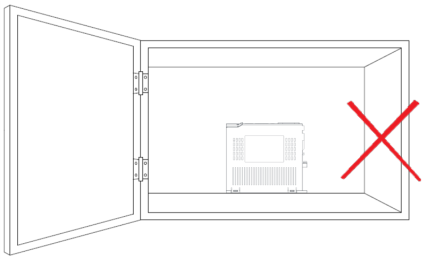
Horizontal installation



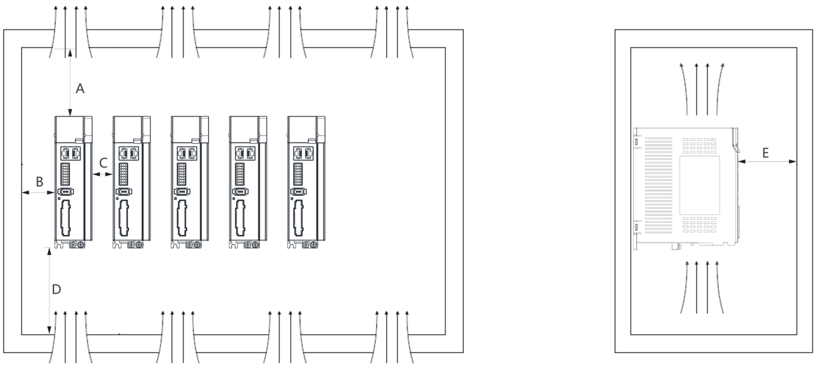
Tilt Mount



Flush mounting



- Cooling To ensure cooling by fan and natural convection, please refer to the following diagram and leave enough space around the servo drive. Please install a fan for cooling on the upper part of the servo driver in order not to make the ambient temperature of the servo driver too high locally. Please keep the temperature inside the electric cabinet even.



Note: Product specifications A size>120mm,B size>50mm,C size>30mm,D/E size>120mm

- Side-by-side installation.

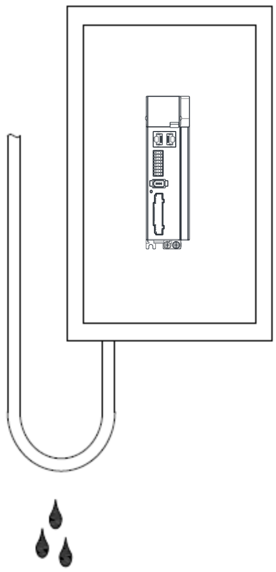
When the lateral sides are recommended to leave more than 30mm spacing on each side (V1 specifications, no fan structure, using the side heatsink for heat dissipation, so a clearance of 30mm must be left). Between the first and last two drives and the side of the cabinet, leave at least 50 mm clearance.

- Grounding.

Be sure to ground the ground terminal, otherwise there may be a risk of electric shock or interference that may cause a false operation.

- Alignment requirements.

When wiring the drive, be careful to avoid having liquid adhere to the surface of the cable in the field, which could cause liquid to flow inside the drive along the cable.



3.2 Installation of servo motor

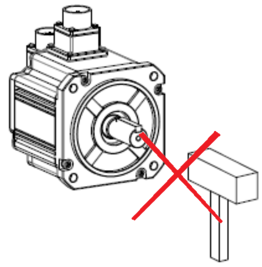
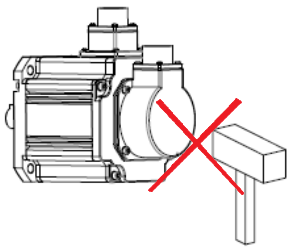
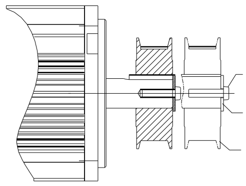
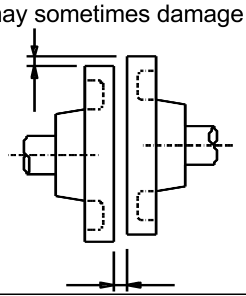
3.2.1 Installation site

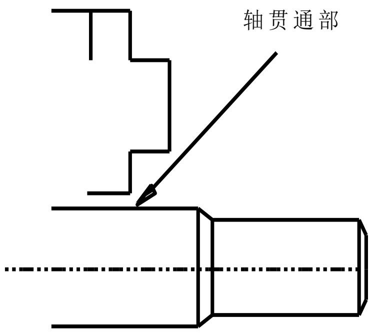
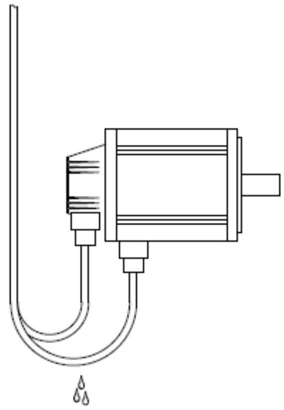
- Do not use this product in the vicinity of corrosive and flammable gas environments such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, salts, and combustible materials.
- Please choose the model with oil seal in the place where there are grinding fluid, oil mist, iron powder, cutting, etc.;
- Places away from heat sources such as fireplaces;
- Do not use the motor in an enclosed environment. Enclosed environments can cause high motor temperatures; shortening the life of the motor.

3.2.2 Installation Environment

Projects	Description
Operating ambient temperature	0~40℃ (no freezing)
Use of environmental humidity	20%~90%RH (no condensation)
Storage temperature	-20℃ ~60℃ (maximum temperature guarantee: 80℃ for 72 hours)
Storage humidity	20%~90%RH (no condensation)
Vibration	Below 49m/s2
Impact	Below 490m/s2
Protection level	H1, H4: IP65 (except for the shaft penetration part and the motor connector connection terminal part) Other: IP67 (except for the shaft penetration part and the motor connector connection terminal part)
Elevation	Below 1000m, above 1000m, please reduce the amount of use.

3.2.3 Installation Notes

Projects	Description
Anti-rust treatment	◆ Before installation, wipe off the "rust inhibitor" on the shaft extension of the servo motor and then do the relevant rust prevention treatment.
Note on encoders	◆ It is forbidden to hit the shaft extension and the encoder shield during installation, otherwise it will cause the encoder glass optical code disc to break.   ◆ When mounting a pulley on a servo motor shaft with a keyway, use a screw hole in the shaft end. ◆ To install the pulley, first insert the double-headed nail into the screw hole of the shaft, then use the washer on the surface of the coupling end and gradually lock it in with the nut Pulley.  Screws Gasket Flange couplings, pulleys, etc. ◆ For servo motor shafts with keyways, use screw holes in the shaft end; for shafts without keyways, use friction coupling or similar methods. ◆ When dismantling the pulley, a pulley remover is used to prevent the bearing from being strongly impacted by the load. ◆ To ensure safety, install a protective cover or similar device, such as a pulley mounted on the shaft, over the rotating area. ◆ When connecting to the machine, use a coupling and keep the axis of the servo motor in a straight line with the axis of the machine. Install the servo motor so that it meets the centering accuracy requirements shown in the figure on the left. If the centering is not sufficient, vibration will occur and may sometimes damage the bearings and encoder, etc.  measured at four locations around the entire circumference of the circle. The difference between the maximum value and the minimum value is guaranteed to be less than 0.03mm
Installation direction	◆ The servo motor can be mounted in horizontal or vertical direction.

Oil and water countermeasures	◆ Do not use ordinary servo motors or cables immersed in oil or water. ◆ When used in places where water, oil or condensation are present, special treatment of the motor is required to meet the protection requirements; however, the motor needs to be shipped from the factory to meet the protection requirements for the shaft through section, and the motor type with oil seal should be specified. (The shaft through section is the clearance of the shaft protruding from the end of the motor) ◆ In applications where liquids are present, install the motor wiring ports facing down (as shown below) to prevent liquids from flowing down the cable to the motor body.   ◆ If you are using a servo motor with an oil seal in a place where oil drips onto the shaft penetration part, please specify the servo motor with an oil seal. Use of servo motors with oil seals Conditions of use: ◆ Ensure that the oil level is below the lip of the oil seal when in use. ◆ When mounting the servo motor vertically upward, do not allow oil to accumulate on the lip of the oil seal.
Cable Tension	◆ Connecting the cable bending radius should not be too small, but also should not apply too much tension on the cable. In particular, the core wire diameter of the encoder signal cable is usually only 0.2 ~ 0.3mm, the wiring should not be tensioned too tightly to prevent the cable core from tearing.

Section 4 Wiring

4.1 General wiring diagram and port introduction

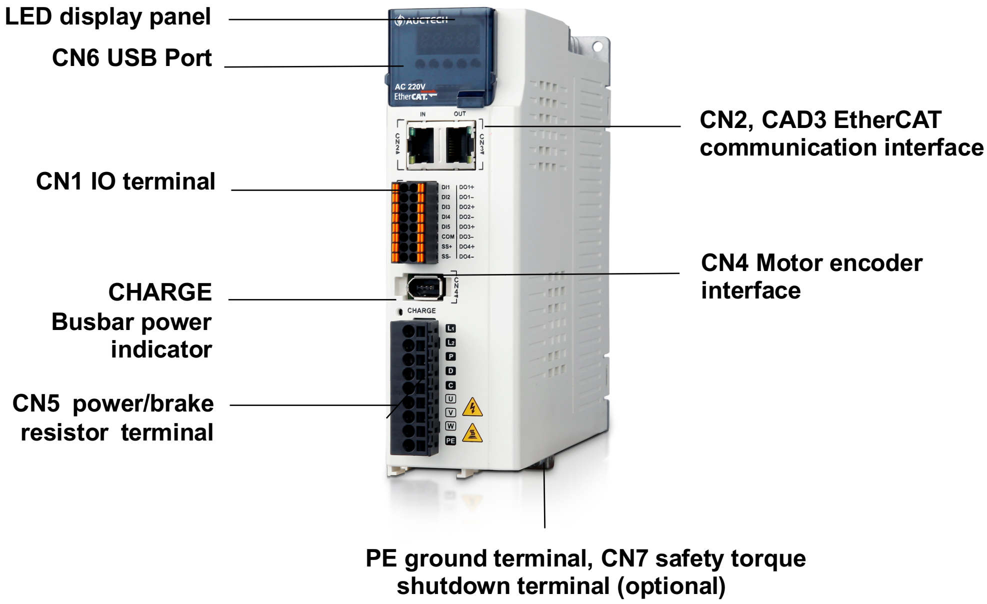


Figure 4.1.1 - Drive terminals layout

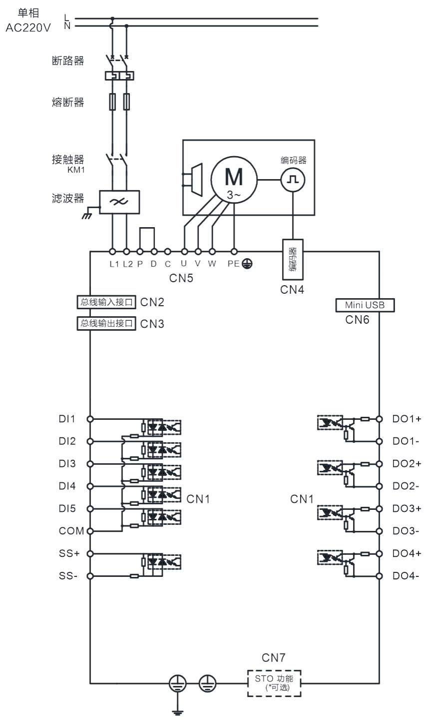


Figure 4.1.2 - General Wiring Diagram

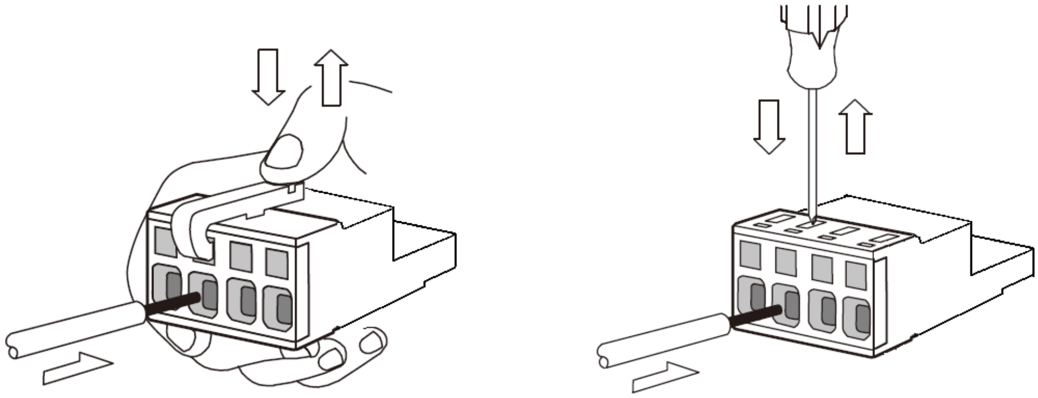
4.1.1 Definition and explanation of terminals

AC220V class C1, C2 specifications driver terminal definition.
Includes 1R8SA/2R8SA/3R5SA/4R2SA models.

Terminal number	Marker	Name	Function
CN6	USB	USB communication interface	Computer commissioning communication port.
CN2	IN	EtherCAT communication IN	EtherCAT communication In.
CAD3	OUT	EtherCAT communication OUT	EtherCAT communication Out.
CN1	IO	IO signals	DI\DO\SS and other functions.
CN4	Encoder	Master encoder feedback interface	Servo motor body encoder input.
CN5	L1, L2	Power input terminal	L1/L2 is the control power input, which needs to be connected to single-phase AC220V power supply.
	P, D, C	Braking resistor terminal	By default, P and D are shorted using the shorting tabs, and the braking resistor inside the drive is used for braking energy absorption. When the external braking resistor is needed, the short connection between P and D should be removed and the external braking resistor should be connected to P and C.
	U, V, W	Motor power output terminal	Motor power cable interface.
	PE	PE ground terminal	For servo driver body grounding, and servo motor power line grounding.
CN7	STO	Safe torque shutdown terminal	STO function (Only drive versions with security features have this port.)
PE	⏚	Grounding	Motor ground, drive ground.

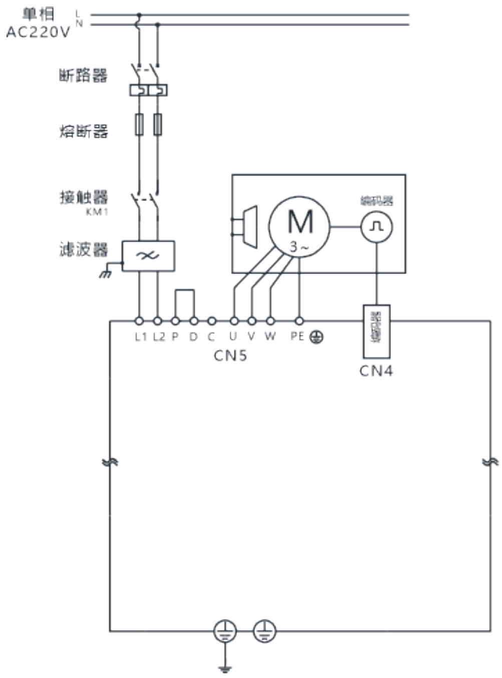
Table 4.1.1 - AC220V drive C1/C2 specification terminal definition

4.1.2 Wiring tool use

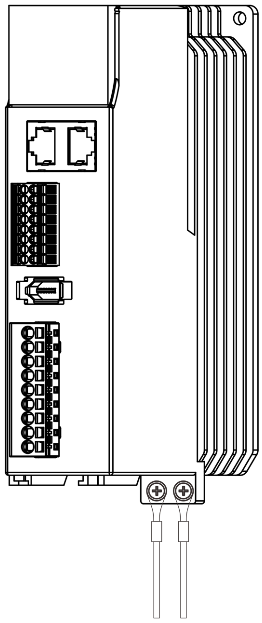


4.2 Servo drive main circuit and control circuit connection

4.2.1 Main circuit connection AC220V class C1/C2 specifications



4.2.2 System grounding



Drive Motor

⚠ 危险

- To prevent electric shock, be sure to ground the servo driver and servo motor.
- According to the relevant standards for electrical equipment, Class D grounding (grounding resistance below 100Ω) is used for 200V level, and 400V level
- Class C grounding (grounding resistance of 10Ω or less)
- Use a cable with a wire diameter above the applicable wire size, and keep it as short as possible.
- When using multiple drives, do not ground in series, as this will cause misoperation of the drive and surrounding control equipment.

4.2.3 System Wiring

AD3 drive input main circuit recommended wire size

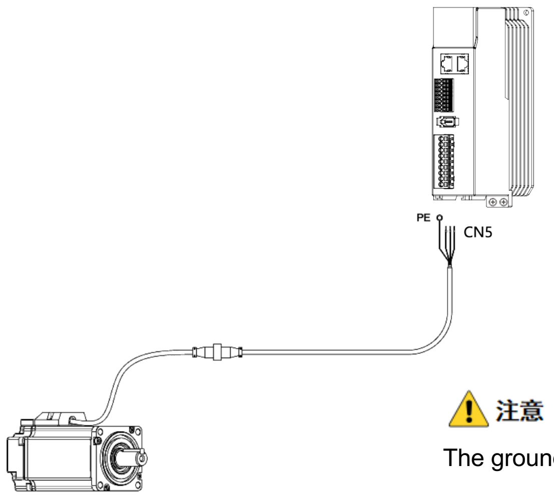
Size specification	Model	Rated input current	L1、L2 recommended wiring specifications		PE grounding	
			mm²	**AWG**	**mm²**	**AWG**
C1	1R8SA	2.5A	0.3	22	0.75	18
C1	2R8SA	4.1A	0.3	22	0.75	18
C2	3R5SA	5.2A	0.3	22	0.75	18
C2	4R2SA	6.1A	0.3	22	0.75	18

4.3 Servo drive and ASK series servo motor power connection

4.3.1 Drive and AC220V ASK motor recommended model comparison table

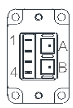
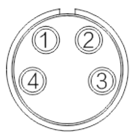
ASK Motor Model	AD3 drive model	Motor UVW Recommended Wiring Specifications		Motor PE Recommended Wiring Specifications		Recommended grips Wiring specifications	
		mm²	AWG	mm²	AWG	mm²	AWG
ASK40-2-003M3060	AD3RE-1R8SA	0.5	20	0.5	20	0.5	20
ASK60-2-006M3060	AD3RE-1R8SA	0.5	20	0.5	20	0.5	20
ASK60-2-013M3050	AD3RE-2R8SA	0.5	20	0.5	20	0.5	20
ASK80-2-024M3050	AD3RE-4R2SA	0.5	20	0.5	20	0.5	20

4.3.2 Power connection of servo motor without holding device

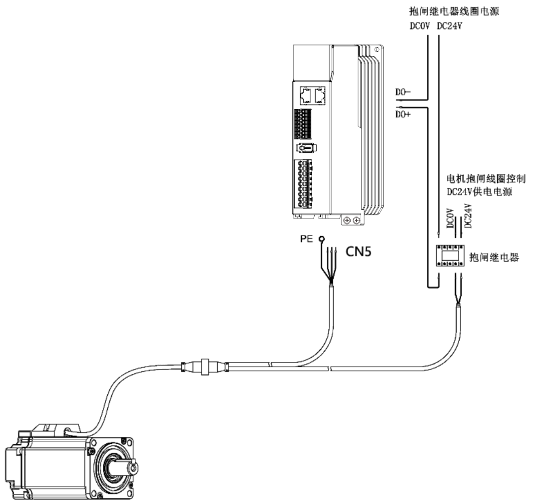


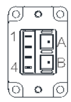
⚠ 注意

The ground wire must be firmly connected!

Connector Drawing	Adapted motor frame	Terminal Pin Definition
	Plastic housing inline connectors for ASK series 40 flange motor, 60 flange motor, 80 flange motor.	 端子符号: 1, 2, 3, 4, A, B 信号: U, V, W, PE, Brake-, Brake+
	Plastic housing aerial plug connector for ASK series 40 flange motor, 60 flange motor, 80 flange motor.	 端子符号: 1, 2, 3, 4 信号: V, U, W, PE

4.3.3 Power connection of servo motor with holding device



Connector Drawing	Adapted motor frame	Terminal Pin Definition
	Plastic housing inline connectors for ASK series 40 flange motor 60 flange motor 80 flange motor	 端子符号 1 2 3 4 A B 信号 U V W PE Brake− Brake+
	Plastic housing aerial plug connector for ASK series 40 flange motor 60 flange motor 80 flange motor	 端子符号 1 2 3 4 5 6 信号 V U W PE Brake+ Brake−

4.4 Servo drive and servo motor encoder connection

The encoder cable must be twisted shielded

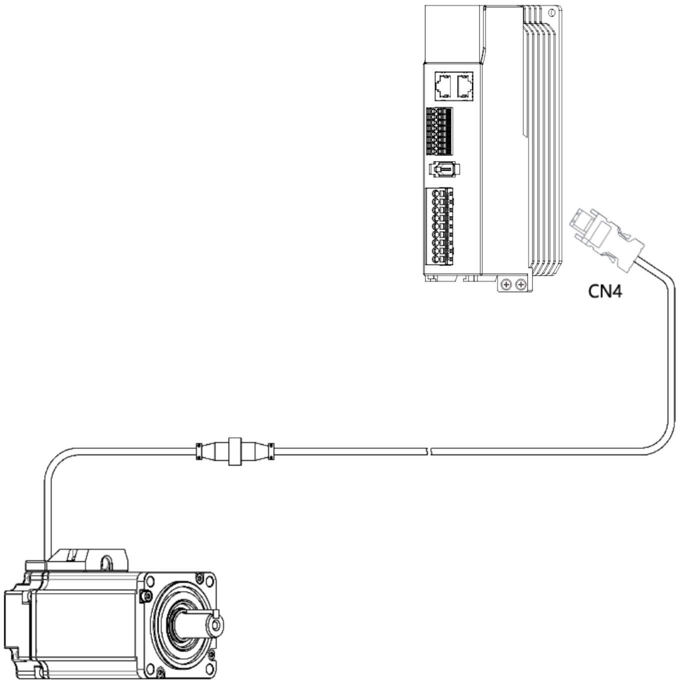
Table 4.4 - Recommended Cable Information

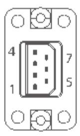
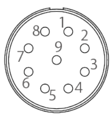
Wire diameter size	Ω/km	Theoretical allowable cable length
26 AWG (0.13mm²)	143	10
25 AWG (0.15mm²)	89.4	16
24 AWG (0.21mm²)	79.6	18
23 AWG (0.26mm²)	68.5	20
22 AWG (0.32mm²)	54.3	25

注意

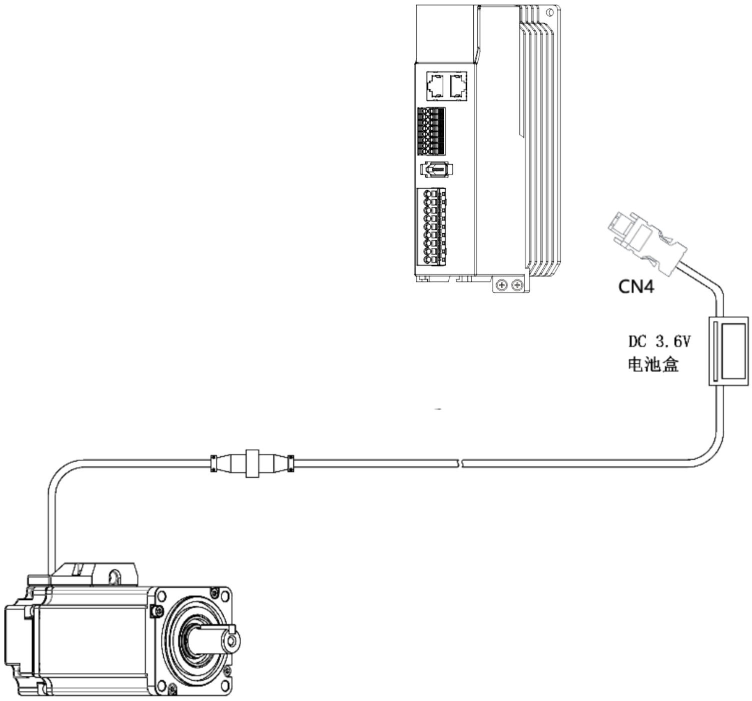
The above table shows the values in the ideal environment. In actual use, the quality of wire, wiring standards, interference, laying environment, connector quality, crimp (solder) quality and other factors should be considered. If the cable length is longer than 20m, please confirm with our technical staff.

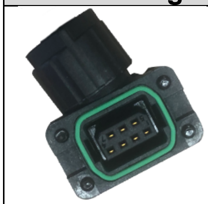
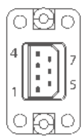
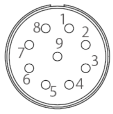
4.4.1 Connection of bus-type incremental encoders



Connector Drawing	Adapted motor frame	Terminal Pin Definition
	Plastic Housing In-line Connectors for ASK Series 40 flange motor 60 flange motor 80 flange motor	 端子符号 1 2 3 4 5 6 7 信号 PE 5V 0V SD+ SD− BAT+ BAT−
	Plastic housing aerial plug connector for ASK series 40 flange motor 60 flange motor 80 flange motor	 端子符号 1 2 3 6 7 8 9 信号 SD+ SD− BAT+ 5V 0V BAT− PE

4.4.2 Connection of bus type absolute encoders



Connector Drawing	Adapted motor frame	Terminal Pin Definition
	Plastic housing inline connectors for ASK series 40 flange motor, 60 flange motor, 80 flange motor.	 端子符号 1 2 3 4 5 6 7 信号 PE 5V 0V SD+ SD- BAT+ BAT-
	Plastic housing aerial plug connector for ASK series 40 flange motor, 60 flange motor, 80 flange motor.	 端子符号 1 2 3 6 7 8 9 信号 SD+ SD- BAT+ 5V 0V BAT- PE

BAT+ Absolute Battery Positive
BAT- Absolute battery negative

4.4.3 Encoder battery information and precautions

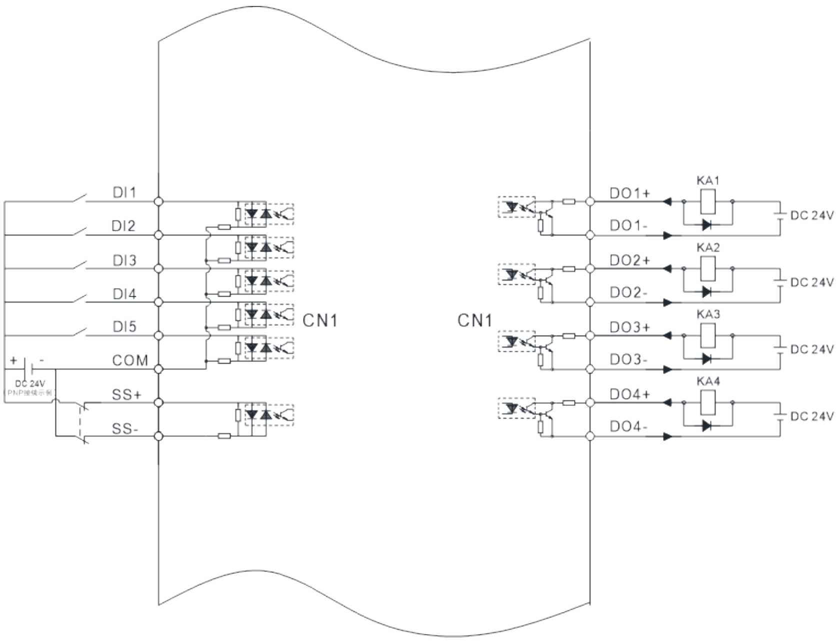
After a long time, use of the battery has the risk of leakage, it is recommended to replace the battery every 2 years. If you use the battery incorrectly, it may happen that the battery leaks and corrodes the components, or cause the battery to explode and other dangerous situations, so please make sure to observe the following:

- Connect the positive and negative terminals of the battery correctly and pay attention to its + and - direction when putting it into the battery box.
- If the battery used for a long time or has been disposed of in the machine, there may be battery leakage and other situations, which will not only corrode the surrounding parts, but also corrode the surrounding parts.
- And because it is conductive, there is a risk of short circuit. Solid please replace it regularly (reference period: recommended to replace it every two years).
- It is forbidden to disassemble the battery to prevent the electrolyte from flying out and affecting personal safety.
- It is forbidden to put the battery into fire or use it in a high temperature environment. If the battery is subjected to continuous heating, the risk of explosion may arise.
- Do not short-circuit the battery, the battery positive and negative short-circuit may cause fire, explosion and other hazards.
- This battery is a disposable lithium battery, please do not charge, otherwise it may cause leakage, explosion and other risks.
- After replacement, please dispose of the discarded batteries according to local regulations.

Table 4.4.3 - Encoder Battery Information Description

Battery specifications	Projects and Units	Rating		
		Minimum value	Typical values	Maximum value
Output: DC3.6V 2700mAh Battery specification: ER14505H	Battery Voltage(V)	3.2	3.6	5
	Battery alarm voltage (V)	2.6		
	Battery fault voltage (V)	2.85	3	3.2
	Battery use environment(℃)	0	/	40

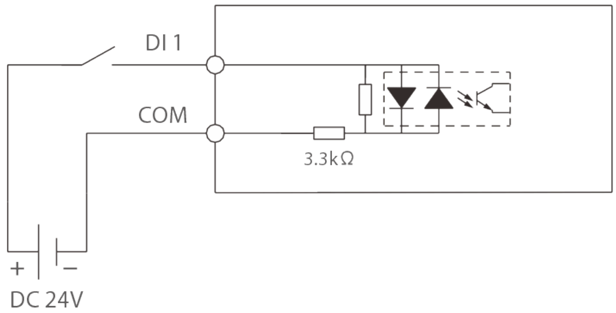
4.5 Drive CN1 terminal IO connection



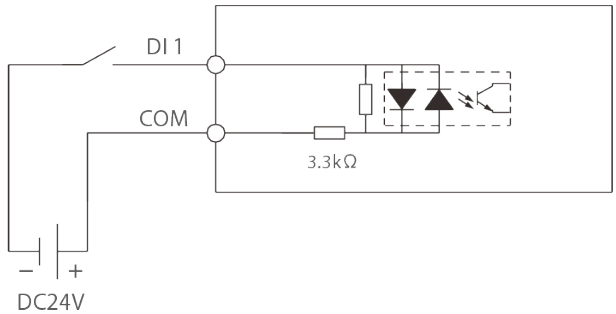
4.5.1 Digital input

Pins		Default Function	Explanation	Remarks
CN1	DI1	Positive motion prohibition (POT)	Feedback the status of this DI channel to the upper controller via the bus	Bus Mapping Address 60FD.20
	DI2	Reverse motion prohibition (NOT)	Feedback the status of this DI channel to the upper controller via the bus	Bus Mapping Address 60FD.21
	DI3	Return to zero proximity switch	Feedback the status of this DI channel to the upper controller via the bus	Bus Mapping Address 60FD.22
	DI4	Bus IO input NO	Feedback the status of this DI channel to the upper controller via the bus	Bus Mapping Address 60FD.23
	DI5	Bus IO input NO	Feedback the status of this DI channel to the upper controller via the bus	Bus Mapping Address 60FD.24

1) PNP signal input wiring when using external DC24V power supply



2) NPN signal input wiring when using external DC24V power supply



注意

PNP and NPN signals must not be mixed at the same time!

4.5.2 Digital output

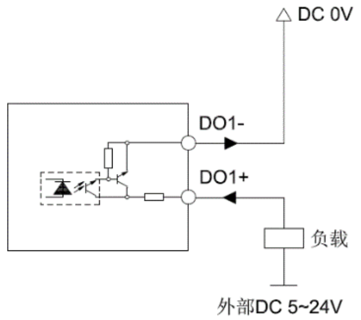
Pins		Default Function	Explanation	Remarks
CN1	DO1	Bus IO output NO	The upper controller controls the output status of this DO channel via the bus.	Bus Mapping Address 60FE:01.16
	DO2	Bus IO output NO	The upper controller controls the output status of this DO channel via the bus.	Bus mapping address 60FE:01.17
	DO3	Bus IO output NO	The upper controller controls the output status of this DO channel via the bus.	Bus mapping address 60FE:01.18
	DO4	Bus IO output NO	The upper controller controls the output status of this DO channel via the bus.	Bus mapping address 60FE:01.19

注意

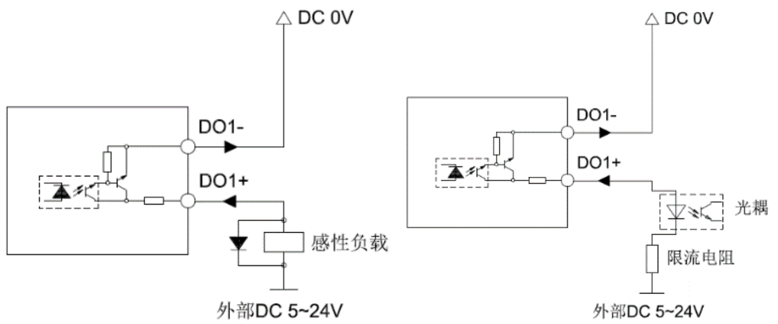
DO maximum withstand voltage of DC 30V
DO single output current up to DC 50mA.

The following is an example of DO1 to illustrate the wiring and usage of DO, DO2 wiring and usage are the same as DO1.

1) Use common load access DO



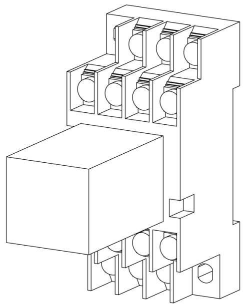
2) When using inductive loads to connect to DO, please use a current-continuing diode and pay attention to its polarity

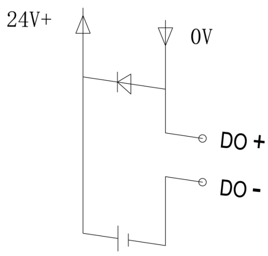


3) When using an optocoupler to connect to the DO, a current limiting resistor should be put in series in the circuit
4) Use of Continuity Diodes: to protect the Servo Drive, be sure to connect a Schottky diode (hereinafter referred to as a continuity diode) in the external circuit when using the DO output of the Servo Drive.

Recommended Continuity Diode Model: SB2100
Manufacturer: Qiangmao
Technical parameters: 100V/2A

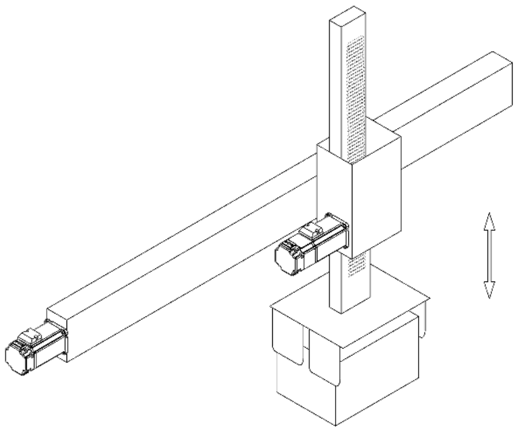
The wiring diagram is as follows:





4.5.3 Holding brake control

Typical applications of the contracting brake.

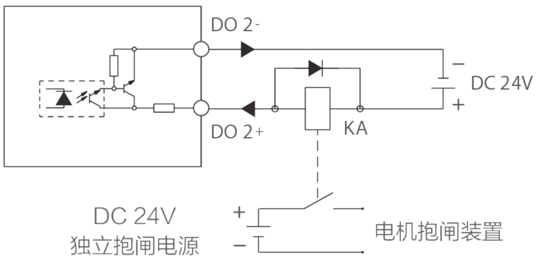


- The contracting brake mechanism built into the servo motor is a special mechanism for fixing the current position of the shaft in the event of a power failure, and is not used for braking purposes, but only when the motor is brought to a stop.
- When the brake is not marked, there is no polarity distinction between its coils. If it is marked as permanent magnet brake, please pay attention to the polarity and do not reverse it.
- Please set the correct timing and parameters of contracting brake with the actual working condition.
- When the servo motor of the built-in holding mechanism is running, the contracting brake may make a slight clicking sound, which does not affect the function.
- When the contracting brake coil is energized, magnetic flux leakage may occur at the shaft end, etc. Be sure to consider the effect when using magnetic sensors and other instruments near the motor.
- Due to the high current of the contracting brake coil of the servo motor, the contracting brake control of

the AD3 drive needs an external relay:

⚠ 注意

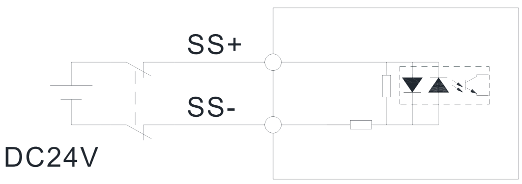
Please note the current flow direction when using and use an external circuit with a current-continuing diode.
Please also check whether the configuration of DO output parameter of the driver is contracting brake output control and whether it corresponds to the actual wiring port.



4.5.4 Safety emergency stop input

Pins		Default Function	Explanation	Remarks
CN1	SS-	Emergency stop function Normally open logic	When this signal is triggered, the servo will perform an emergency stop action.	The default is normally open logic, but in practice it is recommended to use normally closed logic.
	SS+			

Example of normally closed logic wiring:

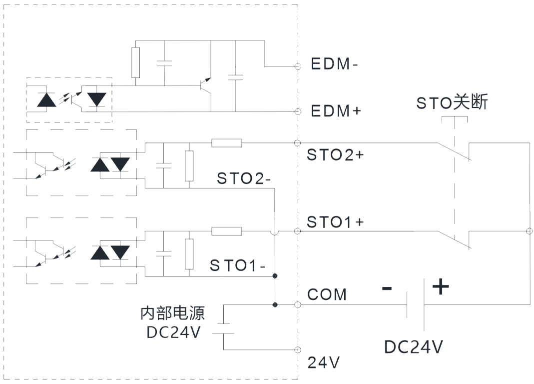


4.6 STO Wiring

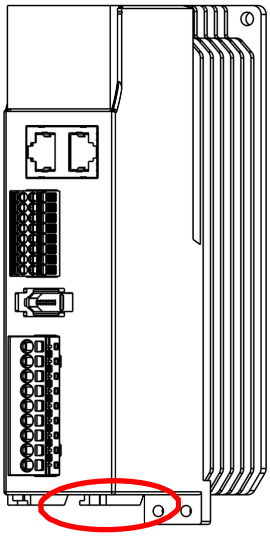
The STO function, Safe Torque Off, prevents the motor from generating torque at standstill or from accidental starting.

⚠ 注意

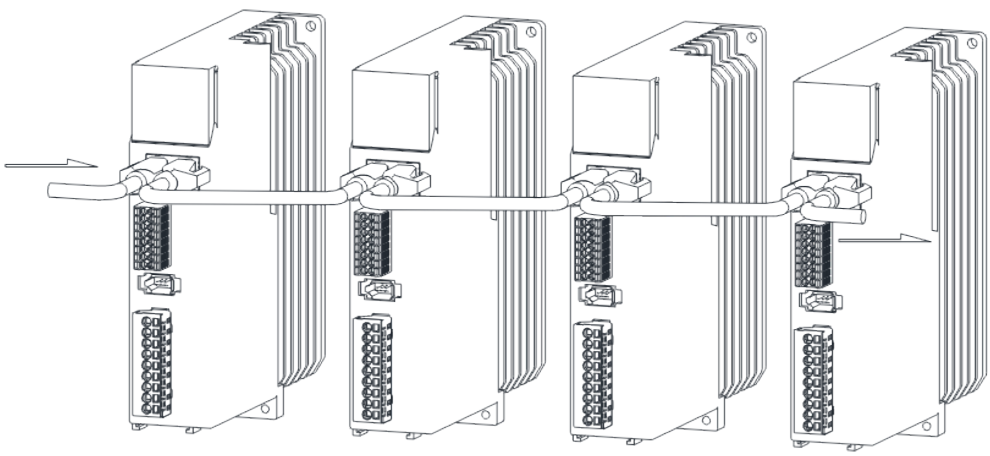
If the STO function is activated while the motor is in motion, the motor will continue to rotate according to inertia until it stops, so please use the STO function correctly in relation to the load conditions (STO function is optional, please check whether the ordered model supports it)

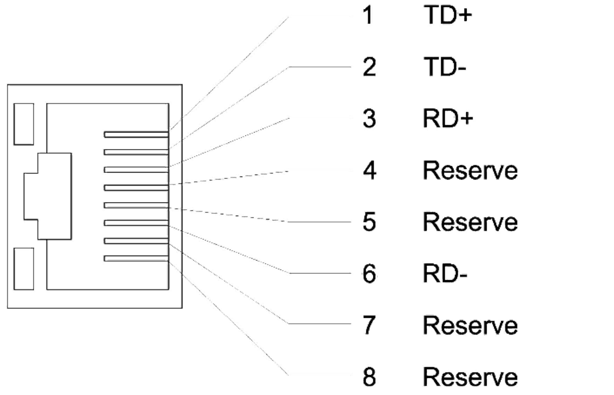


The 24V power supply inside the driver can only be used for short connection and not for external load. If the STO port needs to access external components, external 24V power supply must be used.



4.7 EtherCAT communication connection



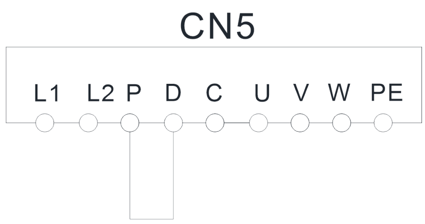
RJ45 Pinout	Definition	Description	Pin Distribution
1	TD+	Data sending+	
2	TD-	Data sending-	
3	RD+	Data receiving+	
4	/	/	
5	/	/	
6	RD-	Data receiving -	
7	/	/	
8	/	/	
Housing	Shielded	Shielded	

4.8 Braking resistor connection

The use of braking resistors is divided into two forms: internal braking resistors and external braking resistors. By default, the drive uses internal braking resistors for braking energy absorption.

By default, when the motor is in the braking and generating state, the braking energy generated needs to be absorbed by the drive capacitor and internal braking resistor. If the braking energy is large, the drive internal capacitor and braking resistor can not be absorbed in time, it will lead to high DC bus voltage, causing the drive failure alarm. In this case, it is necessary to choose a suitable external braking resistor to absorb the braking energy to ensure the stable operation of the drive.

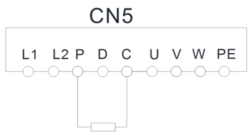
Figure: CN5 terminal wiring when internal brake resistor is used



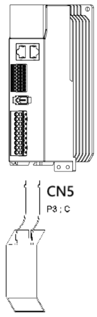
Use of internal braking

Note: Some drive models do not have built-in braking resistors, please see the drive specification information section for details

Figure: CN5 terminal wiring when external brake resistor is used



Use of external braking



⚠ **注意**

Please note the following points when using external braking resistors:

- Be sure to remove the shorting tab between P and D before connecting the external braking resistor between terminals P and C. Otherwise, it will cause the drive damage.
- The brake resistor resistance value should not be less than the minimum resistance value allowed by the drive, otherwise it may cause a drive fault alarm or damage the drive.
- Please configure the braking resistor parameters correctly, such as incorrectly filling in the braking resistor resistance and power will cause the drive false alarm or braking resistor damage, in severe cases, it may cause a fire.
- Please install the brake resistor on a non-combustible material such as metal.

Braking energy calculation and braking resistor selection
(For specific selection, please refer to section 2, Product Information, Brake Energy Absorption Instructions section)

Table - Braking energy absorption and minimum allowable resistance of the drive

AD3 Regenerative absorption within the drive					
Drive Model	**Built-in braking resistor**	**External braking resistor resistance value**	**Power**	**Braking resistor model**	**absorbed by the driver capacitor Maximum braking energy Ec(J)**
AD3RE-1R8SA (200W)	None	50Ω	100W	RXLG-100W 50RJ	20
AD3RE-2R8SA (400W)	None	50Ω	100W	RXLG-100W 50RJ	20
AD3RE-3R5SA (600W)	40W; 80Ω	50Ω	200W	RXLG-200W 50RJ	20
AD3RE-4R2SA (750W)	40W; 80Ω	50Ω	200W	RXLG-200W 50RJ	20

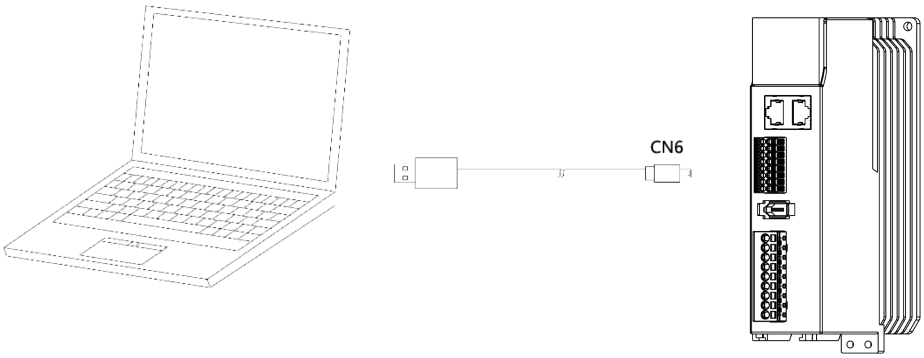
4.9 Mini USB software commission and firmware upgrade connection

By default, the operator panel dip switch is in the "0" position, and the drive is in normal operation mode in this position. For firmware upgrade, you need to toggle this switch to the "1" position.

注意

When the switch is toggled to 1, the drive does not function properly. Please toggle this switch back to "0" after a successful firmware upgrade.

The AD3 driver uses the CN6 (Mini USB) interface to communicate with a PC where commission software or firmware update.



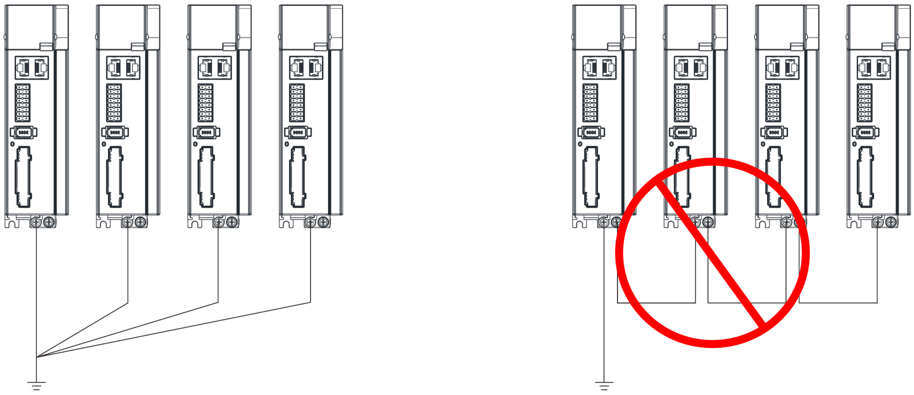
注意

- Commissioning cable requires the use of industrial-grade USB data cable with magnetic ring and shielding layer, otherwise the site interference is easy to cause problems with the connection, we recommend the use of the purchase of our special data cable.
- Due to the limited space height of the CN1 connector, please use a Mini USB connector with a connector height ≤ 10 mm. Do not use a MINI USB connector that is too high or too large to prevent damage to the drive's CN6 interface.

4.10 System grounding

⚠ 注意

- ◆ To prevent accidental electric shock, be sure to implement grounding.
- ◆ Be sure to ground the motor and drive firmly and reliably.
- ◆ According to the relevant standards for electrical equipment, Class D grounding (grounding resistance of 100Ω or less) should be used for 200V class drivers and 400V class drivers.
- ◆ C-level grounding (grounding resistance of 10Ω or less) should be used.
- ◆ Use a grounding cable of the recommended wire diameter or greater and as short as possible.
- ◆ When grounding multiple drives, series grounding should not be used, but individual grounding or common grounding should be used.



4.11 Anti-interference strategies for electrical wiring

To suppress interference, take the following measures:

- Power cable and encoder cable should be less than 20m, the longest should not exceed 25m, and the encoder cable should be twisted shielded cable.
- Use thicker wire diameter cables ($2mm^2$ or more recommended) for grounding wiring whenever possible.
- It is recommended to unify the use of grounding above category D (grounding resistance resistance value of 100Ω or less).
- Single point of grounding must be used
- Please use noise filter to prevent RF interference. When using in a civil environment or in an environment with strong power supply interference noise, please install the noise filter on the input side of power core.
- To prevent misoperation caused by electromagnetic interference, the following treatment methods can be used:

  1) Install the noise filter as close to the servo drive as possible.

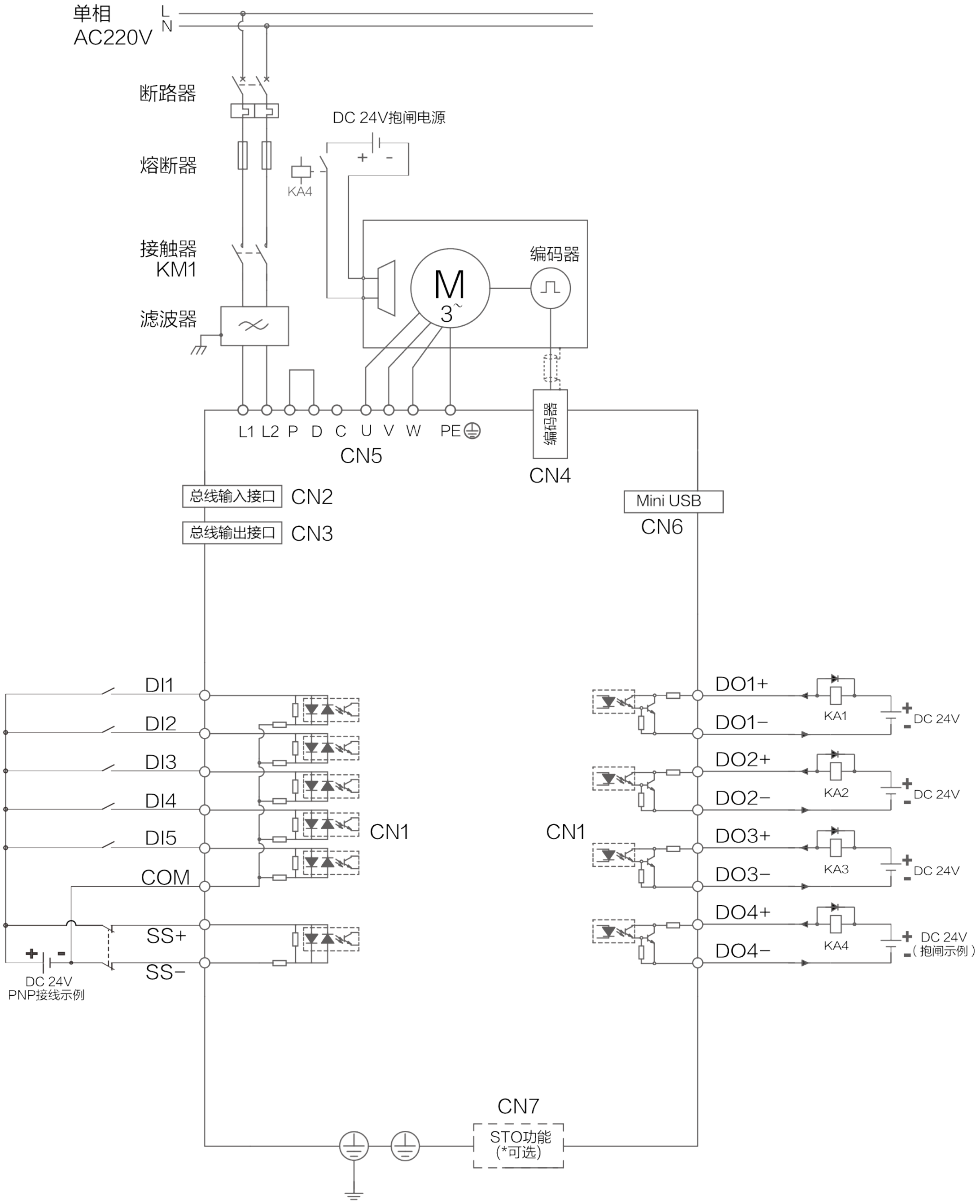
  2) Install surge suppressors on the coils of relays and electromagnetic contactors.

  3) When wiring, please lay the strong lines separately from the weak lines and keep a distance of more than 30cm. Do not put them into the same pipe or bundle them together.

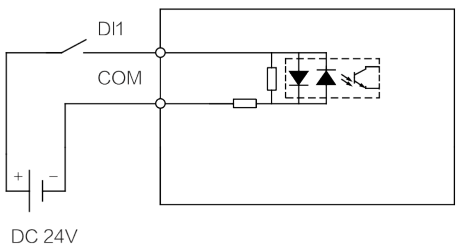
  4) Do not share the same power supply with welding machines, electrical discharge processing equipment, etc. When there is a high frequency generator nearby, install a noise filter on the input side of the power line.

- Adding magnetic rings to the control power, power, and encoder cables.
  Recommended magnetic ring material: manganese zinc magnetic ring
  Manufacturer: New Conda Magnetic Material
  Model: NCD/HP1-H60/35/20
  Control cable wound 3 turns on the magnetic ring and connected to the driver.
  Power cable U\V\W three-phase on the magnetic ring wound 3 turns and then connected to the drive, note that the PE ground wire can not be wound into the ring.
  The encoder cable is wound 3 turns on the magnetic ring and connected to the driver.

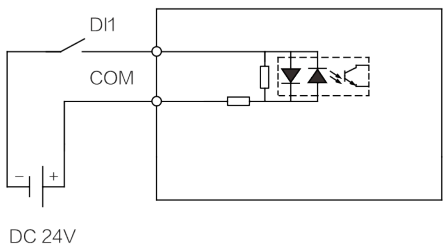
4.12 General wiring diagram



使用外部DC24V供电时的PNP信号输入接线



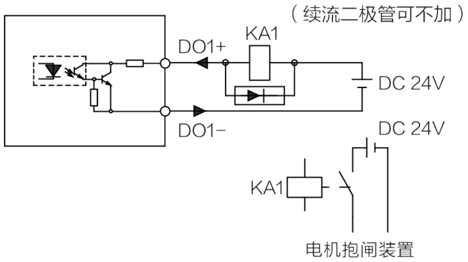
使用外部DC24V供电时的NPN信号输入接线



DO输出接线−抱闸举例

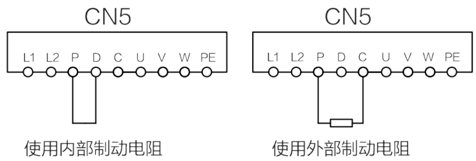
注意: 请注意电流流向及使用带有续流二极管的外部回路。

（续流二极管可不加）

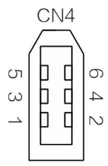


分别使用内部、外部制动电阻时的接线

注意：使用外部制动电阻时，需要取消P、D之间的短接片。

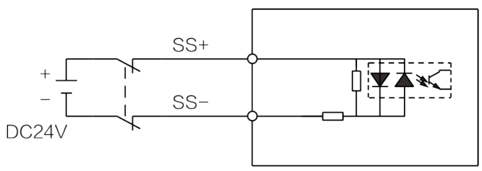


电机编码器CN4接口引脚定义

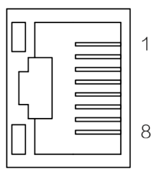


通讯式编码器	
1	5V
2	GND
3	- -
4	- -
5	SD+
6	SD−
外壳	屏蔽

急停接线图(常闭接线示例)

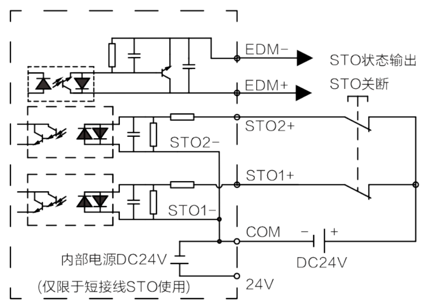


EtherCAT 网口定义



1	TD+
2	TD−
3	RD+
4	−−
5	−−
6	RD−
7	−−
8	−−

STO 功能接线图(仅定制版)



Section 5 Panel Display

5.1 Panel Composition and Introduction

5.1.1 Panel Composition

Name	Function
5-bit 8-segment LED digital tube	Displays various types of drive information, parameter settings, general functions, etc.
Panel operation keys	For switching, changing, and setting operations.
Firmware flash switch	Firmware burn-in switch, toggle to the "0" position above for normal use.
Mini USB communication port	Communicates with a computer that has debug software or a firmware burn-in environment installed.
Download Port	Connecting to the firmware burner

5.1.2 Digital tube display

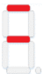
Mode	Top Menu	Submenu example
Monitoring and displaying group	Dp.**002**	**r.10**
Parameter setting group	**P10.01**	**68**
Fault alarm group	**En.001**	**E.52.10**
Control function group	**Fn.001**	**JOG**
Normal state	Ξ n. 1	**None**

5.1.3 Panel operation keys

Button	Key Name	Function
MODE	Mode selection \ Return button	◆ Return to the top-level directory; if it is already in the top-level directory, it is the function to switch between modes. ◆ Exits the editing state. ◆ Parameter browse page, press, and hold for 2 seconds to switch between large and small groups of parameters. ◆ Mode+▲: EtherCAT board reset.
▲	Number increase key	◆ Add numbers or indexes (number order is -0123456789). When long numbers are displayed, move up one page of the screen to display the content. ◆ Special controls, such as forward rotation, adjustable speed, etc. ◆ Browse the status, if it is the alarm content, you can directly on the alarm.
▼	Numeric reduction key	◆ Decrease the number or index (the number sequence is 9876543210-). When long numbers are displayed, move down one page of the screen to display the content. ◆ Special controls, such as reversing, adjusting speed, etc. ◆ Browse the status, if it is alarm content, you can directly next alarm.
	Shift key	◆ In the Browse state, access the submenu items from the parent menu. ◆ The edit bit is shifted left in the edit state.
SET	OK button	◆ In the parameter editing state, make sure to save the setting (long press 2s to save).

5.2 The panel displays the contents of

After the servo drive is powered on, the display can be used for servo power-on status display, parameter display, fault display and monitoring information display.

Power-on status display	Used to display the current status of the servo, such as servo ready, running, etc. When the servo drive is fault-free and not in other display menus, the first digital tube on the far left of the panel is used to display the current status of the servo, as follows: Indicates that the servo internal self-test is normal, and initialization is successful. Indicates that the servo main power is on.  Indicates that the servo is ready.  Indicates that the servo is running.
Parameter display	Displays the function code and the function code setting value.
Fault display	Servo fault alarm code is displayed.
Monitoring Information	Displays information such as the current operating parameters of the servo.

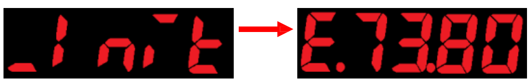
5.2.1 Power-up initialization process

- When the servo is normal

Initializat   Initialization successful   The main power is on, and the servo is ready to run.

When the servo fault alarm or initialization fails, the screen will display the fault code and flash
Example: When the encoder is disconnected, the display will show a 73.80 fault code and flash at a frequency of 0.5S.

Initialization   Fault Alarm



5.2.2 Panel display switching method

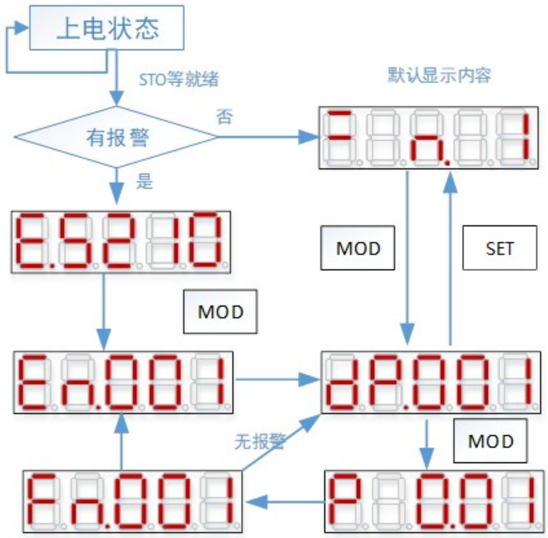


Figure 5.2.2 - Panel showing how to switch between menus

5.2.3 Parameter display

The AD3 series drives have a total of 27 groups of parameters, which can be used to quickly locate parameter positions by group. A list of parameters can be found in the Parameter Object section.

Parameter groups are displayed:

Show	Name	Content
PXX.YY	Function code group	XX : Function code group number. YY : The number within the function code group.

Example: P10.01

Show	Name	Content
	Motor parameter group	10 : Motor parameter group. 01 : Motor series.

Data of different lengths and negative numbers are displayed:

Signed data with 4 digits or less, or unsigned data with 5 digits or less, is displayed on a single page (5-digit digital tube on one page.) For signed numbers, the highest bit of the data "-" indicates a negative number.

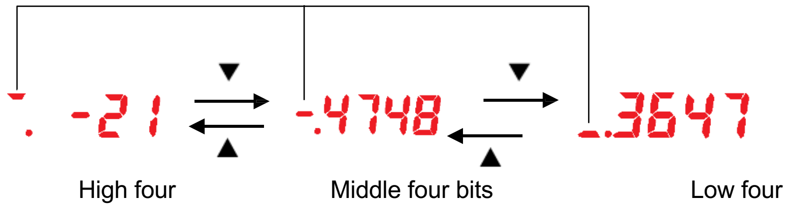
Example: -9999 Display: 

Example: 65535: 

4 bits or more signed, or 5 bits or more unsigned data are displayed in multiple pages (up to three pages) from high to low by bit, with every 4 bits being one page, press ▲ to page up, press ▼ to page down.

Example: -2147483647

The first digital tube on the left side displays the current page number (high four-digit page, middle four-digit page, low four-digit page).



Display of decimal points

Example: 10.2: 

5.2.4 Parameter setting display

Show	Name	Display Occasions
	Done	Function completed successfully
	P.INIT	Parameter initialization
	OK	Successful parameter setting
	NOT OK	Unsuccessful parameter setting

5.2.5 Fault display

The panel can display current or historical fault information. For analysis and troubleshooting of fault information, please refer to the chapter "Section 11 Troubleshooting".

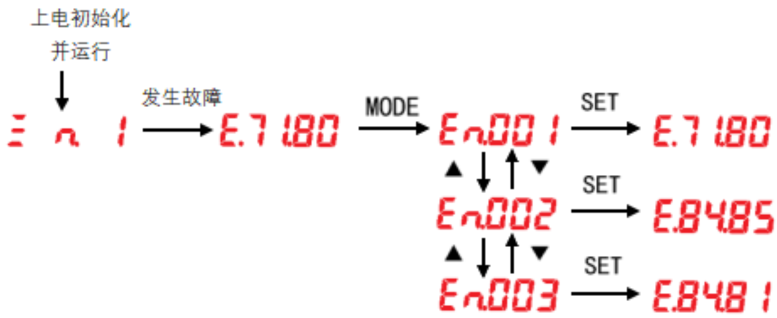
If a single fault occurs, the panel pops up the corresponding fault code and keeps flashing until the fault is confirmed and reset. If more than one fault occurs at the same time, the last fault code occurs is displayed. Multiple fault codes occurring at the same time can be viewed one by one by flipping through EN.001.

The parameter P91.18 allows you to select the 10 most recent fault codes that have occurred, and the fault codes are displayed in P91.19.

Example: Single fault code 73.80

Show	Name	Content
	Encoder connection error	73. Fault code group 80 Number in fault code group

Example: Multiple faults occurred at the same time, in chronological order E8481;E8485;E7180.



5.2.6 Monitoring parameter display

The dp group in Panel Status can be used to display the operational status of the drive.

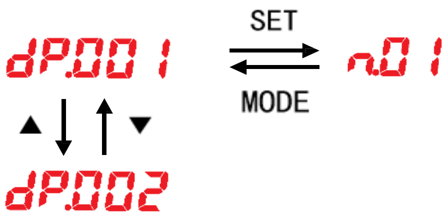


Figure 5.2.6 - Monitoring display switching

The following table shows the specific information of the dp monitoring group:

Function Code	Name	Unit	Meaning	Examples
dp.001	Node number	-	The local node number, which is shown here as the EtherCAT slave address when the EtherCAT bus writes the station number.	Local node number n.01 The slave address is "1".
dp.002	Actual speed	rpm	Servo motor actual speed	
dp.003	Given speed	rpm	Current given speed	
dp.004	Current output	A	Output Current RMS	
dp.005	Voltage output	V	Output Voltage RMS	
dp.006	DC bus voltage	V	DC bus voltage	
dp.007	Encoder	inc	Actual feedback value of the encoder, communication object 0X6064	
dp.008	Pulse Feeding	inc	Position ring gives incremental pulses	
dp.009	Control word	/	Communication object 0x6040	
dp.010	Status word	/	Communication object 0x6041	
dp.011	EtherCAT Status Word	/	EtherCAT communication status word	

5.3 Basic panel operation

5.3.1 Parameter Setting

Parameter setting can be done using the panel of the servo driver, please refer to the chapter of parameter object for details. In the parameter setting group, press and hold "MOD" to quickly position the parameters by group.

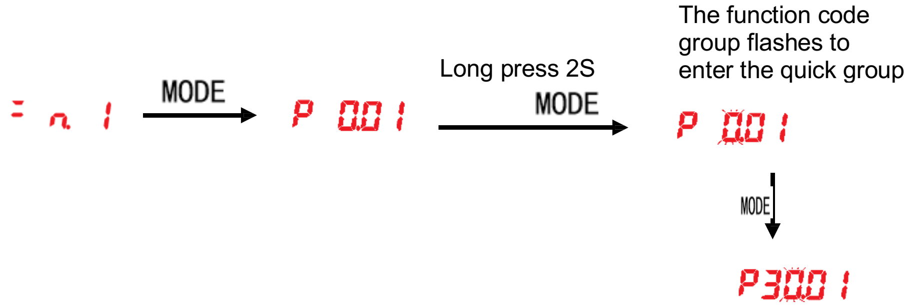


Figure 5.3.1.1 - Quick selection of parameter groups

The following are examples of changing the direction of motor rotation to "clockwise positive" and changing the "holding brake opening delay" to 250ms respectively after power on:

注意

You must login with password to edit the parameters before changing them, otherwise the parameters will be failed to be saved.

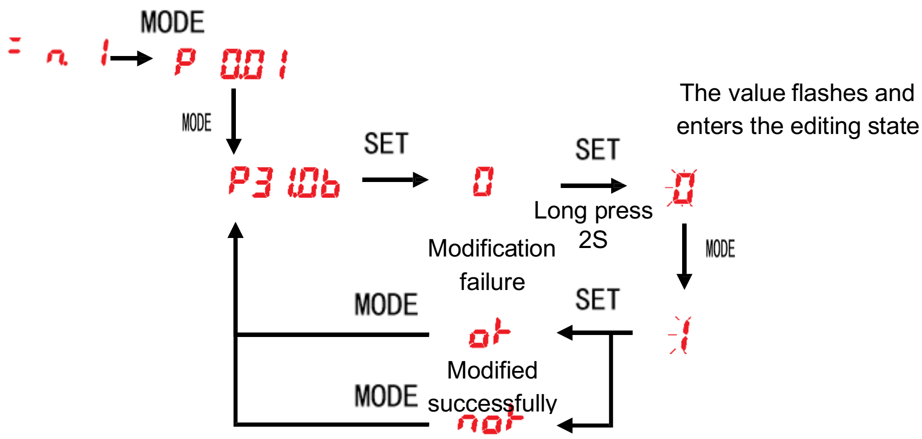


Figure 5.3.1.2: Changing the direction of motor rotation

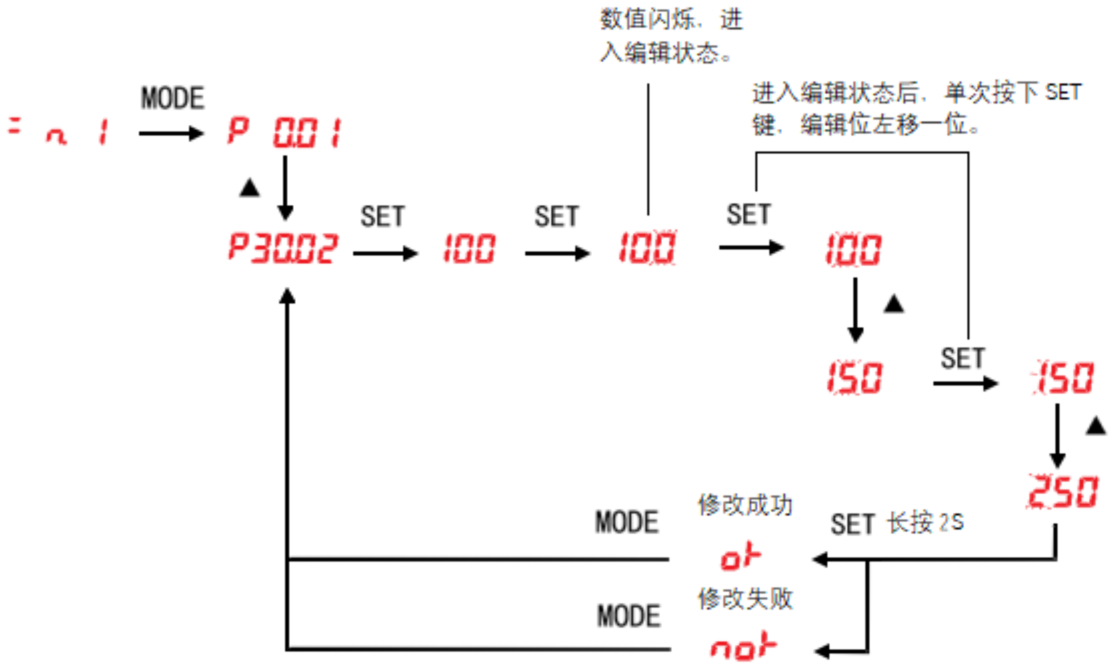


Figure 5.3.1.3 - Changing the "Opening time of the contracting brake"

5.3.2 User Login

By default, users can only view the parameters and cannot edit or modify them. To modify parameters, you first need to log in with a password. After 6 minutes of logging in, the password will automatically expire, so if you want to continue editing, you need to log in again. The default login password is "1111" and the following is the password login procedure:

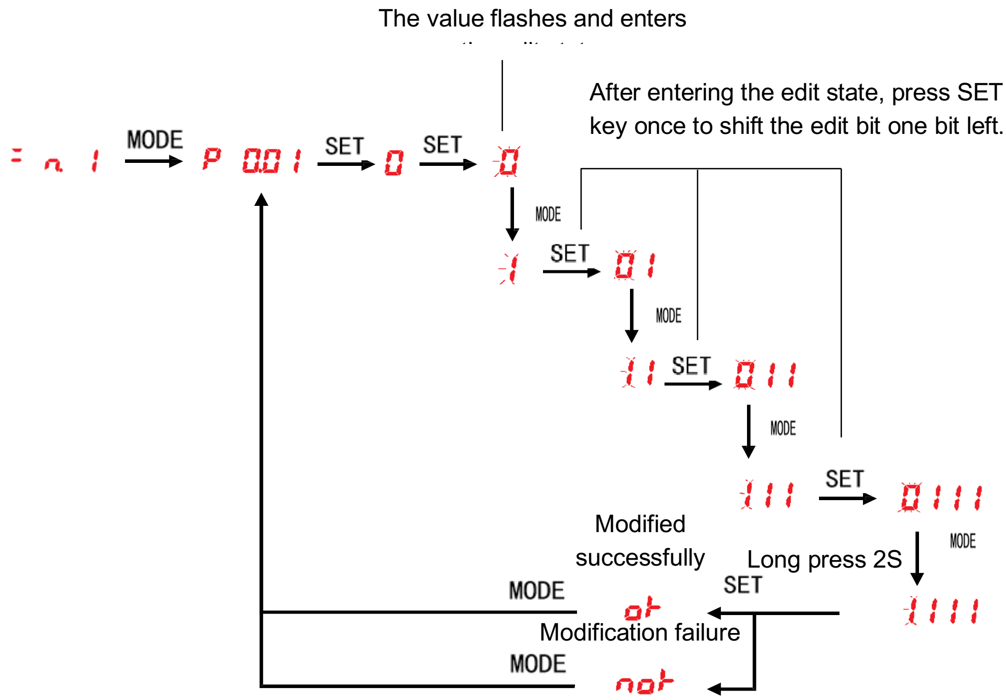


Figure 5.3.2 - Panel user login

⚠ 注意

After firmware version 0.11.6, you don't need a login page to change parameters

5.3.3 Fault Reset

When the drive control channel is selected as "AD Commissioning Software Control" or "Panel Control", the panel can provide a fault reset function to clear the current alarm status.

⚠ 注意

This function is not effective when the control channel is selected as "Controller Control".

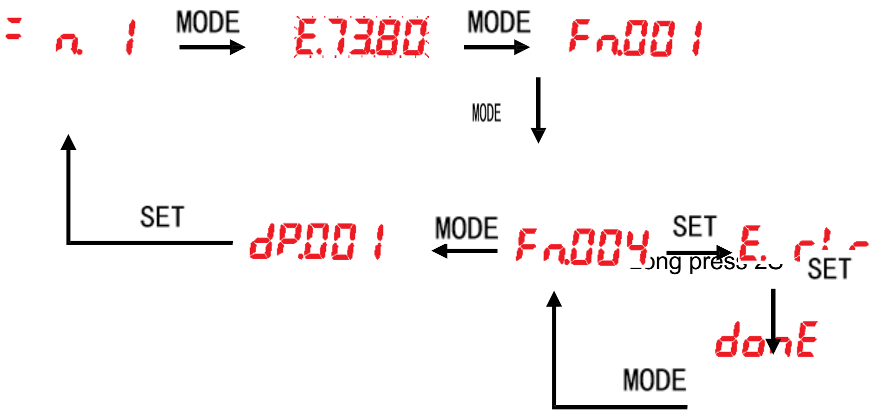


Figure 5.3.3 - Panel Fault Reset Operation

5.3.4 Point-and-click function JOG

When the drive control channel is selected as "Panel Control", the panel can provide JOG pointing function to facilitate the axis test without the debugging software and upper controller.

⚠ 注意

- The JOG function must be active during "panel control" (parameter P0.02 is set to 0).
- Before running, please pay attention to whether the operating environment is safe and whether the wiring and grounding measures are properly implemented.
- After the trial run is completed, please take care to change back to the original control channel selection.

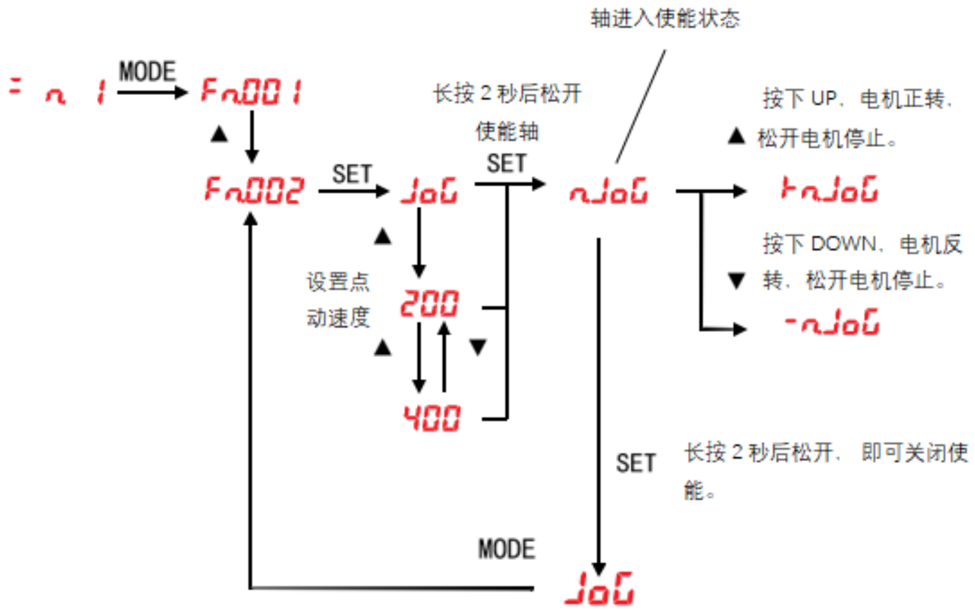


Figure 5.3.4 - Panel JOG Operation

About the jogging speed: the unit of jogging speed is 0.1RPM. Therefore, the panel display shows 200, the actual is 20 RPM. The default jog speed is 200, and the incremental value of single increase or decrease is 200. For safe operation, the maximum value of JOG is one-tenth of the maximum speed of the motor, for example, the rated speed of 3600RPM motor, the actual maximum speed of jogging is 360 RPM, and the panel shows 36 as the maximum speed of jogging.

Section 6 Introduction to EtherCAT Communication

This chapter introduces the basics of EtherCAT real-time industrial Ethernet communication, communication parameter settings, EtherCAT state machine, PDO configuration, DC clock, etc.

6.1 EtherCAT bus communication basics

6.1.1 EtherCAT Protocol Overview

EtherCAT is a high-performance, low-cost, easy-to-use, topology-flexible and easy-to-implement industrial Ethernet technology for high-speed networks at the industrial field level, using a standard Ethernet physical layer and a twisted pair (100Base-TX) transmission medium.
The EtherCAT system consists of a master and a slave. The master requires only a common network card, the slave requires a special slave control chip.

Figure 6.1.1 - Schematic diagram of the EtherCAT network

EtherCAT main features:

1) Full compliance with Ethernet standards, allowing coexistence with other Ethernet devices and protocols on the same bus.
2) No slave subnets, complex nodes, or IO nodes with only 2 bits can be used as EtherCAT slaves.
3) High transmission rate, 100-megabit Ethernet, full duplex mode.
4) Good synchronization performance, clock synchronization accuracy of less than 1us for each slave node device.
5) The refresh cycle is short and can achieve a data refresh cycle of less than 100us.
6) In order to support a wider variety of devices and a wider range of application layers, EtherCAT has established the following application protocols:
    - CoE (EtherCAT-based CAN application protocol);
    - SoE (servo-driven equipment line regulation according to IEC 61800-7-204);
    - EoE (Ethernet over EtherCAT);
    - FoE (File access over EtherCAT);

Slave devices do not need to support all communication protocols; instead, they simply choose the one that best suits their application.

6.1.2 System parameter setting

In order for the AD3 series Servo Drives to be correctly connected to the EtherCAT fieldbus network, the relevant parameters of the AD3 series Servo Drives need to be set.

Servo parameter serial number	Name	Setting range	Default Value	Target set value
P00.02	Control channel selection	0: Control panel control 1: Controller control 2: AD commissioning software control 3: Analog 1 control 4: Analog 2 control 5: Retention	1	1
P01.01	Bus Type Selection	0: No bus board 1: EtherCAT 2: CANOpen	1	1

Note: When using EtherCAT bus control, you need to select P00.02 command channel as controller control; P01.01 bus type as EtherCAT, download and save parameters, and power off and restart.

6.1.3 EtherCAT communication specification and communication structure

1) EtherCAT Communication Specification

Projects		Specification
Communication Protocol		IEC 61158 Type 12. IEC 61800-7CiA 402 Drive Profile
Application Layer	SDO	Fast Transfer Service General transmission services Segmented Transfer Service
	PDO	Variable PDO Mapping Support 4 TPDO channels, each supporting up to 16 objects Supports 4 RPDO channels, each supporting up to 16 objects
	CiA 402	Profile Position Mode (PP) Profile speed mode (PV) Profile Torque Mode (PT) Home Recurrence Mode (HM) Synchronous Periodic Position Mode (CSP) Synchronous Cycle Velocity mode (CSV) Synchronous Periodic Torque Mode (CST)
Physical Layer	Transfer Protocol	100BASE-TX (IEEE802.3)
	Maximum distance	100m
	Interface	RJ45*2(IN,OUT)

2) EtherCAT Communication Architecture

Various application layer protocols are available for communication using EtherCAT. In the AD3 series Servo Drives, the IEC 61800-7 (CiA402)-CANOpen motion control sub-protocol is used.

The following figure shows the EtherCAT communication structure based on the CANOpen application layer.

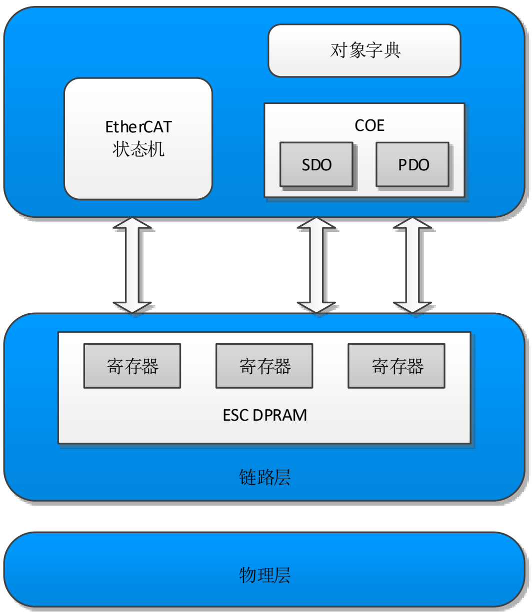


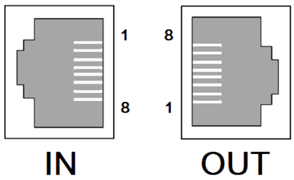
Figure 6.1.3 - EtherCAT communication structure based on the CANOpen application layer

In the structure diagram, the application layer object dictionary contains: communication parameters, application data, and PDO mapping data, etc. The PDO process data object contains real-time data during the operation of the servo drive and is accessed periodically for reading and writing, while the SDO mailbox communication is accessed and modified acyclically for some communication parameter objects and PDO process data objects.

6.1.4 Basic Features

1) Interface Information

The EtherCAT grid cable is connected to a network port terminal with metal shield and is divided into input (IN) and output (OUT) interfaces. The electrical characteristics are in accordance with IEEE802.3, ISO8877.

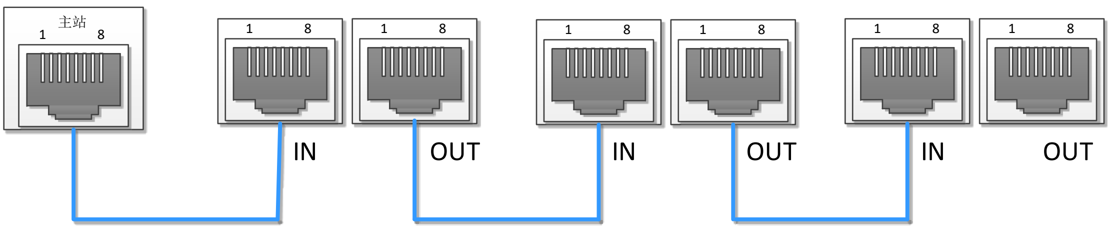


Pinning	Definition	Description
1	TD+	Data sending +
2	TD-	Data sending -
3	RD+	Data reception +
4	/	Empty Foot
5	/	Empty Foot
6	RD-	Data reception-
7	/	Empty Foot
8	/	Empty Foot
Housing	Shielded	Shielded

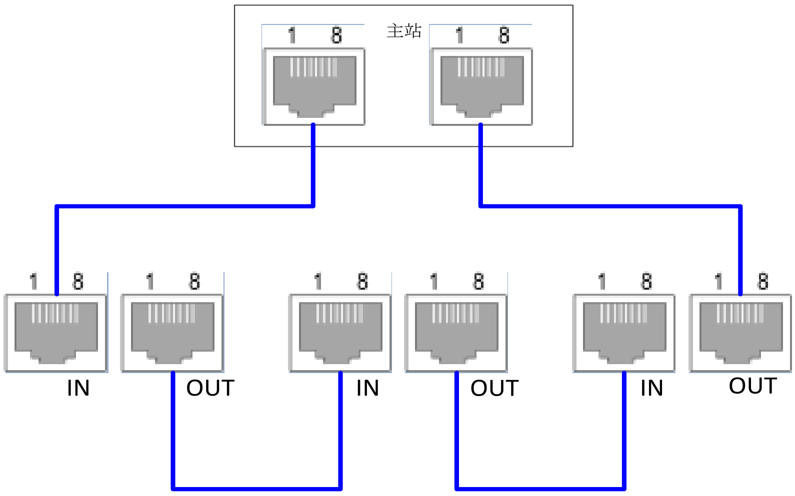
2) Topology Connection

The EtherCAT communication topology is flexible in connection. This servo comes with IN and OUT interfaces and the topology connection is as follows.

- ◆ Linear connection.



- ◆ Redundant ring connections:


主站
1 8
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IN
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OUT

6.2 EtherCAT Communication Basics

6.2.1 State Machine

The following block diagram shows the EtherCAT state transition:

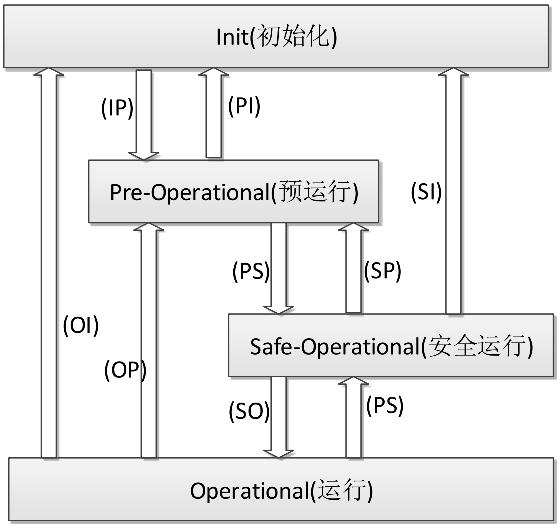


Figure 6.2.1 - ETherCAT state machine

The EtherCAT device must support 4 states and is responsible for coordinating the state relationship between the master and slave applications during initialization and runtime.

Init: initialization, abbreviated as I;
Pre-Operational: Pre-operational, abbreviated as P;
Safe-Operational: Safe operation, abbreviated as S;
Operational: Run, abbreviated as O.

When transforming from the initialization state to the operation state, the sequence of "Initialization -> Pre-operation -> Safe operation -> Operation" must be followed, and no transitions are allowed.
Transitioning is possible when returning from the running state. The state transformation operations and initialization process are listed below:

State and state transformation	Operation
Initialization Init (I)	No communication at the application layer, the master can only read and write ESC registers
Initialization to pre-run conversion Init to Pre-Op (IP)	Master configuration slave site address register Configure mailbox channels Configuring the DC Distribution Clock Request "pre-run" status
Pre-run Pre-Op (P)	Application layer mailbox data communication (SDO)
Conversion of pre-operation to safe operation Pre-Op to Safe-Op (PS)	Master uses mailbox initialization process data mapping SM channel used for master configuration process data communication Master configuration FMMU Request "Security Status"
Safe operation Safe-Op (S)	Process data communication is available, but only read input data is allowed, no output signal is generated (TPDO)

State and state transformation	Operation
Safe operation to operation conversion Safe-Op to Op (SO)	Master sends valid output data Request "Operational Status"
Operation Status Op(O)	All inputs and outputs are valid Mailbox communication is possible (SDO, TPDO, RPDO)

6.2.2 Process Data PDO

PDO real-time process data transmission follows the producer-consumer model.PDO can be divided into RPDO (Receive PDO), where the slave receives commands from the master through RPDO; and TPDO (Trasmit PDO), where the slave feeds its own status through TPDO.

Figure 6-2-2 PDO transmission model

1) PDO mapping parameters

PDO mapping is used to establish the mapping relationship between object dictionary and PDO. 1600h~17FFh is RPDO and 1A00h~1BFFh is TPDO. 4 RPDOs and 4 TPDOs are available in the AD3 series servo drive. The drive defaults to two fixed PDO mappings, one RPDO and one TPDO, using communication objects 0x1600 and 0x1A00.

Object 0x1600: RPDO1 mapping			
Sub-index	Numerical value	Number of data bytes	Meaning
0	7	1	Number of mapped objects
1	0x6040	2	Control Word (control word)
2	0x607A	4	Target Position
3	0x60FF	4	Target Velocity
4	0x6071	2	Target Torque
5	0x6081	4	Profile Velocity (Torque Limiting Velocity)
6	0x60B8	2	Touch Probe Function (latching function)
7	0x6060	1	Modes Of Operation (operation mode)
Object 0x1A00: TPDO1 mapping			
Sub-index	Numerical value	Number of data bytes	Meaning
0	8	1	Number of mapped objects
1	0x6041	2	Status Word
2	0x6064	4	Position Actual Value(Actual Position)
3	0x606C	4	Velocity Actual Value(Actual Velocity)
4	0x6077	2	Torque Actual Value(Actual Torque)

5	0x60B9	2	Touch Probe Status (latching status)
6	0x60BA	4	Touch Probe Pos1 Pos Value (latch value 1 rising edge position)
7	0x60FD	4	Digital Input(Digital Input)
8	0x6061	1	Modes Of Operation Display (actual operation mode)

2) PDO Configuration

The PDO mapping parameter contains a pointer to the process data corresponding to the PDO that the PDO needs to send or receive, including the index, subindex and the length of the mapped object. The subindex 0 records the number of objects mapped by the PDO, and the length of each PDO data can be up to 4*N bytes, which can map one or more objects at the same time. Sub-indexes 1 to N are the mapping contents. The mapping parameters are defined as follows.

<table>
<tr><th rowspan="2">Digits</th><td></td><td rowspan="2">......</td><td></td><td></td><td rowspan="2">......</td><td></td><td></td><td rowspan="2">......</td><td></td></tr>
<tr><td>31</td><td>16</td><td>15</td><td>8</td><td>7</td><td>0</td></tr>
<tr><th>Meaning</th><td colspan="3">Index</td><td colspan="3">Sub-index</td><td colspan="3">Object Length</td></tr>
</table>

The index and subindex together determine the location of the object in the object dictionary, and the object length specifies the specific bit length of the object, expressed in hexadecimal, i.e:

Object Length	Seat length
08h	8-bit
10h	16-bit
20h	32-bit

For example, the mapping parameter that represents the 16-bit control word 6040h-00 is 60400010h.

6.2.3 Mailbox Data SDO

EtherCAT mailbox data SDOs are used to transfer non-periodic data, such as configuration of communication parameters, configuration of servo drive operating parameters, etc. The EtherCAT CoE service types include:

1) Information on emergency events;

SDO request; SDO response; TxPDO; RxPDO; remote TxPDO send request; remote RxPDO send request; SDO message.

6.2.4 Distributed Clocks

The Distributed Clock enables all EtherCAT devices to use the same system time and thus control the synchronized execution of tasks for each device. The slave devices can generate synchronization signals based on the synchronized system time. AD3 series drives only support the DC synchronization mode. The synchronization period is controlled by SYNC0. The cycle range varies according to the different motion modes.

⚠ 注意

EtherCAT supports three synchronization modes, i.e. DC synchronization, SM2 (Sync manager) synchronization and FreeRun (free run), DC synchronization is based on the first axis clock with high accuracy, SM2 synchronization is based on the RxPDO information time and FreeRun has no synchronization.

6.2.5 CiA402 Control Introduction

The Servo Drive must be guided in accordance with the process specified in the standard CiA402 protocol to use the AD3 Series Drive before the Servo Drive can operate in the specified state.

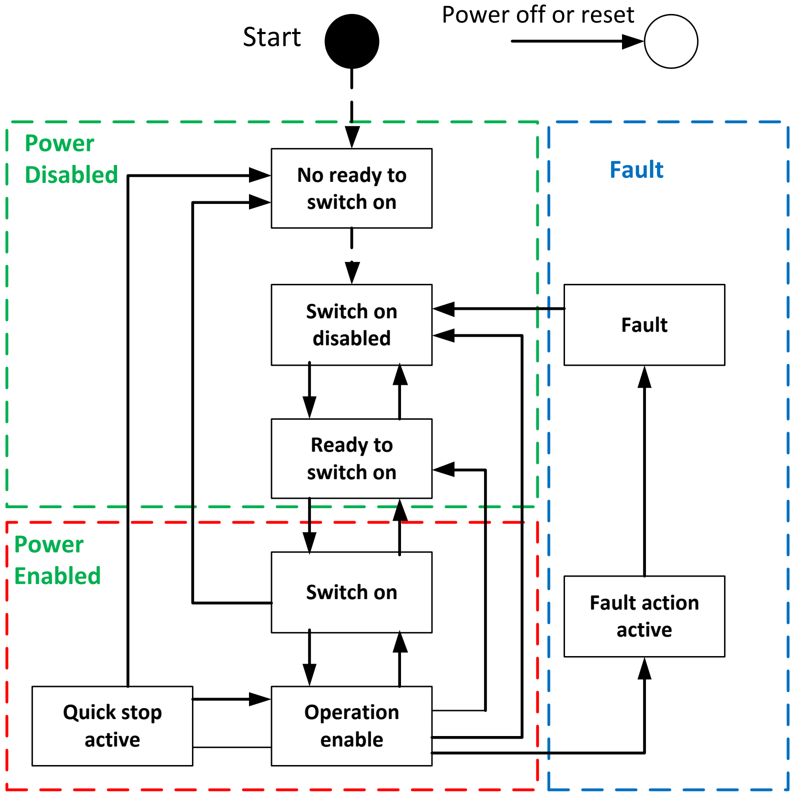


Figure 6.2.5 - CiA402 state switching diagram

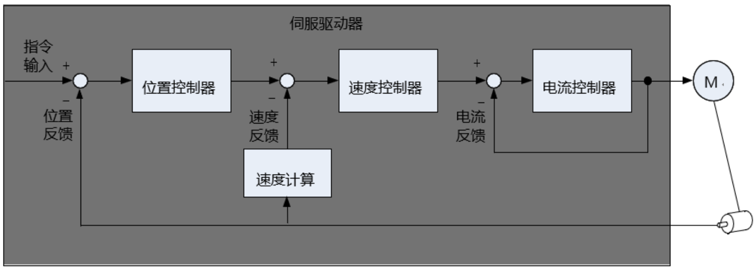
The states are described in the following table:

Not ready to switch on	The control is powered on, the driver initializes, internal self-tests, and remains in this state until initialization is complete.
Switch on disable	Servo initialization is complete, and the Servo Drive is fault-free or errors have been eliminated. The drive parameters can be set.
Ready to switch on	The servo drive is ready. The drive parameters can be set.
Switch on	The servo driver is waiting to turn on the servo enable. The drive parameters can be set.
Operation Enable	The drive is running normally, a certain servo operation mode has been enabled, the motor has been energized, and the motor rotates when the command is not 0. If the drive parameter property is "Run Change", you can set it, otherwise you cannot set it.
Quick stop active	The Quick Stop function is activated, and the drive is performing the Quick Stop function. If the drive parameter property is "Run Change", you can set it, otherwise you cannot set it.
Fault action active	The drive has failed and is in the process of performing a failover. If the drive parameter property is "Run Change", you can set it, otherwise you cannot set it.

Fault	Fault shutdown is complete, and all drive functions are disabled while allowing drive parameters to be changed for troubleshooting.

Section 7 Basic control mode

This section lists the control modes supported by the AD3 series Servo Drives and how to use them. Please select and use the corresponding control mode properly according to the application.
The servo system consists of three main parts: servo driver, servo motor and encoder.



The servo driver is the control core of the servo system. Through the processing of input signals and feedback signals, the servo driver can work in position control mode, speed control mode and torque control mode, and the above three modes can realize the precise control of motor position, speed, or torque respectively. Among them, position control is the most important and most used control mode of servo system.
A brief description of each control mode is as follows:

1) Position Control

Position control is to control the position of the motor by position command. The total number of position commands is used to determine the target position of the motor, and the rate of change of the target position determines the motor rotation speed. By reading the feedback value from the encoder, the servo drive can achieve fast and precise control of the motor rotor position and the motor speed. Therefore, the position control mode is mainly used in applications that require precise position control, such as robots, placement machines, engraving machines, CNC machine tools, etc.

2) Speed Control

Speed control refers to the control of the motor speed by speed command. By parsing the speed command given externally, the servo drive can achieve fast and accurate control of the motor speed. Therefore, the speed control mode is mainly used in applications with high requirements for motor speed, such as the spindle of CNC milling machines.

3) Torque control

The input current of a servo motor is linearly related to the output torque; therefore, the control of the current can realize the control of the output torque of the motor. Torque control means that the output torque of the motor is controlled by inputting a torque command to the servo controller. The torque command can be given by means of communication. The torque control mode is mainly used in devices with strict requirements on the force of the material, such as winding and unwinding devices and other tension control applications.

7.1 Basic Settings

Figure 7.1 - Servo setup workflow

7.1.1 Pre-run inspection

The following checks are required before running the servo driver and servo motor:

Records	No.#	Content
Wiring		
☐	1	The AC220V control power supply of the servo driver and the main circuit power input terminals (L1, L2) must be properly connected.
☐	2	The servo driver main circuit output terminals (U, V, W) and the servo motor main circuit cable (U, V, W) must be in phase and securely connected.
☐	3	The main circuit power input terminals (L1, L2) and the main circuit output terminals (U, V, W) of the servo driver cannot be short-circuited.
☐	4	Each control signal cable of the servo driver is wired correctly: external signal cables such as the contracting brake have been connected correctly.
☐	5	The servo driver and servo motor must be reliably grounded.
☐	6	When using an external braking resistor, the two poles of the external braking resistor must be connected between P3 and C on the CN6 terminal.
☐	7	All cables are within the specified force range.
☐	8	The wiring terminals have been insulated.
Environment and Machinery		
☐	1	There are no foreign objects such as wire heads and metal shavings inside or outside the servo drive that will cause short circuits in the signal and power lines.

☐	2	The servo drive and external braking resistor are not placed on combustible objects.
☐	3	The mounting of the servo motor, the shaft and the mechanical connection must be reliable.
☐	4	The servo motor and the connected machinery must be in an operable condition.

7.1.2 Turn on the power

1) Turn on the control power and main circuit power

Turn on the AC220V of the control circuit, and the main circuit power supply:
For single-phase 220V main circuit power terminals of L1, L2 two.
When the control circuit power and the main circuit power are turned on, the panel display shows the set node number, and the top and middle two horizontal lights of the first LED from the left are on, indicating that the servo driver is in the operational state, waiting for the servo enable signal from the host computer.
If the drive panel display keeps showing "no.SS", it means the emergency stop signal is valid, please configure the emergency stop signal parameters correctly or connect the emergency stop signal correctly.
If the drive panel display shows a fault, please refer to "Section 11 Troubleshooting" to analyze and troubleshoot the cause.

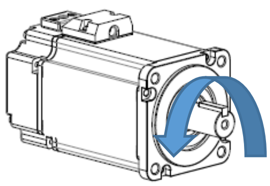
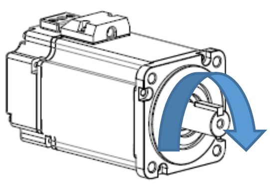
2) Disable servo enable

Refer to "6.2.5 Introduction to CiA402 Control" for a description of the process.

7.1.3 Rotation direction selection

By setting "Rotation direction selection (P31.0B)", the direction of rotation of the motor can be changed without changing the polarity of the input command.

◆ Associated parameters:

<table>
<tr><td rowspan="2">Serial number P31.0B</td><td>Name</td><td colspan="3">Rotation direction selection</td><td>Settings Effective</td><td>Break Enable</td><td>Data Scope</td><td>0~1</td></tr>
<tr><td>Access Properties</td><td>RW</td><td>Unit</td><td>-</td><td>Related Mode</td><td>ALL</td><td>Factory Settings</td><td>0</td></tr>
<tr><td colspan="9">0: Counterclockwise is positive, facing the motor shaft, specifying that its direction of rotation is positive when counterclockwise.

1: Clockwise is positive, facing the motor shaft, specifying that its direction of rotation is positive when clockwise.
</td></tr>
</table>

7.1.4 Contracting brake setting

A contracting brake is a mechanism that prevents the servo motor axis from moving when the servo drive is in a non-operating state, and keeps the motor locked in position so that the moving part of the machinery does not move due to self-weight or external forces. If the servo motor does not come with a contracting brake, this subsection can be skipped.

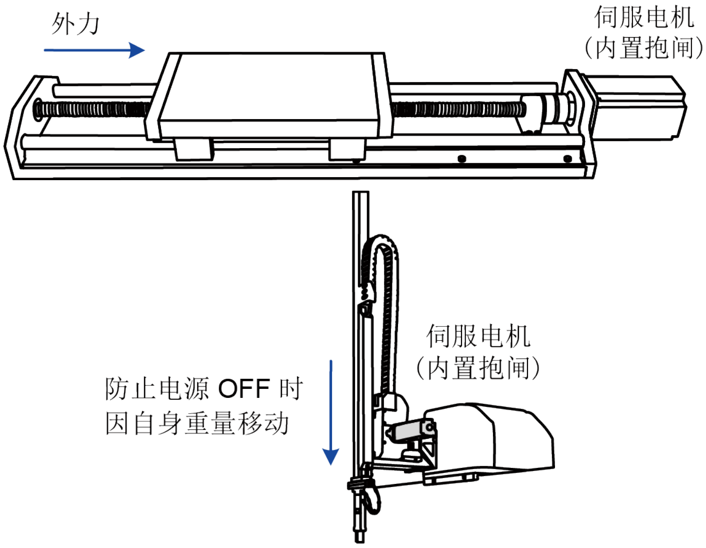


Figure 7.1.4-1 Schematic diagram of contracting brake application

⚠ 注意

- The contracting brake mechanism built into the servo motor is a non-energy-activated fixed special mechanism that cannot be used for braking purposes and is used only to keep the servo motor stopped.
- The possibility of polarity of the brake coils requires careful examination of the servo motor instructions.
- When the motor with built-in contracting brake runs, the contracting brake may make a clicking sound, which does not affect the function.
- When the brake coil is energized (brake open state), flux leakage may occur at the shaft end, etc. Please be careful when using instruments such as magnetic sensors near the motor.

1) Contracting brake wiring

The AD3 series servo driver can be equipped with a contracting brake control DO output signal at the CN7 interface (STO terminal), which drives an external intermediate relay circuit to control the motor contracting brake coil.

⚠ 注意

The maximum output current of DO circuit is DC 50mA, so the control of contracting brake coil should not be connected to DO directly.

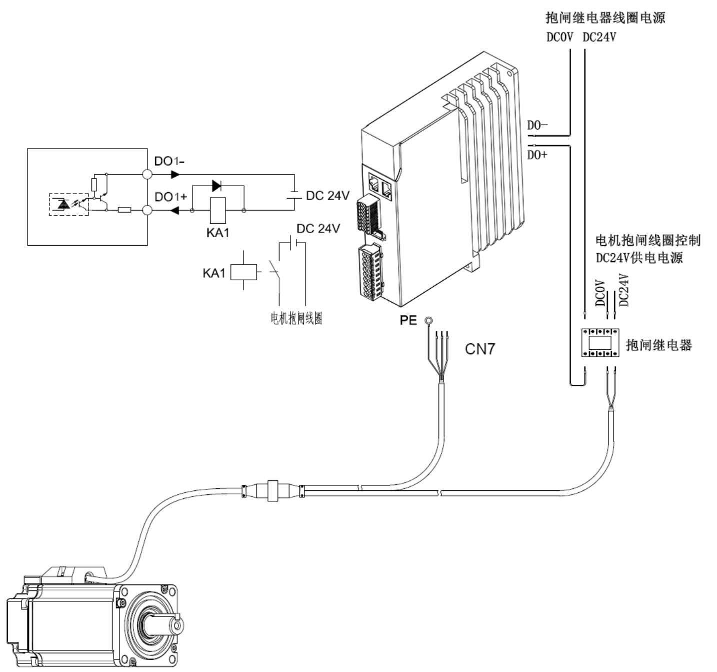


Fig. 7.1.4 - 2 Schematic diagram of contracting brake wiring

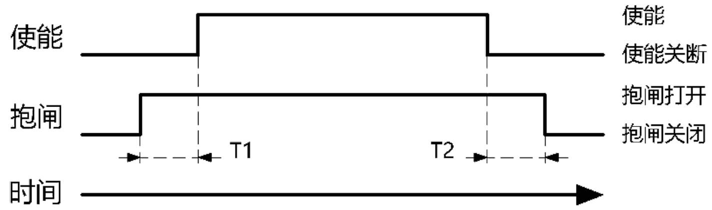
Note on the wiring of the contracting brake:

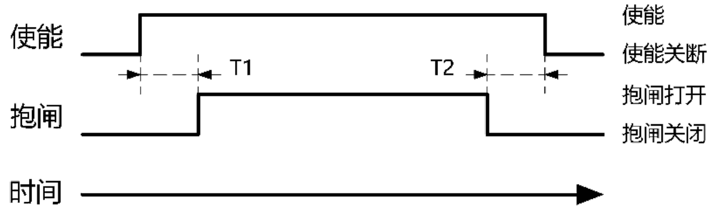
- The cable length of the motor contracting brake needs to fully consider the voltage drop caused by the cable resistance, and the contracting brake needs to ensure that the input voltage is at least 24V.
- Do not share the power supply with other electrical equipment to prevent the voltage or current from decreasing due to the work of other electrical equipment, which will eventually lead to the false operation of the contracting brake, and the impact of the contracting brake will affect other electrical equipment.
- Recommend the use of copper cables conforming to the national standard GB/T12706.1-20020.5mm2 or above.
- If the holding coil with the servo motor has polarity direction, please pay attention to the positive and negative polarity of the wiring.
- Use an external circuit with a current-continuing diode to prevent reverse voltage breakdown of internal components.
- Please check whether the driver DO parameter is configured as contracting brake output and whether it corresponds to the actual wiring port.

2) Software settings for grips

Before using the brake function, please make sure the following parameters are set correctly

<table>
<tr><td rowspan="3">Serial number P30.02</td><td>Name</td><td colspan="3">Gate opening time delay</td><td>Setting effective</td><td>Effective immediately</td><td>Data Range</td><td>1~1000</td></tr>
<tr><td>Access Properties</td><td>RW</td><td>Unit</td><td>ms</td><td>Related Models</td><td>ALL</td><td>Factory settings</td><td>100</td></tr>
<tr><td colspan="8">Since the brake has a mechanical response time, this parameter is used to set the delay time for the opening of the brake.</td></tr>
<tr><td rowspan="3">Serial number P30.03</td><td>Name</td><td colspan="3">Locking delay time</td><td>Setting effective</td><td>Effective immediately</td><td>Data Range</td><td>1~1000</td></tr>
<tr><td>Access Properties</td><td>RW</td><td>Unit</td><td>ms</td><td>Related Models</td><td>ALL</td><td>Factory settings</td><td>100</td></tr>
<tr><td colspan="8">Since the contracting brake has mechanical response time, this parameter is used in the negative timing control of the contracting brake to set the delay time from the motor holding coil holding to the servo stop output torque. The longer the time, the more obvious the effect of preventing fall, but generally not more than 500ms.</td></tr>
<tr><td>Serial number</td><td>Name</td><td colspan="3">Locking Timing</td><td>Setting effective</td><td>Effective immediately</td><td>Data Range</td><td>0~1</td></tr>
</table>

<table>
<tr><td rowspan="2">P30.04</td><td>Access Properties</td><td>RW</td><td>Unit</td><td>-</td><td>Related Models</td><td>ALL</td><td>Factory settings</td><td>1</td></tr>
<tr><td colspan="8">Change the parameter to set the sequence of servo output and contracting brake action.
0: Positive timing sequence of contracting brake
Open the brake → servo output enables → operation → servo output shutdown → brake locking


1: Negative timing sequence of contracting brake
Servo output enable → brake open → operation → brake lock → servo output shutdown


T1：P30.02 brake opening delay time; T2：P30.03 brake holding delay time</td></tr>
</table>

According to the current state of the servo driver, the working timing of the contracting brake mechanism can be divided into the normal state contracting brake timing of the servo driver and the fault state contracting brake timing of the servo driver.

3) Servo driver normal state holding timing (negative timing sequence of contracting brake)

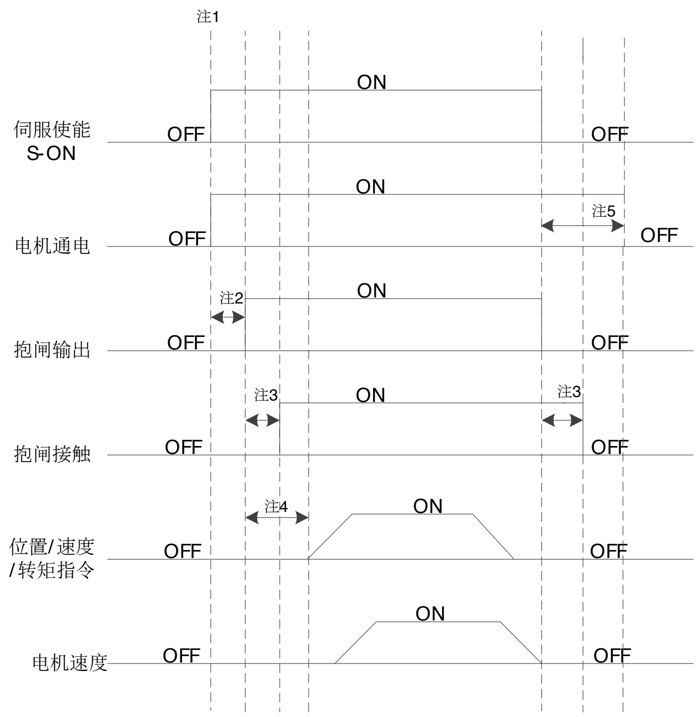


Fig. 7.1.4-3 Timing of contracting brake when the motor is stationary

⚠ **注意**

- When the servo is enabled ON, the contracting brake output is set to ON and the motor enters the energized state.

- Output of the contracting brake output signal after a delay of 10ms.
- Refer to the motor specifications for the delay time of the contact part of the brake.
- From the time the contracting brake output is set to ON to the time when the position/speed/torque command is input, please interval P30.02 or more.
- When the servo is enabled OFF, the contracting brake output is set to OFF at the same time, and the delay time for the motor to enter the non-energized state after the contracting brake output is OFF can be set by P30.03.
- Do not input position/speed/torque commands during the P30.02 time after the brake output is turned ON from OFF, as this may result in lost commands or operation errors.
- When used in the vertical axis, the mechanical moving part may move slightly due to the self-weight or external force. When the servo motor is stationary, servo enable OFF occurs and the contracting brake output immediately turns OFF, but the motor remains energized during P30.03 time to prevent the mechanical moving part from moving due to self-weight or external force.

4) Servo drive fault state time sequence of contracting brake

Servo failure is divided into Class 0 controllable failure and Class 1 uncontrollable failure according to the shutdown mode. The servo drive fault state contracting brake timing can be divided into the following 2 cases:

① Type 0 fault occurs: The contracting brake DO output condition is the same as the " contracting brake timing in the normal state of the Servo Drive".

② Type 1 fault occurs: When a type 1 fault occurs and the contracting brake is enabled, the contracting brake output immediately becomes OFF and the motor is in a power-off state.

7.1.5 Brake settings

When the motor torque and speed are in opposite directions, energy is transferred from the motor end back into the drive, causing the bus voltage value to rise, and when the voltage rises to a certain height, the energy can only be consumed through the braking resistor. At this time, excessive energy must be consumed according to the braking requirements, otherwise the servo drive will be damaged. Some models of AD3 series Servo Drives are not equipped with internal braking resistors. When the braking resistor is required to implement the braking function, an additional braking resistor must be applied.

1) Torque measurement

If the motor does a back-and-forth action, the kinetic energy will be converted into electrical energy fed back to the bus capacitor. If the bus voltage exceeds the braking voltage, the braking resistor will consume the excess feed-back energy. Taking the motor no-load from 3000rpm to standstill as an example, the motor speed curve is as follows:

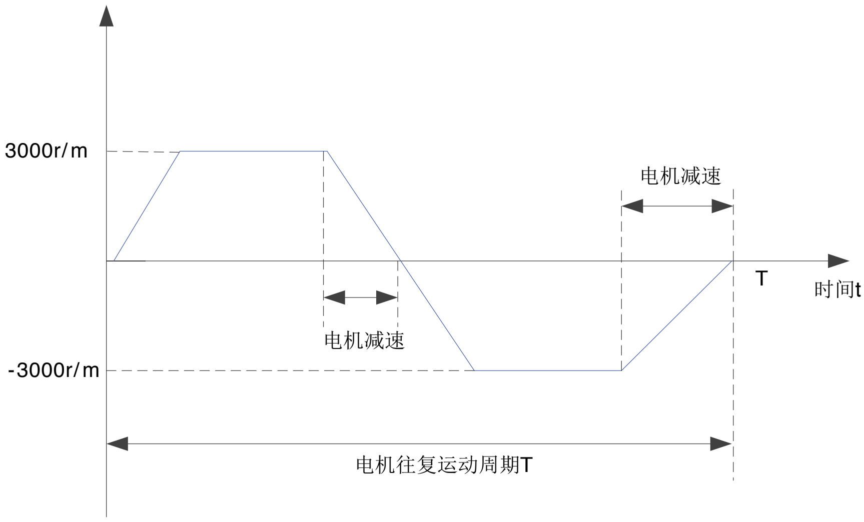
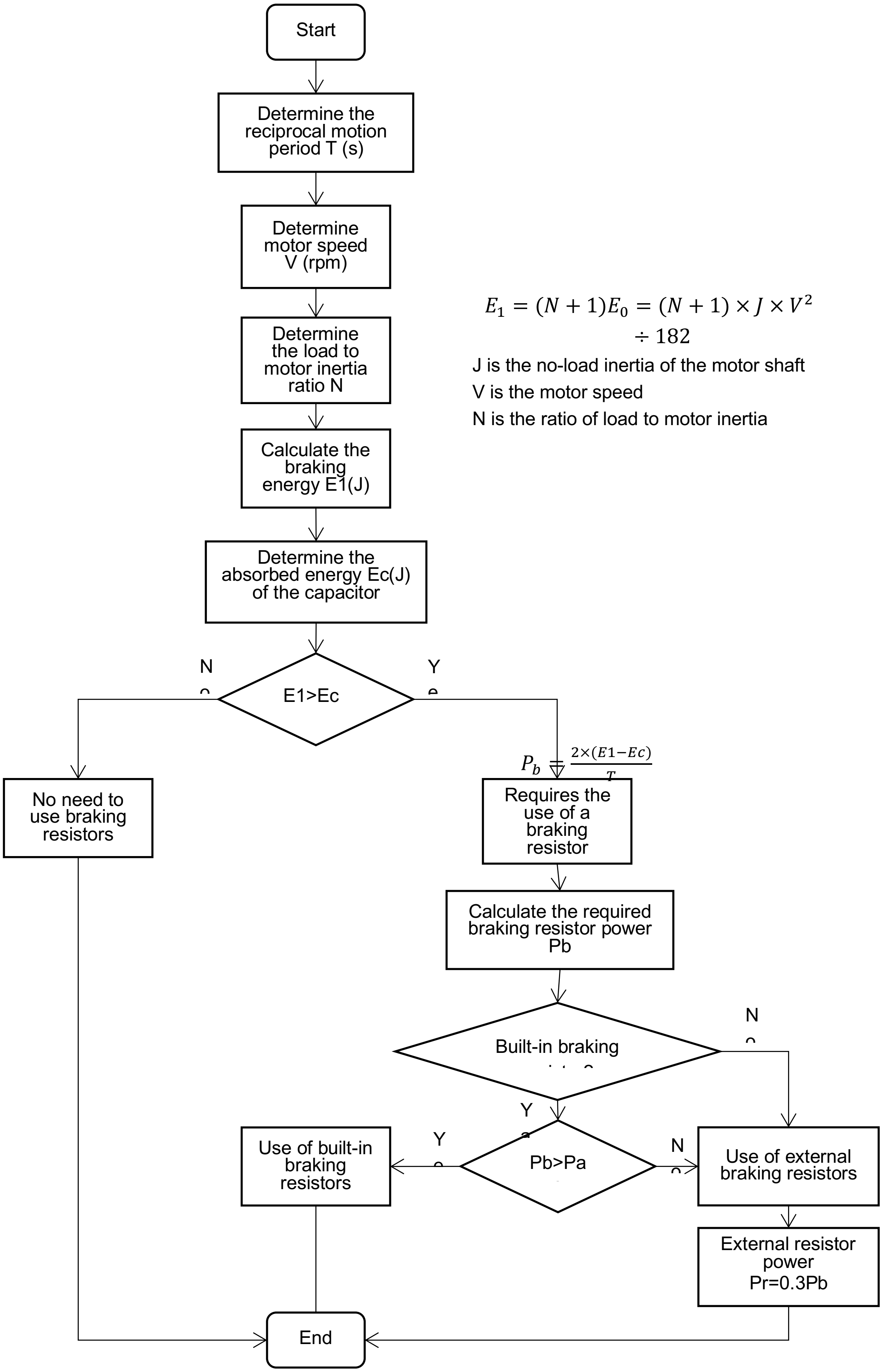


Figure 7.1.5-1 Example of motor speed curve in the absence of external load torque

2) Braking resistor selection



$$E_1 = (N+1)E_0 = (N+1) \times J \times V^2 \div 182$$

J is the no-load inertia of the motor shaft

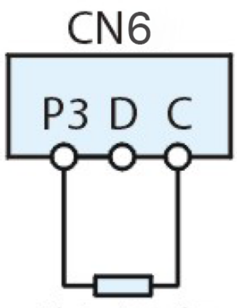
V is the motor speed

N is the ratio of load to motor inertia

For specific selection of braking resistors, please refer to the braking resistor selection in the product specification section.
A simple calculation here is:
Assuming that the load inertia is N times the motor inertia, the total braking energy when decelerating from 3000 rpm to 0 is $E_1 = (N+1)E_0$ The total braking energy, excluding the energy absorbed by the capacitor Ec, is $(n+1) \times Eo - Ec$ joules. Assuming a reciprocal motion period of T, the required braking resistor power is $2 \times \frac{(n+1) \times Eo - Ec}{T}$. According to Figure 7.1.5-2, it can be determined whether to use the current braking resistor, and the power selection of the braking resistor.

3) Braking resistor connection and setting

① Use of external braking resistors:
When Pb×T>=EC, an external braking resistor needs to be connected. Currently, according to the different ways of braking resistor cooling. The external braking resistor should be used at 70% derating, that is: Pr=Pb/(1-70%), and ensure that it is greater than the minimum resistance value allowed by the drive. The two ends of the external braking resistor are connected to P3 and C of the servo CN6 terminal.



② Pb × T < Pa without using braking resistors:
When Pb×T<EC, there is no need to connect the braking resistor, and the braking energy can be absorbed by the bus capacitor only.

⚠ 注意

- Please set the resistance value (P31.10) and power (P31.11) of the external braking resistor correctly, otherwise it will affect the use of this function.
- If an external braking resistor is used, make sure that the resistance value meets the minimum allowable resistance value limit. If the resistance value of the braking resistor is too small, the
- Will cause damage to the drive brake tube.
- Under natural environment, when the braking resistor can handle power (average value) is used at rated capacity, the temperature of the resistor will rise to 120°C or more (under continuous braking). For safety reasons, use forced cooling to reduce the braking resistor temperature; or use a braking resistor with a thermal switch. For the load characteristics of the braking resistor, please consult the manufacturer.

4) There is external load torque, and the motor is in power generation

The direction of motor rotation is the same as the direction of torque, and the motor outputs energy to the outside. But some special occasions motor torque output is opposite to the direction of rotation, this When the motor makes negative work, the external energy is fed back to the drive by generating electrical energy through the motor. The common DC bus scheme is recommended when the load is in continuous power generation.

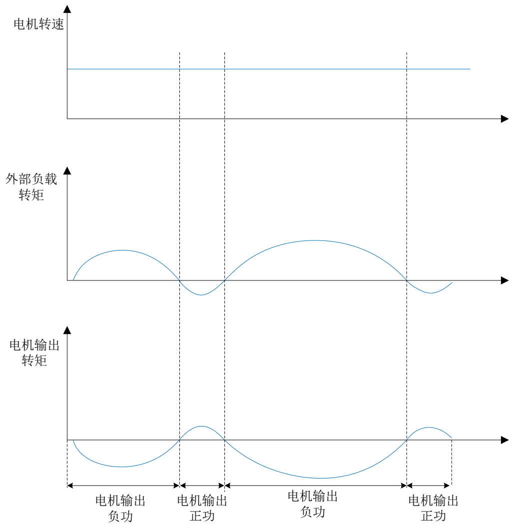


Figure 7.1.5.4 - Example of curve in the presence of external load torque

Taking a 750W servo motor (rated torque 2.39N-M) as an example, when the external load torque is 60% of the rated torque and the speed reaches 1500rpm, the return

The power to the driver is (60% × 2.39) × (1500 × 2π/60) = 225W, considering that the braking resistor needs to be derated by 70%, so the external braking resistor power is 225/(1-70%) = 750W, and the resistance value is 50Ω.

- Associated parameters:

Serial number P31.10	**Name**	**Braking resistor resistance value**			**Setting effective**	**Break Enable**	**Data Range**	**1~1000**
	Access Properties	RW	Unit	ohm	Related Models	ALL	Factory setting	Model decision
This parameter is used to set the actual braking resistor resistance value, the default is the built-in braking resistor resistance value corresponding to each drive model (please refer to the product specification chapter for details). When the external braking resistor is connected, it should be filled in according to the actual value of the external braking resistor resistance. This value, if set to 0, does not provide protection related to brake resistor overload, so it is not recommended to set this value to 0.								
Serial number P31.11	**Name**	**Braking resistor power**			**Setting effective**	**Break Enable**	**Data Range**	**1~10000**
	Access Properties	RW	Unit	W	Related Models	ALL	Factory settings	Model decision
This parameter is used to set the actual braking resistor power used, and the default is the built-in braking resistor resistance value corresponding to each drive model (please refer to the product specification section for details). When the external braking resistor is connected, it should be filled in according to the actual value of the external braking resistor power. This value, if set to 0, does not provide protection related to brake resistor overload, so it is not recommended to set this value to 0.								

7.1.6 Servo operation

1) Select the appropriate control mode by parameter modification

Serial number P00.02	Name	Control channel selection			Setting effective	Restart power	Data Range	0~4
	Access Properties	RW	Unit	-	Related Models	ALL	Factory setting	1

This parameter is used to set the way the control command is given.

0: Control panel control

Use the LED panel for related operations with limited functionality.

1: Controller control

Through bus communication such as EtherCAT/CAN Open, the servo drive is enabled, run, stop, reset, etc., and the relevant control commands, such as position command, speed command, torque command, etc., are issued by the bus.

2: AD commissioning software control

The servo drive is operated by AD Servo Tool commissioning software.

3: Analog 1 control

Reserved

4: Analog 2 control

Reserved

注意

There are five control modes for AD3 series servo, be sure to pay attention to choose the appropriate control mode according to the current working condition

2) After inputting the command, the servo motor rotates

Servo operation instructions		
Records	**No.#**	**Content**
☐	1	For initial operation, a relatively low given command should be set to rotate the motor at low speed to confirm that the motor rotation is correct.
☐	2	Observe whether the motor rotation direction is correct. If you find that the motor turns opposite to the expected one, check the input command signal and command direction setting signal.
☐	3	If the motor rotates in the correct direction, the actual speed, time current and other data of the motor can be observed using the drive panel or AD commissioning software.
☐	4	After the above motor operating conditions are checked, the relevant parameters can be adjusted to make the motor work at the desired operating conditions.
☐	5	Refer to "Section 9 Adjustment" to commission the Servo Drive.

3) Power-on Timing Diagram

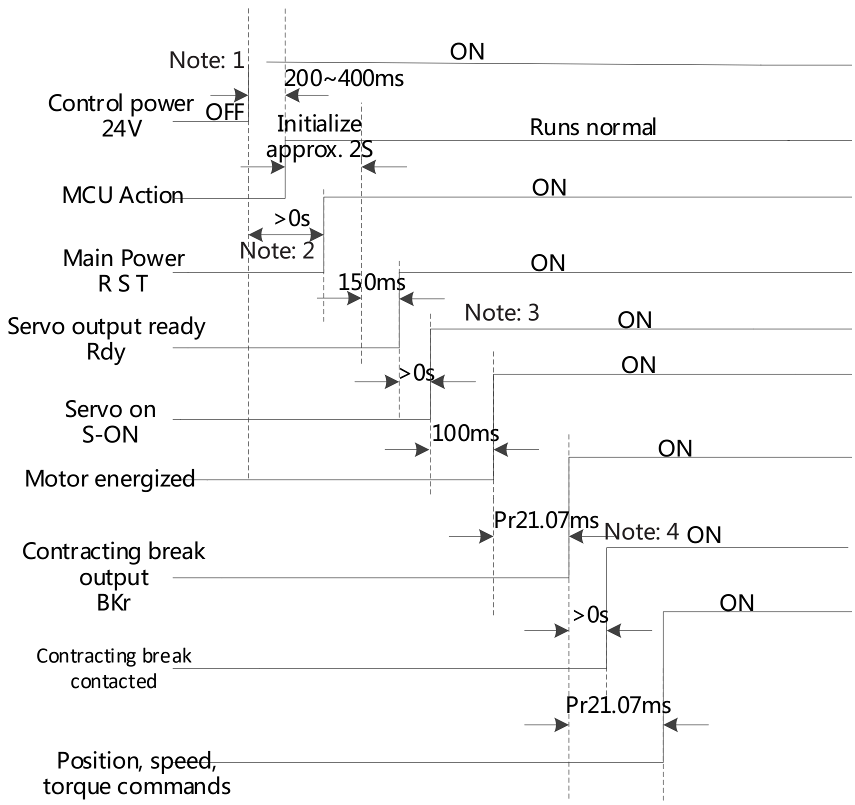


Figure 7.1.6-1 Power-on timing sequence

⚠ 注意

- The main power energizing is recommended to be after the control power.
- The servo enable power-up time depends on the command given.
- The delay time of the brake contact part action depends on the mechanical action time of the motor's contracting brake, and the P30.02 setting time needs to be greater than the delay time.

Associated parameters:

Serial number P30.02	Name	Gate opening time delay			Setting effective	Effective immediately	Data Range	1~1000
	Access Properties	RW	Unit	ms	Related Models	ALL	Factory settings	100
Since the brake has a mechanical response time, this parameter is used to set the delay time for the opening of the brake.								

4) Timing diagram for shutdown in case of failure or overtravel

① Fault: Zero speed stop

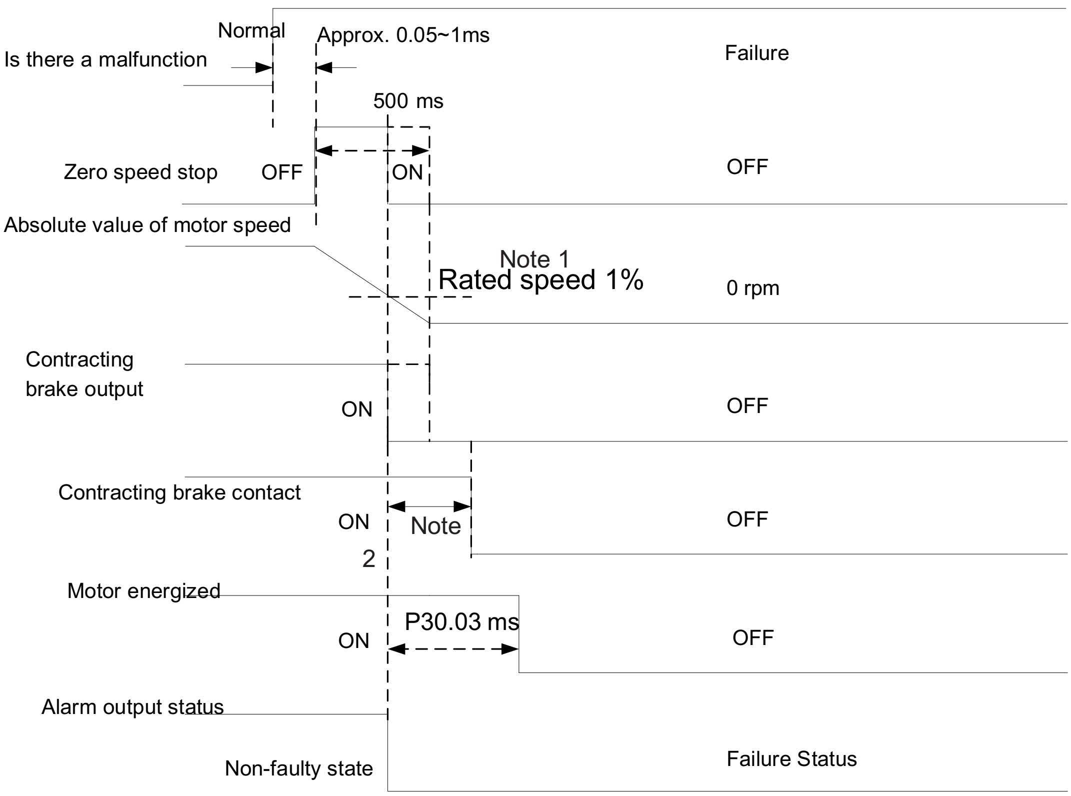


Figure 7.1.6-2 Timing sequence diagram of zero-speed shutdown state at fault

Note 1: If the motor speed reaches below 1% of rated speed before 500ms, the zero-speed stop signal becomes invalid.

Note 2: The delay time of contracting brake contact part action depends on the motor's contracting brake specification, and the setting time of P30.03 needs to be greater than the delay time.

② Fault: Contracting brake forced stop

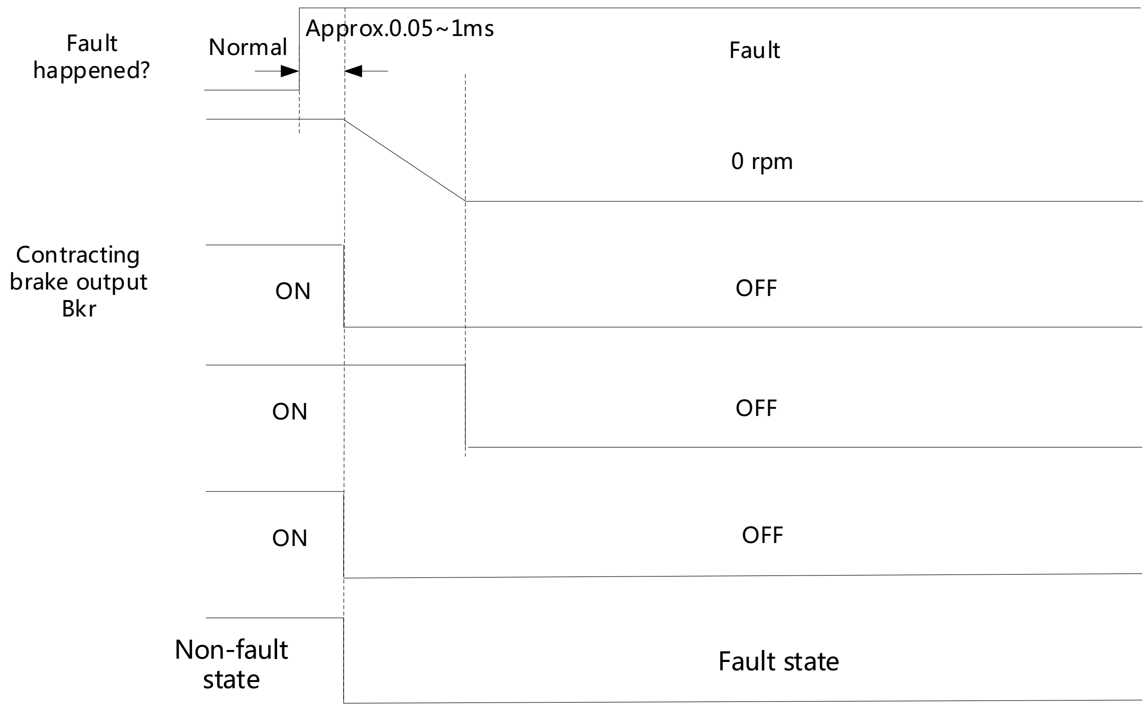


Figure 7.1.6-3 Timing sequence diagram of forced holding state at fault

If the brake output is not connected, it will stop freely.

③ Overtravel: zero speed stop, keep position latching state

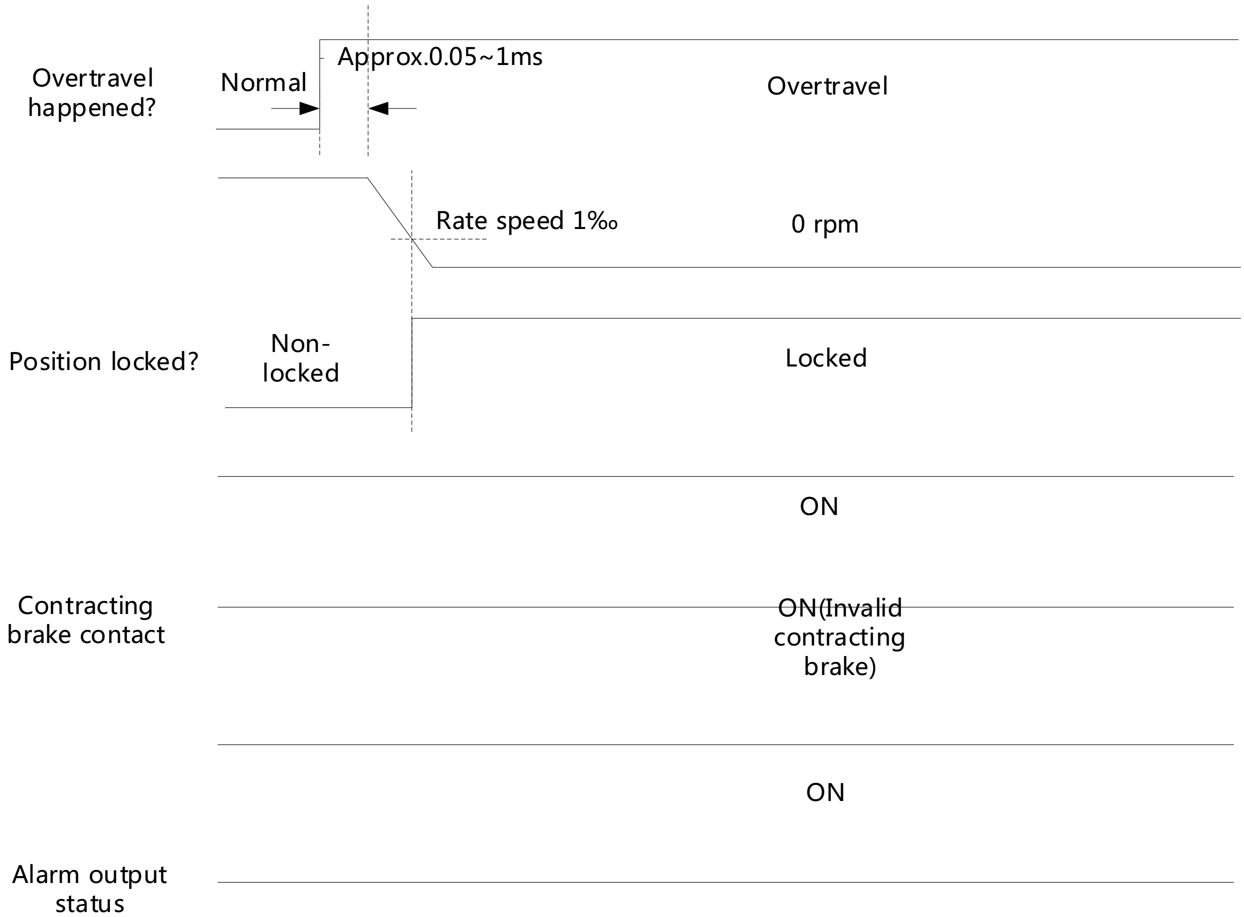


Figure 7.1.7-4 Timing sequence diagram of zero-speed stop state during overtravel

④ Fault reset:

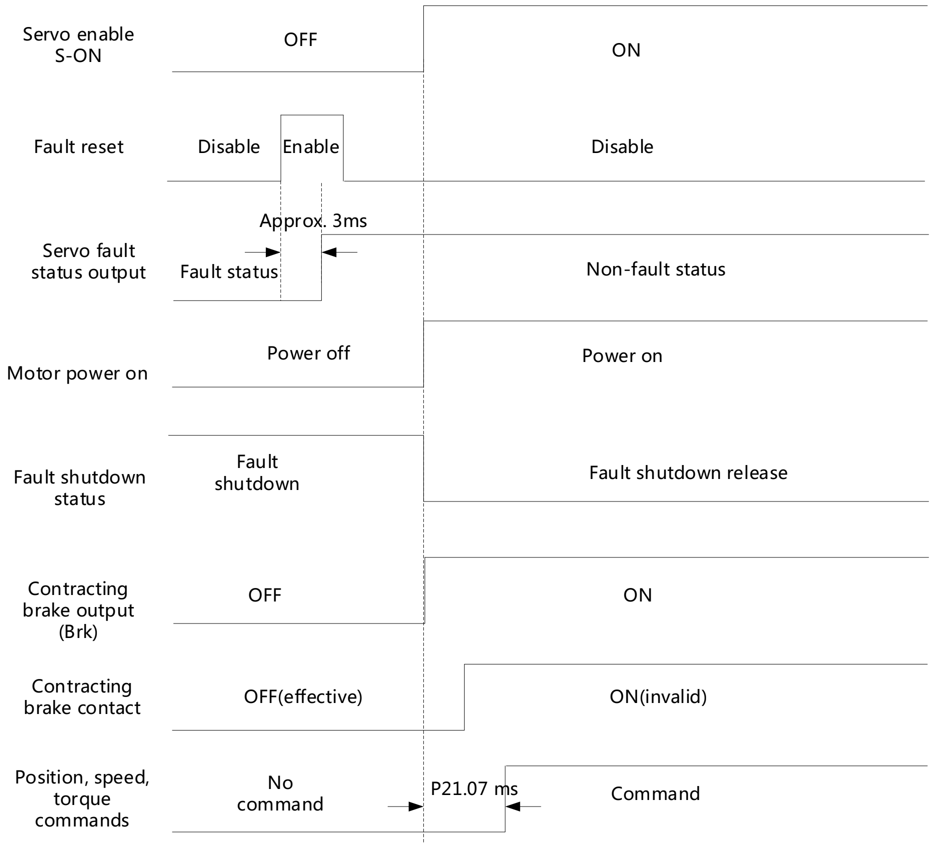


Figure 7.1.6-5 Fault Reset Timing Sequence Diagram

7.1.7 Servo stops

According to the different stopping methods, it can be divided into contracting brake stop and zero speed stop; according to the stopping state, it can be divided into motor drive off state and position hold lock state. The details are as follows:

Shutdown method	Hold brake stop	Zero speed stop
Downtime Description	Servo motor is not energized, forced to stop by contracting brake, deceleration time is decided by contracting brake specification; if there is no contracting brake, it will stop freely.	The servo driver outputs the reverse braking torque, and the motor rapidly decelerates to 0.
Shutdown characteristics	If there is a contracting brake, the mechanical impact is larger and the deceleration process is extremely fast; if there is no contracting brake, the deceleration is smooth and the mechanical impact is small, but the deceleration process is slow.	Fast deceleration, there is mechanical shock, but the deceleration process is fast.

	Drive off state	Position hold latching state

Downtime status	After the motor stops rotating, the motor is not energized, and if there is a contracting brake, the motor shaft is locked; if there is no contracting brake the motor shaft can rotate freely.	After the motor stops rotating, the motor shaft is locked and cannot rotate freely.

Servo stop bus object dictionary setting

1） Servo enable invalid stop

Enable is invalid when communication control servo, and servo Disable operation mode stop.

★ Associated with:

<table>
<tr><th>Index</th><th>Name</th><th colspan="3">Disable operation option code</th><th>Settings Effective</th><th>Operation settings Downtime effective</th><th>Data Structure</th><th>VAR</th><th>Data Type</th><th>Uint16</th></tr>
<tr><td>605Ch</td><td>Access Properties</td><td>RW</td><td>Can I Mapping</td><td>NO</td><td>Related Mode</td><td>ALL</td><td>Data Width</td><td>0~1</td><td>Factory Settings</td><td>1</td></tr>
<tr><td colspan="11">The set values mean the following:
0: Turn off the output of the servo unit and stop the motor freely.
1: After the motor stops at the deceleration ramp, the output of the servo unit is turned off.
Note: When the state machine jumps from Operation Enable to Switch On state, use 605Ch to select the shutdown method.</td></tr>
</table>

注意

Only in the bus control mode, the servo can be set to enable stop or contracting brake stop

2) Fault shutdown

The servo shutdown method is different depending on the type of fault. Please refer to "Section 11 Troubleshooting" for fault classification.

★ Associated with:

Index	Name	Fault reaction option code			Settings Effective	Operation settings Downtime effective	Data Structure	VAR	Data Type	Uint16
605Eh	Access Properties	RW	Can Mapping	NO	Related Mode	ALL	Data Width	0~3	Factory Settings	1
The set values mean the following: 0: Turn off the output of the servo unit and stop the motor freely. 1: The motor stops at the deceleration ramp. 2: The motor stops at a fast stop ramp. 3: Motor stops at maximum current (speed control, speed given command is 0). Note: After an alarm occurs, i.e., before the system jumps into the Fault state machine, use 605Eh to select the shutdown method.										

3) Overtravel stop

★ Explanation of the term:

"Overtravel": is the mechanical movement beyond the designed safe range of movement.

"Over-range stop": It is a safety function that when the moving part of the machinery is beyond the safe moving range, the output level of the limit switch changes, and the servo driver makes the servo motor stop forcibly.

When the servo motor drives the vertical axis, the workpiece may fall off if it is in the overtravel state. To prevent the workpiece from falling, the servo program has fixed the overtravel stop method "zero speed stop, position lock state". If the workpiece is moving in a straight line, be sure to connect a limit switch to prevent damage to the machine. In the overtravel condition, the motor (workpiece) can be reversed by inputting a reverse command.

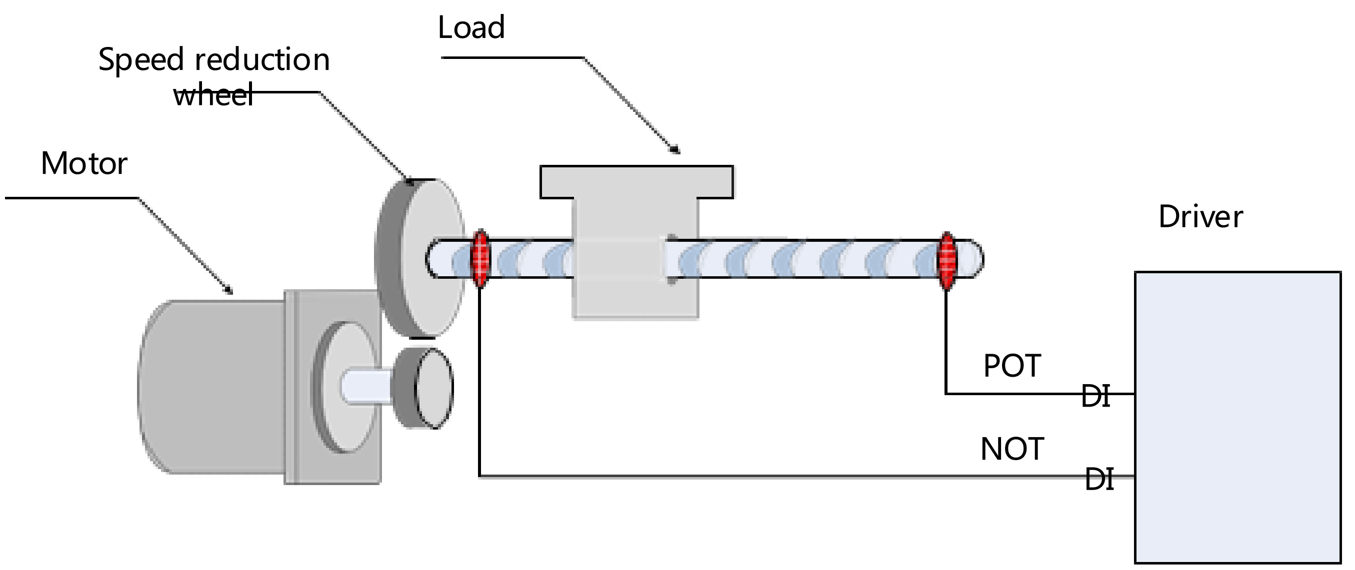


Figure 7.1.7-1 Installation schematic of limit switch

When using the overtravel stop function, any two of the four digital input ports from DI1 to DI4 of the CN4 port of the servo drive should be configured as function 2/102 (forward motion disable) and function 3/103 (reverse motion disable), respectively, with corresponding configuration parameter numbers P70.01 to P70.04, to receive the limit switch input level signal. Set 2 and 3 for normally open logic, and 102 and 103 for normally closed logic. depending on whether the DI terminal level is valid, the drive will enable or disable the overtravel stop state.

4) Quick Shutdown

The servo has two types of quick stops:

① Using the SS interface of the CN4 port, input the emergency stop signal and configure the correct parameters according to the level logic of the external input

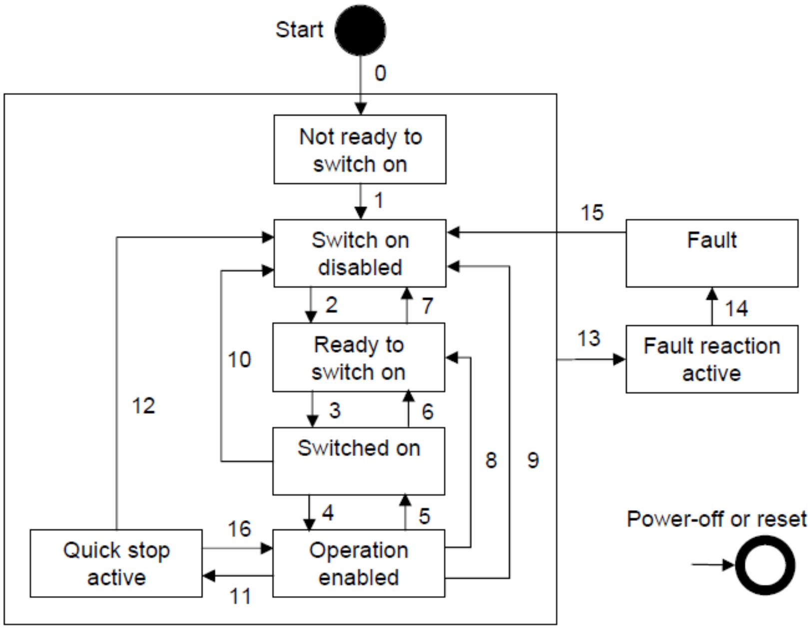
Serial number P70.06	Name	Emergency stop input logic			Setting effective	Effective immediately	Data Range	6, 106
	Access Properties	RW	Unit	-	Related Models	ALL	Factory setting	6
This parameter is used to select the logic setting for the emergency stop input 6: Normally open logic, representing the valid state corresponding to the servo's emergency stop state. 106: Normally closed logic, representing the emergency stop state of the corresponding servo in case of invalid state.								

② When bit2 (Quick stop) of control word 6040h is 0, the quick stop is executed and the stop method is selected by object dictionary 605Ah.

Index	Name	Quick stop option code			Settings Effective	Operation Settings Downtime effective	Data Structure	VAR	Data Type	Uint 16
605Ah	Access Properties	RW	Can Mapping	NO	Related Mode	ALL	Data Width	0~7	Factory Settings	2
The set values mean the following: 0: Turn off the output of the servo unit and stop the motor freely. 1: After the motor stops at the deceleration ramp, it jumps to the Switch on disabled state. 2: After the motor stops at the fast stop ramp, it jumps to the Switch on disabled state. 3: After the motor stops at the maximum current, it jumps to Switch on disabled state (speed control, speed given command is 0). 4: Undefined 5: After the motor stops at the deceleration ramp, it still stops at Quick Stop state. 6: After the motor stops at the Quick Stop ramp, it still stops at Quick Stop. 7: After the motor stops at the maximum current, it still stops in Quick Stop state (speed control, speed give command is 0). Note: When the state machine jumps from Operation Enable to Quick reaction active state, use 605Ah (Quick stop option code) to select the stopping method.										

7.2 Servo status setting

The servo drive must be guided according to the process specified in the standard 402 protocol to use the AD3 series drive before the servo drive can operate in the specified state.



The states are described in the following table:

Start	This state is entered automatically after power-up or reset.
Initialization Not ready to switch on	The control is powered on, the driver initializes, internal self-tests, and remains in this state until initialization is complete.
No servo failure Switch on disable	Servo initialization is complete, and the Servo Drive is fault-free or errors have been eliminated. Drive parameters can be set.
Servo ready Ready to switch on	The servo drive is ready. Drive parameters can be set.
Enables Switch on	The servo drive waits for the servo enable to be turned on. Drive parameters can be set.
Operation Enable	The drive is running normally, a servo operation mode is enabled, the motor is powered on, and the motor rotates when the command is not 0. If the drive parameter property is "Run Change", it can be set, otherwise it cannot be set.
Quick stop active	The Quick Stop function is activated, and the drive is performing the Quick Stop function. The drive parameter property "Run Change" can be set, otherwise it cannot be set.
Fault shutdown	The drive has failed and is in the process of performing a failover. If the drive parameter property is "Run Change", it can be set, otherwise it cannot be set.
Fault	Fault shutdown is complete, and all drive functions are disabled while allowing drive parameters to be changed for troubleshooting.

◆ Control commands and status switching:

CiA402 state switching		**Control word 6040h**	**Status word 6041h bit0~bit9*1**
0	Power up-->Initialization	Natural transition without control commands	0x0000
1	Initialization --> servo without	Natural transition, no control command	0x0250

CiA402 state switching		Control word 6040h	Status word 6041h bit0~bit9*1
	fault	required if an error occurs during initialization, go directly to 13	
2	No servo failure-->Servo ready	0x0006	0x0231
3	Servo ready --> waiting to turn on servo enable	0x0007	0x0233
4	Wait to turn on servo enable --> servo operation	0x000F	0x0237
5	Servo run --> wait to turn on servo enable	0x0007	0x0233
6	Wait to turn on servo enable --> servo ready	0x0006	0x0231
7	Servo ready --> No servo failure	0x0000	0x0250
8	Servo run-->Servo ready	0x0006	0x0231
9	Servo operation-->No servo failure	0x0000	0x0250
10	Waiting to turn on servo enable --> no servo failure	0x0000	0x0250
11	Servo operation --> quick stop	0x0002	0x0217
12	Quick stop-->no servo failure	Quick stop mode 605A is selected as 0~3, after the stop is completed, natural transition without control command	0x0250
13	Fault shutdown	Once the servo drive fails in any state other than "fault", it will automatically switch to the fault stop state without control commands.	0x021F
14	Failure to stop-->Failure	Natural transition after failure shutdown is complete, no control commands required	0x0218
15	Failure-->No servo failure	0x80; bit7 rising edge is valid; bit7 is held as 1, all other control instructions are invalid.	0x0250
16	Quick stop --> servo operation	Fast stop mode 605A is selected as 5~7, and after the stop is completed, send 0x0F	0x0237

注意

*1, because the status word 6041h bit10~bit15 (bit14 is meaningless) is related to the operation status of each servo mode, it is indicated by "0" in the above table, please check the specific status of each servo operation mode.

7.2.1 Control word 6040h

Index	Name	Control words control word			Settings Effective	Operation setting shutdown is effective	Data Structure	VAR	Data Type	Uint16
6040h	Accessibility	RW	Can Mapping	RPDO	Related Mode	ALL	Data Scope	0~65535	Factory Settings	00

Set control commands:

Bit	Name	Description
0	Servo ready	1 - valid, 0 - invalid
1	Connections Main Circuit Electricity	1 - valid, 0 - invalid
2	Quick Shutdown	1 - invalid, 0 - valid
3	Servo operation	1 - valid, 0 - invalid
4~6		Related to servo operation mode
7	Fault Reset	Performing a fault reset function for resettable faults and warnings. bit7 rising edge active. The bit7 is kept as 1, and all other control instructions are invalid.
8	Suspension	Please refer to the object dictionary 605Dh for the pause method in each mode.
9~10	NA	Reserved.
11~15	Manufacturer customization	Reserved, undefined

Notes:

- Each bit of the control word is meaningless on its own and must be used in conjunction with other bits to form a particular control instruction.
- bit0~bit3 and bit7 have the same meaning in each servo mode, and the commands must be sent by sequence order. Then it can set the servo driver following CiA402 state machine switching process leads into the expected states, with each command corresponding to a determined state.
- bit4~bit6 are related to each servo mode (please check the control commands in different modes).

7.2.2 Status word 6041h

Index	Name	Status word			Setting effective	-	Data Structure	VAR	Data Type	Uint16
6041h	Accessibility	RO	Can Mapping	TPDO	Related Models	ALL	Data Range	0~FFFF	Factory setting	00

Reflects servo status:

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

Notes:

- (a) Each bit of the status word is meaningless when read alone and must be composed together with other bits to feed back the current state of the servo.
- bit0~bit9 have the same meaning in each servo mode, and the control word 6040h sends the command in sequence, and the servo feeds back a determined state.
- bit12~bit13 are related to each servo mode (please check the control commands in different modes).
- The bit10 bit11 bit15 has the same meaning in each servo mode and gives feedback on the state of the servo after executing a certain servo mode.

7.3 Servo mode setting

7.3.1 Introduction of servo mode

The servo pre-run mode can be set via object dictionary 6060h. The servo current operation mode can be viewed via object dictionary 6061h.

◆ **Mode setting 6060h:**

Index	Name	Mode Selection Modes of operation			Setting effective	-	Data Structure	VAR	Data Type	Int8
6060h	Accessibility	RW	Can Mapping	RPDO	Related Mode	ALL	Data Scope	0~10	Factory Settings	00

Set the polarity of position command, speed command, and torque command.

Set value	Name	Description
0	No mode setting	Reserved
1	Contour position mode (pp)	Reference profile position mode (pp)
2	No mode setting	Reserved
3	Contour speed mode (pv)	Reference profile velocity mode (pv)
4	Contour torque mode (pt)	Reference profile torque mode (pt)*Note
5	No mode setting	Reserved
6	Back to zero mode (hm)	Reference home zero return mode (hm)
7	Interpolation mode (ip)	Reference position interpolation mode (ip)*Note
8	Cycle synchronous position mode (csp)	Reference period synchronous position mode (csp)
9	Cyclic synchronous velocity mode (csv)	Reference period synchronous velocity mode (csv)
10	Periodic synchronous torque mode (cst)	Reference period synchronous torque mode (cst)

*Note: This control mode is not supported by AD3 series.

◆ **Mode display 6061h:**

Index	Name	Operation mode display Modes of operation display			Setting effective	-	Data Structure	VAR	Data Type	Uint16
6061h	Accessibility	RO	Can Mapping	TPDO	Related Models	ALL	Data Range	0~10	Factory setting	00

Set the polarity of position command, speed command, and torque command.

Set value	Name	Description
0	No mode setting	Reserved
1	Contour position mode (pp)	Reference profile position mode (pp)
2	No mode setting	Reserved
3	Contour speed mode (pv)	Reference profile velocity mode (pv)
4	Contour torque mode (pt)	Reference profile torque mode (pt)*Note
5	No mode setting	Reserved
6	Return to zero mode (hm)	Reference home zero return mode (hm)
7	Interpolation mode (ip)	Reference position interpolation mode (ip)*Note
8	Cycle synchronous	Reference period synchronous

		position mode (csp)	position mode (csp)
	9	Cyclic synchronous velocity mode (csv)	Reference period synchronous velocity mode (csv)
	10	Periodic synchronous torque mode (cst)	Reference period synchronous torque mode (cst)
*Note: This control mode is not supported by AD3 series.			

7.3.2 Mode Switching

Notes on the use of mode switching:

- When the servo drive is in any state, unexecuted position commands are discarded after cutting from the contour position mode or the cycle synchronous position mode to other modes.
- When the servo drive is in any state, after cutting to other modes from the profile speed mode, profile torque mode, cycle synchronous speed mode, cycle synchronous torque mode, it first performs a ramp stop, and after the stop is completed, it can cut to other modes.
- When the servo is in zero return mode and is running, it cannot be cut to other modes; when zero return is completed or is interrupted (fault or invalid enable), it can be cut to other modes.
- When switching from other modes to cycle synchronous mode in servo operation status, please send commands at least 1ms apart, otherwise command loss or error will occur.

7.3.3 Each mode supports communication cycles

Periodicity Time	Profile Position Mode (PP)	Back to zero mode (HM)	Cycle synchronization Location Mode (CSP)	Cycle synchronization Speed Mode (CSV)	Profile speed mode (PV)	Profile Torque Mode (PT)	Cycle synchronization Torque mode (CST)
100us	×	×	×	×	×	×	×
200us	√	√	√	√	√	×	√
400us	√	√	√	√	√	×	√
1ms	√	√	√	√	√	×	√

The synchronization periods supported by each mode of 1ms and below are shown in the table above and may lead to operational errors when used outside the specifications.
1ms or more, the value of the position loop control cycle (AD3 series servo position loop control cycle is 200us) integer times of the synchronization cycle can also be supported, but the maximum should not exceed 8ms, otherwise the servo control effect cannot be guaranteed.

7.4 Cycle synchronous position mode (csp)

In the cyclic synchronous position mode, the upper controller completes the position command planning, and then sends the planned target position (607Ah) to the servo drive in a cyclic synchronous manner, and the position, speed and torque control is done internally by the servo drive.

7.4.1 Control Block Diagram

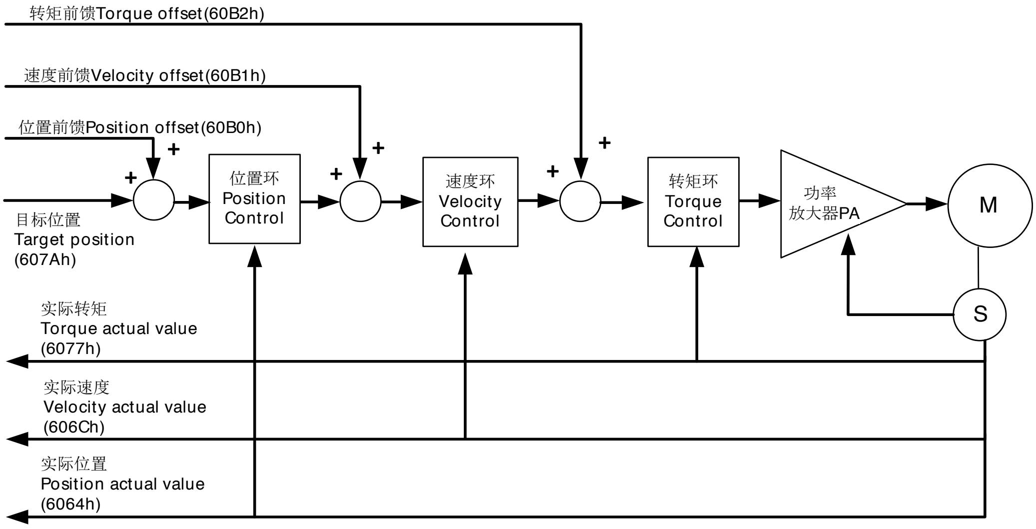


Figure 7.4.1-1 Block diagram of cycle synchronous position control

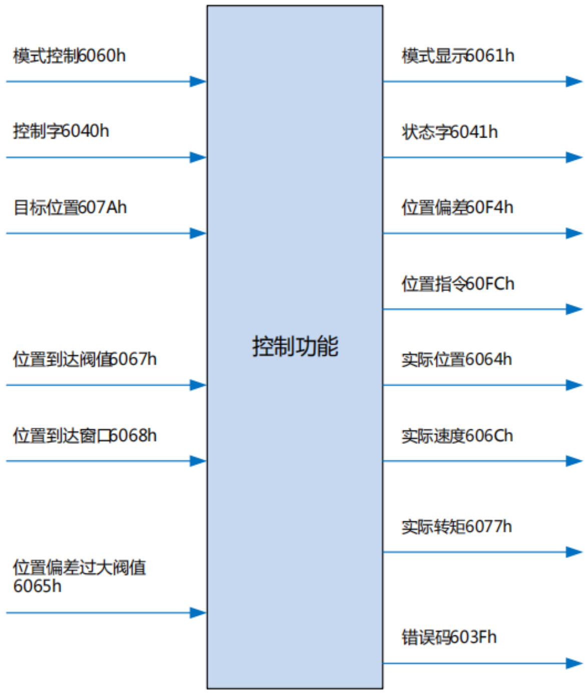


Figure 7.4.1-2 Cycle synchronization position input and output objects

7.4.2 Related objects

Control word 6040h		
Bit	Name	Description
0	Servo ready: switch on	bit0~bit3 are 1, which means start operation
1	Turn on the main circuit power	
2	Quick stop	
3	Servo operation: enable operation	
8	Pause: halt	0: Servo set by Bit0~bit3 1: Servo press 605Dh to set pause.

Status word 6041h		
Bit	Name	Description
10	Target Reached	0: Target location not reached 1: Target location arrival
11	Software internal position overtravel	0: Position command and position feedback are not overtravel 1: Position command or position feedback overtravel
12	Drive follows the command Value	0: Slave did not follow the command 1: Slave follow instruction: if the slave is in operation and starts to execute the position instruction, the position is 1; otherwise, it is 0
13	Following deviation	0: No position deviation too much fault 1: Excessive position deviation fault occurs
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero completed

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control word	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~65535	0
6060	0	Operation Mode	RW	Int8	-	0~10	0
6061	0	Mode Display	RO	Int8	-	0~10	0
6062	0	Location commands	RO	Int32	Command unit	-	-
6063	0	Location Feedback	RO	Int32	Encoder units	-	-
6064	0	Location Feedback	RO	Int32	Command unit	-	-
6065	0	Position deviation Oversize threshold	RW	Uint32	Command unit	0~(2^{32} -1)	3145728
6067	0	Location Reaching the threshold	RW	Uint32	Encoder Unit	0~65535	734
6068	0	Location Arrival Window	RW	Uint16	ms	0~65535	x10
606C	0	Actual speed	RO	Int32	Command unit/s	-	-
6072	0	Maximum torque	RPDO	Uint16	0.10%	0~5000	5000
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
607A	0	Target Location	RW	Int32	Command unit	-2^{31} ~(2^{31} -1)	0
6091	1	Motor resolution	RW	Uint32	-	0~(2^{32} -1)	1

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
	2	Axis Resolution	RW	Uint32	-	1~(2^{32} -1)	1
60E0	0	Positive Torque limiting	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limiting	RW	Uint16	0.10%	0~5000	5000
60F4	0	Position deviation	RO	Int32	Command unit	-	-
60FC	0	Location commands	RO	Int32	Encoder units	-	-
Note: See "Section 8 Parameter and Object Dictionary Details" for more details on using the relevant objects.							

7.4.3 Related function settings

1) Positioning completed

Index	Sub-index	Name	Description
6067	0	Position reaches threshold	When the position deviation is within the ±6067h interval and the time reaches 6068, the DO signal of positioning completion is valid, while bit10=1 of 6041. if either of the two conditions is not satisfied, the position arrival is invalid.
6068	0	Location arrival window	

2) Position Deviation Excess Threshold

Index	Sub-index	Name	Description
6065	0	Position Deviation Excess Threshold	When the position deviation is greater than this value, a position deviation fault occurs and the panel displays an alarm, while bit13 of the status word is set. When 6065h=0xFFFFFFFF, the drive does not perform position deviation over detection.

7.4.4 Recommended configuration

Cyclic synchronous position mode (csp) with the following basic configuration:

RxPDO	TxPDO	Remarks
6040：control word	6041: Status word status word	Must
607A: target position	6064: Position feedback position actual value	Must
6060: Mode of operation	6061: modes of operation display	Optional

7.5 Cyclic synchronous velocity mode (csv)

In the cyclic synchronous speed mode, the upper controller sends the calculated target speed of 60FF cyclically synchronized to the servo driver, and the speed and torque adjustment is executed by the servo internally.

7.5.1 Control Block Diagram

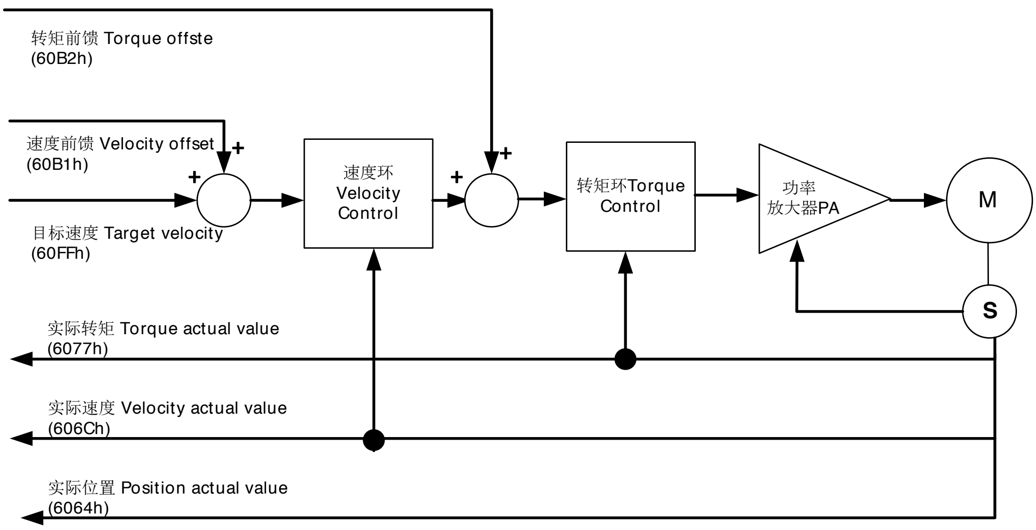


Figure 7.5.1-1 Block diagram of cycle synchronous speed control

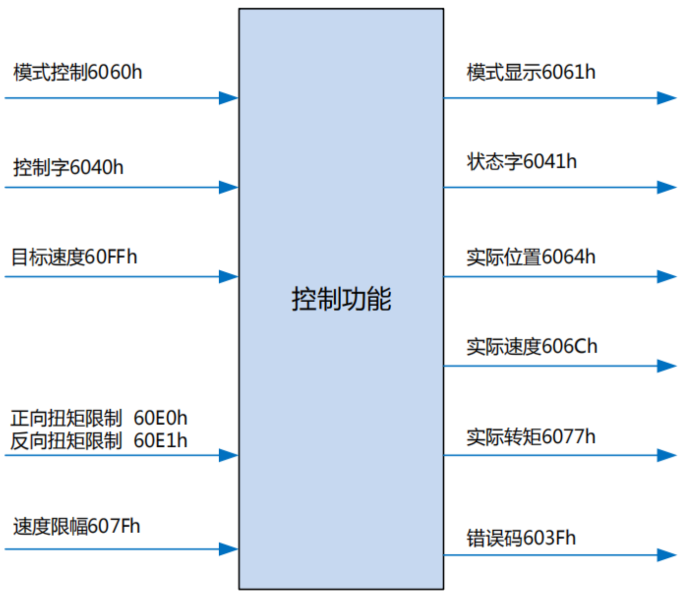


Figure 7.5.1-2 Input and output objects

◆ **Related objects**

Control word 6040h		
Bit	Name	Description
0	Servo ready	bit0~bit3 are 1, which means start operation
1	Turn on the main circuit electrical power	

2	Quick stop	
3	Enable operation	
8	Pause	0: Servo set by bit0~bit3 1: Servo press 605Dh to set pause.

Status word 6041h		
Bit	Name	Description
10	Target Reach	0: Target speed not reached 1: Target speed arrival
12	Drive follow the command Value	0: Slave did not follow the command 1: Slave follow command
13		Undefined
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero completed

Index(hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control words	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~65535	0
6060	0	Operation Mode	RW	Int8	-	0~10	0
6061	0	Mode Display	RO	Int8	-	0~10	0
6063	0	Location Feedback	RO	Int32	Encoder units	-	-
6064	0	Location Feedback	RO	Int32	Command unit	-	-
606C	0	Actual speed	RO	Int32	Command unit/s	-	-
606D	0	Speed Reaching the threshold	RW	Uint32	Encoder units	0~65535	0
606E	0	Speed Arrival Window	RW	Uint16	ms	0~65535	0
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
607F	0	Maximum speed	RW	Uint32	Command unit/s	0~(232-1)	230
6083	0	Acceleration	RW	Uint32	Command unit/S2	0~(232-1)	100
6084	0	Deceleration	RW	Uint32	Command	0~(232-1)	100

Index(hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
					unit/S2		
60B1	0	Speed Offset	RW	Int32	Command unit/s	-231~(231-1)	0
60B2	0	Torque bias	RW	Int32	0.10%	-5000~5000	0
60E0	0	Positive Torque limiting	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse Torque limiting	RW	Uint16	0.10%	0~5000	5000
60FF	0	Target speed	RW	Int32	Command unit /s	-231~(231-1)	0

注意

See "Section 8 Parameter and Object Dictionary Details" for detailed instructions on using the relevant objects.

7.5.2 Related function settings

◆ Speed arrival function

Index	Sub-index	Name	Description
606Dh	0	Speed reaches threshold value	When the difference between the target speed 60FF (converted to motor speed/rpm) and the actual motor speed is within ±606D and the time reaches 606E, the speed is reached and bit 10 of status word 6041 = 1, while the speed reached DO function is valid. This flag bit is meaningful when the servo enable is valid in profile speed mode and cycle synchronous speed mode; otherwise, it is meaningless.
606Eh	0	Speed to window	

7.5.3 Recommended configuration

Periodic synchronous velocity mode (csv) with the following basic configuration.

RxPDO	TxPDO	Remarks
6040：control word	6041: Status word status word	Must
60FF: target Velocity		Must
6064: Position feedback position actual value	606C: Velocity feedback velocity actual value	Must
6060: Mode selection modes of operation	6061: Modes of operation display	Must

7.6 Periodic synchronous torque mode (cst)

In this mode, the upper controller sends the calculated target torque 6071h to the servo driver periodically and synchronously, and the torque regulation is executed by the servo internally. When the speed reaches the limit value it will enter the speed regulation phase.

7.6.1 Control Block Diagram

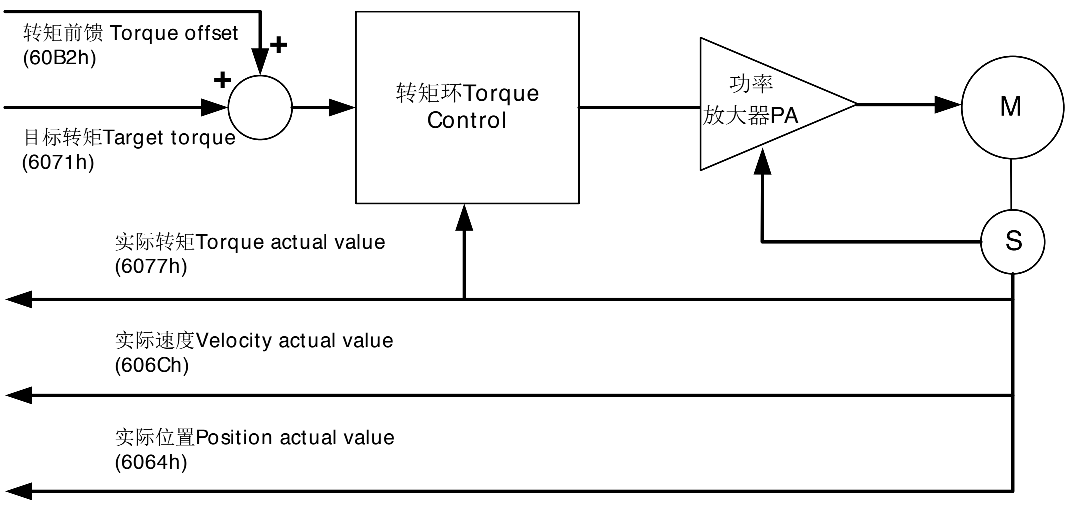


Figure 7.6.1-1 Block diagram of cycle synchronous torque mode

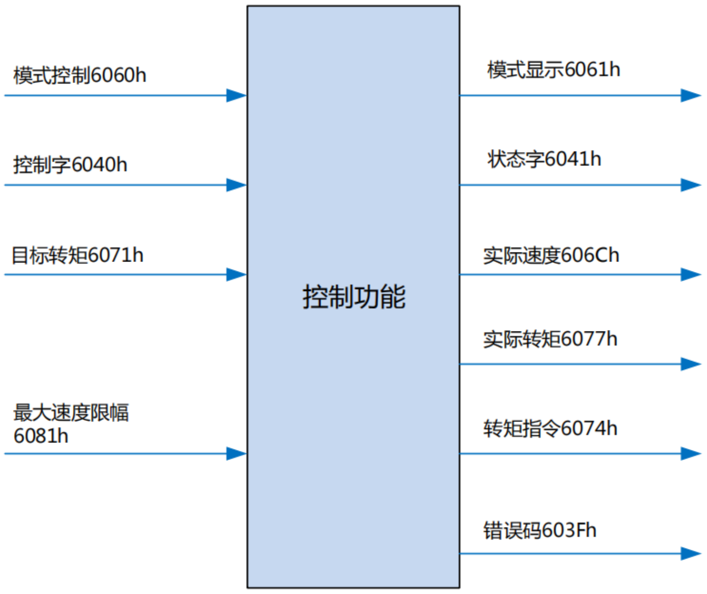


Figure 7.6.1-2 Periodic synchronous torque mode input and output objects

◆ **Related objects**

Control word 6040h		
position	Name	Description
0	Servo ready	bit0~bit3 are 1, which means start operation
1	Turn on the main circuit electrical power	
2	Quick stop	
3	Enable operation	
8	Pause	0: Servo set by bit0~bit3 1: Servo press 605Dh to set pause

Control word 6041h		
position	Name	Description
10	Target Reach	0: Target torque not reached 1: Target torque reached
12	Drive follow the command Value	0: Slave did not follow the command 1: Slave follow command
13		Undefined
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero completed

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control word	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~x65535	0
6060	0	Operation Mode	RW	Int8	-	0~10	0

6061	0	Mode Display	RO	Int8	-	0~10	0
606C	0	Actual speed	RO	Int32	Command unit/s	-	-
6071	0	Target torque	RW	Int16	0.10%	-5000~5000	0
6074	0	Torque command	RO	Int16	0.10%	-5000~5000	0
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
6081	0	Maximum speed	RW	Uint32	Command unit/s	320~(2 - 1)	230
60B2	0	Torque bias	RW	Int32	0.10%	-5000~5000	0
60E0	0	Positive Torque limiting	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse Torque limiting	RW	Uint16	0.10%	0~5000	5000

Note: See "Chapter 8 Parameter and Object Dictionary Details" for details on using the related objects.

7.6.2 Recommended configuration

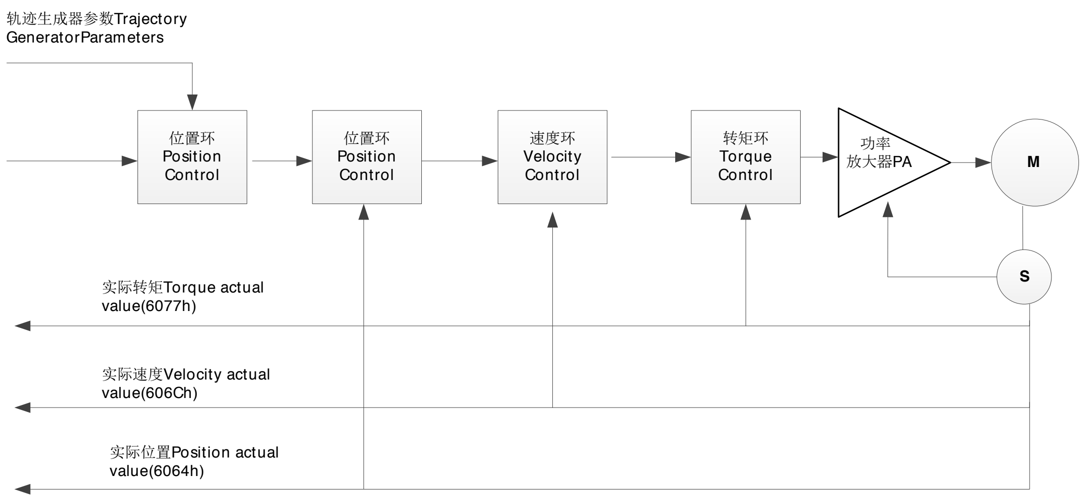
Periodic synchronous torque mode (cst) with the following basic configuration.

RxPDO	TxPDO	Remarks
6040：control word	6041: Status word status word	Must
6071: Target Torque target Torque	6064: Position feedback position actual value	Must
6081: Speed limit ProfileVelocity	606C: Velocity feedback velocity actual value	Must
6060: Mode selection modes of operation	6077: Torque Feedback Torque ActualValue	Must
	6061: modes of operation display	Must

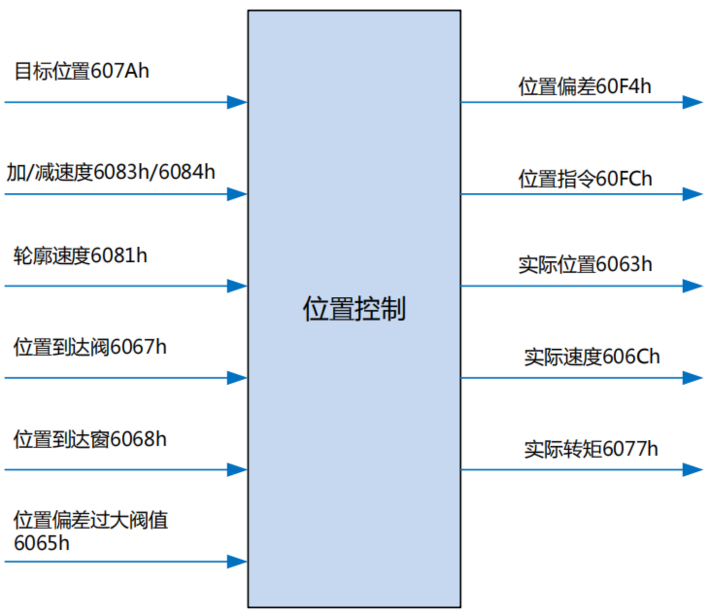
7.7 Contour position mode (pp)

This mode is mainly used for point-to-point positioning applications. In this mode, the host computer gives the target position (absolute or relative), velocity, acceleration and deceleration of the position curve, and the trajectory generator inside the servo will generate the target position curve command according to the setting, and the drive completes the position control, velocity control and torque control internally.

7.7.1 Control Block Diagram



7.7.1-1 Contour position mode control block diagram



7.7.1-2 Contour position mode (pp) input and output block diagram

◆ Related objects

Control word 6040h		
position	Name	Description
0	Servo ready	bit0~bit3 are 1, which means start operation
1	Turn on the main circuit electrical power	
2	Quick stop	
3	Enable operation	
4	New set-point	The rising edge of this bit from 0 to 1 indicates the pre-trigger of the new target position 607Ah, profile velocity 6081h, acceleration 6083h and deceleration 6084h given
5	Update immediately	0: Not immediately updated 1：Update immediately

6	Absolute position command/relative position command abs/rel	0: Target position is absolute position command 1: The target position is a relative position command

Status word 6041h		
position	Name	Description
10	Target Reach	0: Target location not reached 1: Target location arrival
12	Set point acknowledge	0: Slave did not follow the command 1: The slave does not follow the instruction, the slave is in the running state and starts to execute the position instruction, the position is 1; otherwise, it is 0
13	Following deviation	0: No position deviation too much fault 1: Excessive position deviation fault occurs
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero completed

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control words	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~xFFFF	0
6060	0	Operation Mode	RW	Int8	-	0~10	0
6061	0	Mode Display	RO	Int8	-	0~10	0
6062	0	Location commands	RO	Int32	Command unit	-	-
6063	0	Location Feedback	RO	Int32	Encoder units	-	-
6064	0	Location Feedback	RO	Int32	Command unit	-	-
6065	0	Position deviation Oversize threshold	RW	Uint32	Command unit	$0\sim(2^{32}-1)$	1048576
6067	0	Location Reaching the threshold	RW	Uint32	Encoder units	0~65535	734
6068	0	Location Arrival Window	RW	Uint16	ms	0~65535	x10
606C	0	Actual speed	RO	Int32	Command unit/s	-	-
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
607A	0	Target Location	RW	Int32	Command unit	$-2^{31}\sim(2^{31}-1)$	0
6083	0	Acceleration	RW	Uint32	Command unit/S2	$0\sim(2^{32}-1)$	100

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
6084	0	Deceleration	RW	Uint32	Command unit/S2	0~(2^{32} -1)	100
6091	1	Motor resolution	RW	Uint32	-	0~(2^{32} -1)	1
	2	Axis Resolution	RW	Uint32	-	1~(2^{32} -1)	1
60E0	0	Positive Torque limiting	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse Torque limiting	RW	Uint16	0.10%	0~5000	5000
60F4	0	Position deviation	RO	Int32	Command unit		
60FC	0	Location commands	RO	Int32	Encoder units		

Note: See "Section 8 Parameter and Object Dictionary Details" for details on using related objects.

7.7.2 Related function settings

1) Positioning completed

Index	Sub-index	Name	Description
6067	0	Position reaches threshold	When the position deviation is within the ±6067h interval and the time reaches 6068, the DO signal of positioning completion is valid, while bit10=1 of 6041. if either of the two conditions is not satisfied, the position arrival is invalid.
6068	0	Location arrival window	

2) Position Deviation Excess Threshold

Index	Sub-index	Name	Description
6065	0	Position deviation Oversize threshold	When the position deviation is greater than this value, a position deviation too large fault occurs and the panel displays an alarm, while bit 13 of the status word is set. When 6065h=0xFFFFFFFF, the drive does not perform excessive position deviation detection.

7.7.3 Position curve generator

The curve generator contains two modes, which are divided into single-point mode and multi-point mode.
When 6040h.bit5=1, it is single-point operation mode, i.e., immediate update mode.
When 6040.bit5=0, it is multi-point operation mode. After setting a new point in the 607Ah object dictionary, by controlling 6040h.bit4 a rising edge, the newly established point can be enabled, and the drive can control the motor to run to the newly set coordinates. At the same time the status word 6041h.bit12 will give a 1 status, and the new set point can only be accepted if 6041h.bit12 = 0.

1) Single point of operation mode

When 6040h.bit5=1 it is single point operation mode as shown in the figure below. When a new Target position is set, a rising edge is given using 6040h.bit4 to trigger the setpoint to run. When the point is run and a new point is set, a rising edge needs to be given again using 6040h.bit4 and the driver immediately uses the new Target position to set the trajectory parameters for trajectory planning, as shown in the figure below.

2) Multi-point movement mode

When 6040h.bit5=0, it is multi-point operation mode. This mode of operation is divided into two types, as follows:
The first one is 6040h. bit9=0 is the sequential planning mode, as shown in the figure below, one point is being processed, and when the planning of that point is completed, the second set point will be run immediately after the planning.
The second one is 6040h.bit9=1, keeping the speed of 6040h.bit4 trigger moment to finish the current position planning, and using this speed as the starting speed for the next position planning.
The planning is shown as the solid line in the figure, and the dotted line is the planning diagram in the case of bit9=0. When the planning of the first point set is completed, the position of the next point will be started for planning.

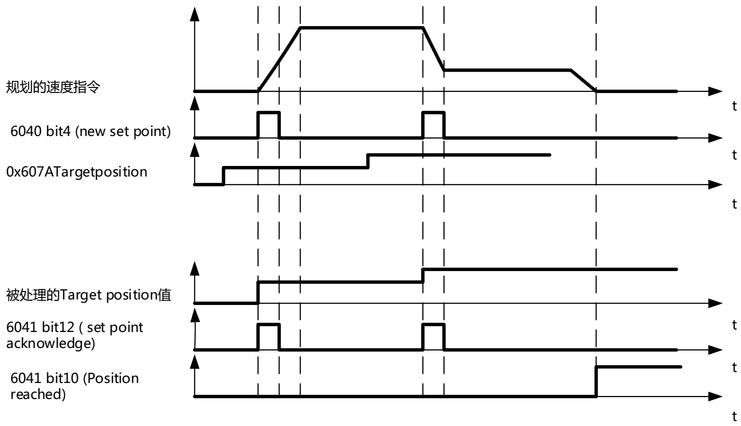


Figure 7.7.4-1 Single-point operation mode update Target Position diagram

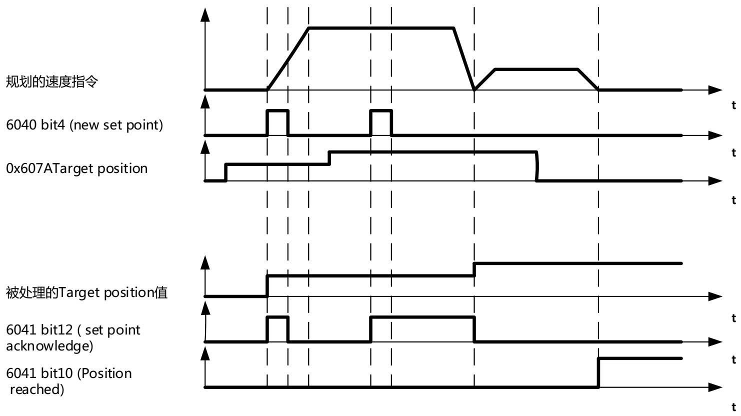


Figure 7.7.4-2 Multipoint operation mode 6040.bit9=0 operation diagram

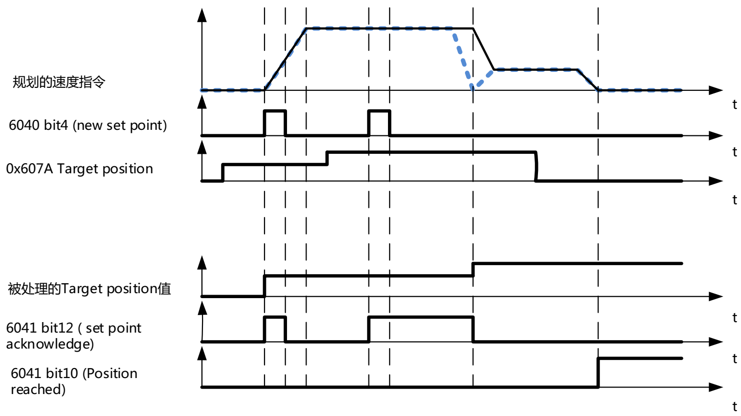


Figure 7.7.4-3 Multipoint operation mode 6040.bit9=1 operation diagram

7.7.4 Recommended configuration

Contour position mode (pp) with the following basic configuration:

RxPDO	TxPDO	Remarks
6040：Control word	6041: Status word status word	Must
607A: Target position	6064: Position feedback position actual value	Must
6081: Contours velocity		Must

RxPDO	TxPDO	Remarks
6083: Contours acceleration		Optional
6084: Contours deceleration		Optional
6060: Modes of operation	6061: modes of operation display	Optional

7.8 Contour speed mode (pv)

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.

7.8.1 Control Block Diagram

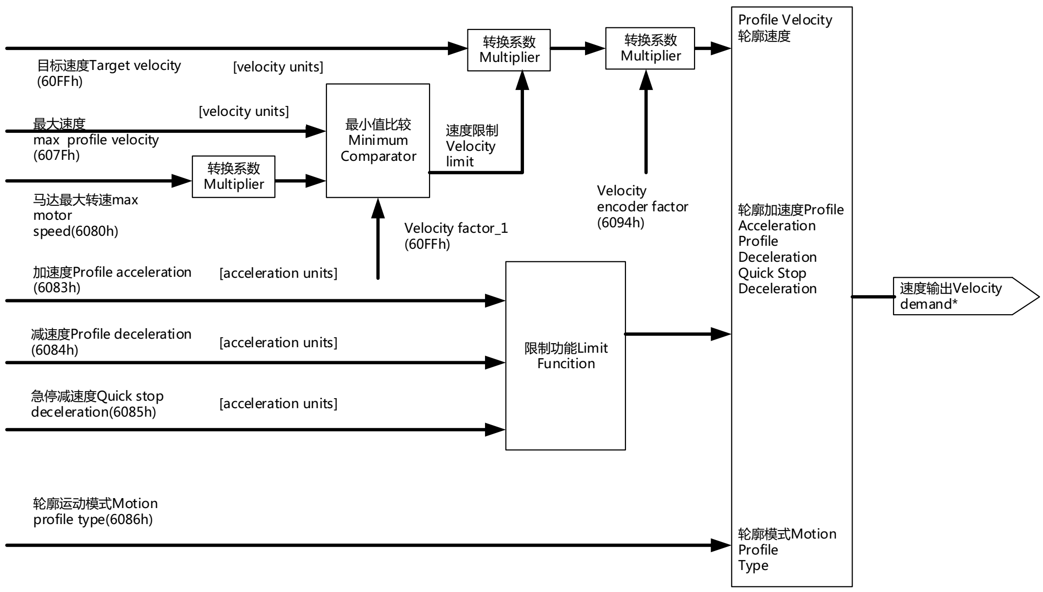


Figure 7.8.1-1 Contours diagram of contour speed mode control

7.8.2 Related objects

Control word 6040h		
position	Name	Description
0	Servo ready	Bit0~bit3 are 1, which means start running
1	Turn on the main circuit electrical Power	
2	Quick stop	
3	Enable operation	
8	Pause	0: Servo set by Bit0~bit3 1: Servo press 605Dh to set pause

Status word 6041h		
position	Name	Description
10	Target Reach	0: Target location not reached 1: Target location arrival
11	Software internal position overtravel	0: Position command and position feedback are not exceeded 1: Position command or position feedback over limit
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero completed

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control word	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~65535	0
6060	0	Operation Mode	RW	Int8	-	0~10	0
6061	0	Mode Display	RO	Int8	-	0~10	0
607F	0	Maximum contour speed	RW	Uint32	Command unit /s	0~(232-1)	230
6063	0	Location Feedback	RO	Int32	Encoder units	-	-
6064	0	Location Feedback	RO	Int32	Command unit	-	-
60FF	0	Target speed	RW	Int32	Command unit /s	-231~(231-1)	0
60E0	0	Forward torque limiting	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limiting	RW	Uint16	0.10%	0~5000	5000
606C	0	Actual speed	RO	Int32	Command unit /s	-	-
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0

Note: See "Chapter 8 Object Dictionary Details" for detailed instructions on using related objects.

7.8.3 Related function settings

Speed arrival function

Index	Sub-index	Name	Description
606Dh	0	Speed reaches threshold value	When the difference between the target speed 60FF (converted to motor speed/rpm) and the actual motor speed is within ±606D and the time reaches 606E, the speed is reached and bit 10 of status word 6041 = 1, and the speed reached DO function is valid at the same time. This flag bit is meaningful when the servo enable is valid in profile speed mode and cycle synchronous speed mode; otherwise, it is meaningless.
606Eh	0	Speed to window	

7.8.4 Recommended configuration

Profile velocity mode (pv) with the following basic configuration:

RxPDO	TxPDO	Remarks
6040: Control word	6041: Status word	Must
60FF: target Velocity		Must
	6064: Position feedback position actual value	Optional
	606C: Velocity feedback velocity actual value	Optional
6083: Contours acceleration		Optional
6084: Contours deceleration		Optional
6060: Modes of operation	6061: modes of operation display	Optional

7.9 Contours torque mode (pt)

This function is not supported by bus type Servo Drive.

7.10 Home zero return mode (hm)

Home zero return mode is used to find the mechanical home point and locate the position of the mechanical home point in relation to the mechanical zero point. Mechanical home point: a fixed position on the machinery, which can correspond to a certain determined home switch and can correspond to the motor Z signal. Mechanical zero point: the absolute 0 position on the machinery. After the origin back to zero into, the motor stop position is the mechanical origin, by setting 607Ch, you can set the relationship between mechanical origin and mechanical zero: mechanical origin = mechanical zero + 607Ch (origin offset). When 607Ch=0, the mechanical origin coincides with the mechanical zero point.

7.10.1 Control Block Diagram

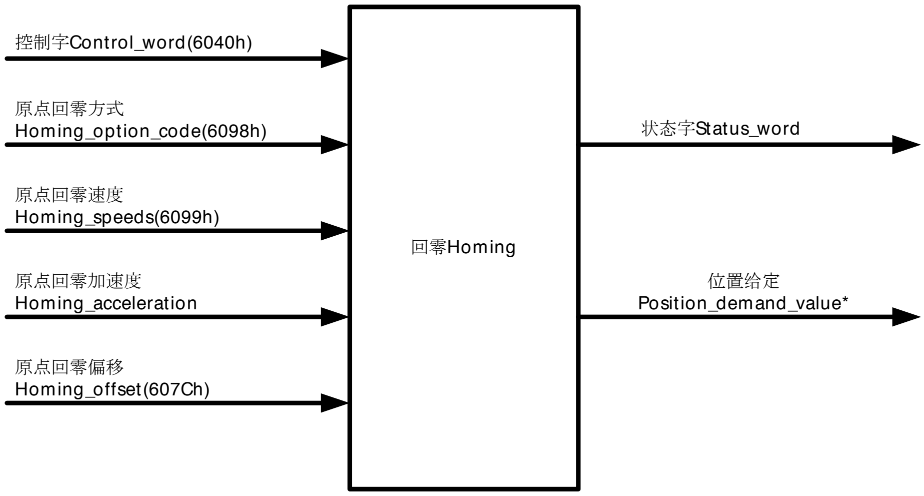


Figure 7.10.1-1 Home return to zero control block diagram

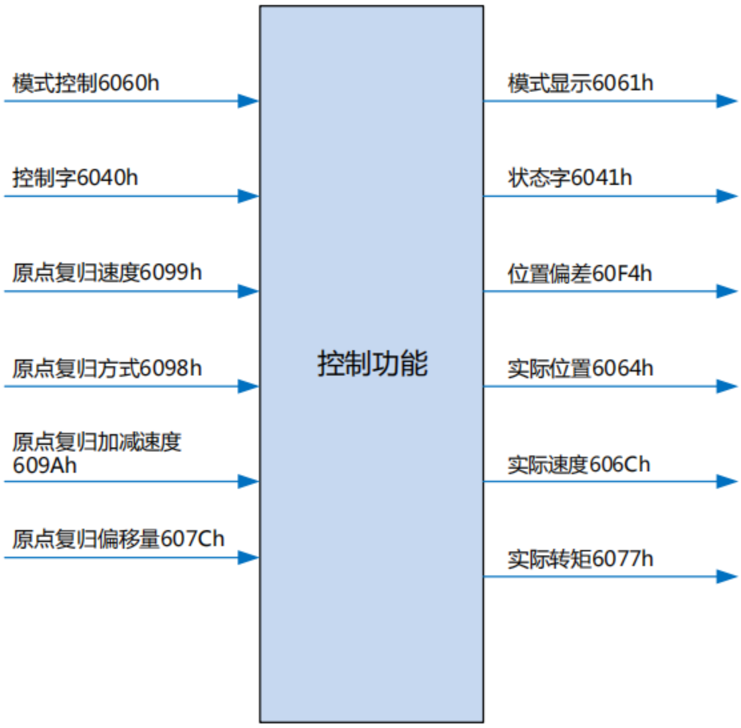


Figure 7.10.1-2 Home return to zero input and output objects

7.10.2 Related objects

Control word 6040h		
position	**Name**	**Description**
0	Servo ready	bit0~bit3 are 1, which means start operation
1	Turn on the main circuit electrical power	
2	Quick stop	
3	Enable operation	
4	Start back to zero, Homing start	0->1: Start back to zero 1: Back to zero in progress 1->0: end back to zero
8	Pause	0: Servo set by Bit0~bit3 1: Servo press 605Dh to set pause

Status word 6041h		
position	**Name**	**Description**
10	Target Reach	0: Target torque not reached 1: Target torque reached
12	Back to zero	0: Return to zero unsuccessful 1: Zero return success, this flag is valid after the target reach signal is set when the servo is in zero return mode operation
13	Return to zero error Homing error	0: Back to zero no error occurred 1: Return to zero timeout or deviation too large error occurred
15	Home Find	0: Origin back to zero is not completed 1: Home return to zero is complete, this flag bit is set when the home signal is encountered

Index (hex)	Subindex (hex)	Name	Access	Data Type	Unit	Setting range	Default Value
603F	0	Error Code	RO	Uint16	-	0~65535	0
6040	0	Control words	RW	Uint16	-	0~65535	0
6041	0	Status word	RO	Uint16	-	0~xFFFF	0
6060	0	Operation Mode	RW	Int8	-	0~10	0
6061	0	Mode Display	RO	Int8	-	0~10	0
6062	0	Actual Location	RO	Int32	Command unit	-	-
6064	0	Location Feedback	RO	Int32	Command unit	-	-
6067	0	Position reaches threshold	RW	Uint32	Encoder units	0~65535	734
6068	0	Location arrival window	RW	Uint16	ms	0~65535	x10
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
606C	0	Actual speed	RO	Int32	Command unit /s	-	-
6098	0	Origin restoration method	RW	Int8	-	1~35	1
6099	1	High-speed search for speed bumps	RW	Uint32	Command unit/s	0~232--1)	100
	2	Search origin low speed	RW	Uint32	Command unit/s	10~(232--1)	100
609A	0	Acceleration	RW	Udint32	Command unit/s2	0~(232--1)	100
60F4	0	Position deviation	RO	Dint32	Command unit	-	-

Note: See "Section 8 Parameter and Object Dictionary Details" for details on using related objects.

7.10.3 Related function settings

Current position calculation method

Index	Sub-index	Name	Description
60E6	0	Current Location Calculation	60E6 determines whether the user can use absolute or relative return to zero in incremental systems. 60E6 = 0 (absolute return to zero): After the return to zero is complete, position feedback 6064 is set to home bias 607C. 60E6 = 1 (relative return to zero): After the return to zero is complete, position feedback 6064 is superimposed on the original position offset 607C.

7.10.4 Introduction to Zero Return Operation

Back to zero mode introduction:

1) Zero return method 1 (6098h=1) uses negative limit and motor encoder index pulse (Z-phase pulse) signals.

The driver drives the motor to move rapidly in the negative direction at a speed of 6099h.01h until it detects the negative limit signal to slow down and stop, and then moves in the positive direction at a low speed of 6099h.02h to find the zero position, which is the position of the first encoder index pulse (Z-phase pulse signal) after the falling edge of the negative limit signal is detected. This is shown in the figure below. (Note: Index Pulse: Encoder Index Pulse Negative Limit Switch: Negative Limit Positive Limit Switch: Positive Limit Home Switch Origin, same as below)

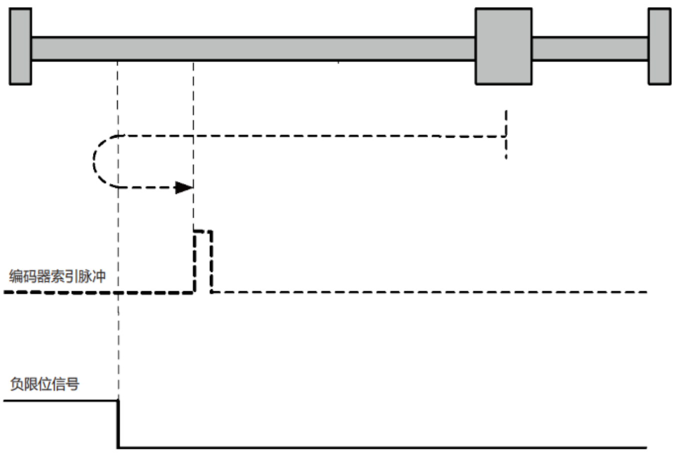


Figure 7.10.3-1 Zero return method 1

2) Zero return method 2 (6098h=2) uses forward limit and motor encoder index pulse (Z-phase pulse) signals

The servo motor moves rapidly in the positive direction at the speed of the object 6099h.01h until it detects the positive limit signal to decelerate and stop and moves negatively at the low speed of the object 6099h.02h to find the zero position, which is the position of the first encoder index pulse (Z-phase pulse) signal after the falling edge of the positive limit signal is detected. The following figure shows:

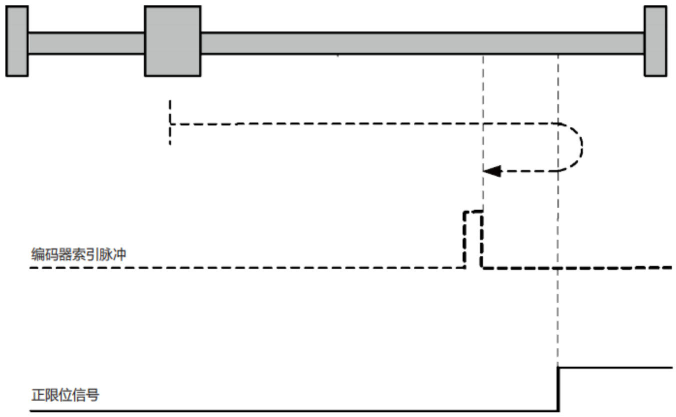


Figure 7.10.3-2 Zero return method 2

3) Zero return method 3 Using home and motor encoder index pulses (Z-phase pulses)

- The deceleration point signal is invalid at zero return start.

When starting to return to zero, the home limit signal is 0. The driver drives the motor to start returning to zero at high speed in the forward direction until the rising edge of the home limit signal is detected, decelerates, reverses, and runs at low speed to find the zero position, which is the position of the first encoder index pulse (Z-phase pulse) signal after the rising edge of the home limit signal is detected.

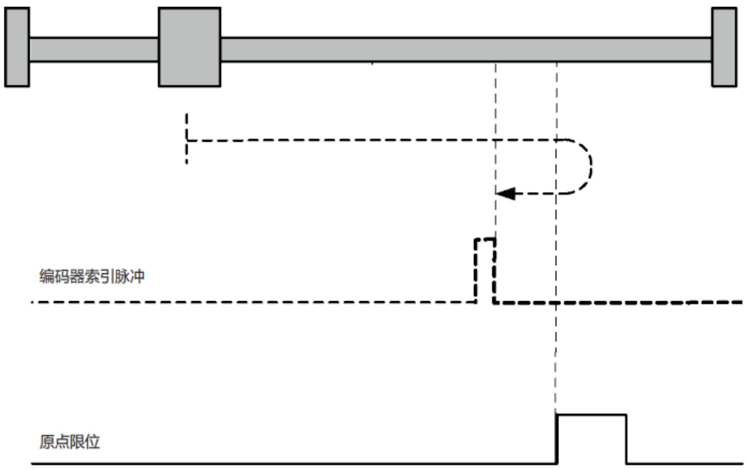


Figure 7.10.3-3-1 Zero return method 3

- The deceleration point signal is valid at zero start.

Start back to zero when the home limit signal is 1, the driver directly drives the motor to reverse low speed to start back to zero, looking for the zero position, the zero point for the check

The position of the first encoder index pulse (Z-phase pulse) signal after the falling edge of the home signal is measured.

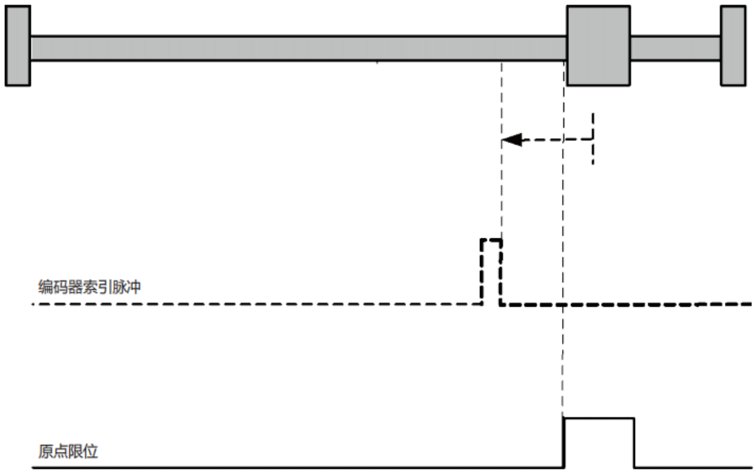


Figure 7.10.3-3-2 Zero return method 3

4) Zero return method 4 Using home and motor encoder index pulses (Z-phase pulses)

- The deceleration point signal is invalid at zero return start.

The zero point is the position of the first encoder index pulse (Z-phase pulse) signal after the rising edge of the home limit signal is detected.

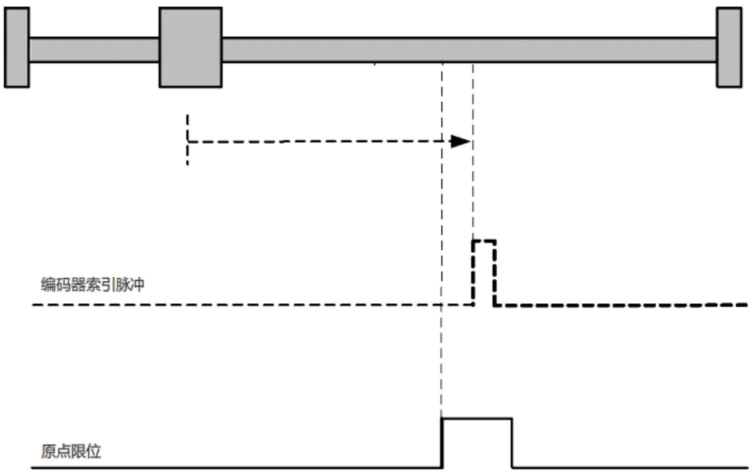


Figure 7.10.3-4-1 Zero return method 4

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home limit signal is 0. The driver drives the motor to start to return to zero at reverse high speed until the falling edge of the home limit signal is detected, decelerate, reverse and run at low speed to find the zero position, which is the position of the first encoder index pulse (Z-phase pulse) signal after the falling edge of the home limit signal is detected.

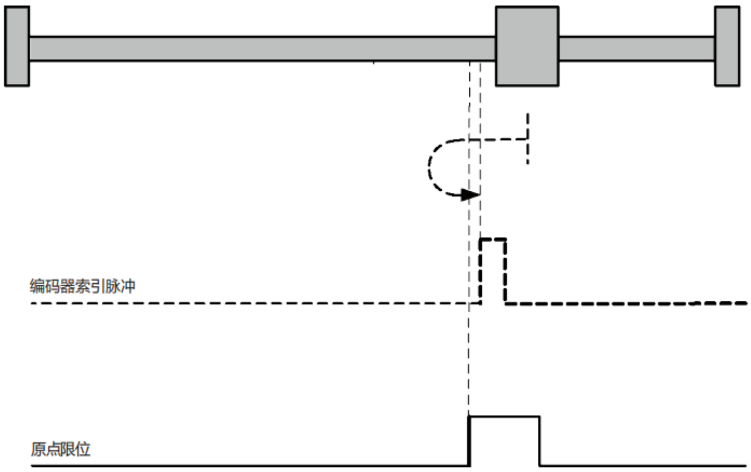


Figure 7.10.3-4-2 Zero return method4

5) When the zero return mode is 5 (6098h=5) use the home and motor encoder index pulse (Z signal)

- The deceleration point signal is invalid when starting back to zero, and the home limit signal is 0 when starting back to zero. The driver drives the motor to move rapidly in the negative direction at a speed of 6099h.01h until it detects the negative limit signal to decelerate and stop, and moves in the positive direction at a low speed of the object of 6099h.02h to find the zero position, and the zero point is the first encoder index pulse after the falling edge of the negative limit signal is detected (Z-phase pulse) signal after the falling edge of the negative limit signal is detected.

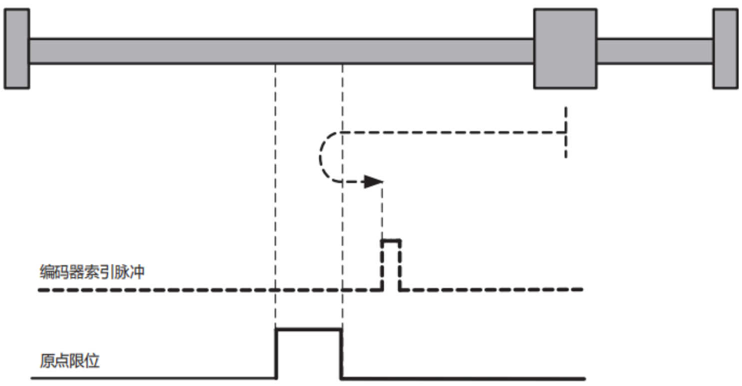


Figure 7.10.3-5 Zero return method 5

- The deceleration point signal is valid at the start of zero return, i.e., the limit signal is 1 at the start of zero return, and the servo motor starts zero return directly at a low positive speed until the position of the first encoder index pulse (Z-phase pulse) after the falling edge of the limit signal is detected.

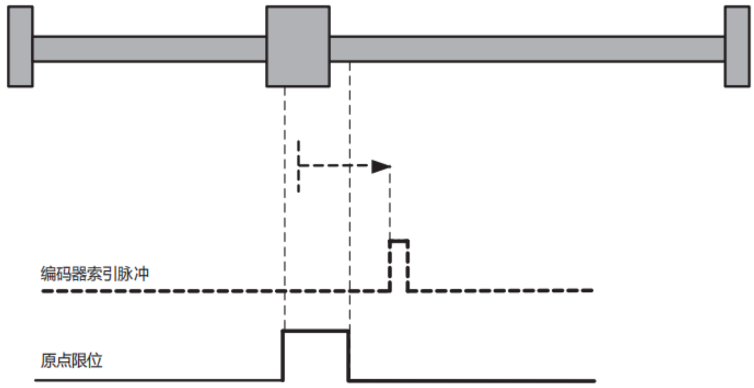


Figure 7.10.3-5 Zero return method 5

6) Zero return method 6 (6098=6) uses the home and motor encoder index pulses (Z-phase pulses)

- Invalid decelerations point signal at return to zero start:

Start back to zero when the home limit signal is 0, the drive drives the motor directly reverse low speed to start moving, looking for the zero position, zero is the position of the first encoder index pulse (Z-phase pulse) signal after the rising edge signal of the limit signal is detected.

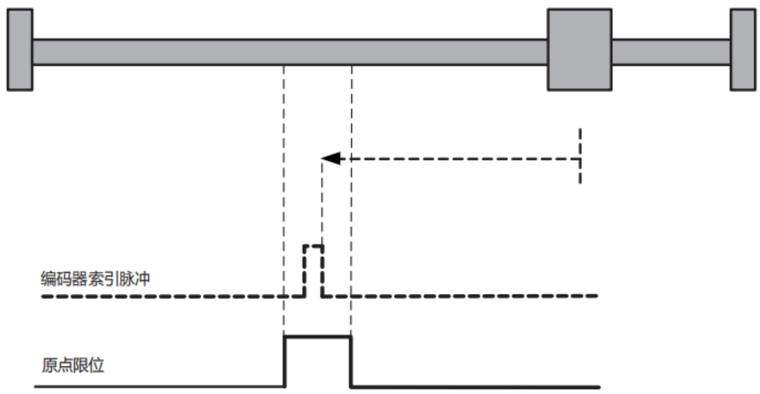


Figure 7.10.3-6-1 Zero return method 6

- The deceleration point signal is valid at zero return start:

Start back to zero when the home limit signal is 1, the drive drives the motor to start moving at a positive high speed to find the zero position, the zero point is the position where the falling edge of the limit signal is detected and starts to decelerate and run at low speed in reverse, encountering the first encoder index pulse (Z-phase pulse) signal.

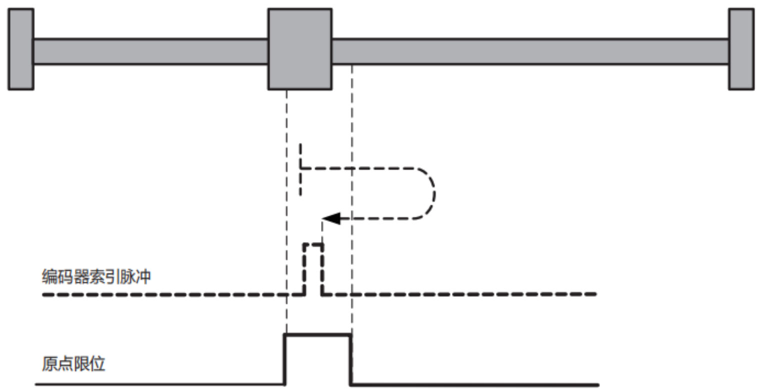


Figure 7.10.3-6-2 Zero return method 6

7) Return to zero method 7 (6098=7) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid deceleration point signal at return to zero start, no positive limit switch encountered:

Start back to zero when the forward pulse signal is 0, the driver drives the motor to start back to zero at high speed, if it does not encounter the forward limit switch, after encountering the rising edge of the home limit signal, the motor decelerates and runs at low speed in reverse, the zero point is the position of the first encoder index pulse after the falling edge of the home signal is detected.

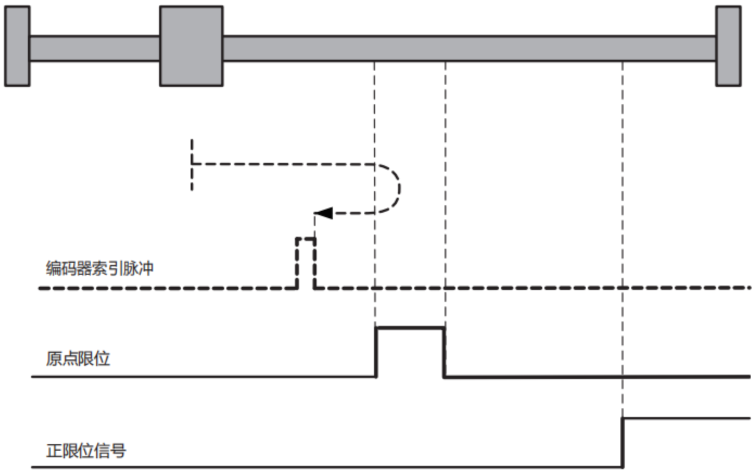


Figure 7.10.3-7-1 Zero return method7

- Invalid deceleration point signal at return to zero start, positive limit switch encountered:

Start back to zero when the home limit signal is 0, the drive takes the motor to start back to zero at high speed in the forward direction, if it meets the forward limit switch, it automatically reverses and runs at high speed until it meets the rising edge of the home limit signal, the motor decelerates and continues to run at low speed in the reverse direction, the zero point is the position where the first encoder index pulse (Z-phase pulse) is detected.

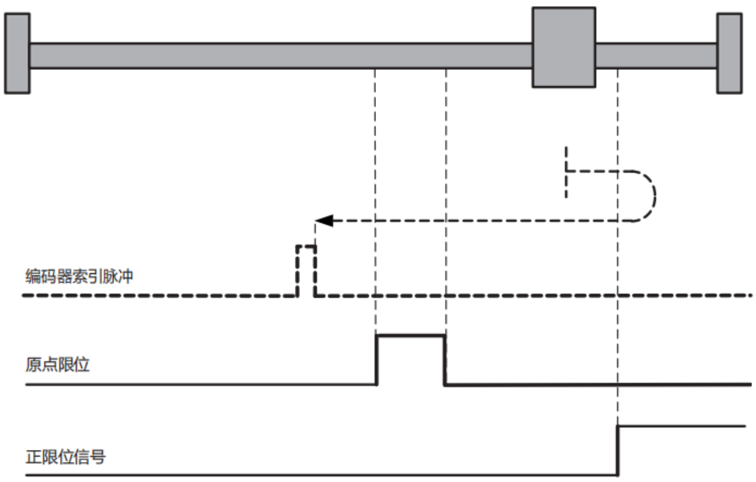


Figure 7.10.3-7-2 Zero return method7

- The deceleration point signal is valid at zero start.

Return to zero start, the home limit signal is 1, the drive drives the motor directly reverse low speed to start back to zero, the zero point is the position of the first motor encoder index pulse after the falling edge of the home limit signal is detected.

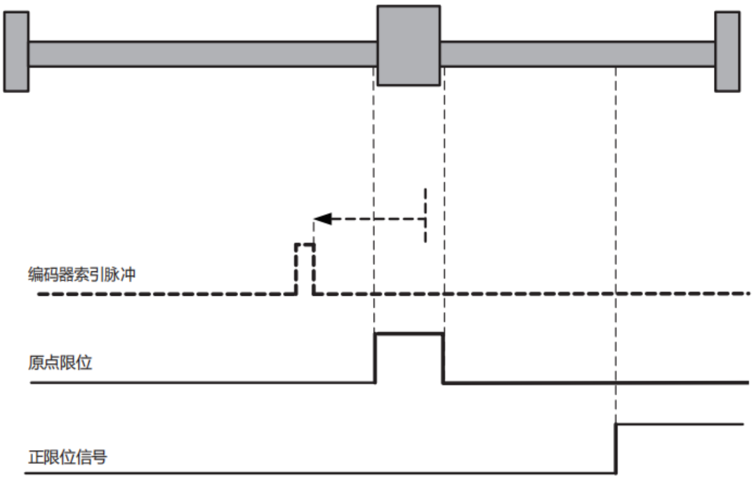


Figure 7.10.3-7-3 Zero return method 7

8) Return to zero method 8 (6098=8) uses the index pulse (Z phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered.

If the motor does not meet the limit switch, it will decelerate and run at low speed until it meets the falling edge of the home signal, then it will start to reverse and the motor will run at low speed in the positive direction, with the zero point being the position of the first motor encoder index pulse after the rising delay of the home signal is detected.

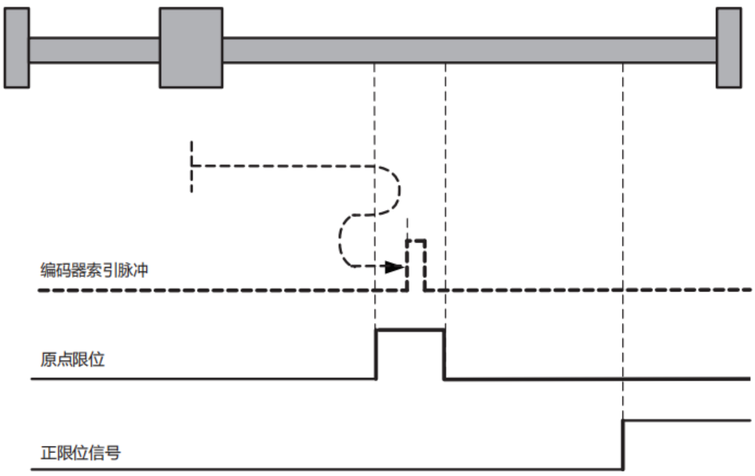


Figure 7.10.3-8-1 Zero return method 8

- Invalid decelerations point signal at return to zero start, positive limit switch encountered:

When starting to return to zero, the home limit signal is 0, the driver drives the motor to start to return to zero at high speed in the forward direction, and if it encounters the limit switch, it will automatically reverse and run at high speed; until it encounters the rising edge of the home limit signal, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position of the first motor encoder index pulse after the rising edge of the home limit signal is detected.

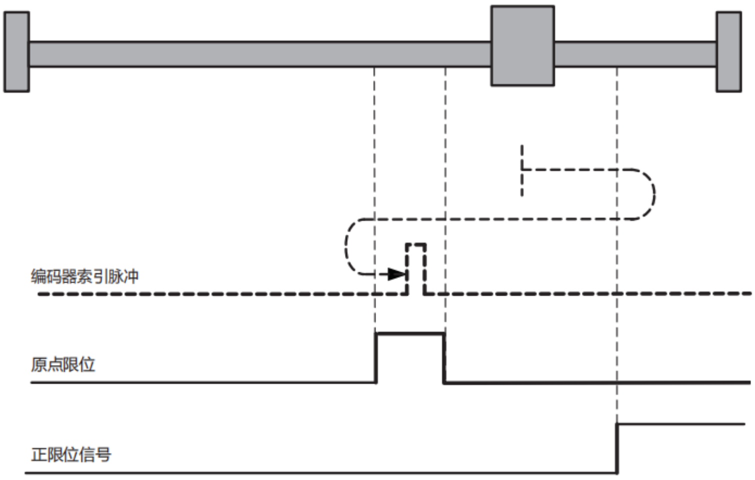


Figure 7.10.3-8-2 Zero return method 8

- The deceleration point signal is valid at zero start.

At the beginning of the zero return, the home limit signal is 1, and the driver drives the motor directly to reverse low-speed motion until it encounters the home limit signal down, then the motor reverses and runs forward low-speed, with the zero point being the position of the first motor encoder index pulse after the home limit signal is detected.

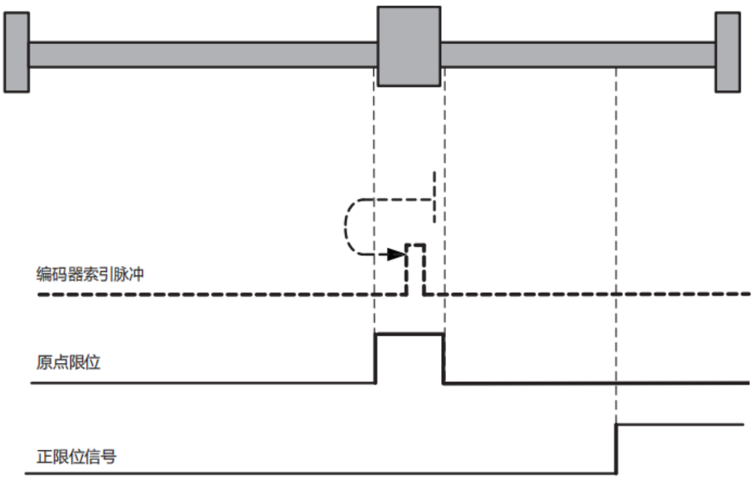


Figure 7.10.3-8-3 Zero return method 8

9) Return to zero method 9 (6098=9) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

If the motor does not meet the limit switch, it will decelerate and run at low speed until it detects the falling edge of the home signal, then the motor will run at low speed in the reverse direction, with the zero point being the position of the first motor encoder index pulse after the rising edge of the home signal is detected.

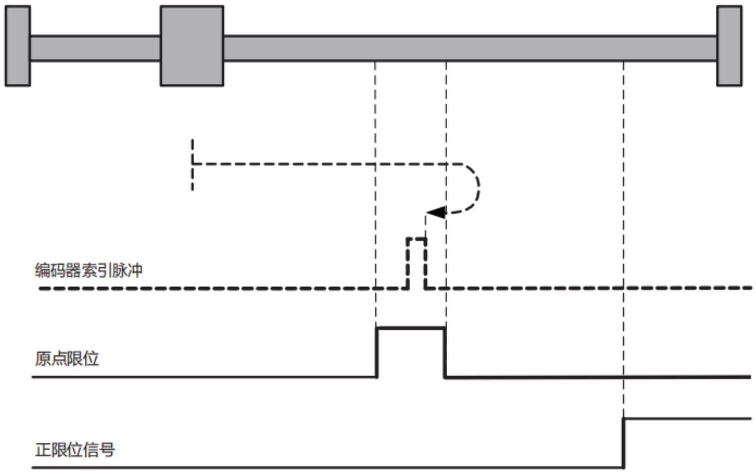


Figure 7.10.3-9-1 Zero return method 9

- Invalid decelerations point signal at return to zero start, positive limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start to return to zero at high speed in the forward direction, and if it meets the limit switch, it will automatically reverse and run at high speed until it detects the rising edge of the home signal, the motor decelerates and reverses to resume forward operation, and after the falling edge of the home signal is met, the motor reverses to run at low speed, and the zero point is the first motor encoder index pulse after the rising edge of the home signal is detected. The zero point is the position of the first motor encoder index pulse after the rising edge of the home signal is detected.

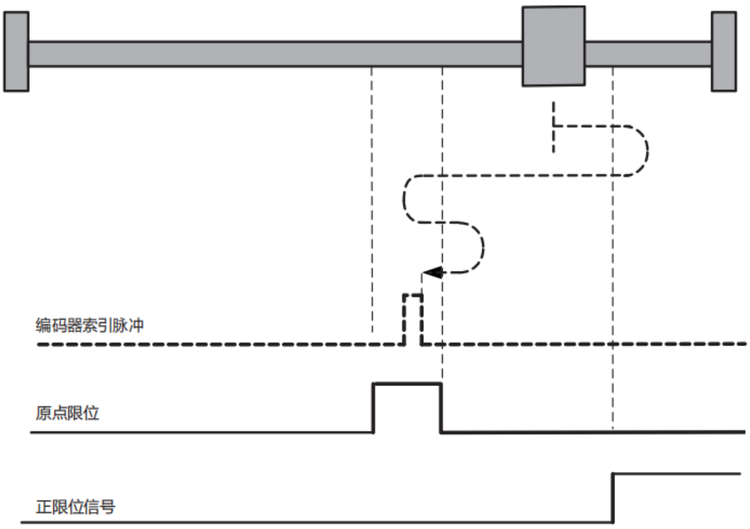


Figure 7.10.3-9-2 Zero return method 9

◆ The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor directly to start returning to zero at low speed in the forward direction until the motor runs at low speed in the reverse direction after encountering the falling edge of the home switch signal, and the zero point is the position of the first motor encoder index pulse after the rising edge of the home switch signal is detected.

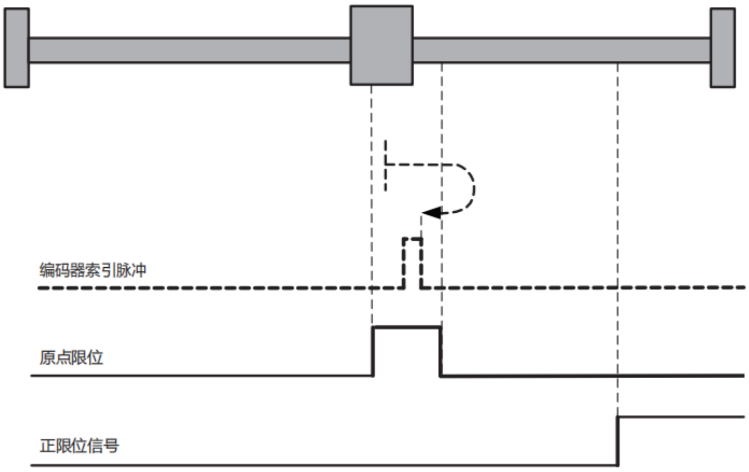


Figure 7.10.3-9-3 Zero return method 9

10) Return to zero mode 10 (6098=10) using the index pulse (Z phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to start returning to zero at a positive high speed. If the limit switch is not encountered, the motor decelerates and continues to run in a positive direction after encountering the rising edge of the home signal until it continues to run in a positive low speed after encountering the falling edge of the home signal, with the zero point being the position of the first motor index pulse detected afterwards.

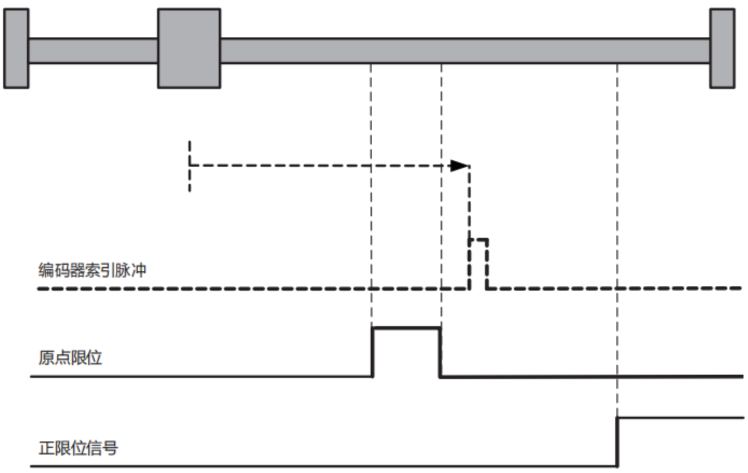


Figure 7.10.3-10-1 Zero return method 10

- Invalid decelerations point signal at return to zero start, encountering positive limit switch.

Start back to zero, the home switch signal is 0, the driver drives the motor to start back to zero at high speed in the forward direction, if it encounters the limit switch, automatically reverse and reverse high-speed operation; until it encounters the rising edge of the home switch signal, decelerate and reverse that is to resume forward operation, the zero point is the position of the first motor encoder index pulse after the falling edge of the home switch signal is detected at low speed in the forward direction.

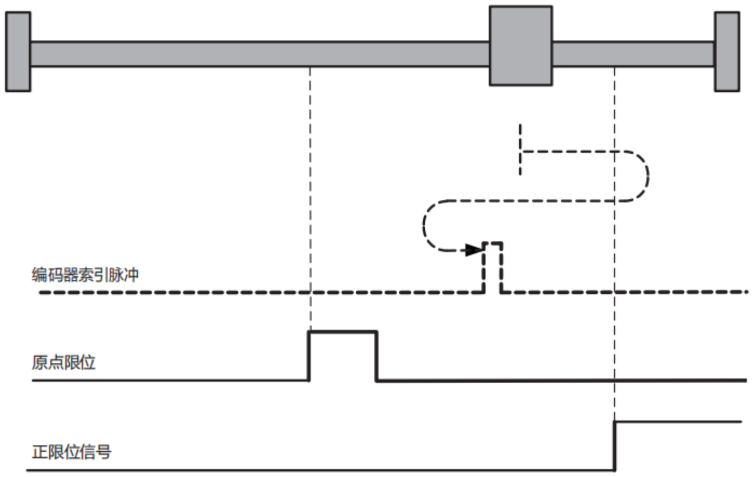


Figure 7.10.3-10-2 Zero return method 10

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor to start running directly at low speed in a positive direction to find the zero point, which is the position of the first motor encoder index pulse after the falling edge of the home switch signal is detected.

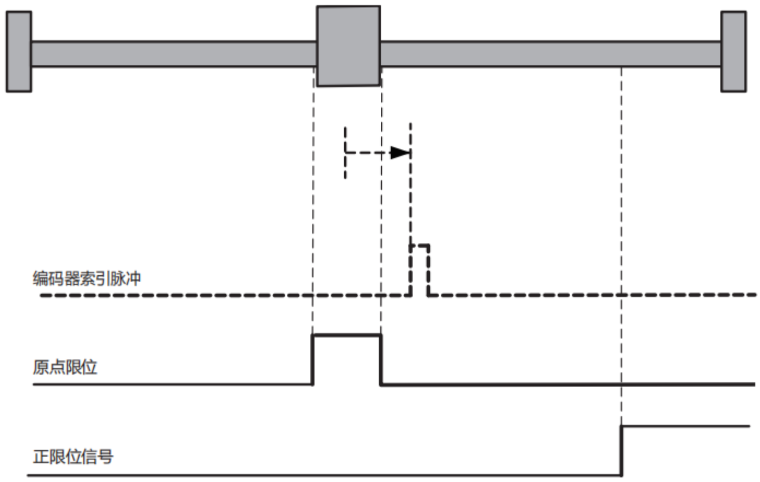


Figure 7.10.3-10-3 Zero return method 10

11) Return to zero mode 11 (6098=11) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to start running at reverse high speed to find the zero position. If the limit switch is not encountered, the motor decelerates and reverses after encountering the rising edge of the home signal, that is, positive low speed operation, and the zero point is the position of the first motor encoder index pulse after detecting the falling edge of the home limit signal.

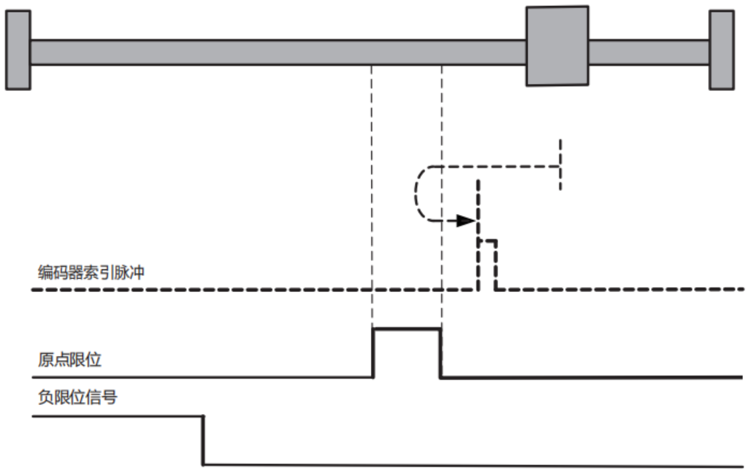


Figure 7.10.3-11-1 Zero return method 11

- Invalid decelerations point signal at return to zero start, reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start running at high speed in reverse to find the zero position, and if it encounters the limit switch, the motor automatically reverses, that is, runs at high speed in forward direction until after the rising edge of the home switch signal is detected, the motor decelerates and continues to run at low speed in forward direction, and the zero point is the bit of the first motor encoder index pulse after the falling edge of the home switch signal is detected .

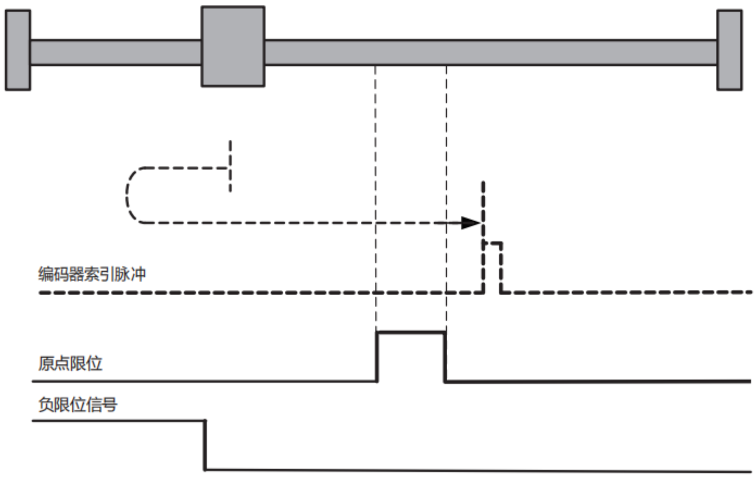


Figure 7.10.3-11-2 Zero return method 11

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1 and the drive drives the motor to run directly at low speed in the positive direction, with zero being the position of the first motor encoder index pulse after the falling edge of the home signal is detected.

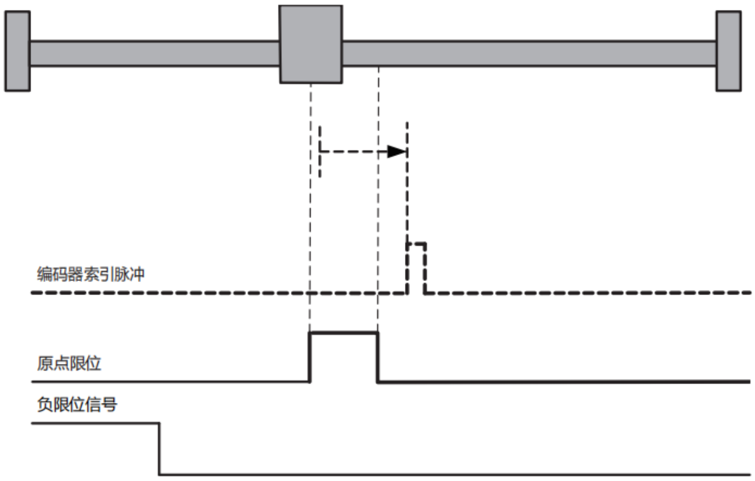


Figure 7.10.3-11-3 Zero return method 11

12) Return to zero mode 12 (6098=12) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at high speed in reverse to find the zero position. After not encountering the limit switch and detecting the rising edge of the home switch signal, the motor decelerates and reverses and runs at low speed in the positive direction, with the zero point being the position of the first motor encoder index pulse after detecting the rising edge of the home switch signal.

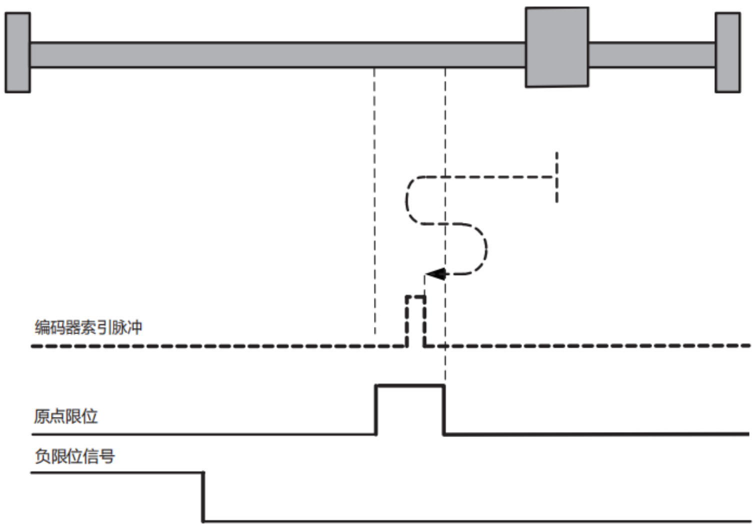


Figure 7.10.3-12-1 Zero return method 12

- Invalid decelerations point signal at return to zero start, reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to reverse high-speed operation to find the zero position, encounter the limit switch, the motor automatically reverses and begins to run at high speed in the forward direction, after encountering the rising edge of the home switch signal, the motor decelerates and runs at low speed in the forward direction, the zero point is the position of the first motor encoder index pulse after the rising edge of the home switch signal is detected

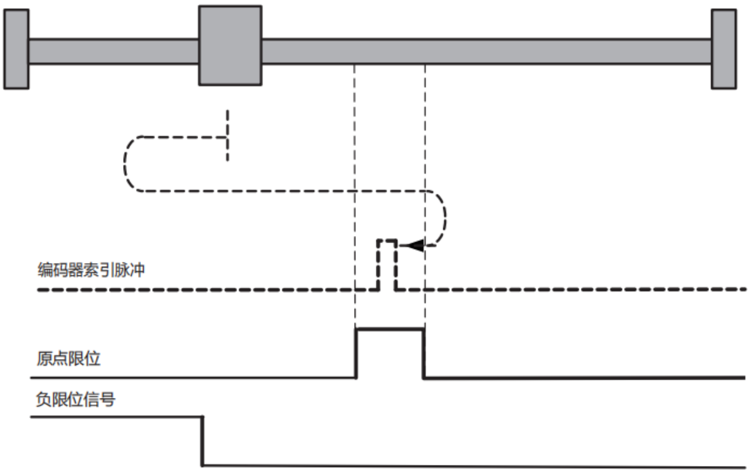


Figure 7.10.3-12-2 Zero return method 12

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, the drive electric motor runs directly forward and low speed to find the zero position, and after encountering the falling edge of the home switch signal, the motor starts to run in reverse and low speed, and the zero point is the position of the first motor encoder index pulse after detecting the home switch signal.

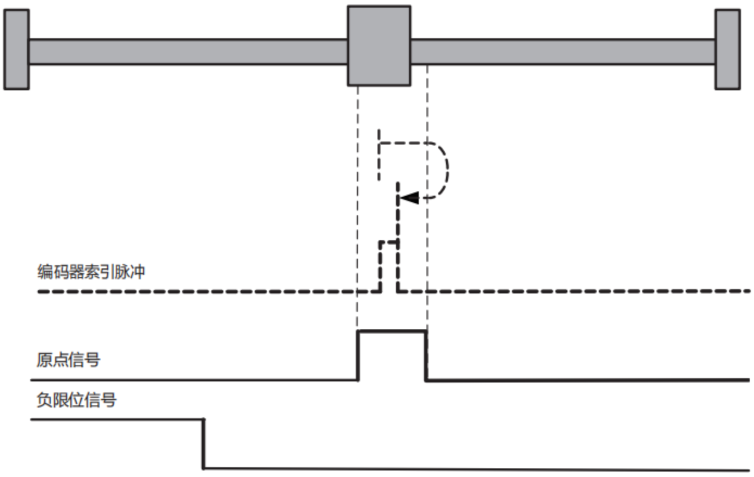


Figure 7.10.3-12-3 Zero return method 12

13) Return to zero method 13 (6098=13) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at reverse high speed to find the zero position. If the limit switch is not encountered, the motor decelerates and runs at reverse low speed after the rising edge of the home switch signal is detected, and the zero point is the position of the first motor encoder index pulse after the rising edge of the home switch signal is detected.

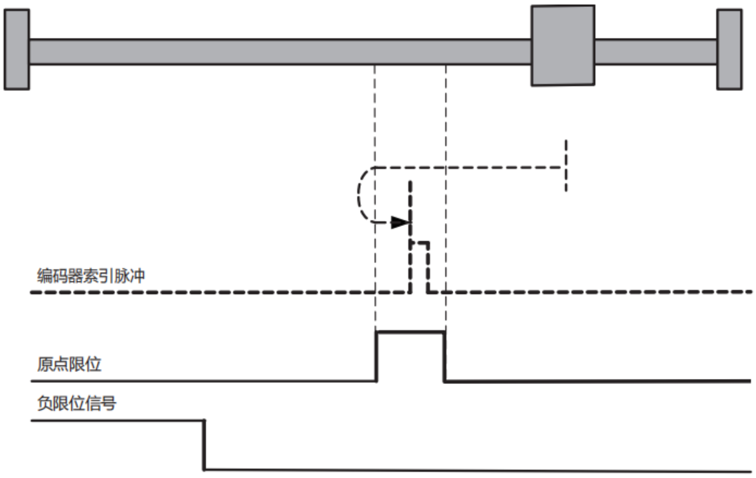


Figure 7.10.3-13-1 Zero return method 13

- Invalid decelerations point signal at return to zero start, reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at reverse high speed to find the zero point. If the motor decelerates and runs at reverse low speed after encountering the rising edge of the limit switch signal, the zero point is the position of the first motor encoder index pulse after the rising edge of the home switch signal is detected when the motor is running in the forward direction.

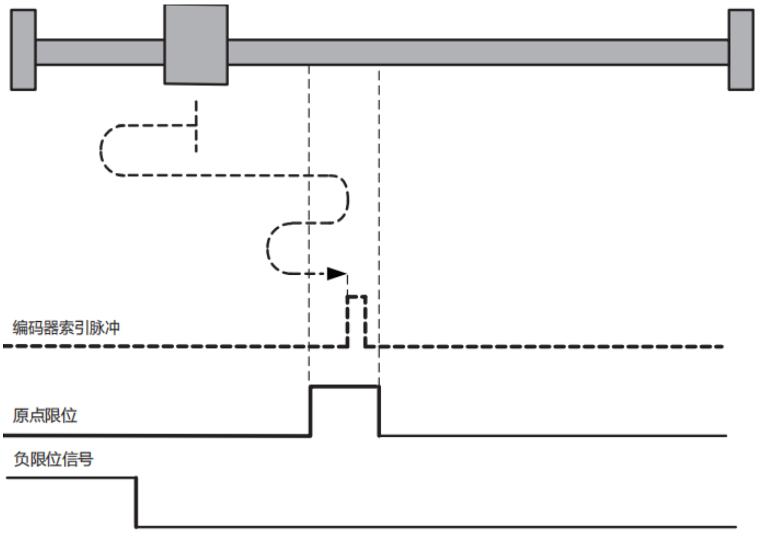


Figure 7.10.3-13-2 Zero return method 13

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1, the driver drives the motor to run directly in reverse at low speed to find the zero position, if after detecting the falling edge of the home switch signal, the motor starts to run in reverse that is forward at low speed, the zero point is the position of the first motor encoder index pulse after detecting the rising edge of the original electric switch signal.

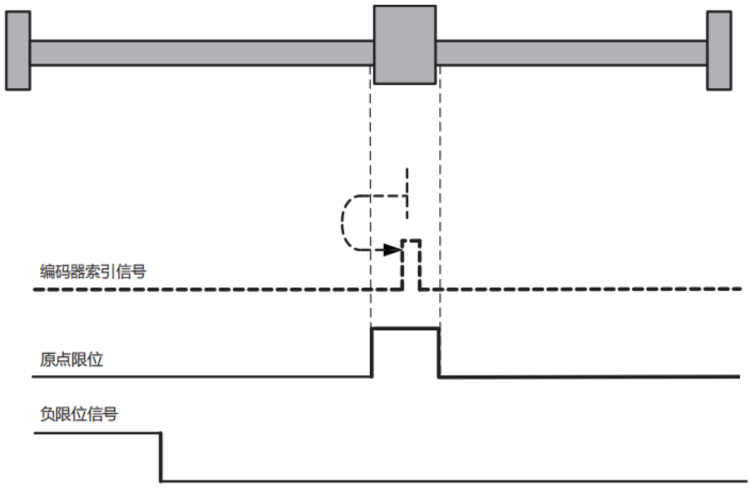


Figure 7.10.3-13-3 Zero return method 13

14) Return to zero method 14 (6098=14) uses the index pulse (Z-phase pulse) of the home and motor encoder

- Invalid decelerations point signal at return to zero start, no reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to start running at reverse high speed to find the zero position. After not encountering the limit switch and detecting the rising edge of the home switch signal, the motor starts to decelerate and run at reverse low speed, and the zero point is the position where the first motor encoder index pulse is detected after detecting the falling edge of the home switch signal.

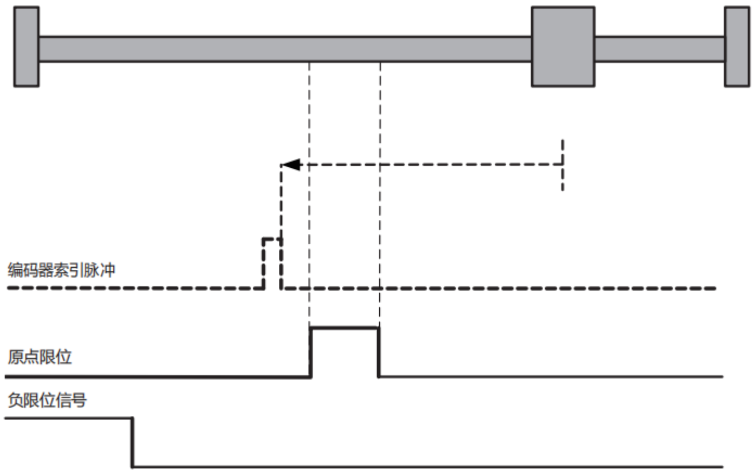


Figure 7.10.3-14-1 Zero return method 14

- Invalid decelerations point signal at return to zero start, reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to run at high speed in reverse to find the zero position, and when it encounters the limit switch, the motor automatically reverses, that is, runs at high speed in the forward direction until it encounters the rising edge of the home switch signal, the motor decelerates and runs in reverse, and the zero point is the position of the first motor encoder index pulse after detecting the rising edge of the home switch signal.

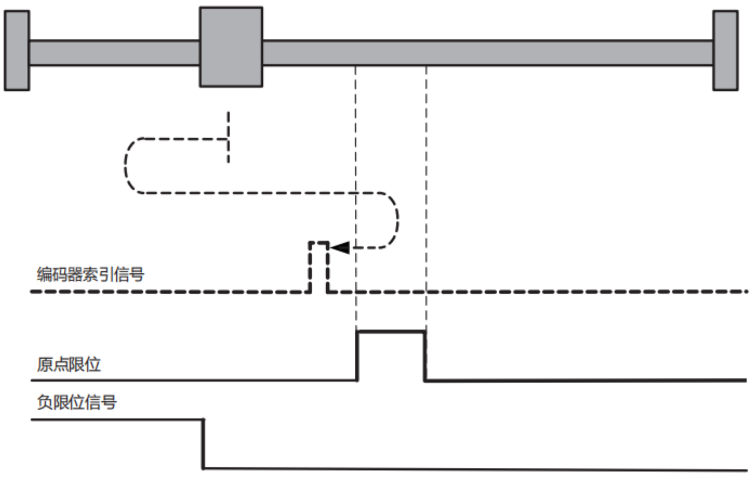


Figure 7.10.3-14-2 Zero return method 14

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1 and the drive drives the motor to run directly in reverse at low speed, with the zero point being the position of the first motor encoder index pulse after the falling edge of the home switch signal is detected.

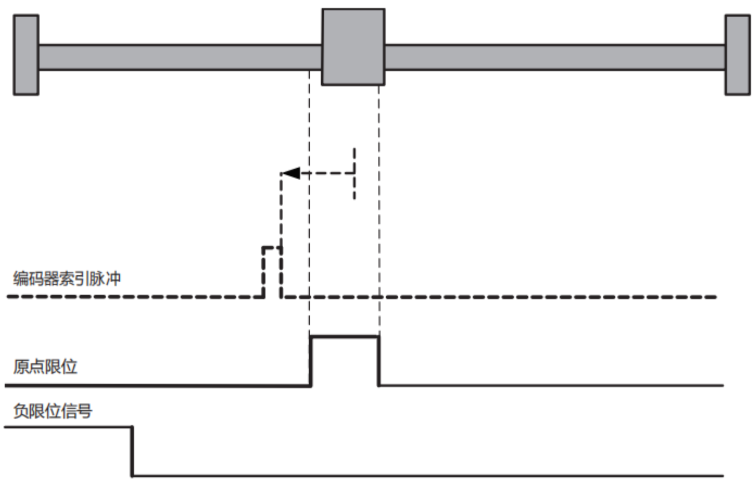


Figure 7.10.3-14-3 Zero return method 14

15) Return to zero mode 17 (6098=17) using mechanical home and reverse overtravel switches

- Invalid decelerations point signal at return to zero start:

When starting to return to zero, the reverse overtravel switch signal is 0. The driver drives the motor to run at reverse high speed to find the zero position. After detecting the rising edge of the reverse overtravel switch signal, the motor starts to decelerate and reverse that is forward low speed operation, and the zero point is the position where the falling edge of the reverse overtravel switch signal is detected.

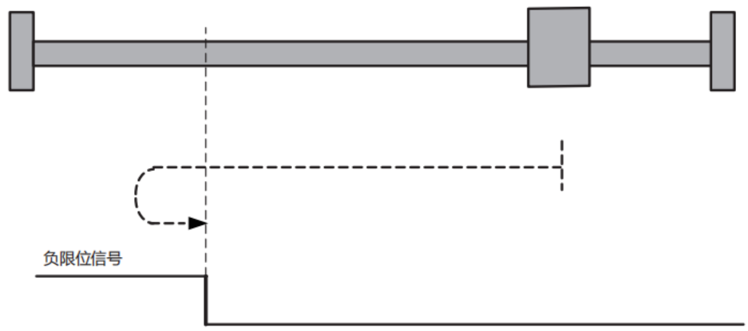


Figure 7.10.3-17-1 Zero return method 17

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the reverse overtravel switch signal is 1, and the driver drives the motor to run directly at low speed in the forward direction, with the zero point being the position where the falling edge of the overtravel switch signal is detected.

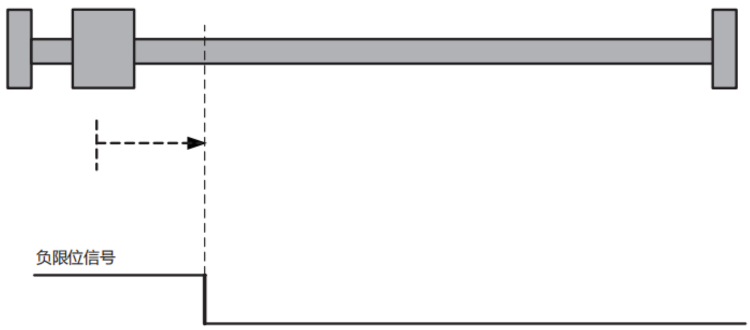


Figure 7.10.3-17-2 Zero return method 17

16) Return to zero mode 18 (6098=18) using mechanical home and forward overtravel switch

- Invalid decelerations point signal at return to zero start:

When starting to return to zero, the forward overtravel switch signal is 0. The driver drives the motor to run at high speed in the forward direction to find the zero position. After detecting the rising edge of the forward overtravel switch signal, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the falling edge of the forward overtravel switch is detected.

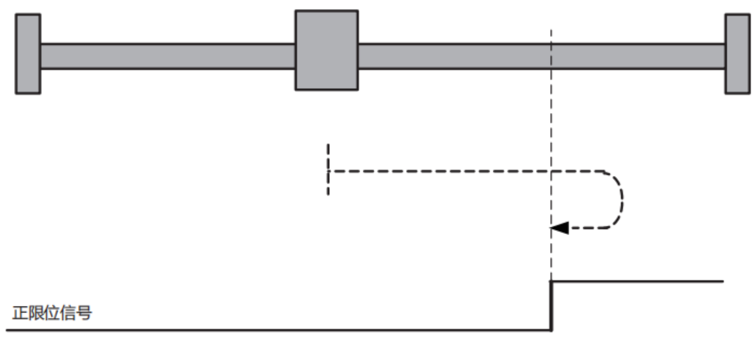


Figure 7.10.3-18-1 Zero return method 18

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the forward overtravel switch signal is 1, and the driver drives the motor to start returning to zero at a reverse low speed, with the zero point being the position where the falling edge of the overtravel switch signal is detected.

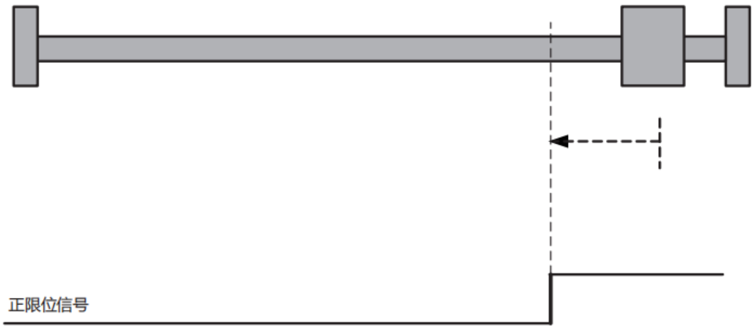


Figure 7.10.3-18-2 Zero return method 18

17) Return to zero mode 19 (6098=19) using home switch

- Invalid decelerations point signal at return to zero start:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at high speed in the forward direction to find the zero position until after the rising edge of the home switch signal is detected, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the falling edge of the home switch signal is detected.

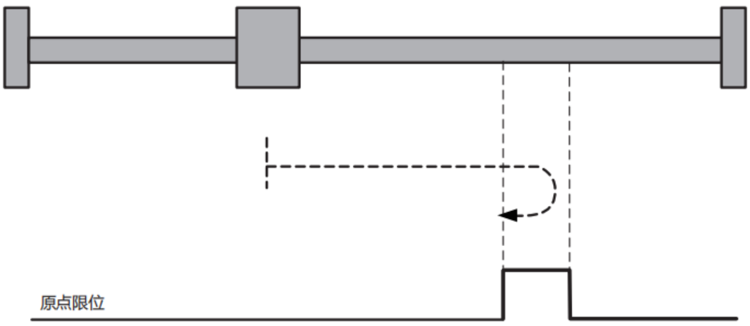


Figure 7.10.3-19-1 Zero return method 19

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor to directly reverse low speed to start returning to zero, and the zero point is the position where the falling edge of the home switch signal is detected.

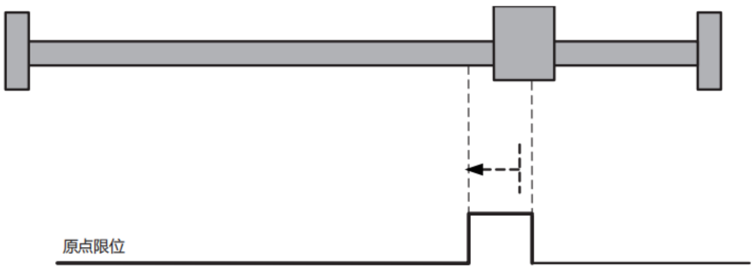


Figure 7.10.3-19-2 Zero return method 19

18) Return to zero mode 20 (6098=20) using home switch

- The deceleration point signal is invalid at zero return start.

When starting to return to zero, the home switch signal is 0. The driver drives the motor directly to start returning to zero at low speed, and the zero point is the position where the rising edge of the home switch signal is detected.

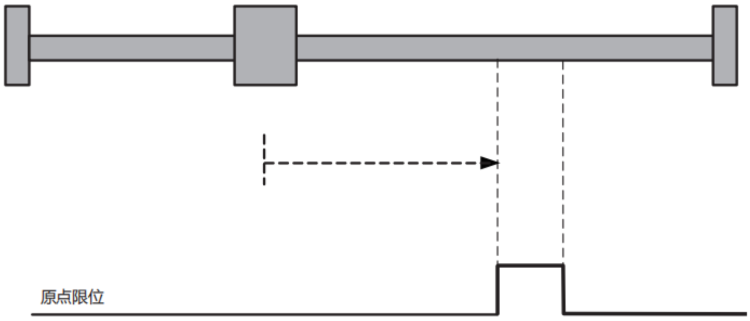


Figure 7.10.3-20-1 Zero return method 20

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, the driver drives the motor to start running at reverse high speed to find the zero position until after the falling edge of the home switch signal is detected, the motor decelerates and reverses, i.e., runs at positive low speed, and the zero point is the position where the rising edge of the home switch signal is detected.

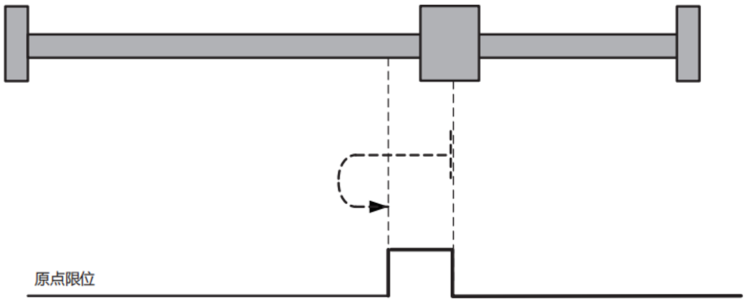


Figure 7.10.3-20-2 Zero return method 20 Zero return method 21 (6098=21) using home switch

- The deceleration point signal is invalid at zero return start.

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at high speed in reverse to find the zero position until after the rising edge of the home switch signal is detected, the motor decelerates and reverses, i.e., runs at low speed in the forward direction, and the zero point is the position of the falling edge after the home switch signal is detected.

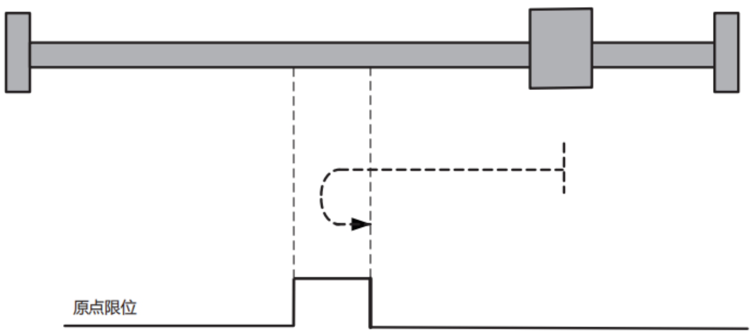


Figure 7.10.3-21-1 Zero return method 21

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor directly to start returning to zero at a positive low speed, with the zero point being the position of the falling edge of the home switch detection.

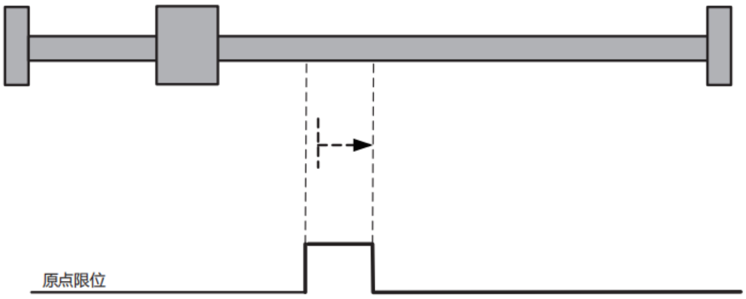


Figure 7.10.3-21-2 Zero return method 21 Zero return method 22 (6098=22) using home switch

- The deceleration point signal is invalid at zero return start.

When starting to return to zero, the home switch signal is 0, and the driver drives the motor directly to reverse low speed to start returning to zero, and the zero point is the position where the rising edge of the home switch signal is detected.

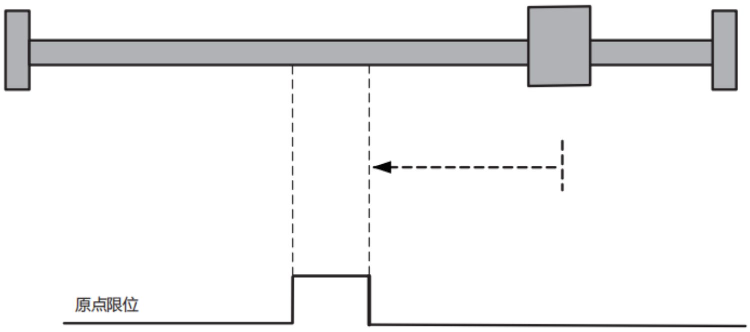


Figure 7.10.3-22-1 Zero return method 22

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1, and the driver drives the motor to run at high speed in the forward direction to find the zero position. Until after encountering the falling edge of the home switch signal, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the rising edge of the home switch signal is detected.

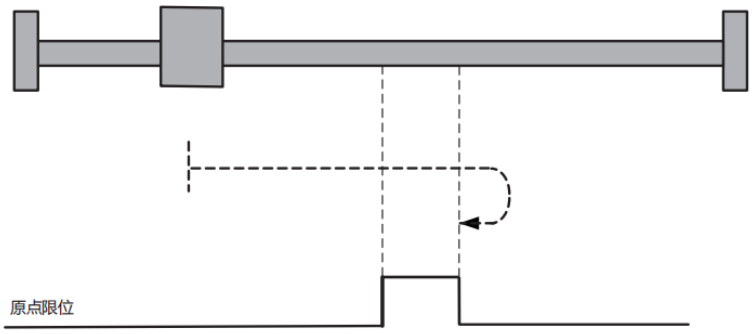


Figure 7.10.3-22-2 Zero return method 22

19) Return to zero mode 23 (6098=23) using home switch

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at high speed in the forward direction to find the zero position. If the limit switch is not encountered until the rising edge of the home switch signal is detected, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the falling edge of the home switch signal is detected.

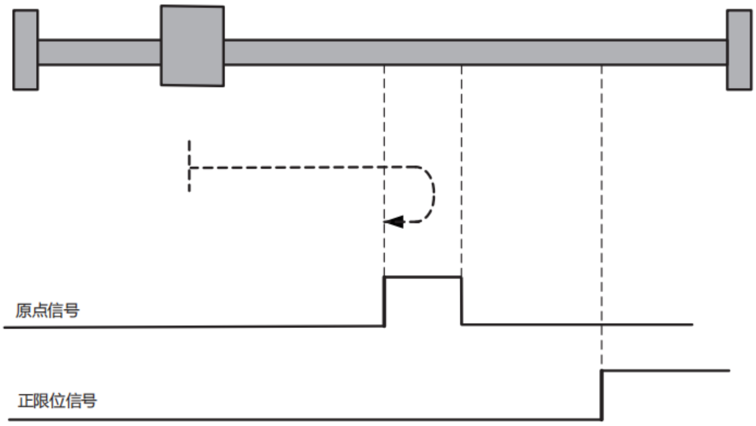


Figure 7.10.3-23-1 Zero return method 23

- Invalid decelerations point signal at return to zero start, positive limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start to return to zero at high speed in the forward direction, and if it meets the limit switch, the motor automatically runs at high speed in the reverse direction until the rising edge of the home switch signal is detected, the motor decelerates and continues to run at low speed in the reverse direction, and the zero point is the position where the falling edge of the home switch signal is detected.

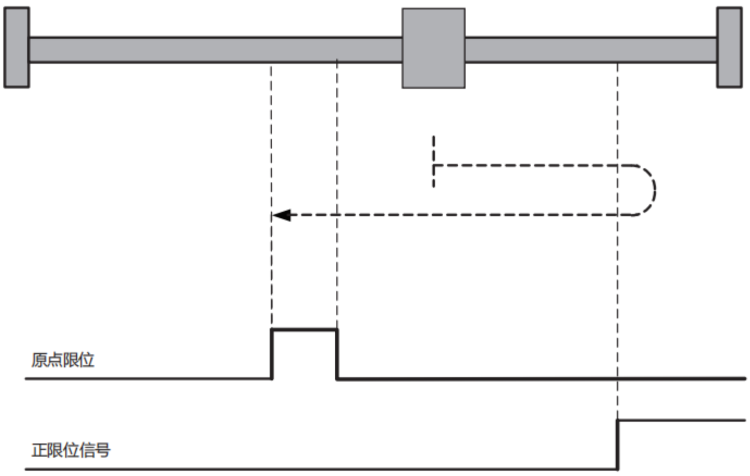


Figure 7.10.3-23-2 Zero return method 23

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor to directly reverse low speed to start returning to zero, and the zero point is the position where the falling edge of the home switch signal is detected.

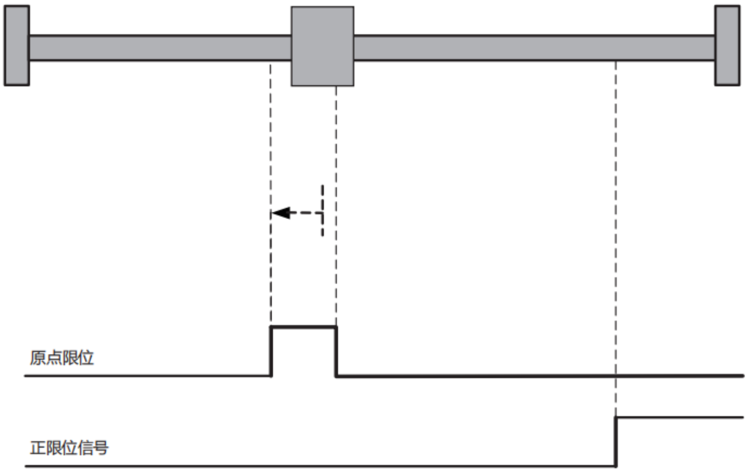


Figure 7.10.3-23-3 Zero return method 23

20) Return to zero mode 24 (6098=24) using home switch

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start returning to zero at high speed in the forward direction, without encountering the limit switch until after detecting the rising edge of the home switch signal, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the rising edge of the home switch limit is detected.

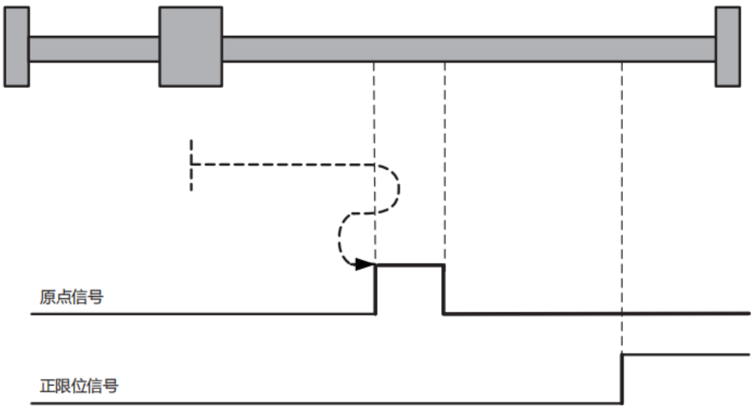


Figure 7.10.3-24-1 Zero return method 24

- Invalid decelerations point signal at return to zero start, positive limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start to return to zero at high speed in the forward direction, and when it meets the limit switch, the motor automatically reverses and runs at high speed until the rising edge of the home switch signal is detected, then the motor starts to decelerate and run at low speed in the reverse direction, and the zero point is the position where the rising edge of the home switch signal is detected.

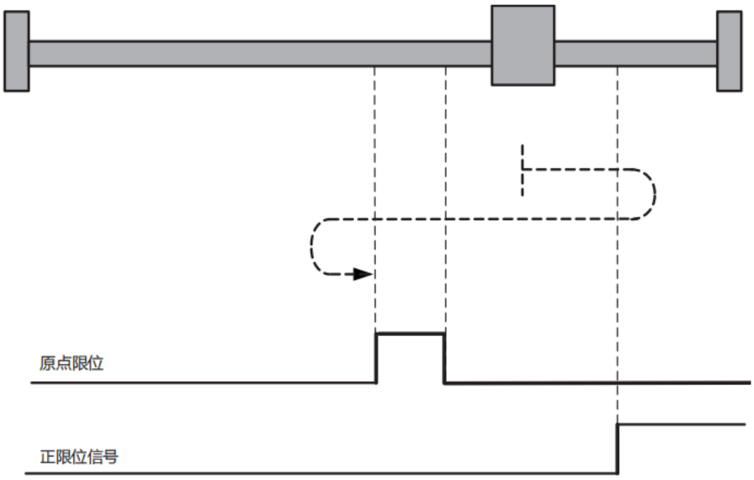


Figure 7.10.3-24-2 Zero return method 24

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, the driver drives the motor directly reverse low speed to start returning to zero, until after detecting the falling edge of the home switch signal, the motor reverses and runs forward low speed, the zero point is the position where the rising edge of the original electric switch signal is detected.

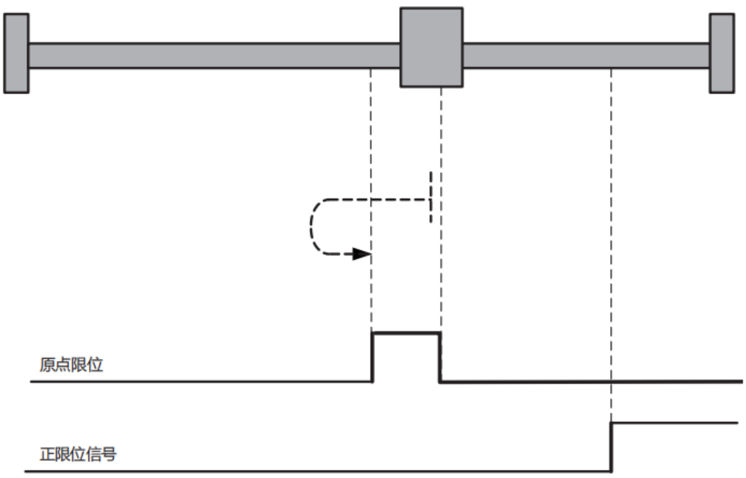


Figure 7.10.3-24-3 Zero return method 24

21) Return to zero mode 25 (6098=25) using home switch

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to start returning to zero at a positive high speed, without encountering the limit switch, until after detecting the rising edge of the home switch signal, the motor decelerates and runs at a positive low speed, with the zero point being the position where the rising edge of the home switch signal is detected.

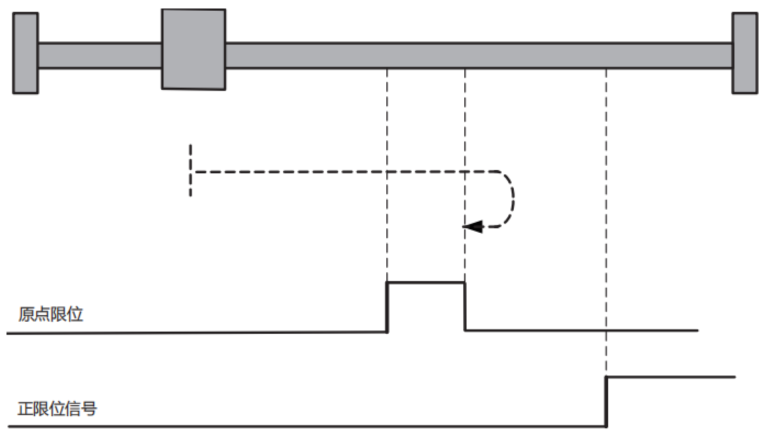


Figure 7.10.3-25-1 Zero return method 25

- Invalid decelerations point signal at return to zero start, positive limit switch encountered.

When it starts to return to zero, the home switch signal is 0. When the driver drives the motor to return to zero at high speed in the forward direction, the motor will automatically reverse and run at high speed when it meets the limit switch until it detects the rising edge of the home switch signal, the motor decelerates and reverses to resume forward running, and the motor will reverse and run at low speed after the falling edge of the home switch signal is detected in the forward low speed operation. position.

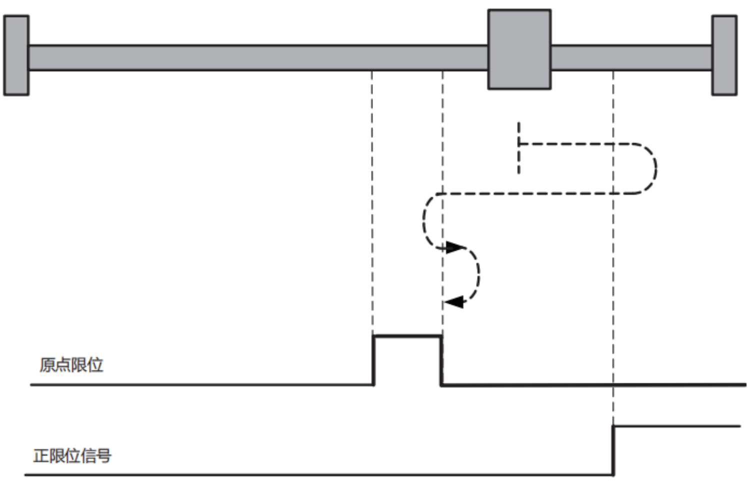


Figure 7.10.3-25-2 Zero return method 25

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1, and the driver drives the motor directly to start returning to zero at low speed until after the falling edge of the home switch signal is detected, the motor reverses and runs at low speed, and the zero point is the position where the rising edge of the home switch signal is detected.

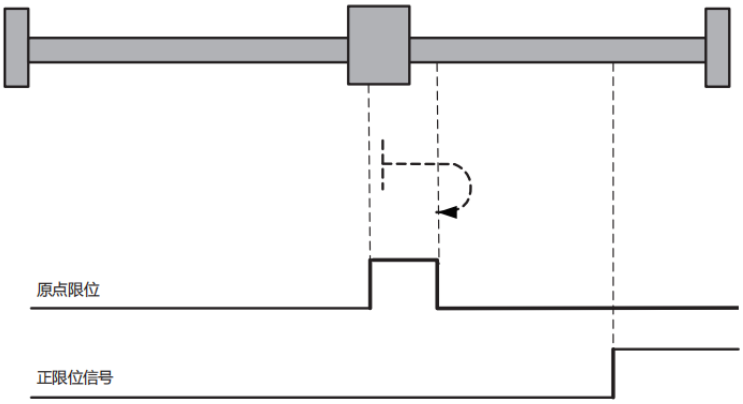


Figure 7.10.3-25-3 Zero return method 25

22) Return to zero mode 26 (6098=26) using home switch

- Invalid decelerations point signal at return to zero start, no positive limit switch encountered:

When starting to return to zero, the home switch signal is 0, and the driver drives the motor to start returning to zero at a positive high speed without encountering the limit switch, until after the rising edge of the home switch signal is detected, the motor decelerates and runs at a positive low speed, and the zero point is the position where the falling edge of the home switch signal is detected.

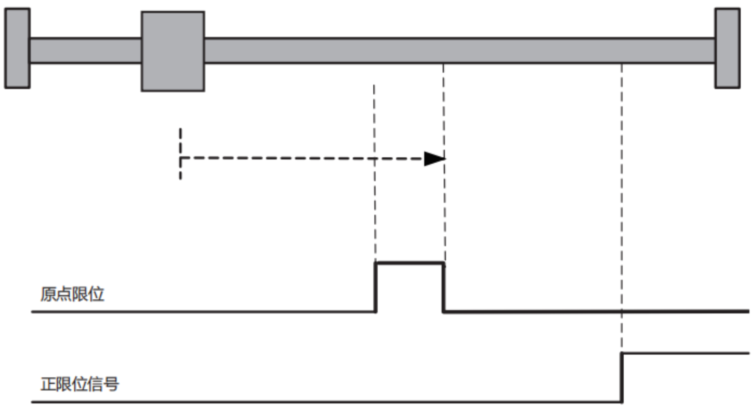


Figure 7.10.3-26-1 Zero return method 26

- Invalid decelerations point signal at return to zero start, positive limit switch encountered:

When starting to return to zero, the home switch signal is 0, the driver drives the motor to run at high speed in the forward direction to find the zero position. If the limit switch is encountered, the motor automatically reverses and runs at high speed until the rising edge of the home switch signal is detected, the motor decelerates and reverses to resume forward operation, and the zero point is the position where the falling edge of the home switch signal is detected.

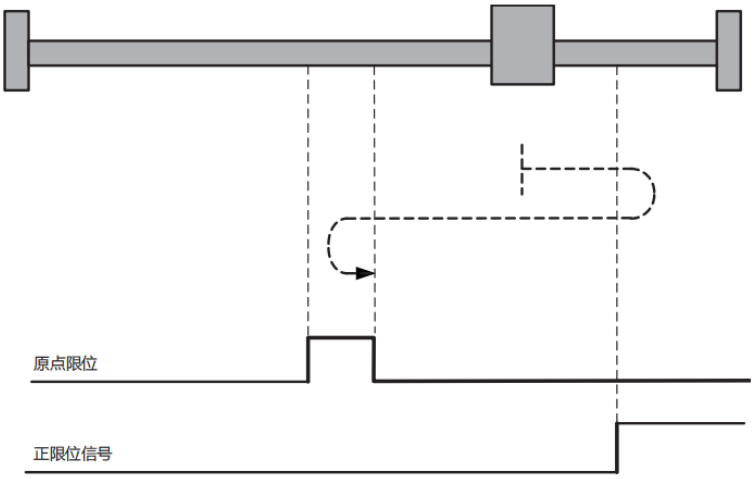


Figure 7.10.3-26-2 Zero return method 26

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor directly to start returning to zero at low speed, and the zero point is the position where the falling edge of the home signal is detected.

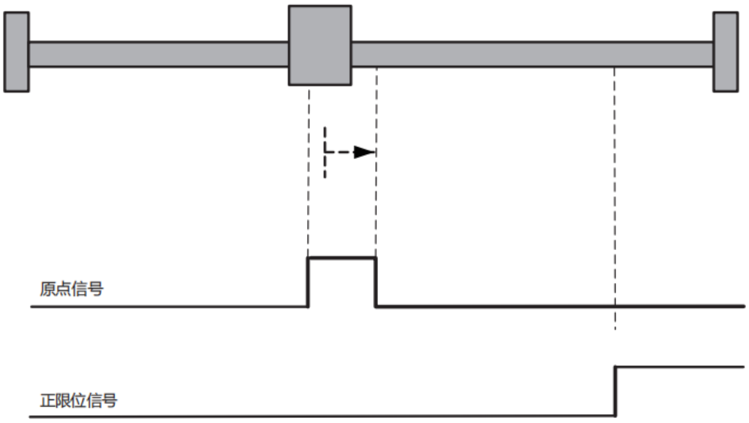


Figure 7.10.3-26-3 Zero return method 26

23) Return to zero mode 27 (6098=27) using home switch

- Invalid decelerations point signal at return to zero start, no reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0, the driver drives the motor to reverse the high speed to start back to zero, not encountering the limit switch, after detecting the rising edge of the home switch signal, the motor decelerates and reverses, that is, the positive low speed operation, the zero point is the position where the falling edge of the home switch signal is detected.

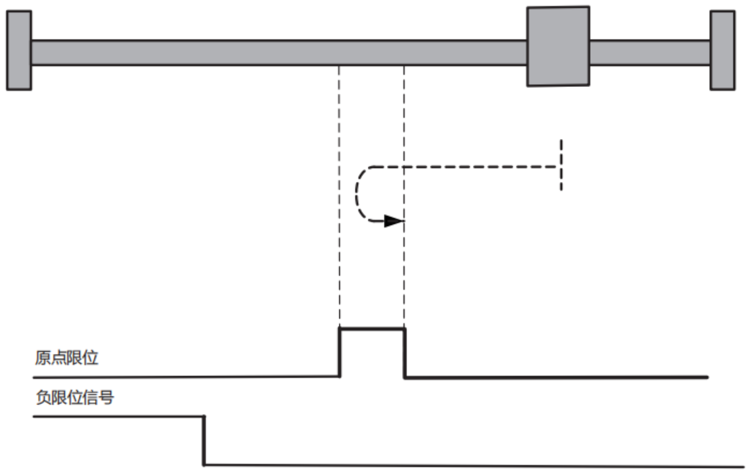
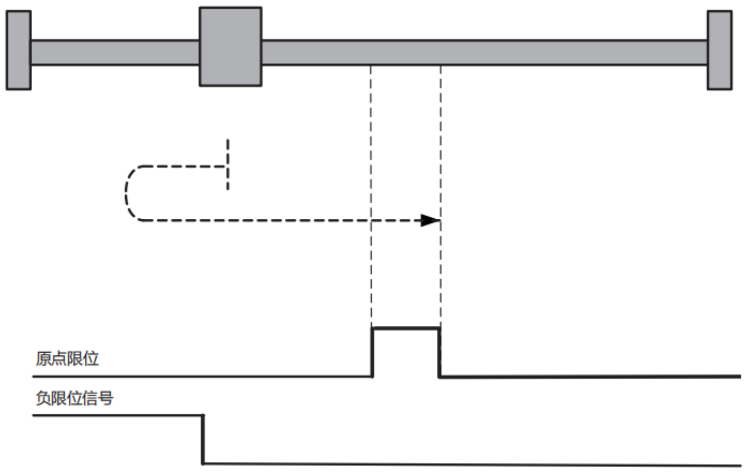


Figure 7.10.3-27-1 Zero return method27

- The invalid deceleration point signal at return to zero start, reverse limit switch encountered.

When starting to return to zero, the home switch signal starts to return to zero at reverse high speed, if it meets the limit switch, the motor automatically reverses and runs at high speed in the forward direction until the rising edge of the home switch signal is detected, then the motor starts to decelerate and continues to run at low speed in the forward direction, and the zero point is the position where the falling edge of the home switch signal is detected.

Figure 7.10.3-27-2 Zero return method27



- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, and the driver drives the motor directly to start returning to zero at low speed, and the zero point is the position where the falling edge of the home switch signal is detected.

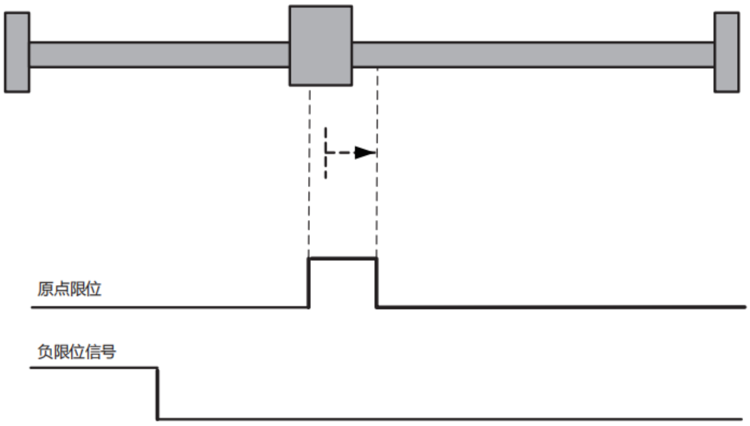


Figure 7.10.3-27-3 Zero return method27

24) Return to zero mode 28 (6098=28) using home switch

- The invalid deceleration point signal at return to zero start, no reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0. The driver drives the motor to run at high speed in the reverse direction to find the zero position. When the limit switch is not encountered, after the rising edge of the home switch signal is detected, the motor decelerates and reverses, and the motor runs positively at low speed until after the falling edge of the home switch signal is detected, the motor reverses and runs at low speed, and the zero point is the position where the rising edge of the home switch signal is detected.

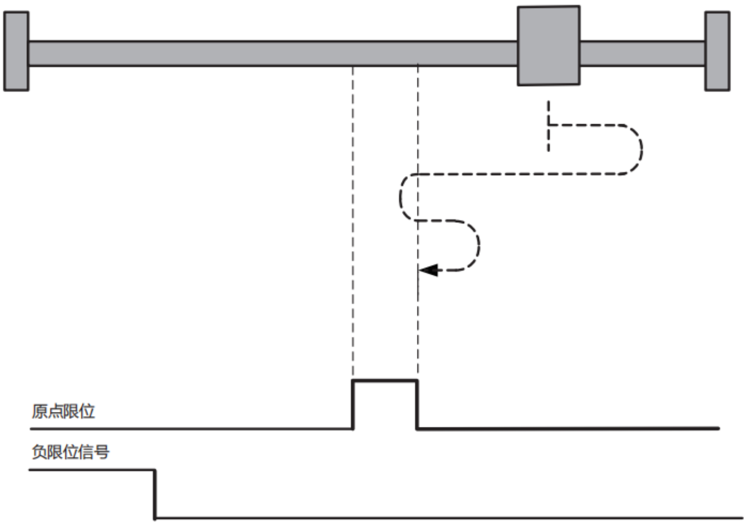


Figure 7.10.3-28-1 Zero return method 28

- The invalid deceleration point signal at return to zero start, reverse limit switch encountered

HW=0 at the beginning of zero return, start zero return at reverse high speed, encounter limit switch, automatically reverse, forward high-speed operation, after encountering HW rising edge, decelerate, forward low speed operation, after encountering HW falling edge, reverse, reverse low speed operation, encounter HW rising edge stop.

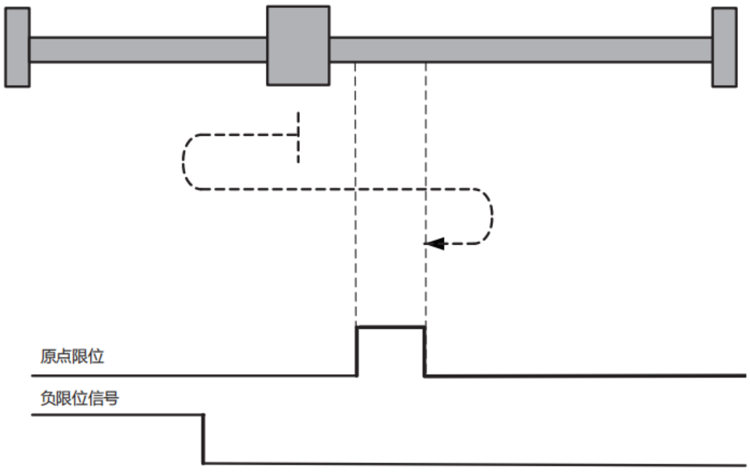


Figure 7.10.3-28-2 Zero return method 28

- The deceleration point signal is valid at zero return start

return to zero start with HW=1, then directly forward low speed start back to zero, after encountering the falling edge of HW, reverse, reverse low speed, encounter the rising edge of HW stop.

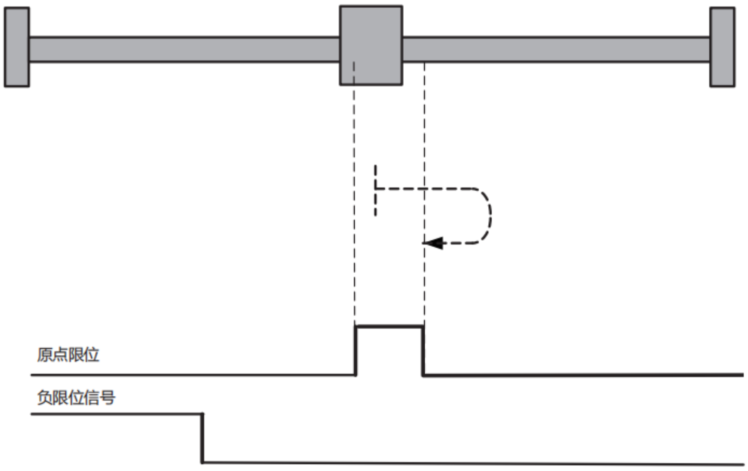


Figure 7.10.3-28-3 Zero return method 28

25) Return to zero mode 29 (6098=29) using home switch

- The invalid deceleration point signal at return to zero start, no reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0, and the driver drives the motor to run at reverse high speed to find the zero position. If the limit switch is not encountered, after the rising edge of the home switch signal is detected, the motor decelerates and runs at low speed in the reverse direction, and the zero point is the position where the rising edge of the home switch signal is detected.

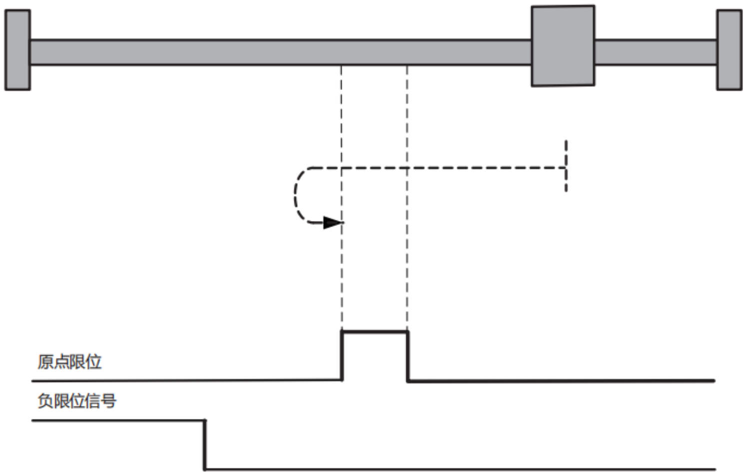


Figure 7.10.3-29-1 Zero return method 28

- The invalid deceleration point signal at return to zero start, reverse limit switch encountered.

Start back to zero, the origin switch signal is 0, the driver drives the motor to reverse high speed to start back to zero, if it encounters the limit switch, the motor automatically reverses, the motor starts positive high speed operation until after detecting the rising edge of the origin switch signal, the motor starts to decelerate reverse operation, reverse low speed operation after detecting the falling edge of the origin switch signal, the motor reverses and starts positive low speed operation, the zero point is the detection of the original electric switch signal The position of the rising edge.

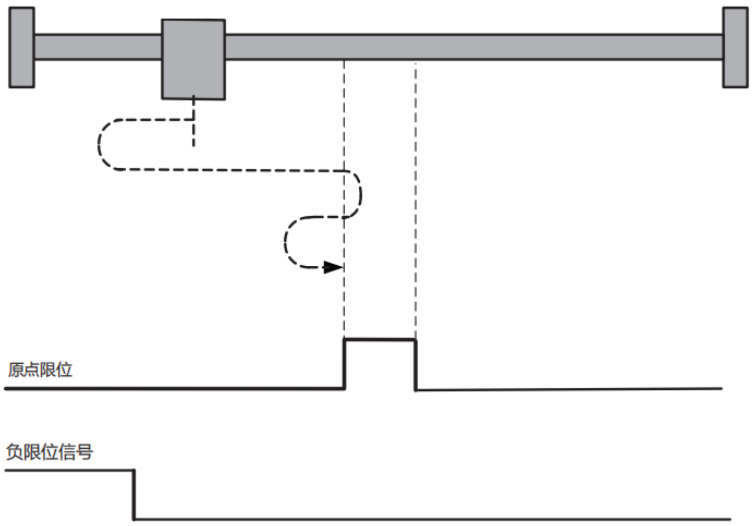


Figure 7.10.3-29-2 Zero return method 28

- The deceleration point signal is valid at zero return start:

When starting to return to zero, the home switch signal is 1, the driver drives the motor directly reverse low speed to start back to zero, until after detecting the falling edge of the home switch signal, the motor reverses that is positive low speed operation, the zero point is the position where the rising edge of the home switch signal is detected.

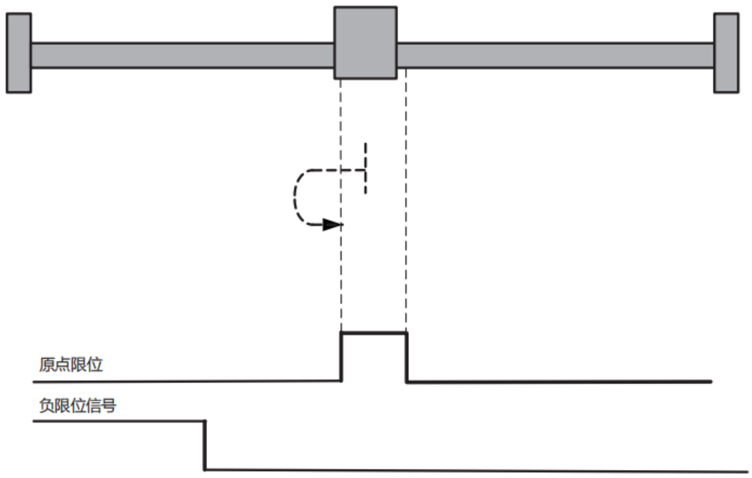


Figure 7.10.3-29-3 Zero return method 28

26) Return to zero mode 30 (6098=30) using home switch

- The invalid deceleration point signal at return to zero start, no reverse limit switch encountered.

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start to return to zero at reverse high speed, if it does not encounter the limit switch, after detecting the rising edge of the home switch signal, the motor decelerates and runs at reverse low speed, and the zero point is the position where the falling edge of the home switch signal is detected.

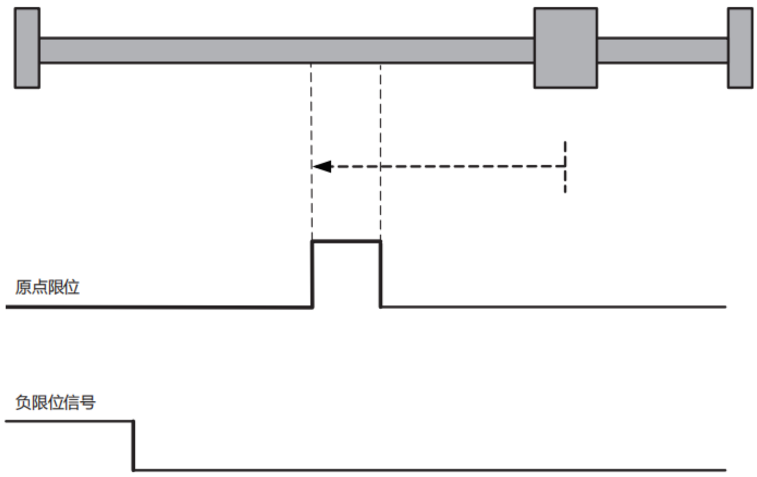


Figure 7.10.3-30-1 Zero return method 30

- The invalid deceleration point signal at return to zero start, reverse limit switch encountered:

When starting to return to zero, the home switch signal is 0, the driver drives the motor to start to return to zero at reverse high speed, if it meets the limit switch, the motor automatically reverses and runs at high speed in the forward direction until the rising edge of the home switch signal is detected, the motor decelerates and runs in the reverse direction, and the zero point is the position where the falling edge of the home switch signal is detected.

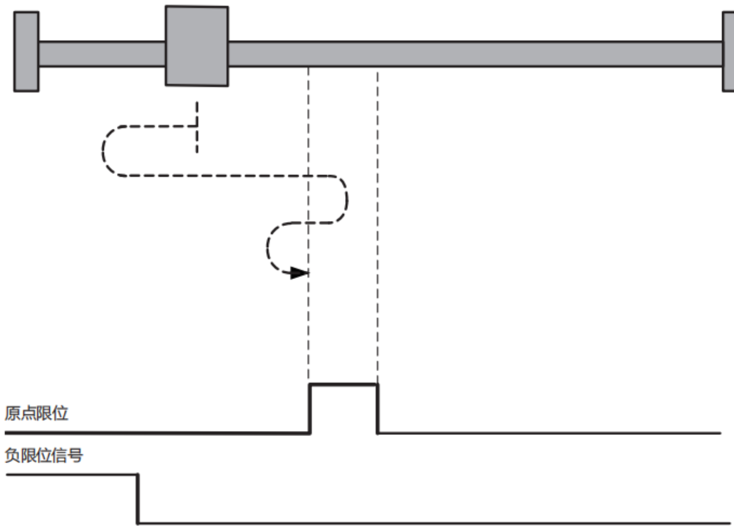


Figure 7.10.3-30-2 Zero return method 30

- The deceleration point signal is valid at zero start.

When starting to return to zero, the home switch signal is 1, and the driver drives the motor to directly reverse low speed to start returning to zero, and the zero point is the position where the falling edge of the home switch signal is detected.

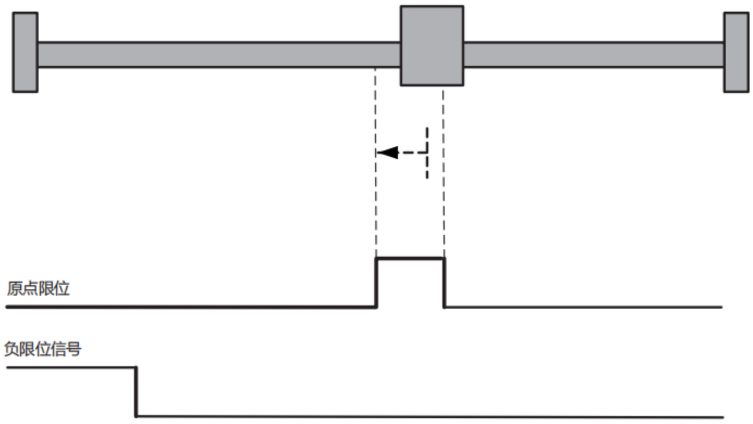


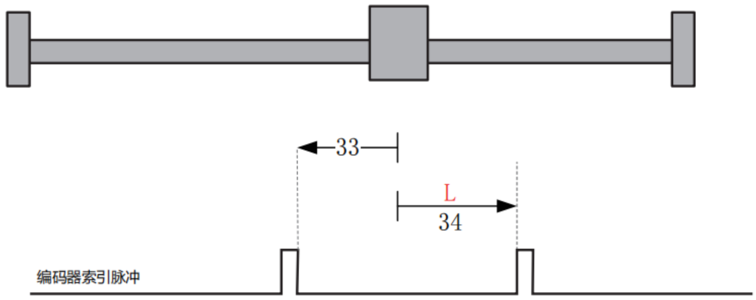
Figure 7.10.3-30-3 Zero return method 30

27) Return to zero mode 31/32 (6098=31/32)

This mode is not defined in the standard 402 protocol and can be used for extensions.

28) Zero return method 33/34 (6098=33/34) using motor encoder index pulse (Z believe signal)

Zero return mode 33: Reverse low speed operation, first Z signal encountered stops
Return to zero mode 34: Forward low speed operation, stop at the first Z signal encountered



29) Return to zero mode 35 (6098=35)

Zero return mode 35, with the current position as the mechanical home, after triggering the home return to zero (6040 control word: 0x0F → 0x1F):

- 60E6= 0 (absolute return to zero):

When the return to zero is complete, position feedback 6064 is set to home bias 607C.

- 0E6 = 1 (relative return to zero):

After the return to zero is complete, position feedback 6064 is superimposed on the original position offset 607C.

- When the home signal is OFF:

Zero return mode 3: The servo motor moves forward at a high speed of 6099h.01h, detects the rising edge of the home signal, decelerates, and stops and moves negatively at a low speed of 6099h.02h to find the zero point, which is the position of the first encoder index pulse (Z-phase pulse) signal after the falling edge of the home signal is detected.
Zero return mode 4: The servo motor runs at 6099h.02h in the forward direction at low speed to find the zero point, which is the position of the first encoder index pulse (Z-phase pulse) signal after the rising edge of the home signal is detected.

- When the home signal is ON:

Zero return method 3: The servo motor runs at a low negative speed of 6099h.02h to find the zero point, which is the position of the first encoder index pulse (Z-phase pulse) signal after the falling edge of the home signal is detected.
Zero return mode 4: The servo motor moves negatively at 6099h.01h, detects the falling edge of the home signal, decelerates, and stops and moves positively at 6099h.02h to find the zero point, and the zero position is the position of the first encoder index pulse (Z-phase pulse) signal after the rising edge of the home signal is detected.

7.10.5 Recommended configuration

Back to zero mode, the basic configuration is as follows:

RxPDO	TxPDO	Remarks
6040: Control word	6041: Status word status word	Must
6098: Homing method		Optional
6099-01: Search for deceleration point signal		Optional
6099-02: search for the origin signal speed		Optional
609A: Homing acceleration		Optional
	6064: Position feedback position actual	Optional

RxPDO	TxPDO	Remarks
	value	
6060: Mode of operation	6061: Modes of operation display	Optional

7.11 Auxiliary Functions

The drive provides the following auxiliary functions:
(1) Input phase loss detection function.
(2) Motor protection function.
(3) Probe function.

7.11.1 Input phase loss detection function

The AD3 series bus servo has a mains RST input phase loss detection function. When enabled on the servo, it detects whether the main power input is out of phase according to parameter P31.08 setting.

<table>
<tr><th rowspan="2">Serial number
P31.08</th><th>Name</th><th colspan="3">Input phase loss detection configuration</th><th>Setting effective</th><th>Effective immediately</th><th>Data Range</th><th>0~2</th></tr>
<tr><td>Accessibility</td><td>RW</td><td>Unit</td><td>-</td><td>Related Models</td><td>ALL</td><td>Factory settings</td><td>1</td></tr>
<tr><td colspan="9">This parameter is used to enable the servo's input out-of-phase detection function.
0: detection not enabled: disables the servo's input out-of-phase detection function.
1: Input single-phase detection: When using single-phase AC220V power supply, enable the servo's input phase-loss detection function, which will alarm and stop when single-phase power input is detected to have a deteriorating effect on the servo's current operating performance.
2: Input three-phase detection: When using three-phase AC220V or AC380V power supply, enable the servo's input phase-loss detection function, which will alarm and stop when the three-phase power input is detected to have a deteriorating effect on the servo's current operating performance.</td></tr>
</table>

7.11.2 Motor protection function

- Motor overload protection:

After the servo motor is energized, heat is continuously generated due to the thermal effect of the current, and heat is released to the surrounding environment at the same time. When the generated heat exceeds the released heat, the motor temperature rises and the temperature is too high, which will cause the motor to burn up. Therefore, the driver provides motor overload protection function to prevent the motor from burning up due to high temperature.
The time at which the motor overload fault (E71.80) is reported can be adjusted by setting the time for the corresponding overload multiplier (relevant parameters: P31.01, P31.02, P31.03, P31.04). P31.01, P31.02, P31.03, P31.04 generally remain as default values, but can be changed according to the actual motor heating when the following conditions occur Change:
Servo motors operating in high ambient temperatures.
Servo motor cyclic motion, and single motion cycle is short, frequent acceleration and deceleration occasions.
Associated parameters:

<table>
<tr><th rowspan="2">Serial number
P31.01</th><th>Name</th><th colspan="3">1.5 times overload time</th><th>Setting effective</th><th>Break Enable</th><th>Data Range</th><th>1~1000000</th></tr>
<tr><td>Accessibility</td><td>RW</td><td>Unit</td><td>ms</td><td>Related Models</td><td>ALL</td><td>Factory settings</td><td>100000</td></tr>
<tr><td colspan="9">This parameter is used to set the time required for the overload alarm to last after the servo current exceeds 1.5 times the rated current. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.</td></tr>
</table>

Serial number P31.02	Name	2.5 times overload time			Setting effective	Break Enable	Data Range	1~1000000
	Accessibility	RW	Unit	ms	Related Models	ALL	Factory settings	20000
This parameter is used to set the time required for the overload alarm to last after the servo current exceeds 2.5 times the rated current. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.								

Serial number P31.03	Name	Motor maximum overload multiplier			Setting effective	Break Enable	Data Range	300~400
	Accessibility	RW	Unit	%	Related Models	ALL	Factory settings	400
The maximum allowable motor current is a multiple of the rated motor current. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.								

Serial number P31.04	Name	Maximum overload current time			Setting effective	Break Enable	Data Range	1~50000
	Accessibility	RW	Unit	ms	Related Models	ALL	Factory settings	1000
The maximum time that the maximum motor current is allowed to last. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.								

Serial number P31.05	Name	Overload gain			Setting effective	Break Enable	Data Range	1~50000
	Accessibility	RW	Unit	ms	Related Models	ALL	Factory setting	1000
The maximum time that the maximum motor current is allowed to last. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.								

- Motor speed protection:

Excessive servo motor speed will lead to motor damage or mechanical damage. Therefore, the Servo Drive provides motor over maximum speed protection and motor stall protection functions.

① Over maximum speed protection

A motor speed exceeding P11.05 motor maximum speed for 300ms continuously is reported as exceeding maximum speed fault (E84.82).

Associated parameters:

Serial number P11.05	Name	Maximum motor speed			Setting effective	Downtime effective	Data Range	1~30,000
	Accessibility	RW	Unit	rpm	Related Models	ALL	Factory setting	3000
This parameter is used to enter the maximum speed of the motor; or it is automatically filled in by P10.02 after selecting the model.								

② Motor stall protection

A motor stall fault (E84.85) is reported when the difference between the motor speed feedback and the speed command exceeds the P50.16 stall threshold for a sustained P50.17 stall filter time.

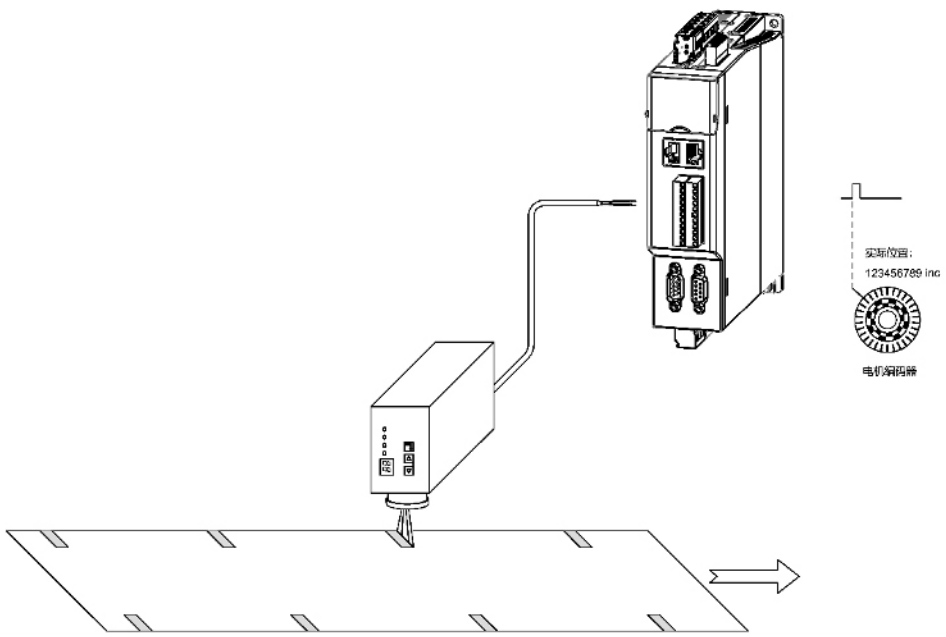
- Associated parameters:

Serial number	Name	Stall Threshold			Setting effective	Effective immediately	Data Range	0~200
P50.16	Accessibility	RW	Unit	%	Related Models	P/S	Factory settings	100
This parameter is used to set the threshold value for stall protection, with the base value being the current speed given. When the difference between the speed feed and speed feedback reaches or exceeds the threshold set in P50.16 and the duration exceed the filter time set in P50.17 (e.g. flying car), the servo drive will stop and report a fault.								

Serial number	Name	Stall filtering time			Setting effective	Effective immediately	Data Range	0~2000
P50.17	Accessibility	RW	Unit	ms	Related Models	P/S	Factory settings	100
This parameter is used to set the filtering time of stall protection, which is generally not adjusted and set according to the default value.								

7.11.3 Probe Function

The probe function is the position latching function. It can latch the position information (command unit) when the external DI signal or motor Z signal (real Z signal or analog Z signal) changes.
The AD3 servo driver supports 2 probes enabled at the same time, which can record the position information corresponding to the rising and falling edges of each probe signal at the same time, that is, 4 position information can be latched at the same time. Probe 1/2 can select DI or motor Z signal as the probe signal.



1) Related objects

Index	Sub-index	Name	Access	Data Type	Unit	Setting range	Default Value
60B8h	00	Probe Function	RW	Uint16	-	0~65535	0

60B9h	00	Probe Status	RO	Uint16	-	-	0
60BAh	00	Probe 1 rising edge latch position	RO	Int32	inc	-	0
60BBh	00	Probe 1 falling edge latch position	RO	Int32	inc	-	0
60BCh	00	Probe 2 rising edge latch position	RO	Int32	inc	-	0
60BDh	00	Probe 2 falling edge latch position	RO	Int32	inc	-	0

Note: See "Srction 8 Object Dictionary Details" for detailed instructions on using related objects.

2) Setting steps

① Set DI

If you use external DI signal as probe trigger signal, you need to set P70.01 and P70.02 for probe function, and set 11 (probe 1 normally open) or 12 (probe 2 normally open) when the valid logic of DI terminal is positive logic, and set as 111 (probe 1) and 112 (probe 2) when the valid logic of DI terminal is negative logic.

② Set the probe function

The meaning of each of the probe functions (0x60B8) is as follows:

Bit	Description	Description
0	Probe 1 enables: 0 - Probe 1 is not enabled 1 - Probe 1 enable	bit0~bit5: Probe 1 related settings. Bit0 of 60B8h must remain valid during the action of probe 1 For absolute encoders, the Z signal refers to the zero point of the motor's single-turn position feedback
1	Probe 1 trigger mode 0-Single trigger, only trigger when the trigger signal is valid for the first time 1-Continuous trigger	
2	Probe 1 trigger signal selection 0-DI input signal 1-Z signal	
Bit	**Description**	**Description**
3	NA	
4	Probe 1 rising edge enable 0 - No latching on rising edge 1 - Rising edge latching	
5	Probe 1 falling edge enable 0 - No latching on falling edge 1 - Falling edge latching	
6~7	NA	NA
8	Probe 2 enables: 0 - Probe 2 is not enabled 1 - Probe 2 enable	bit8~bit13: Probe 2 related settings. The bit8 of 60B8h must remain active during the action of probe 2 For absolute encoders, the Z signal refers to the zero point of the motor's single-turn position feedback
9	Probe 2 trigger mode 0-Single trigger, only trigger when the trigger signal is valid for the first time 1-Continuous trigger	
10	Probe 2 trigger signal selection 0-DI input signal 1-Z signal	
11	NA	
12	Probe 2 rising edge enable 0 - No latching on rising edge 1 - Rising edge latching	
13	Probe 2 falling edge enable 0 - No latching on falling edge 1 - Falling edge latching	
14~15	NA	NA

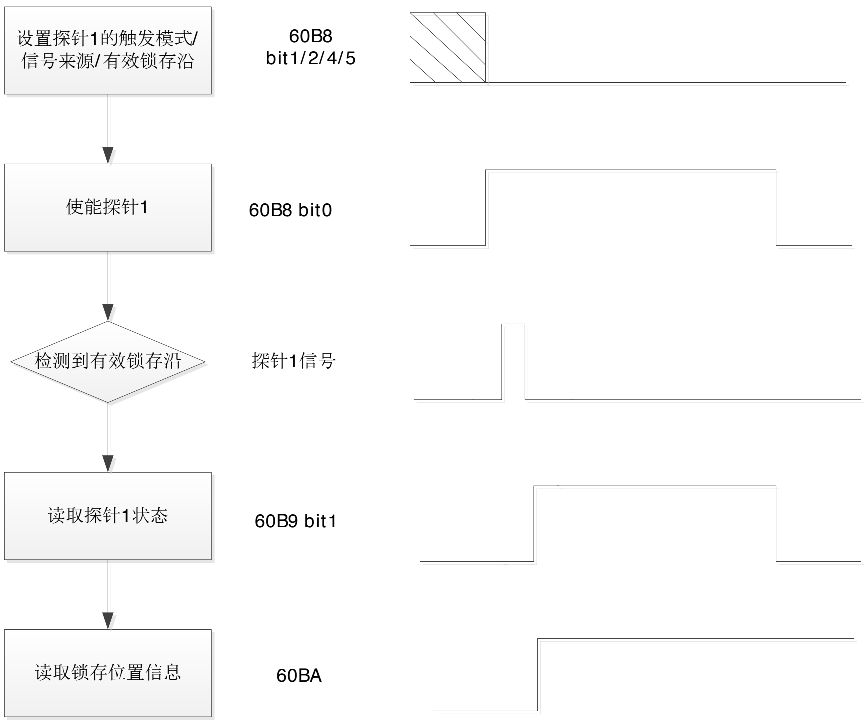
3) Read probe status 0x60B9

Bit	Description	Remarks
0	Probe 1 enables: 0 - Probe 1 not enabled 1 - Probe 1 enable	bit0~bit2: Response probe 1 status
1	Probe 1 rising edge latch execution	

	0 - rising edge latch not executed 1 - Rising edge latch is executed	
2	Probe 1 falling edge latch execution 0 - Falling edge latch not executed 1 - Falling edge latch is executed	
3~7	NA	NA
8	Probe 2 enables: 0 - Probe 2 not enabled 1 - Probe 2 enable	bit8~bit10: Response probe 2 status
9	Probe 2 rising edge latch execution 0 - rising edge latch not executed 1 - Rising edge latch is executed	
10	Probe 2 falling edge latch execution 0 - Falling edge latch not executed 1 - Falling edge latch is executed	
11~15	NA	NA

4) Read Probe Latch Position

The information of the 4 positions of the probe is recorded in objects 0x60BA~0x60BD.
Example: Set 0x60B8=0x0013, i.e., DI signal as probe 1 trigger signal, rising edge single trigger. By reading bit1 of 0x60B9 can determine whether the servo driver has executed the probe 1 rising edge position latch function. If it is judged that the probe 1 rising edge position latch function has been executed, the position information can be read by reading 0x60BA (probe 1 rising edge position feedback latch value, command unit).



Section 8 Object Dictionary

◆ Terminology:

Name	Explanation
Protection level	0 General browsing privileges 1 Operator rights 2 Engineer Permissions
Access Properties	RW read/write RO Read-only WO Write only
Setting method	0 Shutdown settings 1 Run settings
Effective method	0 Effective immediately 1 Downtime effective 2 Power on again
Can mapping?	NO may not be mapped in the PDO RPDO can be mapped to RPDO
Mapping	TPDO can be mapped to TPDO RTPDO can be mapped to RPDO or TPDO

Note: The units in the parameter object table in this chapter refer to the units when reading and writing parameters using the upper controller. It is not the same as the units in the debugging software interface, so use
When setting parameters in the debugging software, please pay attention to distinguish between units and factory values.

◆ P00 General configuration parameter group

Sub-index	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
3000h (P00)	General configuration	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
01h (P00.01)	Permission password	DINT32	-	WO	Operation Settings	Effective immediately	0
		Data Range	-	0~65535	Can mapping?	Related Models	Protection level
		Unit	-	-	NO	ALL	0
	This parameter is used to input the login password, when using the operation panel to set parameters, the corresponding parameters of the servo are allowed to be modified only after successful login; when using the debugging software to set parameters, the corresponding password can be input in the login interface and is not restricted by this parameter						

Sub-index	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode
02h (P00.02)	Control channels Select	DINT32	RW	Shutdown settings	Effective immediately	1
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	This parameter is used to set the way the control commands are given in different control modes.					

	0: Control panel control 1: Controller control 2: AD commission software control 3：Analog 1 control 4：Analog 2 control 5：Reserve					
Sub-index 03h (P00.03)	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**
	Motor configuration Select	DINT32	RW	Shutdown settings	Power on again	0
		Data Range	0~2	Can mapping	Related Models	Protection level
		Unit	-	NO	ALL	2
	This parameter is used to set the way of giving the motor parameters. The modification of this parameter should be operated under the protection level 2 (engineer level). 0: Motor reading Matching the 0x3010 motor model parameters, 0x3011 motor nameplate parameters, 0x3002:02 and 0x3002:03 encoder parameters for single-turn multi-turn resolution, and 0x3002:07 encoder position angle parameters by reading the internal data of the motor encoder. When using this mode, please note that the matching motor is our ASK series motor, and should confirm 0x3002:01 The encoder type parameter matches the current matching motor type. 1: User settings When the motor used is another series motor, you need to manually configure the parameter groups 0x3010, 0x3011, 0x3020, 0x3021, etc. 2: Bus Configuration Temporarily invalid.					

◆ P01 Bus control parameter group

Sub-index	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 3001h (P01)	Communication parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h (P01.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Bus Type Select	DINT32	RW		Operation Settings	Power on again	1
		Data Range	0~2		Can mapping?	Related Models	Protection level
		Unit	-		NO	ALL	1
	This parameter is used to select the communication method selected for the servo; the default is EtherCAT communication: 0: No bus interface 1：EtherCAT 2: CANopen (Reserved)						
Sub-index 02h (P01.02)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Local Node Number	DINT32	RW		Shutdown settings	Power on again	1
		Data Range	0~240		Can mapping?	Related Models	Protection level
		Unit	-		NO	ALL	0
	This parameter is used to set the node number of the servo in the bus topology for bus communication; when the bus type is EtherCAT, the node setting supports two setting methods, see parameter 0x3001:05 Node Number Configuration Selection for details.						

<table>
<tr><td rowspan="5">Sub-index 03h (P01.03)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Master communication cycle</td><td>DINT32</td><td>RO</td><td>-</td><td>Downtime effective</td><td>2000</td></tr>
<tr><td>Data Range</td><td>200~1000000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>us</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter shows the communication period of the bus communication EtherCAT does not need to be set by the user and automatically gets the communication period of the master</td></tr>
<tr><td rowspan="5">Sub-index 04h (P01.04)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Synchronous detection Enable</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Power on again</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set whether to enable synchronous data detection during bus communication:
0: No
1: Yes</td></tr>
<tr><td rowspan="5">Sub-index 05h (P01.05)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Node number Configuration Options</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the station number setting method:
0: Bus setting
Station address can be written by the upper controller via the bus
1: P01.02 Parameter setting
The station address is determined by the drive local parameter P01.02, but note that some host controllers, such as Pepperl+Fuchs, do not allow slave stations to use.
This method writes the station number, so please be careful to distinguish whether the upper controller supports it when setting the slave address in this way.</td></tr>
</table>

◆ P10~P11 Motor parameter group

<table>
<tr><td rowspan="4">Sub-index 3010h (P10)</td><td>Name</td><td>Data Type</td><td>Data Structure</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor Model Parameters</td><td>-</td><td>ARR</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Data Range</td><td colspan="2">-</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="5">Sub-index 01h (P10.01)</td><td>Name</td><td>Data Type</td><td colspan="2">Data Structure</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td></tr>
<tr><td rowspan="3">Motor Series</td><td>DINT32</td><td colspan="2">RW</td><td>Shutdown settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td colspan="2">0~6</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>NO</td><td>ALL</td><td>0</td></tr>
<tr><td colspan="7">This parameter is used to select the motor series:
0: Other series motors
1: ASK 200V motor</td></tr>
</table>

<table>
<tr><td></td><td colspan="7">2: ASK 400V motor</td></tr>
<tr><td rowspan="8">Sub-index 02h (P10.02)</td><td>Name</td><td>Data Type</td><td colspan="2">Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor Model</td><td>DINT32</td><td colspan="2">RW</td><td>Shutdown settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td colspan="2">0~40</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>NO</td><td>ALL</td><td>0</td></tr>
<tr><td colspan="7">This parameter is used to select the motor type based on the 3010h:01h motor series parameters:</td></tr>
<tr><td colspan="2">0：Other series motors</td><td colspan="5">0: Custom motor</td></tr>
<tr><td colspan="2">1: ASK 200V motor</td><td colspan="5">Examples:
1: ASK40-2-002M30</td></tr>
<tr><td colspan="2">2: ASK 400V motor</td><td colspan="5">Examples:
1: ASK180-4-480H1518</td></tr>
<tr><td rowspan="5">Sub-index 03h (P10.03)</td><td>Name</td><td>Data Type</td><td colspan="2">Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor type</td><td>DINT32</td><td colspan="2">RW</td><td>Shutdown settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td colspan="2">0~2</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>-</td><td>NO</td><td>ALL</td></tr>
<tr><td colspan="7">This parameter is used to set the type of motor:
0: Synchronous motor
1: Asynchronous motor
2: Linear motor</td></tr>
<tr><td rowspan="4">Sub-index 3011h (P11)</td><td>Name</td><td>Data Type</td><td>Data Structure</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor nameplate Parameters</td><td>-</td><td>ARR</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Data Range</td><td colspan="2">-</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="5">Sub-index 01h (P11.01)</td><td>Name</td><td>Data Type</td><td colspan="2">Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor rating Power</td><td>DINT32</td><td colspan="2">RW</td><td>Operation Settings</td><td>Downtime effective</td><td>68</td></tr>
<tr><td>Data Range</td><td colspan="2">1~20,000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">0.01kW</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="7">This parameter is used to enter the rated power of the motor; or it is filled in automatically when the motor model is selected by P10.01 and P10.02.</td></tr>
<tr><td rowspan="5">Sub-index 02h (P11.02)</td><td>Name</td><td>Data Type</td><td colspan="2">Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor rating Current</td><td>DINT32</td><td colspan="2">RW</td><td>Operation settings</td><td>Downtime effective</td><td>20</td></tr>
<tr><td>Data Range</td><td colspan="2">-1~4000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">0.1A</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="7">This parameter is used to enter the rated current rms value of the motor; or it is automatically filled in after the motor model is selected by P10.01 and P10.02.</td></tr>
<tr><td rowspan="2">Sub-index 03h (P11.03)</td><td>Name</td><td>Data Type</td><td colspan="2">Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td>Motor static</td><td>DINT32</td><td colspan="2">RW</td><td>Operation Settings</td><td>Downtime effective</td><td>25</td></tr>
</table>

	Current	Data Range	1~4000	Can mapping?	Related Models	Protection level
		Unit	0.1A	NO	ALL	1
	This parameter is used to enter the quiescent current of the motor; or it is automatically filled in after the model is selected by 10.02.					
Sub-index 04h (P11.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor rating Rotational Speed	DINT32	RW	Operation Settings	Downtime effective	3000
		Data Range	1~30,000	Can mapping?	Related Models	Protection level
		Unit	rpm	NO	ALL	1
	This parameter is used to enter the rated speed of the motor; or it is filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 05h (P11.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Maximum motor speed	UDINT32	RW	Operation settings	Downtime effective	4000
		Data Range	1~30,000	Can mapping?	Related Models	Protection level
		Unit	rpm	NO	ALL	1
	This parameter is used to enter the maximum speed of the motor; or it is filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 06h (P11.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Number of motor pole pairs	UDINT32	RW	Operation settings	Downtime effective	5
		Data Range	1~80	Can mapping?	Related Models	Protection level
		Unit	Pn	NO	ALL	1
	This parameter is used to enter the number of pole pairs of the motor; or it can be filled in automatically by selecting the motor type from P10.01 and P10.02. When using a custom motor, it can be obtained by the pole pair self-tuning method or filled in by looking up the motor technical data.					
Sub-index 07h (P11.07)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor rating Torque	DINT32	RW	Operation settings	Downtime effective	2150
		Data Range	1~1000000	Can mapping?	Related Models	Protection level
		Unit	0.001N.m	NO	ALL	1
	This parameter is used to enter the rated torque of the motor; or it can be filled in automatically after selecting the model from 10.02.					
Sub-index 08h (P11.08)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor stator Phase resistance	DINT32	RW	Operation settings	Downtime effective	505
		Data Range	1~100000	Can mapping?	Related Models	Protection level
		Unit	0.01ohm	NO	ALL	1
	This parameter is used to enter the stator phase resistance of the motor; or it is automatically filled in after the motor model is selected by P10.01 and P10.02. Note: Pay attention to the calculation of different brands of motors.					
Sub-index 09h	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor D axis	DINT32	RW	Operation	Downtime	1620

(P11.09)	Inductors			settings	effective	
		Data Range	1~100000	Can mapping?	Related Models	Protection level
		Unit	0.01mH	NO	ALL	1
	This parameter is used to enter the D-axis inductance of the motor; or it can be filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 0Ah (P11.0A)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor Q-axis Inductors	DINT32	RW	Operation settings	Downtime effective	1620
		Data Range	1~100000	Can mapping?	Related Models	Protection level
		Unit	0.01mH	NO	ALL	1
	This parameter is used to enter the Q-axis inductance of the motor; or it can be filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 0Bh (P11.0B)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor rotor Rotational inertia	DINT32	RW	Operation settings	Downtime effective	223
		Data Range	1~100000	Can mapping?	Related Models	Protection level
		Unit	0.01Kc2	NO	ALL	1
	This parameter is used to enter the rotor inertia of the motor; or it is filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 0Ch (P11.0C)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Motor Reverse Electricity Potential constants	DINT32	RW	Operation Settings	Downtime effective	73
		Data Range	1~2000	Can mapping?	Related Models	Protection level
		Unit	Vkr	NO	ALL	1
	This parameter is used to enter the motor's counter potential constant; or it can be filled in automatically when the motor model is selected by P10.01 and P10.02.					
Sub-index 0Dh (P11.0D)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Self-adjusting power Machine pole logarithm	DINT32	RW	Operation Settings	Effective immediately	5
		Data Range	1~80	Can mapping?	Related Models	Protection level
		Unit	Pn		ALL	2
	This parameter indicates the number of motor pole pairs automatically obtained by the Servo Drive after the self-tuning operation of the Servo Motor. This parameter will be automatically saved in the Servo Drive after completing the motor pole pair self-tuning process until the motor pole pair self-tuning is performed again.					

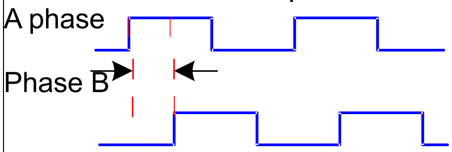
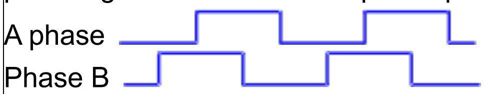
◆ P20~P21 Encoder parameter group

Sub-index 3020h (P20)	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**
	Encoder Basic parameters	-	ARR	-	-	-
		Data Range	-	Can mapping?	Related Models	Protection level
		Unit	-	-	-	-
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**

01h (P20.01)	Encoder type	DINT32	RW	Operation Settings	Power on again	0
		Data Range	0~6	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	0
	This parameter sets the encoder communication protocol type, when setting motor parameters by motor reading, this parameter needs to be set first and then powered on again to obtain. 0: Tamagawa encoder 1: ENDAT encoder 2: NIKON Encoder 3: SICK Encoders 4: Rotary encoder 5: ABZ encoder 6: Panasonic encoder					
Sub-index 02h (P20.02)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Encoder single Circle Resolution	DINT32	RW	Operation settings	Power on again	17
		Data Range	10~24	Can mapping?	Related Models	Protection level
		Unit	-		ALL	0
Sub-index 03h (P20.03)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Encoder multi-turn Resolution	DINT32	RW	Operation settings	Power on again	16
		Data Range	0~99	Can mapping?	Related Models	Protection level
		Unit	-		ALL	0
Sub-index 04h (P20.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	ABZ code Number of pulses	DINT32	RW	Operation settings	Power on again	2500
		Data Range	0~2097152	Can mapping?	Related Models	Protection level
		Unit	ppr		ALL	1
	When the encoder is ABZ					
Sub-index 05h (P20.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Frequency division pulses Number of outputs	DINT32	RW	Power outage setting	Power on again	2500
		Data Range	0-32767	Can mapping?	Related Models	Protection level
		Unit	ppr	-	-	1
	Set the number of output pulses for the 1-turn pulse output terminal PAO or PBO of the motor. After 4 times the frequency, the pulse output resolution is: 1 rotation of the motor pulse output resolution = (2005-12h) X 4.					
Sub-index 06h (P20.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Output pulse Phases	DINT32	RW	Shutdown settings	Power on again	0
		Data Range	0-1	Can mapping?	Related Models	Protection level

Unit	-	-	ALL	1

Set the phase relationship between the output A-phase pulses and B-phase pulses when using the pulse output function with the same direction of motor rotation:

Set value	Output pulse phase	Remarks
0	A ahead of B	Phase A pulses are 90° ahead of phase B pulses in the encoder divider output 
1	A Lagging B	The A-phase pulse of the encoder divider output pulse lags 90° behind the B-phase pulse 

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0X07 (P20.07)	Encoder position angle	DINT32	RO	-	Effective immediately	24567
		Data Range	0~33554432	Can mapping?	Related Models	Protection level
		Unit	inc	NO	ALL	1

This parameter shows the motor encoder position angle obtained by "encoder zeroing by micro-movement", "encoder zeroing by offset", "encoder zeroing by write", "encoder zeroing by offset" and "encoder zeroing by write". 2" and "encoder write zero 2", the motor encoder position angle is obtained after the encoder zero point self-tuning.

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0X08 (P20.08)	Resolver polar logarithm	DINT32	RW	Operation Settings	Downtime effective Power on again	1
		Data Range	1~10	Can mapping?	Related Models	Protection level
		Unit	-		ALL	2

This parameter is used to set the polar logarithm of the Resolver

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0X09 (P20.09)	Pulse output Source selection	DINT32	RW	Shutdown settings	Power on again	0
		Data Range	0-3	Can mapping?	Related Models	Protection level
		Unit	-	-	-	1

Set the output source of the pulse output port:

Set value	Output Sources	Remarks
0	Encoder Crossover output	When the motor is rotating, the encoder feedback signal will be set according to the 2005-12h The set value is divided into frequencies and output. When the upper computer is used as closed loop feedback, it is recommended to use the

		encoder frequency division output method.
1	Pulse command Synchronous output	When the position instruction is derived from a pulse instruction, the input pulse instruction is synchronized Output. For multi-axis servo pulse synchronous tracking, the pulse command synchronous output method is recommended.
2	Fixed frequency output	Output at an internal fixed frequency for testing crossover functions
3	Virtual encoder output	When the upper computer is running on the dummy axis, the crossover output is divided according to the set value of 2005-12h according to the position of the dummy axis and then output.

Pulse output hardware terminals:

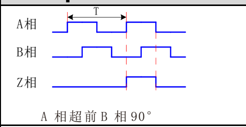
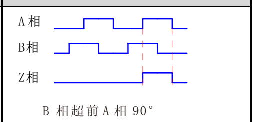
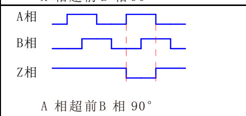
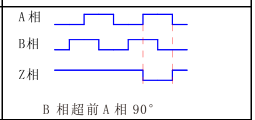
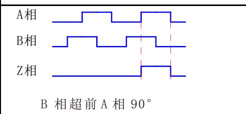
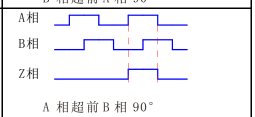
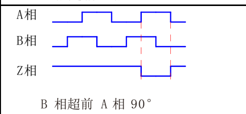
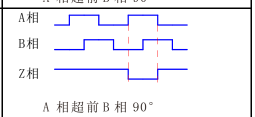
Signal Name	Output Form	Output Port	Maximum pulse frequency
A Belief number	Differential Output	PAO+, PAO-	1Mpps
B Belief number	Differential Output	PBO+, PBO-	1Mpps
Z Believe No.	Differential Output	PZO+, PZO-	1Mpps
	Open collector output	PZ-OUT, GND	100kpps

The signal width of the A/B phase pulse is determined by the motor speed, and the signal width of the Z phase pulse is half of the A/B phase pulse signal width.
Z signal output polarity is set by 2005-2Ah (Z pulse output polarity selection).

Sub-index 0X0A (P20.0A)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Z pulse output Polarity selection	DINT32	RW	Shutdown settings	Power on again	1
	Data Range	0-1	Can mapping?	Related Models	Protection level
	Unit	-	-	-	1

Set the output level of the pulse output terminal Z when the pulse is active:

2002-04h (Output pulse phase)	2005-2Ah (Z pulse output polarity)	Positive rotation, pulse Output schematic	Reversal, pulse Output schematic
0	0		
	1		
1	0		
	1		

For applications requiring high accuracy of the Z-signal divider output, it is recommended to use the effective variation edge of the Z-signal output:

Set value	Z Pulse output polarity selection	
0	Positive polarity (high when Z pulse is active)	The effective change edge is the falling edge
1	Negative polarity (low when Z pulse is	The effective change

	active)	edge is the rising edge

Index 10h (P20.10)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Auxiliary encoder settings	DINT32	RW	Shutdown settings	Effective immediately	0
	Data Range	0-3	Can mapping?	Related Models	Protection level
	Unit	-	-	ALL	1

Setting the role of the pulse-assisted encoder:

Set value	Output Sources	Remarks
0	Turn off auxiliary encoder	No second encoder function is used
1	Internal encoder feedback	Turning on the second encoder function, which allows the position feedback from the second encoder to be read;
2	Auxiliary encoder feedback	Open position fully closed loop function

Sub-index 0X11 (P20.11)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Auxiliary encoder type	DINT32	RW	Shutdown settings	Effective immediately	0
	Data Range	0-1	Can mapping?	Related Models	Protection level
	Unit	-	-	ALL	1

Set the type of pulse-assisted encoder:

Set value	Output Sources	Remarks
0	ABZ Encoders	5V differential pulse signal
1	SSI Encoders	The auxiliary encoder type is SSI communication, and the supported protocol format is 24binE or 24bin, 24binE format is recommended

Sub-index 0X12 (P20.12)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Auxiliary encoder Number of pulses	DINT32	RW	Shutdown settings	Effective immediately	2500
	Data Range	0-2097152	Can mapping?	Related Models	Protection level
	Unit	ppr	-	ALL	1

The number of pulses generated by the auxiliary encoder for one revolution of the motor.
Note: This number of pulses is the number of pulses before frequency multiplication.

Sub-index 0X13 (P20.13)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Auxiliary encoder direction	DINT32		Shutdown settings	Effective immediately	0
	Data Range		Can mapping?	Related Models	Protection level

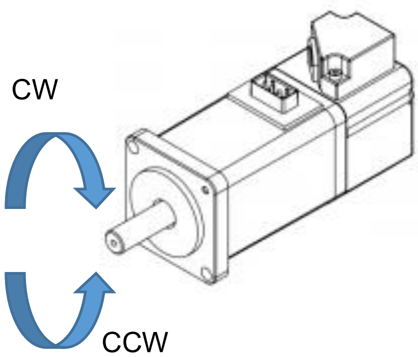
Sub-index	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
		Unit			-	ALL	1
	Auxiliary encoder direction: 0: Positive direction 1: Reverse direction						
Sub-index 3021h (P21)	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Encoder parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h (P21.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Encoder Fault Enable	DINT32	RW		Operation settings	Power on again	1
		Data Range	0~1		Can mapping?	Related Models	Protection level
		Unit	-		NO	ALL	1
	Set whether to enable the encoder's own alarm except "encoder connection error", so that the absolute position of the motor rotor does not need to be saved after a servo power failure.						
	For applications where information is available, the encoder can be installed without the encoder's power supply battery, and the encoder can be shielded from battery undervoltage and encoder battery disconnection faults by this parameter. 0: No 1: Yes						
Sub-index 02h (P21.02)	**Data Type**			**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Encoder Maximum acceleration			RW	Operation settings	Downtime effective	200
				50~5000	Can mapping?	Related Models	Protection level
				inc	NO	ALL	2
	Set the maximum encoder acceleration deviation value allowed between encoder read cycles. In case of poor encoder grounding or severe interference, the In case of static electricity, overrun or overcurrent faults can be avoided. This parameter is set automatically according to the resolution of the connected encoder and is generally not required.						
Sub-index 03h (P21.03)	**Name**	**Data Type**		**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Acceleration overrun enable	DINT32		RW	Operation settings	Effective immediately	1
		Data Range		0~1	Can mapping?	Related Models	Protection level
		Unit		-	NO	-	1
	This parameter is used to set whether to enable the acceleration overrun fault alarm. 0: No 1: Yes						
Sub-index 04h (P21.04)	**Name**	**Data Type**		**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Self-adjusting current threshold	DINT32		RW	Operation settings	Effective immediately	100
		Data Range		10~300	Can mapping?	Related Models	Protection level
		Unit		1%	NO	ALL	1

	This parameter is used to set the amount of current given in the self-tuning case; the value is a percentage of the rated motor current.

◆ P30~P31 Motor control parameter group

Sub-index	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Sub-index 3030h (P30)	Contracting brake and motors Control parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 02h (P30.02)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Contracting brake opening time delay	DINT32	RW		Operation settings	Effective immediately	100
		Data Range	1~1000		Can mapping?	Related Models	Protection level
		Unit	ms		NO	ALL	1
	When using the negative timing of the brake, it means the delay from the start of torque output after servo enable to the issuance of the motor brake coil opening command. The longer the time, the more obvious the effect of fall prevention, but generally not more than 500ms. this parameter should be adjusted according to the motor holding characteristics and load conditions. If the contracting brake timing sequence is used, it indicates the delay time between the opening of the motor contracting brake coil and the start of torque output from the motor.						
Sub-index 03h (P30.03)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Locking delay time	DINT32	RW		Operation Settings	Effective immediately	100
		Data Range	1~1000		Can mapping?	Related Models	Protection level
		Unit	ms		NO	ALL	1
	When negative timing is used, it indicates the delay time from the time the motor issues the holding coil holding command to the time the servo stops outputting torque. The longer the time, the more obvious the effect of fall prevention, but generally not more than 500ms. If using contracting brake timing sequence, it indicates the delay time from motor servo stop output torque to motor contracting brake coil holding command.						
Sub-index 04h (P30.04)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Locking Timing	DINT32	RW		Operation Settings	Effective immediately	1
		Data Range	0~1		Can mapping?	Related Models	Protection level
		Unit	-			ALL	1
	This parameter is used to set the sequence of servo output and contracting brake action. 0: Positive timing of contracting brake 1: Hold gate negative timing						
Sub-index 05h (P30.05)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Contracting brake starting speed	UDINT32	RW		Operation settings	Effective immediately	30
		Data Range	0~3000		Can mapping?	Related Models	Protection level
		Unit	rmp				1
	When an error occurs in servo operation or when an emergency stop command is received to enter the braking state, the servo driver will issue a contracting brake hold command if the motor rotation speed is less than the set value.						
	Name	**Data Type**	**Data**	**Access**	**Setting**	**Effective**	**Factory**

			Structure	Properties	method	mode	value
Sub-index 3031h (P31)	Motor control parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h (P31.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	1.5 times Overload time	DINT32	RW		Operation Settings	Downtime effective	20000
		Data Range	1~1000000		Can mapping?	Related Models	Protection level
		Unit	ms			ALL	1
	This parameter is used to set the time the motor is allowed to run under 1.5 times the rated current overload. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operation curve.						
Sub-index 02h (P31.02)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	2.5 times Overload time	DINT32	RW		Operation Settings	Downtime effective	5000
		Data Range	1~50000		Can mapping?	Related Models	Protection level
		Unit	ms		NO	ALL	1
	This parameter is used to set the time the motor is allowed to run under 2.5 times the rated current overload. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operation curve.						
Sub-index 03h (P31.03)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Motor maximum Overload multiplier	DINT32	RW		Operation settings	Downtime effective	500
		Data Range	300~500		Can mapping?	Related Models	Protection level
		Unit	%		NO	ALL	1
	The maximum allowable motor current is a multiple of the rated motor current. To better protect the motor from damage under overload conditions, this parameter needs to be set correctly according to the motor's overload operating curve.						
Sub-index 04h (P31.04)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Maximum overload Current time	DINT32	RW		Operation settings	Downtime effective	10
		Data Range	1~10000		Can mapping?	Related Models	Protection level
		Unit	ms		NO	ALL	1
	The maximum time allowed for the maximum motor current (parameter 0x3031:03) to last, for better protection of the motor from damage in overload conditions. This parameter needs to be set correctly according to the motor's overload operating curve.						
Sub-index 08h (P31.08)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Input out of phase Detecting the configuration of	DINT32	RW		Operation settings	Effective immediately	1
		Data Range	0~2		Can mapping?	Related Models	Protection level
		Unit	-		NO	ALL	1
	This parameter is used to enable the servo's input out-of-phase detection function. This function will alarm and stop when it detects that the single-phase power input has a deteriorating effect on the current performance of the servo. 0: detection not enabled. 1: Input single-phase detection. 2: Input three-phase detection;						
	Name	**Data Type**	**Access Properties**		**Setting**	**Effective**	**Factory**

<table>
<tr><td rowspan="5">Sub-index 09h (P31.09)</td><td></td><td></td><td></td><td>method</td><td>mode</td><td>value</td></tr>
<tr><td rowspan="3">Output out-of-phase detection enable</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to enable the servo's output out-of-phase detection function (reserved parameter).
0: No
Disable the output phase loss detection function of servo, when the servo output is disconnected or missed, the servo will not report the output phase loss fault but may report other faults and stop. When the servo drive power and the servo motor power are seriously mismatched, the output phase loss false alarm may occur, then the output phase loss detection function can be masked by this parameter, but it is necessary to confirm that the servo system does not have the output phase loss problem, otherwise, it may affect the servo motor operational performance.
1: Yes
Enable the servo's output out-of-phase detection function, which will alarm and stop when 1-3 phases between the servo output and the motor are detected to be not reliably connected.</td></tr>
<tr><td rowspan="5">Sub-index 0Ah (P31.0A)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Out-of-phase protection Current Threshold</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>10</td></tr>
<tr><td>Data Range</td><td>5~100</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>%</td><td></td><td>-</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the out-of-phase protection current threshold size, which is a percentage of the motor's rated current.</td></tr>
<tr><td rowspan="5">Sub-index 0Bh (P31.0B)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Motor rotation Positive Direction</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>2</td></tr>
<tr><td colspan="6">This parameter is used to set the positive direction of motor rotation:
0 means the CCW direction is forward when viewed from the shaft side: When forward command, the motor rotates in the CCW direction when viewed from the motor shaft side, i.e., the motor rotates counterclockwise.
1 means the CW direction is forward when viewed from the shaft side: When the forward command is given, the motor rotates in the CW direction when viewed from the motor shaft side, i.e., the motor rotates clockwise.

</td></tr>
<tr><td>Sub-index</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
</table>

<table>
<tr><td rowspan="4">0Ch
(P31.0C)</td><td rowspan="3">Filter Enable</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Downtime effective</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td></td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to enable the filter enable of the servo:
0: Disable all filters
1: Enables all filters</td></tr>
<tr><td rowspan="5">Sub-index
0Dh
(P31.0D)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Carrier frequency</td><td>DINT32</td><td>RO</td><td>-</td><td>-</td><td>10000</td></tr>
<tr><td>Data Range</td><td>1000~20000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>ALL</td><td>2</td></tr>
<tr><td colspan="6">This parameter shows the carrier frequency of the PWM and cannot be modified. The higher the carrier frequency, the faster the current transient response, but the higher the heat generation of the power module, the higher the thermal loss. The lower the carrier frequency, the less the power module heats up, the less the heat loss, but the current transient response slows down.</td></tr>
<tr><td rowspan="5">Sub-index
0Eh
(P31.0E)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Modulation mode</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Power on again</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>2</td></tr>
<tr><td colspan="6">This parameter sets the modulation mode of the PWM:
0: Bilateral modulation
1: Single-sided modulation
Bilateral modulation mode can expand the current loop bandwidth, mainly used to adjust the control performance of the current loop, generally do not adjust, set according to the default value.</td></tr>
<tr><td rowspan="5">Sub-index
10h
(P31.10)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Braking resistor resistance value</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>80</td></tr>
<tr><td>Data Range</td><td>0~10000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ohm</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the braking resistor resistance value connected to the servo, the servo will carry out braking resistor overload protection according to the set value, if not set (value is 0), no braking resistor overload protection will be carried out.
The AD3 drive has the following built-in system resistors:
<table><tr><td>V1 Specification Drive</td><td>None</td></tr><tr><td>V2 Specification Drive</td><td>40W 80Ω</td></tr></table>
To use an external braking resistor, disconnect the shorting terminals D and P3 of CN6 and connect the two ends of the braking resistor to C and P3 respectively.
When the selected model uses built-in braking resistor, it will automatically match the braking resistor parameters, such as external braking resistor, it needs to be configured according to the actual value.</td></tr>
<tr><td>Sub-index</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting</td><td>Effective</td><td>Factory</td></tr>
</table>

11h (P31.11)				**method**	**mode**	**value**
	Braking resistor power	DINT32	RW	Operation settings	Downtime effective	40
		Data Range	0~10000	Can mapping?	Related Models	Protection level
		Unit	W	NO	ALL	1
	This parameter is used to set the power of the braking resistor connected to the servo, and the servo will protect the braking resistor from overload according to the set value. If not set (value is 0), no braking resistor overload protection is performed.					

◆ P40 Current loop parameter set

Index	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
3040h (P40)	Current ring parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h (P40.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Current Kp	DINT32	RW		Operation settings	Downtime effective	54
		Data Range	0~9999		Can mapping?	Related Models	Protection level
		Unit	0.01			ALL	2
	The three parameters P40.01, P40.02 and P40.03 are mainly for the PID adjustment of the current loop, which is generally not adjusted and set according to the default value. the larger the Kp, the faster the response, but too large is prone to oscillation, Kp cannot completely eliminate deviation, and Ti can be used to eliminate residual deviation; the smaller the Ti, the faster the servo response to deviation changes, but too small is prone to oscillation. If the system has jumpy feedback from time to time, it is necessary to use Kd, which can quickly respond to changes in the deviation of the system feedback from the given one. the larger the Kd, the faster the response, but too large can easily cause oscillations.						
Sub-index 02h (P40.02)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Current Ti	DINT32	RW		Operation Settings	Downtime effective	1000
		Data Range	1~99999		Can mapping?	Related Models	Protection level
		Unit	0.1ms		NO	ALL	2
	Sets the value of the current loop integration time.						
Sub-index 03h (P40.03)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Current Kd	DINT32	RW		Operation Settings	Downtime effective	0
		Data Range	0~9999		Can mapping?	Related Models	Protection level
		Unit	0.1		NO	ALL	2
	Sets the value of the current loop differential constant.						
Sub-index 04h (P40.04)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Dead time	DINT32	RW		Operation settings	Power on again	4000
		Data Range	2000~20000		Can mapping?	Related Models	Protection level

	Unit	ns	NO	ALL	2

This parameter is used to set the dead time, which is generally not adjusted and set according to the default value.

Sub-index 05h (P40.05)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Deadband compensation factor	UDINT32	RW	Operation settings	Downtime effective	500
	Data Range	0~200	Can mapping?	Related Models	Protection level
	Unit	%		ALL	2

3040h:05h and 3040h:06h are two parameters that mainly affect the compensation effect of deadband compensation in current control. Increasing the deadband compensation coefficient helps to reduce the torque pulsation in the high-speed section of the motor, and the deadband compensation threshold mainly affects the sinusality of the current when it passes the zero point.

Sub-index 06h (P40.06)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Deadband compensation threshold	UDINT32	RW	Operation Settings	Downtime effective	100
	Data Range	0~100	Can mapping?	Related Models	Protection level
	Unit	%		ALL	2

3040h:05h and 3040h:06h are two parameters that mainly affect the compensation effect of deadband compensation in current control. Increasing the deadband compensation coefficient helps to reduce the torque pulsation in the high-speed section of the motor, and the deadband compensation threshold mainly affects the sinusality of the current when it passes the zero point.

Sub-index 07h (P40.07)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Weak magnetic control Kp	DINT32	RW	Operation settings	Downtime effective	100
	Data Range	1~9999	Can mapping?	Related Models	Protection level
	Unit	0.01AS	NO	P/T	2

This parameter is used to set the control parameters of the weak magnetic control, the current loop proportionality coefficient, which is generally not modified.

Sub-index 08h (P40.08)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Weak magnetic control Ti	DINT32	RW	Operation settings	Downtime effective	150
	Data Range	1~99999	Can mapping?	Related Models	Protection level
	Unit	0.1ms	NO	P/T	2

This parameter is used to set the control parameters of the weak magnetic control, current.

Sub-index 09h (P40.09)

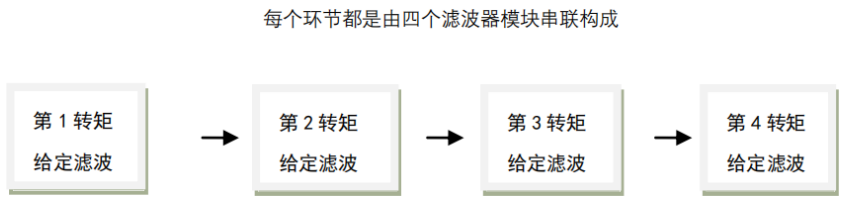
Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Upper limit of torque giving	DINT32	RW	Operation settings	Downtime effective	300
	Data Range	0~1000	Can mapping?	Related Models	Protection level
	Unit	1% rated torque	NO	P/S	1

This parameter refers to the percentage of the maximum forward torque allowed by the servo drive to drive the motor and the quota torque and is used for the current given limit of the speed loop output. When the value set for this parameter exceeds the drive capability of the current model drive inverter module, it is automatically limited to the maximum limit of the module.

<table>
<tr><td rowspan="5">Sub-index 0Ah (P40.0A)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Lower limit of torque giving</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>-300</td></tr>
<tr><td>Data Range</td><td>-1000~0</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>1% rated torque</td><td>NO</td><td>P/S</td><td>1</td></tr>
<tr><td colspan="6">This parameter refers to the percentage of the maximum reverse torque allowed for the servo drive motor versus the quota torque and is used for the current given limit of the speed loop output. When the value set for this parameter exceeds the drive capability of the current model drive inverter module, it is automatically limited to the maximum limit of the module.</td></tr>
<tr><td rowspan="5">Sub-index 0Dh (P40.0D)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Torque acceleration limitation</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>50</td></tr>
<tr><td>Data Range</td><td>5~1000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>1% rated torque</td><td>NO</td><td>ALL</td><td>2</td></tr>
<tr><td colspan="6">Torque acceleration limit refers to the incremental limit value of two adjacent torque giving commands, set as a percentage of the motor's nominal torque. This parameter affects the servo's response speed and anti-interference capability. Increasing the setting value will speed up the servo response and reduce the servo anti-interference ability; decreasing the setting value will slow down the servo response and improve the servo anti-interference ability. This parameter is generally not adjusted and set according to the default value.</td></tr>
<tr><td rowspan="5">Sub-index 0Eh (P40.0E)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Torque control speed limit</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>1200</td></tr>
<tr><td>Data Range</td><td>0~3000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>rpm</td><td>NO</td><td>T</td><td>2</td></tr>
<tr><td colspan="6">This parameter is used for the speed limit value in the torque control mode when the external load is less than the given torque and the motor accelerates continuously.
This parameter takes effect when not controlled by the controller. When using the controller control mode, the speed limit value is set via 0x6081.</td></tr>
</table>

◆ P41~P42 Current loop filter parameter set

<table>
<tr><td rowspan="5">Index 3041h (P41)</td><td>Name</td><td>Data Type</td><td>Data Structure</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Torque-giving filter parameters</td><td>-</td><td>ARR</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Data Range</td><td colspan="2">-</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="7">To enable a certain filter function for the current loop, first set the filter enable (3031-0Ch) to 1; if 3031-0Ch is 0, the filter does not take effect in the current loop control even if the relevant filter for the current loop group 3041h to 3042h is configured.
The AD3 Series Servo Drives are equipped with filter functions in the torque feed and torque feedback sections respectively. Each filter link is composed of 4 separate filter modules connected in series. Take torque feed as an example, the large torque feed link is composed of current feed filters 1, 2, 3, 4, etc., and 4 separate filter modules connected in series, as shown in the figure.</td></tr>
</table>



Each filter module has 4 control parameters, which are illustrated by current given filter 1 (current given filters 2, 3 and 4 are not repeated)

<table>
<tr><td rowspan="5">Sub-index 01h (P41.01)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">No. 1 Torque-giving filter type</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~4</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">The 1st torque giving filter represents the torque giving filter module 1, this parameter is used to select the type of the 1st torque giving filter module, the meaning of the parameter is as follows:
0: No filter is used
1: First-order low-pass filter
4: Notch filter</td></tr>
<tr><td rowspan="5">Sub-index 02h (P41.02)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">Torque-giving cut-off frequency 1</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>3500</td></tr>
<tr><td>Data Range</td><td>200~5000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Torque-giving cutoff frequency 1 represents the low-pass cutoff frequency of the first torque-giving filter (this parameter is meaningful when the first torque-giving filter type is 1 or 2 or 3; the value of this parameter is meaningless when the first torque-giving filter type is 0 or 4) The low-pass filter is used to filter out high-frequency spurious. For a fixed frequency input signal, the lower the cutoff frequency of the filter, the greater the phase delay to the signal. The default current loop filter low-pass cutoff frequency is 3500 Hz. When choosing to adjust the three-loop performance by rigidity, the system will calculate the default torque given cutoff frequency 1, but 3041h:01h filter type is still not using the filter, such as through the oscilloscope observation torque given spurious frequency is significantly higher than this given value, can be considered to configure the first-order low-pass filter.</td></tr>
<tr><td rowspan="5">Sub-index 03h (P41.03)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">Torque-giving wave trap frequency 1</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>100</td></tr>
<tr><td>Data Range</td><td>3~5000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the trap center frequency of the 1st Torque-Giving Filter when the Torque-Giving Filter 1 type is configured as a Notch filter (4), and the parameter 3041h:04h Torque-Giving Notch filter Trap Depth is used to set the trap depth of the Current-Giving Filter Module 1 (the values of these two parameters are meaningless when the Current-Giving Filter type is 0, 1, 2, or 3).
Notch filters, also known as bandstop filters, are filters that pass most of the frequency components, but attenuate certain ranges of frequency components to very low levels; Notch filters have a very strong attenuation effect on signals near the center frequency, and basically have little effect on signals far from the center frequency; the greater the trap depth, the stronger the attenuation effect on the center frequency point.
In general, the Notch filter will be enabled only after the vibration of the motor is detected</td></tr>
</table>

	and the vibration frequency is detected, please refer to "Filter Usage" for detailed configuration.					
Sub-index 04h (P41.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving wave trap depth 1	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	ALL	1
	Sets the value of the 1st torque given the filter trap depth.					
Sub-index 05h (P41.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	No. 2 Torque Giving Filter	UDINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	0: No filter is used 1: First-order low-pass filter 4: Notch filter					
Sub-index 06h (P41.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving cut-off frequency 2	UDINT32	RW	Operation Settings	Downtime effective	3500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	1
Sub-index 07h (P41.07)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving wave trap frequency 2	DINT32	RW	Operation Settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	1
Sub-index 08h (P41.08)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving wave trap depth 2	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	ALL	1
Sub-index 09h (P41.09)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	No. 3 Torque Giving Filter Type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	2
	0: No filter is used 1: First-order low-pass filter 4: Notch filter					
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**

0Ah (P41.0A)	Torque-giving cutoff frequency 3	DINT32	RW	Operation settings	Downtime effective	3500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Sub-index 0Bh (P41.0B)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving trap frequency 3	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Sub-index 0Ch (P41.0C)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving trap depth 3	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	ALL	2
Sub-index 0Dh (P41.0D)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Type 4 Torque Giving Filter	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	2
	0: No filter is used 1: First-order low-pass filter 4: Notch filter					
Sub-index 0Eh (P41.0E)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving cut-off frequency 4	DINT32	RW	Operation settings	Downtime effective	3500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Sub-index 0Fh (P41.0F)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving trap frequency 4	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Sub-index 10h (P41.10)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque-giving trap depth 4	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level

		Unit	db		NO	ALL	2
Index 3042h (P42)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	**Name**
	Torque feedback filter	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	No. 1 Type of Torque Feedback Filter	DINT32	RW	Operation settings	Downtime effective	0	
		Data Range	0~4	Can mapping?	Related Models	Protection level	
(P42.01)		Unit	-	NO	ALL	1	
	0: No filter is used 1: First-order low-pass filter 4: Notch filter						
Sub-index 02h (P42.02)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	Torque feedback cutoff frequency 1	DINT32	RW	Operation settings	Downtime effective	3500	
		Data Range	200~5000	Can mapping?	Related Models	Protection level	
		Unit	Hz	NO	ALL	1	
Sub-index 03h (P42.03)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	Torque feedback trap frequency 1	DINT32	RW	Operation settings	Downtime effective	100	
		Data Range	3~5000	Can mapping?	Related Models	Protection level	
		Unit	Hz	NO	ALL	1	
Sub-index 04h (P42.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	Torque feedback trap depth 1	DINT32	RW	Operation settings	Downtime effective	5	
		Data Range	3~50	Can mapping?	Related Models	Protection level	
		Unit	db	NO	ALL	1	
Sub-index 05h (P42.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	No. 2 Torque Feedback Filter Type	UDINT32	RW	Operation settings	Downtime effective	0	
		Data Range	0~4	Can mapping?	Related Models	Protection level	
		Unit	-	NO	ALL	1	
	0: No filter is used 1: First-order low-pass filter 4: Notch filter						
Sub-index 06h (P42.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**	
	Torque feedback cutoff frequency 2	UDINT32	RW	Operation settings	Downtime effective	3500	

		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 07h (P42.07)	Torque feedback trap frequency 2	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		ALL	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 08h (P42.08)	Torque feedback trap depth 2	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db		ALL	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 09h (P42.09)	No. 3 Torque Feedback Filter Type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	2
	0: No filter is used 1: First-order low-pass filter 4: Notch filter					

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Ah (P42.0A)	Torque feedback cutoff frequency 3	DINT32	RW	Operation Settings	Downtime effective	3500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Bh (P42.0B)	Torque feedback trap frequency 3	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		ALL	2

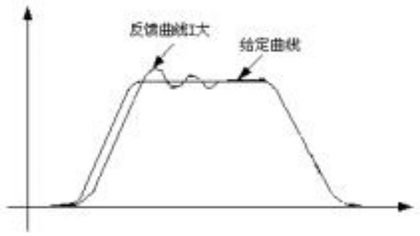
Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Ch (P42.0C)	Torque feedback trap depth 3	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db		ALL	2

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value

0Dh (P42.0D)	No. 4 Torque Feedback Filter Type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	2
	0: No filter is used 1: First-order low-pass filter 4: Notch filter					
Sub-index 0Eh (P42.0E)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque feedback cutoff frequency 4	DINT32	RW	Operation settings	Downtime effective	3500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Sub-index 0Fh (P42.0F)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque feedback trap frequency 4	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	ALL	2
Index 10h (P42.10)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque feedback trap depth 4	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	ALL	2

◆ P50 speed loop parameter set

Index 3050h (P50)	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed ring parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 01h (P50.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Speed loop gain 1	DINT32	RW		Operation settings	Downtime effective	270
		Data Range	1~5000		Can mapping?	Related Models	Protection level
		Unit	0.1Hz		NO	P/S	1
	Set the proportional gain of the speed loop, this parameter determines the response of the speed loop, the larger it is the faster the response of the speed loop, but too large a setting may cause vibration and needs attention. In position mode, if you want to increase the position loop gain, you need to increase the speed loop gain at the same time.						
Sub-index 02h	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Speed loop	DINT32	RW		Operation	Downtime	400

(P50.02)	integration time 1			Settings	effective	
		Data Range	1~3700	Can mapping?	Related Models	Protection level
		Unit	0.1ms	NO	P/S/HM	1
	Set the integration time constant of the speed loop. The smaller the value set, the stronger the integration effect is, and the deviation value at the time of stopping is closer to 0. When the Ti setting is small, the system response is fast, but oscillation may occur when it is too small; when the Ti setting is large, the system response is slow. When Ti is set to 9999.9, the integration is invalid (Kp is controlled separately). The effect of the integration time constant Ti on the velocity tracking is shown in Fig:  					
Sub-index 03h (P50.03)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed ring Kd1	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0-120	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S/HM	1
	Differential time Kd : Generally not adjusted, according to the default setting, this parameter can quickly respond to the system feedback and the given deviation change. The larger the value of Kd, the faster the response, but too large may cause oscillation. When set to 0, the differentiation is invalid.					
Sub-index 04h (P50.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed loop gain 2	DINT32	RW	Operation Settings	Downtime effective	270
		Data Range	1~5000	Can mapping?	Related Models	Protection level
		Unit	0.1Hz	NO	P/S	1
	2nd speed loop gain.					
Sub-index 05h (P50.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed loop integration time 2	UDINT32	RW	Operation Settings	Downtime effective	210
		Data Range	1~3700	Can mapping?	Related Models	Protection level
		Unit	ms	NO	P/S	1
	The 2nd velocity loop integration time constant.					
Sub-index 06h (P50.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed ring Kd2	UDINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~120	Can mapping?	Related Models	Protection level
		Unit	-		P/S	1
	2nd velocity loop differential time coefficient.					
Sub-index 10h	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque feedforward control selection	DINT32	RW	Operation Settings	Downtime effective	2

(P50.10)		Data Range	0~2	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	0: No torque feedforward 1: Internal torque feedforward 2: 60B2h Torque feedforward Only 2 options are currently supported.					
Sub-index 11h (P50.11)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed control cycle	DINT32	RW	Operation settings	Downtime effective	4
		Data Range	2~40	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S	2
	Sets the ratio of the speed control cycle to the current control cycle. This parameter is mainly used to adjust the control period of the speed loop. Speed loop period = (P50.11*1000000) / (P31.0D*(2- P31.0E)) microseconds. When using bus control, the master communication period 3001h:03h needs to be an integer multiple of the speed loop period.					
Sub-index 12h (P50.12)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Upper speed limit	DINT32	RW	Operation settings	Effective immediately	200
		Data Range	0~1000	Can mapping?	Related Models	Protection level
		Unit	1% rated speed	NO	P/S	2
	This parameter is used to set the upper limit of the speed given value as a percentage of the rated speed of the motor. In the position control and speed control modes, the speed given in forward rotation is limited to the range of this parameter.					
Sub-index 13h (P50.13)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Lower speed limit	DINT32	RW	Operation settings	Effective immediately	-200
		Data Range	-1000~0	Can mapping?	Related Models	Protection level
		Unit	1% rated speed	NO	P/S	2
	This parameter is used to set the lower limit of the speed given value as a percentage of the rated speed of the motor. In position and speed control mode, the speed given in forward rotation is limited to the range of this parameter.					
Sub-index 14h (P50.14)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed tracking error threshold	DINT32	RW	Operation settings	Effective immediately	500
		Data Range	0~1000	Can mapping?	Related Models	Protection level
		Unit	0.1% of rated speed	NO	ALL	1
	This parameter is used to set the threshold value of the speed tracking error, with the base value being the current speed given. When the difference between the speed feed and speed feedback reaches or exceeds the threshold value set by this parameter and the duration exceeds the 0x3050:15 set filter time (e.g., overrun), the servo drive will stop and report a fault.					
	Name	**Data Type**	**Access Properties**	**Setting**	**Effective**	**Factory**

				method	mode	value
Sub-index 15h (P50.15)	Tracking error filtering time	DINT32	RW	Operation settings	Effective immediately	500
		Data Range	0~2000	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	This parameter is used to set the filtering time for speed tracking error protection, which is generally not adjusted and set according to the default value.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 16h (P50.16)	Stall Threshold	DINT32	RW	Operation settings	Effective immediately	1000
		Data Range	0~2000	Can mapping?	Related Models	Protection level
		Unit	0.1% of rated speed	NO	ALL	1
	This parameter is used to set the threshold value for stall protection, with the base value being the current speed given. When the difference between the speed feed and speed feedback reaches or exceeds the threshold value set in this parameter and the duration exceeds the 0X3050:17 set filter time (e.g., overrun), the servo drive will stop and report a fault.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 17h (P50.17)	Stall filtering time	DINT32	RW	Operation settings	Effective immediately	100
		Data Range	0~2000	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	This parameter is used to set the filtering time of stall protection, which is generally not adjusted and set according to the default value.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 18h (P50.18)	Stall protection enable	DINT32	RW	Operation Settings	Effective immediately	1
		Data Range	0~1	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	This parameter is used to set whether stall protection fault detection is performed. 0: No 1: Yes					

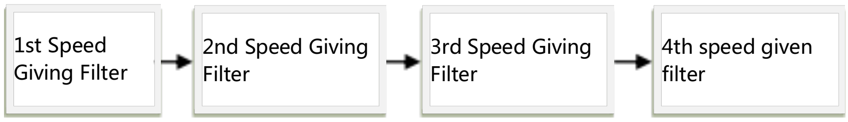
	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 19h (P50.19)	Overspeed filtering time	DINT32	RW	Operation Settings	Effective immediately	100
		Data Range	0~2000	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	This parameter is used to set the filtering time of overspeed protection, which is generally not adjusted and set according to the default value.					

P51~P52 Speed loop filter parameter set

Index 3051h (P51)

Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Speed Giving Filter	-	ARR	-	-	-	-
	Data Range	-		Can mapping?	Related Models	Protection level
	Unit	-		-	-	-

To enable a filter function for the speed loop, first set the filter enable (3031-0Ch) to 1; if (3031-0Ch) is 0, there will be no actual filtering effect even if 0x3051 and 0x3052 group filters for the speed loop are configured.
The servo system's velocity loop has two large links configured with filter functions, namely the velocity feed filter and the velocity feedback filter, which have the same function and are described together. Each large link is composed of 4 individual filter modules in series, for example, the large link of speed feed is composed of 4 individual filter modules such as speed feed filters 1, 2, 3 and 4 in series, as shown in the figure:
(Each large link is composed of four filter modules in series)



Each filter module has 4 control parameters, which are described for the 1st speed-given filter (2nd, 3rd and 4th speed-given filters are not described separately).

Sub-index 01h (P51.01)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
1st speed given filter type	DINT32	RW	Operation settings	Downtime effective	0
	Data Range	0~4	Can mapping?	Related Models	Protection level
	Unit	-	NO	P/HM	1

The default does not turn on the speed given filter:
0: No filter is used
1: First-order low-pass filter
2: Second-order low-pass filter
3: Second order with zero low-pass
4: Notch filter

Sub-index 02h (P51.02)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed given cutoff frequency 1	DINT32	RW	Operation settings	Downtime effective	2500
	Data Range	200~5000	Can mapping?	Related Models	Protection level
	Unit	Hz	NO	P/HM	1

This parameter is used to set the low-pass cutoff frequency of the speed-given filter module 1 (meaningful when the 3051h:01h parameter is set to 1 or 2 or 3; meaningless when the 3051h:01h parameter is set to 0 or 4).
Low-pass filters are used to filter out high-frequency noise. When the input signal frequency is higher than the low-pass cutoff frequency, the output signal amplitude of the filter is attenuated significantly, for a fixed frequency input signal, the lower the cutoff frequency of the filter, the greater the phase delay to the signal. The default low-pass cutoff frequency of the velocity loop filter is 2500Hz.

Sub-index 03h (P51.03)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed given trap frequency 1	DINT32	RW	Operation settings	Downtime effective	100
	Data Range	3~5000	Can mapping?	Related Models	Protection level

	Unit	Hz	NO	P/HM	1

Speed given trap frequency 1 is used to set the trap center frequency of the 1st speed given filter, and speed given trap depth 1 is used to set the trap depth of the 1st speed given filter (these two parameters are meaningful when 3051h:01h is selected as 4; the values of these two parameters are meaningless when 3051h:01h is selected as 0, 1, 2, 3).
Notch filters, also known as bandstop filters, are filters that pass most of the frequency components, but attenuate certain ranges of frequency components to very low levels; Notch filters attenuate signals near the center frequency very strongly and have little effect on signals far from the center frequency; the greater the trap depth, the stronger the attenuation effect on the center frequency point.
In general, the Notch filter is only enabled after vibration has occurred in the motor and the vibration frequency has been detected.

Sub-index 04h (P51.04)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed given trap depth 1	DINT32	RW	Operation Settings	Downtime effective	5
	Data Range	3~50	Can mapping?	Related Models	Protection level
	Unit	db	NO	P/HM	1

As described in 3051h:04h, it is used to set the trap depth of the 1st speed given Notch filter, the greater the trap depth, the stronger the attenuation effect on the center frequency point.

Sub-index 05h (P51.05)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
2nd speed given filter type	UDINT32	RW	Operation settings	Downtime effective	0
	Data Range	0~4	Can mapping?	Related Models	Protection level
	Unit	-	NO	P/HM	1

0: No filter is used
1: First-order low-pass filter
2: Second-order low-pass filter
3: Second order with zero low-pass
4: Notch filter

Sub-index 06h (P51.06)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed given cutoff frequency 2	UDINT32	RW	Operation Settings	Downtime effective	2500
	Data Range	200~5000	Can mapping?	Related Models	Protection level
	Unit	Hz	NO	P/HM	1

Sub-index 07h (P51.07)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed-given trap frequency 2	DINT32	RW	Operation Settings	Downtime effective	100
	Data Range	3~5000	Can mapping?	Related Models	Protection level
	Unit	Hz	NO	P/HM	1

Sub-index 08h (P51.08)

Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Speed given trap depth 2	DINT32	RW	Operation Settings	Downtime effective	5
	Data Range	3~50	Can mapping?	Related Models	Protection level
	Unit	db	NO	P/HM	1

<table>
<tr><td></td><td colspan="6"></td></tr>
<tr><td rowspan="5">Sub-index 09h (P51.09)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">The 3rd speed gives the filter type</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~4</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>P/HM</td><td>2</td></tr>
<tr><td colspan="6">0: No filter is used
1: First-order low-pass filter
2: Second-order low-pass filter
3: Second order with zero low-pass
4: Notch filter</td></tr>
<tr><td rowspan="5">Sub-index 0Ah (P51.0A)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed given cutoff frequency 3</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>2500</td></tr>
<tr><td>Data Range</td><td>200~5000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>P/HM</td><td>2</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="5">Sub-index 0Bh (P51.0B)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed-given trap frequency 3</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>100</td></tr>
<tr><td>Data Range</td><td>3~5000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>P/HM</td><td>2</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="5">Sub-index 0Ch (P51.0C)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed given trap depth 3</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>5</td></tr>
<tr><td>Data Range</td><td>3~50</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>db</td><td>NO</td><td>P/HM</td><td>2</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="5">Sub-index 0Dh (P51.0D)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed 4 given filter type</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~4</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>P/HM</td><td>2</td></tr>
<tr><td colspan="6">0: No filter is used
1: First-order low-pass filter
2: Second-order low-pass filter
3: Second order with zero low-pass
4: Notch filter</td></tr>
<tr><td rowspan="4">Sub-index 0Eh (P51.0E)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed given cut-off frequency 4</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>2500</td></tr>
<tr><td>Data Range</td><td>200~5000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>NO</td><td>P/HM</td><td>2</td></tr>
</table>

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Fh (P51.0F)	Speed-given trap frequency 4	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	2

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 10h (P51.10)	Speed-given trap depth 4	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	2

	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Index 3052h (P52)	Speed feedback filter	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

This group of parameters is used to set the speed feedback filter, mainly used to eliminate the high frequency harmonics in the speed feedback and mechanical vibration caused by the noise, to protect the system operation

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 01h (P52.01)	No. 1 Speed Feedback Filter Type	DINT32	RW	Operation settings	Downtime effective	1
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S/HM	1

By default, the 1st velocity feedback filter is turned on as a first-order low-pass filter:
0: No filter is used
1: First-order low-pass filter
2: Second-order low-pass filter
3: Second order with zero low-pass
4: Notch filter

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 02h (P52.02)	Speed feedback 1 Cutoff frequency	DINT32	RW	Operation settings	Downtime effective	1000
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	1

(a) By default, the 1st velocity feedback filter is turned on as a first-order low-pass filter with a cutoff frequency of 1000hz.
The smaller the setting, the smaller the speed feedback fluctuation, but also the greater the feedback delay.
The cutoff frequency is 5000 Hz with no filtering effect.

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 03h (P52.03)	Speed feedback 1 Trap frequency	DINT32	RW	Operation Settings	Downtime effective	100
		Data	3~5000	Can	Related	Protection

		Range		mapping?	Models	level
		Unit	Hz	NO	P/S/HM	1
Sub-index 04h (P52.04)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 1 Trap depth	DINT32	RW	Operation Settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/S	1
Sub-index 05h (P52.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	No. 2 Speed Feedback Filter Type	UDINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S	1
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero low-pass 4: Notch filter					
Sub-index 06h (P52.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 2 Cutoff frequency	UDINT32	RW	Operation Settings	Downtime effective	2500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	1
Sub-index 07h (P52.07)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 2 Trap frequency	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	1
Sub-index 08h (P52.08)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 2 Trap depth	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/S	1
Sub-index 09h (P52.09)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	No. 3 Speed Feedback Filter Type	DINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S	2
	0: No filter is used 1: First-order low-pass filter					

	2: Second-order low-pass filter 3: Second order with zero low-pass 4: Notch filter					
Sub-index 0Ah (P52.0A)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 3 Cutoff frequency	DINT32	RW	Operation settings	Downtime effective	2500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	2
Sub-index 0Bh (P52.0B)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Speed feedback 3 Trap frequency	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	-	P/S	2
Sub-index 0Ch (P52.0C)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 3 Trap depth	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/S	2
Sub-index 0Dh (P52.0D)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	No. 4 Speed Feedback Filter Type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S	2
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero low-pass 4: Notch filter					
Sub-index 0Eh (P52.0E)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 4 Cutoff frequency	DINT32	RW	Operation settings	Downtime effective	2500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	2
Sub-index 0Eh (P52.0F)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Speed feedback 4 Trap frequency	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/S	2
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**

<table>
<tr><td rowspan="4">10h
(P52.10)</td><td rowspan="3">Speed feedback 4 Trap depth</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>5</td></tr>
<tr><td>Data Range</td><td>3~50</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>db</td><td>NO</td><td>P/S</td><td>2</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td rowspan="5">Sub-index
11h
(P52.11)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed feedback averaging filtering option</td><td>DINT32</td><td>RW</td><td>Shutdown settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0-4</td><td>Can mapping?</td><td>Related Models</td><td>Grade</td></tr>
<tr><td>Unit</td><td>-</td><td>-</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">
<table>
<tr><th>Set value</th><th>Output Sources</th><th>Remarks</th></tr>
<tr><td>0</td><td>Prohibit average filtering</td><td></td></tr>
<tr><td>1</td><td>2 times average filtering</td><td></td></tr>
<tr><td>2</td><td>4 times average filtering</td><td></td></tr>
<tr><td>3</td><td>8 times average filtering</td><td></td></tr>
<tr><td>4</td><td>16 times average filtering</td><td></td></tr>
</table>
</td></tr>
</table>

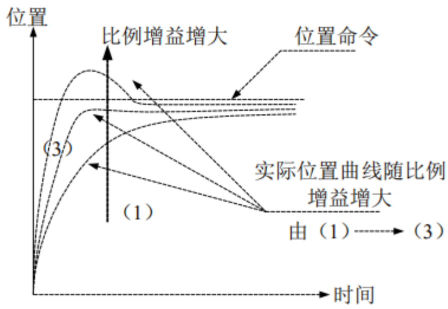
◆ P60 Position ring parameter set

Index 3060h (P60)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Position control parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P60.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position loop gain	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	0~10000	Can mapping?	Related Models	Protection level
		Unit	0.1Hz	NO	P/HM	1

P60.01 and P60.02 parameters mainly adjust the proportional gain and feedforward gain of the position regulator.

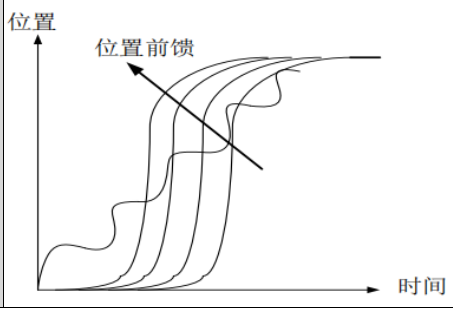
When the position control gain value is increased, the position response can be improved and the amount of position control error can be reduced. However, if the setting is too large, it is easy to generate vibration and noise. The effect of proportional gain is shown in the figure:



Sub-index 02h (P60.02)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedforward coefficient	DINT32	RW	Operation settings	Downtime effective	500
		Data Range	0~10000	Can mapping?	Related Models	Protection level
		Unit	0.1% of position ring given value	NO	P/HM	1

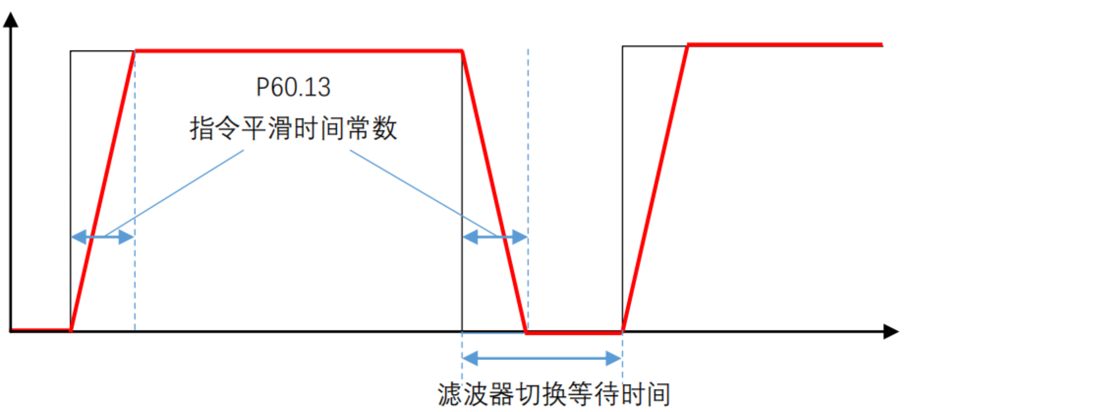
Set the value of the position feedforward factor, the percentage of feedforward speed, usually set to no more than 100%.

In position control mode, increasing the feedforward value improves the amount of position following error. Decreasing the feedforward value can reduce the vibration phenomenon of the mechanism. When the proportional gain is too large, the motor rotor will oscillate at this time. Reduce the proportional gain until the motor rotor no longer oscillates. When the external torque increases, the proportional gain is too low to meet the reasonable position tracking error requirement. At this time, feedforward gain can effectively reduce the position dynamic tracking error. The effect of feedforward gain is shown in the figure:



<table>
<tr><td></td><td colspan="7"></td></tr>
<tr><td rowspan="5">Sub-index 03h (P60.03)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed feed-forward filtering time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>50</td></tr>
<tr><td>Data Range</td><td>0-64</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>-</td><td>PP/HM/CSP</td><td></td></tr>
<tr><td colspan="6">Set the filter time constant for the velocity feedforward</td></tr>
<tr><td rowspan="5">Sub-index 04h (P60.04)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Position ring gain 2</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>640</td></tr>
<tr><td>Data Range</td><td>0-1000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>Hz</td><td>-</td><td>PP/HM/CSP</td><td></td></tr>
<tr><td colspan="6">Set the position loop, the second gain of the speed loop. 2008-04h, 2008-05h, 2008-06h and 2008-07h (the second torque command filter time constant) are called the second gain.</td></tr>
<tr><td rowspan="5">Sub-index 0Bh (P60.0B)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Position tracking error detection enable</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>P/HM</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set whether to perform position tracking error fault detection.
0: Turn off position tracking error fault detection
1: Enables position tracking error fault detection</td></tr>
<tr><td rowspan="5">Sub-index 0Ch (P60.0C)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Position tracking error threshold</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>393216</td></tr>
<tr><td>Data Range</td><td>0~16777216</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>inc</td><td></td><td>P/HM</td><td>1</td></tr>
<tr><td colspan="6">This parameter sets the threshold value of the position tracking error in the position control loop, with the base value being the encoder single-turn resolution. When the difference between position giving and position feedback reaches or exceeds the threshold value (e.g., overrun, motor shaft jamming), the servo drive will stop and report a fault.</td></tr>
<tr><td rowspan="5">Sub-index 0Dh (P60.0D)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Soft limit function setting</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Downtime effective</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~1</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">0: Soft limit function is not enabled.</td></tr>
<tr><td rowspan="2">Sub-index 0Eh (P60.0E)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td>Soft limit maximum</td><td>UDINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediatel</td><td>2147483647</td></tr>
</table>

					y	
		Data Range	0~2147483647	Can mapping?	Related Models	Protection level
		Unit	inc	NO	ALL	1
	Maximum software absolute position limit.					
Sub-index 0Fh (P60.0F)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Soft limit min.	DINT32	RW	Operation settings	Effective immediately	-2147483647
		Data Range	-2147483647~0	Can mapping?	Related Models	Protection level
		Unit	inc	NO	ALL	1
	Minimum software absolute position limit.					
Sub-index 10h (P60.10)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Command exception detection enable	UDINT32	RW	Operation settings	Effective immediately	1
		Data Range	0~1	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	It is used to detect whether the given control command data is abnormal. When the acceleration speed corresponding to two adjacent given control commands is greater than the acceleration indicated by the parameter 0x3060:11 (P60.11), the given command is determined to be abnormal, and the servo is alarmed. Excessive command acceleration or abnormal command may cause the motor Overload or overrun, to prevent damage to the equipment, it is recommended to turn on this function.					
Sub-index 11h (P60.11)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Command detection acceleration time	UDINT32	RW	Operation settings	Effective immediately	2000
		Data Range	200~100000	Can mapping?	Related Models	Protection level
		Unit	μ s	NO	ALL	1
	During the command abnormality detection, the maximum acceleration required for the motor speed to accelerate from zero speed to rated speed in this time according to the trapezoidal plan is calculated. When the acceleration speed corresponding to two adjacent given control commands is greater than the acceleration indicated by this parameter, the given command is determined to be abnormal, and the servo is alarmed.					
Sub-index 13h (P60.13)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Command smoothing time constant	UDINT32	RW	Operation settings	Effective immediately	80
		Data Range	0~500	Can mapping?	Related Models	Protection level
		Unit	0.1ms	NO	ALL	1
	The smooth FIR filter shift time constant for the position loop command can effectively suppress the speed feedforward jitter caused by the position command fluctuation and avoid the sharp fluctuation of the torque feed during the rapid acceleration.					



◆ P61~P62 Position loop filter parameter set

Index 3061h (P61)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Position loop given filtering (This feature is not supported currently)	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P61.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position 1 given filter type	DINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	1
	0: No filter is used 1: First-order low-pass filtering 2: Second-order low-pass filtering 3: Second order with zero low-pass 4: Notch filter					

Sub-index 02h (P61.02)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given cutoff frequency 1	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1

Sub-index 03h (P61.03)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given trap frequency 1	DINT32	RW	Operation Settings	Downtime effective	100
		Data Range	3~500	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1

Sub-index 04h (P61.04)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given trap depth 1	DINT32	RW	Operation Settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value

05h (P61.05)	Position 2 given filter Type	UDINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	1
	0: No filter is used 1: First-order low-pass filtering 2: Second-order low-pass filtering 3: Second order with zero low-pass 4: Notch filter					

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 06h (P61.06)	Position given cutoff frequency 2	UDINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 07h (P61.07)	Position given trap frequency 2	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		P/HM	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 08h (P61.08)	Position given trap depth 2	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db		P/HM	1

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 09h (P61.09)	Position 3 given filter type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-		P/HM	2
	0: No filter is used 1: First-order low-pass filtering 2: Second-order low-pass filtering 3: Second order with zero low-pass 4: Notch filter					

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Ah (P61.0A)	Position given cutoff frequency 3	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		P/HM	2

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 0Bh (P61.0B)	Position given trap frequency 3	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		P/HM	2

Sub-index 0Ch (P61.0C)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given trap depth 3	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db		P/HM	2

Sub-index 0Dh (P61.0D)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position 3 given filter type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-		P/HM	2
	0: No filter is used 1: First-order low-pass filtering 2: Second-order low-pass filtering 3: Second order with zero low-pass 4 : Notch filter					

Sub-index 0Eh (P61.0E)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given cutoff frequency 4	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		P/HM	2

Sub-index 0Fh (P61.0F)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given trap frequency 4	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz		P/HM	2

Sub-index 10h (P61.10)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position given trap depth 4	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	2

Index 3062h P62)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Position feedback filtering (this function is not supported currently)	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P62.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	1st position feedback filter type	DINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	1
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero-point low pass 4: Notch filter					

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 02h (P62.02)	Position feedback cutoff frequency 1	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 03h (P62.03)	Position feedback trap frequency 1	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 04h (P62.04)	Position feedback trap depth 1	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 05h (P62.05)	Position 2 Feedback Filter Types	UDINT32	RW	Operation settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	1
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero-point low pass 4: Notch filter					
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 06h (P62.06)	Position feedback cutoff frequency 2	UDINT32	RW	Operation Settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 07h (P62.07)	Position feedback trap frequency 2	DINT32	RW	Operation Settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 08h (P62.08)	Position feedback trap depth 2	DINT32	RW	Operation Settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	1
Sub-index	**Name**	**Data Type**	**Access Properties**	**Setting**	**Effective**	**Factory**

09h (P62.09)				method	mode	value
	Position 3 Feedback Filter Type	DINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	2
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero-point low pass 4: Notch filter					

Sub-index 0Ah (P62.0A)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedback cutoff frequency 3	DINT32	RW	Operation Settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	2

Sub-index 0Bh (P62.0B)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedback trap frequency 3	DINT32	RW	Operation Settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	2

Sub-index 0Ch (P62.0C)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedback trap depth 3	DINT32	RW	Operation Settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	2

Sub-index 0Dh (P62.0D)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position 4 Feedback filter Type	DINT32	RW	Operation Settings	Downtime effective	0
		Data Range	0~4	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/HM	2
	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero-point low pass 4: Notch filter					

Sub-index 0Eh (P62.0E)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedback cutoff frequency 4	DINT32	RW	Operation settings	Downtime effective	1500
		Data Range	200~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	2

Sub-index 0Fh (P62.0F)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Position feedback trap frequency 4	DINT32	RW	Operation settings	Downtime effective	100
		Data Range	3~5000	Can mapping?	Related Models	Protection level
		Unit	Hz	NO	P/HM	2

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 10h (P62.10)	Position feedback trap depth 4	DINT32	RW	Operation settings	Downtime effective	5
		Data Range	3~50	Can mapping?	Related Models	Protection level
		Unit	db	NO	P/HM	2

◆ P63 Inertia and rigidity setting parameter group

Index 3063h (P63)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Inertia and rigidity setting	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P63.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Inertia ratio	DINT32	RW	Operation settings	Downtime effective	250
		Data Range	0~5000	Can mapping?	Related Models	Protection level
		Unit	1%	NO	ALL	1
	The inertia ratio is obtained when the mechanical inertia converted to the motor shaft by the external mechanical load is divided by the motor's own rotational inertia. This value can be entered manually or filled in automatically by the inertia self-tuning method. Note: This drive supports a maximum of 20 times the load inertia ratio when used for roughly accurate position control. Please consider carefully in the mechanical design selection stage.					

Sub-index 02h (P63.02)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Mechanical rigidity setting	DINT32	RW	Operation settings	Downtime effective	13
		Data Range	0~31	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	The mechanical stiffness level is set from 0 to 31, with 0 representing the weakest gain and 31 representing the strongest gain. Each stiffness level corresponds to a set of three-loop gain data.					

Grade	Position loop gain	Speed loop gain	Speed loop integration time	Current given filtering time constant
0	2	1.5	370	15
1	2.5	2	280	11
2	3	2.5	220	9
3	4	3	190	8
4	4.5	3.5	160	6
5	5.5	4.5	120	5
6	7.5	6	90	4
7	9.5	7.5	70	3
8	11.5	9	60	3
9	14	11	50	2
10	17.5	14	40	2
11	32	18	40	1.26
12	39	22	40	1.03
13	48	27	40	0.84
14	63	35	40	0.64
15	72	40	40	0.57
16	90	50	40	0.45

17	108	60	40	0.38
18	135	75	40	0.29
19	162	90	40	0.25
20	206	115	40	0.19
21	251	140	40	0.16
22	305	170	40	0.13
23	377	210	40	0.11
24	449	250	40	0.09
25	500	280	40	0.08
26	560	310	40	0.07
27	610	340	40	0.07
28	660	370	40	0.06
29	720	400	40	0.06
30	810	450	40	0.05
31	900	500	40	0.05

Sub-index 03h (P63.03)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Inertia recognition frequency	DINT32	RW	Operation Settings	Downtime effective	
		Data Range	1~2000	Can mapping?	Related Models	Protection level
		Unit		NO	ALL	1

Sub-index 10h (P63.10)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	No. 2 Gain Mode Setting	DINT32	RW	Operation Settings	Effective immediately	1
		Data Range	0-1	Can mapping?	Related Models	Protection level
		Unit	-	-	PP/PV/HM/CSP/CSV	-

Set the switching mode of the second gain

Set value	Mode of second gain
0	The first gain is fixed, and the control of the speed loop is switched P/PI using DI function 3.
1	The first gain and second gain switching is valid, the switching condition is 2008-0Ah

Sub-index 11h (P63.11)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Gain switching condition setting	DINT32	RW	Operation settings	Effective immediately	0
		Data Range	0-12	Can mapping?	Related Models	Protection level
		Unit	-	-	PP/PV/HM/CSP/CSV	-

0: First gain fixed (PS)
1: 60FE bit28 Switching
2: Large torque command (PS)
3: Speed command large (PS)
4: Large rate of change of speed command (PS)
5: Speed command high and low speed thresholds (PS)
6: Large position deviation (P)
7: With position command (P)
8: Positioning not completed (P)
9: Actual speed (P)
10: With position command + actual speed (P)

Sub-index	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value

<table>
<tr><td rowspan="4">12h
(P63.12)</td><td rowspan="3">Gain switching delay time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>50</td></tr>
<tr><td>Data Range</td><td>0-1000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>-</td><td>PP/PV/HM/CSP/CSV</td><td>-</td></tr>
<tr><td colspan="6">Set the duration required for the switching condition to be satisfied when returning from the second gain to the first gain.</td></tr>
<tr><td rowspan="5">Sub-index
13h
(P63.13)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Gain switching level</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>50</td></tr>
<tr><td>Data Range</td><td>0-20000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>-</td><td>PP/PV/HM/CSP/CSV</td><td>-</td></tr>
<tr><td colspan="6">Set the level that satisfies the gain switching condition. The actual switching action is influenced by both the level and the time lag conditions, in the manner described in 2008-0Ah. Depending on the gain switching condition, the units of the switching level will change accordingly.</td></tr>
<tr><td rowspan="5">Sub-index
14h
(P63.14)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Gain switching time lag</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Effective immediately</td><td>30</td></tr>
<tr><td>Data Range</td><td>0-20000</td><td>Can mapping?</td><td>Related Models</td><td>-</td></tr>
<tr><td>Unit</td><td>-</td><td>-</td><td>PP/PV/HM/CSP/CSV</td><td>-</td></tr>
<tr><td colspan="6">Set the time lag to satisfy the gain switching condition. The actual switching action is influenced by the combination of two conditions, the generation level and the time lag, in the manner described in 2008-0Ah. Depending on the gain switching condition, the units of the switching time lag will change accordingly.
Note: Please set 2008-0Ch≥2008-0Dh, if 2008-0Ch<2008-0Dh, it will be set to 2008-0Ch=2008-0Dh internally.</td></tr>
<tr><td rowspan="5">Subindex
Subindex
15h
(P63.15)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Position gain switching time</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Effective immediately</td><td>30</td></tr>
<tr><td>Data Range</td><td>0-1000</td><td>Can mapping?</td><td>Related Models</td><td>-</td></tr>
<tr><td>Unit</td><td>ms</td><td>-</td><td>PP/PV/HM/CSP/CSV</td><td>-</td></tr>
<tr><td colspan="6">In position control mode, if 2008-06h (second position loop gain) is much larger than 2008-03h (position loop gain), set the time to switch from 2008-03h to 2008-06h after the switching action is generated.
Use this parameter to reduce the shock caused by the position loop gain becoming larger.
If 2008-06h ≤ 2008-03h, this parameter is invalid and switches to the second gain immediately.</td></tr>
<tr><td rowspan="3">Sub-index
16h
(P63.16)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="2">Position 3 gain effective time</td><td>DINT32</td><td>-</td><td>Operation Settings</td><td>Effective immediately</td><td>-</td></tr>
<tr><td>Data Range</td><td>0-1000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
</table>

		Unit	-	-	-	-
Sub-index 17h (P63.17)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Position 3 gain multiplier	DINT32	-	Operation Settings	Effective immediately	-
		Data Range	50-1000	Can mapping?	Related Models	Protection level
		Unit	%	-	-	-
Sub-index 20h (P63.20)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque disturbance compensation gain	DINT32	RW	Operation settings	Effective immediately	0
		Data Range	-100-100	Can mapping?	Related Models	-
		Unit	%	-	PP/PV/HM/CSP/CSV	-
	In non-torque control mode, set the size of the disturbance torque compensation gain. Disturbance torque compensation can suppress the influence of external disturbance torque on speed, the larger the setting of this parameter the stronger the compensation effect and the stronger the anti-disturbance ability, but if the setting is too large causes vibration and noise, it needs to be used in conjunction with 2009-20h.					
Sub-index 21h (P63.21)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Torque Disturbance Filter Constant	DINT32	RW	Operation Settings	Effective immediately	50
		Data Range	0-25	Can mapping?	Related Models	-
		Unit	ms	-	PP/PV/HM/CSP/CSV	-
	In the non-torque control mode, set the filtering time constant of the disturbance torque compensation filter. The larger the filter time is set, the slower the disturbance torque compensation will take effect, but the noise will be reduced. To adjust, first, set 2009-20h to a larger value; then, gradually increase the setting of 2009-1Fh from 0 until the scrambled observer becomes effective at a certain setting; finally, gradually decrease the setting of 2009-20h while ensuring that the scrambled observer is always effective.					

◆ P70~P73 IO parameter group

Index 3070h (P70)	**Name**	**Data Type**	**Data Structure**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	I/O Parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
Sub-index 0X01 (P70.01)	**Name**	**Data Type**	**Access Properties**		**Setting method**	**Effective mode**	**Factory value**
	Input DI1 Function	DINT32	RW		Operation settings	Effective immediately	2
		Data Range	0~112		Can mapping?	Related Models	Protection level
		Unit	-		NO	ALL	1
	NO indicates normally open logic						

<table>
<tr><td></td><td colspan="6">Options without NO indicate normally closed logic
0: No DI function defined
1: Servo operation NO
2: Forward motion is prohibited NO
3: Reverse motion is prohibited NO
6: Reserved
9: Zero return proximity switch NO
10: Bus IO input NO
11: Probe 1NO
12: Probe 2NO
13: Probe 1ANO (second encoder probe)
14: Probe 2ANO (second encoder probe)
101: Servo operation
102: Forward motion is prohibited
103: Reverse movement is prohibited
106: Reserved
109: Zero return proximity switch
110: Bus IO input
111: Probe 1
112: Probe 2
113: Probe 1A (second encoder probe)
114: Probe 2A (second encoder probe)</td></tr>
<tr><td rowspan="5">Sub-index 02h (P70.02)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Input DI2 Function</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>3</td></tr>
<tr><td>Data Range</td><td>0~ 112</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Same as DI1 input function configuration description</td></tr>
<tr><td rowspan="5">Sub-index 03h (P70.03)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Input DI3 Function</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>10</td></tr>
<tr><td>Data Range</td><td>0~ 112</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">NO for normally open logic and options without NO for normally closed logic;
0: No DI function defined
1: Servo operation NO
2: Forward motion is prohibited NO
3: Reverse motion is prohibited NO
6: Reserved
9: Zero return proximity switch NO
10: Bus IO input NO
101: Servo operation
102: Forward motion prohibition
103: Reverse movement is prohibited
106: Reserved
109: Zero return proximity switch
110: Bus IO input</td></tr>
<tr><td>Sub-index</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
</table>

04h (P70.04)	Input DI4 Function	DINT32	RW	Operation settings	Effective immediately	10
		Data Range	0~ 112	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Same as DI3 input function configuration description.					
Sub-index 05h (P70.05)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Input DI5 Function	DINT32	RW	Operation settings	Effective immediately	10
		Data Range	0~ 112	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Same as DI3 input function configuration description.					
Sub-index 06h (P70.06)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Emergency stop logic	UDINT32	RW	Operation settings	Effective immediately	6
		Data Range	6~ 106	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	This parameter is used to select the logic setting for the emergency stop: 6: Normally open logic: Emergency stop is set to normally open logic, for the valid input state, the servo is in the emergency stop state. 106: Normally closed logic: the emergency stop is set to normally closed logic, for high resistance state and valid input state, the servo is in the emergency stop state					
Sub-index 07h (P70.07)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Digital input filtering time	DINT32	RW	Operation Settings	Effective immediately	5
		Data Range	0~500	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	This parameter is used to set the filtering time of the digital quantity.					
Sub-index 08h (P70.08)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Input Status	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~31	Can mapping?	Related Models	Protection level
		Unit	-			1
	The logic state of DI is displayed. The binary bit4~bit0 of this parameter corresponds to the logic state of DI5~DI1 respectively.					
Sub-index 09h (P70.09)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Analog input enables	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~ 1	Can mapping?	Related Models	Protection level

		Unit	-	NO	ALL	1
	0: No, 1: Yes. This parameter allows you to determine whether to turn on the DI~DI5 input analog function. When this function is turned on, the DI logic can be given via parameter P70.0A; when this function is turned off, the DI logic is given via the corresponding DI physical interface.					
Sub-index 10h (P70.0A)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Analog Inputs	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~31	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	When parameter P70.09 is 1, the DI analog input function is enabled, and the bit4~bit0 of this parameter in binary corresponds to the logic of DI5~DI1 respectively, which determines whether the function logic set by DI is triggered or not;					
Index 3071h (P71)	**Name**	**Data Type**	**Data Structure** / **Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	DO Parameters	-	ARR / -	-	-	-
		Data Range	-	Can mapping?	Related Models	Protection level
		Unit	-	-	-	-
Sub-index 01h (P71.01)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Output DO1 Function	DINT32	RW	Operation settings	Effective immediately	2
		Data Range	0~108	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	0: undefined DO Function: 1: Servo return to zero completed NO 2: Servo operation enable NO 3: Servo alarm NO 4: Position tracking overrun NO 5: Target position reached NO 6: Contracting brake output NO 7: Bus IO output NO 101: Servo return to zero completed NC 102: Servo operation enable NC 103: Servo alarm NC 104: Position tracking overrun NC 105: Target position reached NC 106: Contracting brake output NC 107: Bus IO output NC					
Sub-index 02h (P71.02)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Output DO2 function	DINT32	RW	Operation settings	Effective immediately	3
		Data Range	0~ 108	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Same as 3070h: 01h Parameter Description: 0: DO function not defined					

<table>
<tr><td></td><td colspan="6">1: Servo return to zero completed
2: Servo operation enable
3: Servo alarm
4: Position tracking overrun
5: Target location reached
6: Contracting brake output NO
7: Bus IO output
101: Servo return to zero completed
102: Servo operation enable
103: Servo alarm
104: Position tracking overrun
105: Target location reached
106：Contracting brake output NC
107: Bus IO output</td></tr>
<tr><td rowspan="5">Sub-index 03h (P71.03)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Output DO3 Function</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>5</td></tr>
<tr><td>Data Range</td><td>0~ 108</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Same as 3070h:01h parameter description.
0: DO function not defined
1: Servo return to zero completed
2: Servo operation enable
3: Servo alarm
4: Position tracking overrun
5: Target location reached
6: Contracting brake output NO
7: Bus IO output
101: Servo return to zero completed
102: Servo operation enable
103: Servo alarm
104: Position tracking overrun
105: Target location reached
106: Contracting brake output NC
107: Bus IO output</td></tr>
<tr><td rowspan="5">Sub-index 04h (P71.04)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Output DO4 Function</td><td>DINT32</td><td>RW</td><td>Operation Settings</td><td>Effective immediately</td><td>6</td></tr>
<tr><td>Data Range</td><td>0~ 108</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Same as 3070h:01h parameter description, DO4 is configured to hold the brake normally open output by default:
0: DO function not defined
1: Servo return to zero completed
2: Servo operation enable
3: Servo alarm
4: Position tracking overrun
5: Target location reached
6: Contracting brake output NO</td></tr>
</table>

<table>
<tr><td></td><td colspan="6">7: Bus IO output
101: Servo return to zero completed
102: Servo operation enable
103: Servo alarm
104: Position tracking overrun
105: Target location reached
106：Contracting brake output NC
107: Bus IO output</td></tr>
<tr><td rowspan="4">Sub-index 05h (P71.05)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">DO1 On filtering time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~500</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>-</td><td>ALL</td><td>1</td></tr>
<tr><td></td><td colspan="6">DO1 Setting of the signal turn-on filtering time at the output.</td></tr>
<tr><td rowspan="4">Sub-index 06h (P71.06)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">DO2 On filter time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~500</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td></td><td>ALL</td><td>1</td></tr>
<tr><td></td><td colspan="6">DO2 Setting of the signal turn-on filtering time at the output.</td></tr>
<tr><td rowspan="4">Sub-index 07h (P71.07)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">DO3 Turn-on filtering time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~500</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td></td><td colspan="6">DO3 Setting of the signal turn-on filtering time at the output.</td></tr>
<tr><td rowspan="4">Sub-index 08h (P71.08)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">DO4 Turn-on filtering time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~500</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td></td><td colspan="6">DO4 Setting of the signal turn-on filtering time at the output.</td></tr>
<tr><td rowspan="4">Sub-index 09h (P71.09)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">DO1 Off filter time</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~500</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td></td><td colspan="6">DO1 Setting of the signal shutdown filter time at the output.</td></tr>
<tr><td>Sub-index</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
</table>

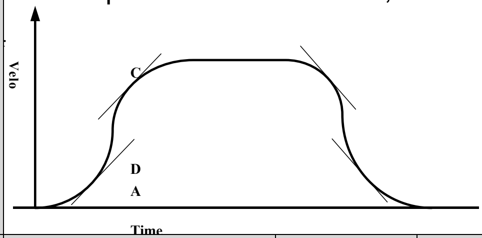
0Ah (P71.0A)	DO2 Off filtering time	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~500	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	DO2 Setting of the signal shutdown filter time at the output.					
Sub-index 0Bh (P71.0B)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	DO3 Off filtering time	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~500	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	DO3 Setting of the signal shutdown filter time at the output.					
Sub-index 0Ch (P71.0C)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	DO4 Off filter time	DINT32	RW	Operation settings	Effective immediately	0
		Data Range	0~500	Can mapping?	Related Models	Protection level
		Unit	ms	NO	ALL	1
	DO4 Setting of signal shutdown filtering time at the output					
Sub-index 0Dh (P71.0D)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Output Status	DINT32	RW	Operation settings	Effective immediately	0
		Data Range	0~ 15	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Bit0-Bit3 of this value corresponds to the actual output status of D01-DO4 ports, for example, the DO1 terminal is low and DO2~DO4 terminals are high: the corresponding binary code is "1110".					
Sub-index 14h (P71.0E)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Forced output enable	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~ 1	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	By setting this parameter, the DO output terminal logic can be selected as the functional logic of the DO configuration, or the user can control the DO output logic directly via 0x3071:0F. 0: No, the DO output is controlled by the internal function logic set by 0x3070:01~0x3070:04. 1: Yes, the user controls the DO output logic directly via 0x3070:0F.					
Sub-index 0Fh (P71.0F)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Forced output	DINT32	RW	Operation settings	Effective immediately	0

<table>
<tr><td rowspan="3"></td><td rowspan="2"></td><td>Data Range</td><td>0~ 15</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">When the 0x3071:0E parameter is set to 1, the user can directly control the DO output logic by this parameter. Bit0-Bit3 of this value binary control the actual output of D01-DO4 port in turn, taking DO1 terminal as low level and DO2~DO4 terminals as high level for example: corresponding binary code is "1110";</td></tr>
</table>

P80 Internal speed profile setting parameter group

<table>
<tr><td rowspan="5">Index 3080h (P80)</td><td>Name</td><td>Data Type</td><td>Data Structure</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td></tr>
<tr><td rowspan="3">Speed planning parameters</td><td>-</td><td>ARR</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Data Range</td><td colspan="2">-</td><td>Can mapping?</td><td>Related Models</td></tr>
<tr><td>Unit</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="6">This parameter group is used for velocity planning for velocity mode control or acceleration planning for torque mode when the channel is not controlled by the controller.</td></tr>
<tr><td rowspan="5">Sub-index 01h (P80.01)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Speed profile type</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>2</td></tr>
<tr><td>Data Range</td><td>0~3</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>S</td><td>1</td></tr>
<tr><td colspan="6">0: Trapezoidal curve
1: sioAD3 curve (not supported yet)
2: Jerk-free curve
3: Jerk-limited curve</td></tr>
<tr><td rowspan="5">Sub-index 02h (P80.02)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Acceleration</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>20</td></tr>
<tr><td>Data Range</td><td>0~3000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>rpm/ms</td><td>NO</td><td>S</td><td>1</td></tr>
<tr><td colspan="6">The parameter gives the acceleration and deceleration of the speed profile</td></tr>
<tr><td rowspan="5">Sub-index 03h (P80.03)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Deceleration</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>20</td></tr>
<tr><td>Data Range</td><td>0~3000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>rpm/ms</td><td>NO</td><td>S</td><td>1</td></tr>
<tr><td colspan="6">This parameter gives the acceleration and deceleration of the velocity profile</td></tr>
<tr><td rowspan="5">Sub-index 04h (P80.04)</td><td>Name</td><td>Data Type</td><td>Access Properties</td><td>Setting method</td><td>Effective mode</td><td>Factory value</td></tr>
<tr><td rowspan="3">Accelerated rounded corners Jerk0</td><td>DINT32</td><td>RW</td><td>Operation settings</td><td>Effective immediately</td><td>1000</td></tr>
<tr><td>Data Range</td><td>1~1000</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>nT</td><td>NO</td><td>S</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the value of acceleration rounding Jerk0. The parameters 0x3080:04~0x3080:07 are used to set the profile of curve planning. The unit is nT, the velocity loop period, which indicates the time (in ms) for Jerk to accelerate from 0 to acceleration or deceleration.
As shown in the diagram: Jerk0 represents the A section, Jerk1 represents the B section,</td></tr>
</table>

Jerk2 represents the C section, and Jerk3 represents the D section.



	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 05h (P80.05)	Accelerated rounded corners Jerk1	UDINT32	RW	Operation Settings	Effective immediately	1000
		Data Range	1~1000	Can mapping?	Related Models	Protection level
		Unit	nT	NO	S	1
	This parameter is used to set the value of the acceleration rounding Jerk1.					
	Name	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 06h (P80.06)	Deceleration rounding Jerk2	UDINT32	RW	Operation Settings	Effective immediately	1000
		Data Range	1~1000	Can mapping?	Related Models	Protection level
		Unit	nT	NO	S	1
	This parameter is used to set the value of the deceleration circle Jerk2.					
	Name	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
Sub-index 07h (P80.07)	Deceleration rounding Jerk3	DINT32	RW	Operation Settings	Effective immediately	1000
		Data Range	1~1000	Can mapping?	Related Models	Protection level
		Unit	nT	NO	S	1
	This parameter is used to set the value of the deceleration circle Jerk3.					

◆ P81 Internal position curve setting parameter group

	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Index 3081h (P81)	Location planning parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-
	This parameter group is used for position profile curve planning for position mode control when the non-controller controls the channel.						

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 01h (P81.01)	Uniform velocity	DINT32	RW	Operation settings	Effective immediately	100
		Data Range	0~5000	Can mapping?	Related Models	Protection level
		Unit	rpm	NO	P	1
	This parameter is used for the uniform segment speed for a given position profile.					
	Name	**Data Type**	**Access Properties**	**Setting**	**Effective**	**Factory**

				method	mode	value
Sub-index 02h (P81.02)	Acceleration	DINT32	RW	Operation settings	Effective immediately	10
		Data Range	0~1000	Can mapping?	Related Models	Protection level
		Unit	rpm/ms	NO	P	1
	This parameter group is used for velocity planning for position mode control when the channel is not controlled by the controller.					
Sub-index 03h (P81.03)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Deceleration	DINT32	RW	Operation settings	Effective immediately	10
		Data Range	0~1000	Can mapping?	Related Models	Protection level
		Unit	rpm/ms	NO	P	1
	This parameter group is used for velocity planning for position mode control when the channel is not controlled by the controller.					

◆ P82~P83 Zero return/emergency stop function parameter group

	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Index 3082h (P82)	Return to zero parameter	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 01h (P82.01)	Back to zero mode	DINT32	RW	Operation settings	-	53
		Data Range	0~53	Can mapping?	Related Models	Protection level
		Unit	-	NO	HM	1
	No function available, please use CiA402 Standard Object Settings (to be associated).					
Sub-index 02h (P82.02)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Return to zero bias	DINT32	RW	Operation settings	-	0
		Data Range	-2147483647 ~2147483647	Can mapping?	Related Models	Protection level
		Unit	inc	NO	-	1
	No function is available, please use CiA402 standard object settings.					
Sub-index 03h (P82.03)	**Name**	**Data Type**	**Access Properties**	**Setting method**	**Effective mode**	**Factory value**
	Return to zero speed 1	DINT32	RW	Operation settings	-	600
		Data Range	0~3000	Can mapping?	Related Models	Protection level
		Unit	rpm/ms	NO	-	1
	No function available, please use CiA402 Standard Object Settings (to be associated).					

Sub-index 04h (P82.04)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Return to zero speed 2	DINT32	RW	Operation settings	Effective immediately	300
		Data Range	0~1000	Can mapping?	Related Models	Protection level
		Unit	rpm/ms	NO	-	1
	No function available, please use CiA402 Standard Object Settings (to be associated).					

Index 3083h (P83)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Emergency stop parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P83.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Emergency stop selection code	DINT32	RW	Operation settings	Effective immediately	1
		Data Range	-32~32	Can mapping?	Related Models	Protection level
		Unit	-	NO		1
	Please set via 0x605A					

Sub-index 02h (P83.02)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	Emergency stop acceleration	DINT32	RW	Operation settings		300
		Data Range	0~3000	Can mapping?	Related Models	Protection level
		Unit	rpm/ms	NO		1
	No function available, please use CiA402 Standard Object Settings (to be associated).					

◆ P90 Control commissioning parameter group

Index 3090h (P90)	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
	Control debugging	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

Sub-index 01h (P90.01)	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
	M Control mode selection	DINT32	RW	Operation Settings	Downtime effective	1
		Data Range	0~2	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	This parameter is used to set the control operation mode of the Servo Drive when the command channel of the Servo Drive is selected as Panel Control, AD Commissioning Software Control, Analog 1, or Analog 2. This parameter is invalid under controller control. 0: Torque control mode 1: Speed control mode 2: Position control mode					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 02h (P90.02)	Reciprocating motion enables	DINT32	RW	Operation Settings	Effective immediately	0
		Data Range	0~1	Can mapping?	Related Models	Protection level
		Unit	-	NO	P/S	1
	This parameter is used for the setting of the reciprocating motion and is controlled in the panel control and AD commissioning software. 0: No 1: Yes					

◆ P91 Display parameter group

	Name	Data Type	Data Structure	Access Properties	Setting method	Effective mode	Factory value
Index 3091h (P91)	Display Parameters	-	ARR	-	-	-	-
		Data Range	-		Can mapping?	Related Models	Protection level
		Unit	-		-	-	-

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 15h (P91.15)	Total power-up time	DINT32	RO	Operation settings	-	0
		Data Range	0~2147483647	Can mapping?	Related Models	Protection level
		Unit	0.1s	NO	ALL	1
	Total system power-up time, cumulative display, this function code is used to record the total time the servo drive has been running. When multiple consecutive power-ups and power-downs occur in a short period of time for the drive, the total power-up time record may be off by a few minutes.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 16h (P91.16)	Maximum load factor	DINT32	RO	Operation settings	-	0
		Data Range	0~10	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Reserved parameters, no function for now.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 17h (P91.17)	Average load factor	DINT32	RO	Operation settings	-	0
		Data Range	0~10	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1
	Reserved parameters, no function for now.					

	Name	Data Type	Access Properties	Setting method	Effective mode	Factory value
Sub-index 18h (P91.18)	Fault log selection	DINT32	RW	Operation settings	Effective immediately	0
		Data Range	0~9	Can mapping?	Related Models	Protection level
		Unit	-	NO	ALL	1

<table>
<tr><td></td><td colspan="6">Selects to display the faults that occurred in the servo drive and the system power-up time when the faults occurred. A total of 10 records of the most recent faults can be recorded, where 0 is the most recent fault.</td></tr>
<tr><td rowspan="5">Sub-index 19h (P91.19)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">Selected fault code</td><td>DINT32</td><td>RO</td><td>Operation settings</td><td>-</td><td>0</td></tr>
<tr><td>Data Range</td><td>0~65535</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">The fault code selected by 0x3091:18 is displayed, note that the values displayed in the error code table are in hexadecimal.</td></tr>
<tr><td rowspan="5">Sub-index 1Ah (P91.1A)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">Fault occurrence time</td><td>DINT32</td><td>RO</td><td>Operation settings</td><td>-</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~2147483647</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>0.1s</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Displays the system power-up time at the time of the selected fault record.</td></tr>
<tr><td rowspan="5">Sub-index 2Ah (P91.2A)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">EtherCAT communication status</td><td>DINT32</td><td>RO</td><td>Operation settings</td><td>-</td><td>1</td></tr>
<tr><td>Data Range</td><td>0~8</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>NO</td><td></td><td>1</td></tr>
<tr><td colspan="6">1: INT communication initialization
2: PreOP
3: SafeOP, the controller can read the communication object of the Servo Drive TPDO normally.
4: OP, this state can be normal operation communication state</td></tr>
</table>

◆ P0A Drive information parameter group

<table>
<tr><td rowspan="5">Sub-index 11h (PA0.0B)</td><th>Name</th><th>Data Type</th><th>Access Properties</th><th>Setting method</th><th>Effective mode</th><th>Factory value</th></tr>
<tr><td rowspan="3">Software Version</td><td>DINT32</td><td>RO</td><td>Operation settings</td><td>-</td><td>2313</td></tr>
<tr><td>Data Range</td><td>0~2147483647</td><td>Can mapping?</td><td>Related Models</td><td>Protection level</td></tr>
<tr><td>Unit</td><td>-</td><td>-</td><td>-</td><td>3</td></tr>
<tr><td colspan="6">This parameter mainly shows the fixed parameters of the servo, which are usually set directly by the manufacturer and need not be set by the user.</td></tr>
</table>

Section 9 Commissioning Software

Software installation environment:

◆ Windows 7 (32-bit/64-bit) 10 (32-bit/64-bit) operating systems are supported, and Windows 10 (64-bit) is recommended.

◆ NET Framework 4.5 needs to be installed.

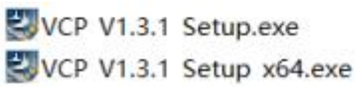
Note: In V0.9.4 or earlier commissioning software version, if the computer display resolution is 1080P or higher, you need to set "Change the size of text, application items" to 100% in the "Scaling and Layout" setting, otherwise the cursor display will Otherwise, the cursor will be displayed with errors.

9.1 Software and Driver Installation

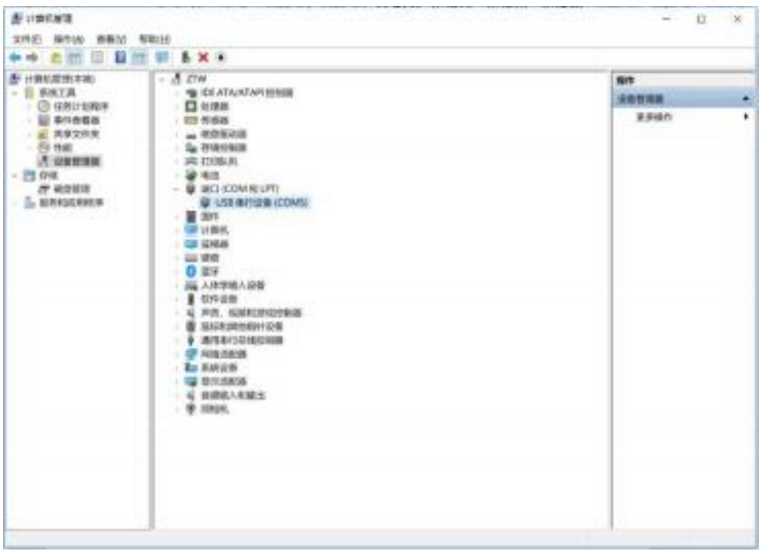
9.1.1 Driver Installation

1) Find the driver folder in the installation package
2) Select the corresponding driver file according to the computer operating system, where x64 is the driver

for 64-bit operating system.

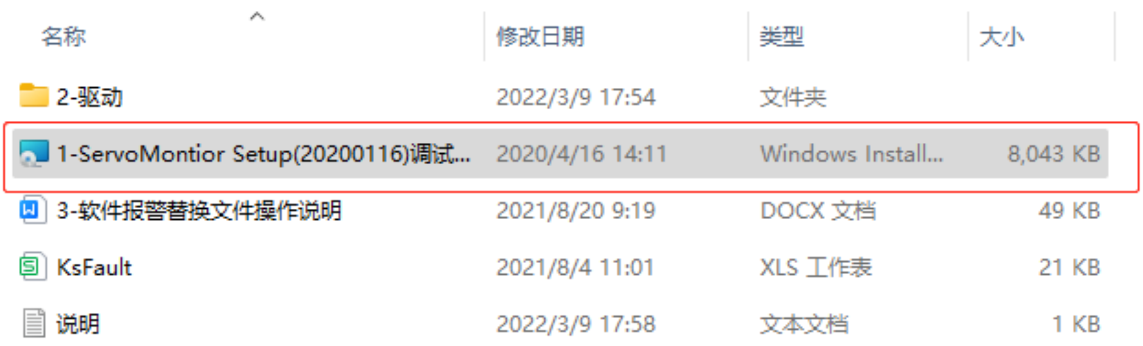


3) Once the driver is successfully installed, connecting the Servo Drive will display the newly installed USB port in the computer's Device Manager.



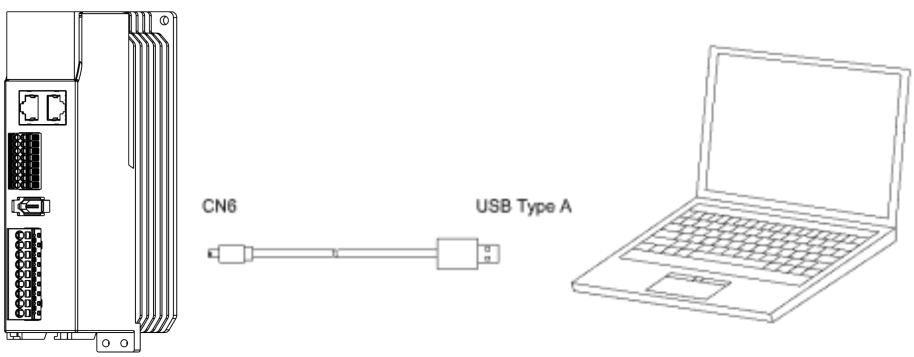
9.1.2 Commissioning software installation

AD Servo Tool is the installation version, unzip it and find the installation runtime file, click on the prompt to install it.



9.2 Connecting the drive

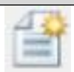
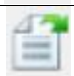
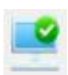
After powering up the drive, use the Mini USB commissioning cable to connect the drive CN6 interface to the computer with AD Servo Tool software installed. Note: Please use AD Servo's standard commissioning cable. If you need to use a third party cable, please ensure the shielding and add a magnetic ring.
The length of the commissioning cable should not exceed 3m, otherwise it may lead to unstable software connection, and please install magnetic ring and other anti-interference measures to ensure the quality of communication.



9.3 Commissioning software usage

9.3.1 Software interface introduction

1. Toolbar introduction

Icons	Name	Explanation
	New Project	Create a new project
	Open Project	Open a project that already exists
	Save Project	Save current project
	Save as	Save Current Project as another project
	Connections	After the drive is powered on and connected with the commission cable, clicking the button will establish a communication connection with the drive, and the button will show green when communication is successfully established.

	Login	When not logged in, only limited parameter information can be observed. If you click on the Login button, you will be logged in with the default password (normal privileges), where you can see most of the parameters, or you can log in with the advanced password (advanced privileges 58Ks), where you can edit the advanced user parameters. When you are not logged in, the icon is unlocked, so you cannot download parameters or perform servo commissioning operations at this time. After logging in, the icon will be unlocked, and the operations corresponding to the login authority can be performed at this time.
	Enable	If the current servo command mode is controller control, this button only shows the enable status, which is OFF when not enabled and ON when enabled, and when the drive command mode is AD commission software control, this icon is the enable button function, which can be clicked to realize the enable operation and clicked again to realize the shutdown enable operation.
2	Nodes	If the servo node number saved in the project does not match the actual node number after the servo driver is successfully connected, the display will be red, and the node number will be green if the node number matches. When the connection is successful, click on the node to set the node number (this operation may cause the host computer and the servo drive to fail to communicate, so please be careful. (For details, please refer to the section on parameter setting)
	Fault display	When there is a fault, the current fault status and alarm information will be displayed, and hidden when there is no fault.

2) Introduction to the menu bar tabs and corresponding functional areas

Menu bar tab	Function	Description
Parameter Setting	Import	Import parameters from a file to the current project.
	Export	Export the parameters in the current project to a separate file.
	Upload	Uploads information about the parameters in the connection drive.
	Download	Download the parameters to the connected drive.
	Save EEP	Save EEPROM.(Do not use!)
	Update parameter templates	When the parameter list in the driver is not consistent with the commission software, click Update Parameter Template to synchronize the parameter list in the driver to the commission software (for example, after the driver firmware version is updated, the parameter list has N parameters, while the parameter list in the commission software has only X parameters. In this case, you need to upload information to synchronize the commission software parameter list to N and get the latest parameters and content).
	Parameter Search	Parameter content can be retrieved based on keywords.
	Reset parameters	Perform a parameter reset (restore factory values) operation on the connected drive.
Servo Control	Fault Reset	When a drive fault alarm occurs and the control mode is "AD Commission Software" control, it can be used to reset the fault after it has been eliminated.
	Forward motion	When the control mode is "AD Commission Software" control, this button is used to give a forward motion command in the speed and torque control mode and to set the direction of motion to forward in the position control mode.

<table>
<tr><td rowspan="7"></td><td colspan="2">Reverse motion</td><td>When the control mode is "AD Commission Software" control, this button is used to set the reverse motion command in the speed and torque control mode and to set the direction of motion in the reverse direction in the position control mode.</td></tr>
<tr><td colspan="2">Back and forth motion</td><td>Valid only in position mode. When the control mode is "AD Commissioning Software" control and parameter P90.02 is set to "1: Yes", this button is used to enable position reciprocating operation. When switching to speed control or torque control, P90.02 must be set to "0", otherwise the speed and torque modes will not operate properly.</td></tr>
<tr><td rowspan="5">Position Mode</td><td>Run button</td><td>When the control mode is "AD Commission Software" control and the operation mode is position mode, this button is used to give the relative position motion command.</td></tr>
<tr><td>Given position</td><td>When commissioning the software servo control, set the distance of movement in position control mode, in unit turns.</td></tr>
<tr><td>Uniform speed setting</td><td>When commissioning the software servo control, set the motion speed in rpm for the position control mode.</td></tr>
<tr><td>Acceleration settings</td><td>When commissioning software servo control, set the motion acceleration in rpm/ms for position control mode.</td></tr>
<tr><td>Deceleration settings</td><td>When commissioning the software servo control, set the motion deceleration in rpm/ms for the position control mode.</td></tr>
<tr><th>Menu bar tab</th><th colspan="2">Function</th><th>Description</th></tr>
<tr><td rowspan="9"></td><td rowspan="5">Speed Mode</td><td>Speed profile type</td><td>When commissioning the software servo control, set the speed acceleration curve type.</td></tr>
<tr><td>Acceleration settings</td><td>When commissioning the software servo control, set the acceleration of the motion in the speed control mode, in units of rpm/ms.</td></tr>
<tr><td>Deceleration settings</td><td>When commissioning the software servo control, set the motion deceleration in speed control mode, in units of rpm/ms.</td></tr>
<tr><td>Run button</td><td rowspan="2">When the control mode is "AD Commissioning Software" control and the operation mode is position mode, this button is used to give the relative position motion command.
This button is used to stop the motion command when the control mode is "AD Commission Software" control, and the operation mode is torque mode.</td></tr>
<tr><td>Stop Button</td></tr>
<tr><td rowspan="4">Torque Mode</td><td>Torque setting</td><td>When commissioning the software servo control, set the target torque in percent (100% equals the rated torque) for the torque control mode.</td></tr>
<tr><td>Speed limit setting</td><td>When commissioning the software servo control, set the speed limit value in torque control mode (in torque control, the motor accelerates all the way to the set target torque, and the speed limit is used to limit the maximum speed at this point)
, unit: percentage (100% equals rated torque).</td></tr>
<tr><td>Point-and-shoot operation</td><td>Used for point operation when commissioning software servo control.</td></tr>
<tr><td>Self-adjusting</td><td>Used for various self-tuning functions when commissioning software servo control.</td></tr>
<tr><td rowspan="5">Signal Sampling</td><td colspan="2">Start sampling</td><td>Start sampling the already configured data.</td></tr>
<tr><td colspan="2">Stop sampling</td><td>Stop the data being sampled.</td></tr>
<tr><td colspan="2">Save data</td><td>Save the sampled data to a file.</td></tr>
<tr><td colspan="2">Number of channels</td><td>Configure the number of data channels to be captured.</td></tr>
<tr><td colspan="2">Sampling period</td><td>The sampling period is generally proportional to the number of channels, the more channels, the larger the period. The</td></tr>
</table>

		recommended setting is "Number of channels + 1".
	Sampling frequency	Automatic calculation based on sampling period, no setup required.
	Event Trigger	Sampling is triggered according to the set conditions.
	Sampling data	To display the configured sample channels, you can click the "CH" button to the left of the sample channel to hide or display the sample channel data in the current curve.
Waveform Analysis	Loading Waveforms	Load the waveform file.
	Frequency domain analysis	Convert waveforms in the frequency and time domains.
	Reset bias	Restores all bias settings to their initial values.
	Sampling data	To display the sample data in the waveform file, you can click the "CH" button to the left of the sample channel to hide or display the sample channel data in the current curve.
	Data Gain	The raw data channels can be scaled proportionally to the gain multiplier.
	Data Bias	The set offset can be superimposed on the original data channel.
Fault Information	Fault Reset	When the drive has a fault alarm, this button can reset the fault when the fault is eliminated.
	Clear records	Clears current and historical fault alarms from the project.
	Current Failure	Displays the current drive fault alarm.
	History of failures	Displays the history of faults in the project (history of faults cannot be saved after the project is closed).

3) Actual state area

Name	Description
Given position	The position loop is given in inc.
Actual Location	The actual position value of the encoder feedback, in inc.
Given speed	The speed loop is given in rpm.
Actual speed	Encoder feedback of the actual speed value in rpm.
Given torque	Torque given value in N-M.
Actual torque	The actual torque value measured by the drive in N-M.
Probe 1 position	The actual encoder position value, in inc, recorded when Probe 1 is triggered.
Probe 2 position	The actual encoder position value recorded when Probe 2 is triggered, in inc.
DI Status	The actual status feedback of DI1~DI5 digital input channels.
DO Status	The actual control status of DO1~DO4 digital output channels.
AI Status	AI1~AI2 Actual voltage feedback for analog input channels in V.
AO Status	AO Analog output channel, the actual voltage value in V output.
Bus voltage	Actual voltage value on the DC bus in V.
Output Voltage	The actual voltage value of the servo driver output in V.
Output Current	The actual current value of the servo drive output in A.
Servo temperature	Servo drive internal temperature in °C.
Active power	The active power of the servo in kW.
Operation Mode	The current operating mode of the Servo Drive (see Section 7, 6060 Servo Operating Modes Introduction section for details).
Control words	The current control word received by the servo drive (see Section 7, 6040 Control Word Introduction section for details).
Status word	The actual status word of the Servo Drive (see Section 7, 6041 Status Word Introduction section for details).

Status of the drive	Displays the actual status of the connected servo, including "ready", "main power on", "running", and "fault error". "The actual status of the connected servo is displayed.
Drive firmware version number	Displays the firmware version number of the connected Servo Drive.

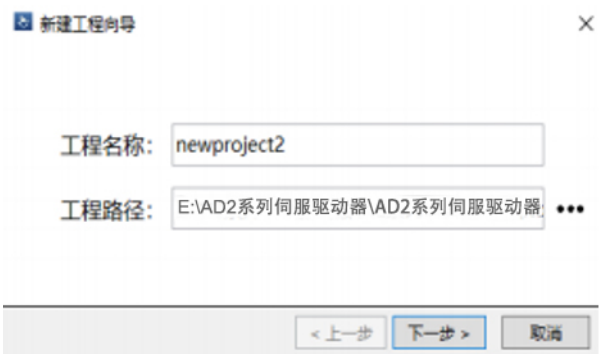
4) Operation area

Menu tab	Operation area	Description
Parameter Setting	Parameter View Edit	View and edit all or filter parameters.
Servo Tuning	Signal sampling recording	Displays the currently performed signal sampling.
Waveform acquisition and analysis		
Troubleshooting	Fault logging, analysis and processing	Displays records of current and historical faults, cause analysis and treatment countermeasures.

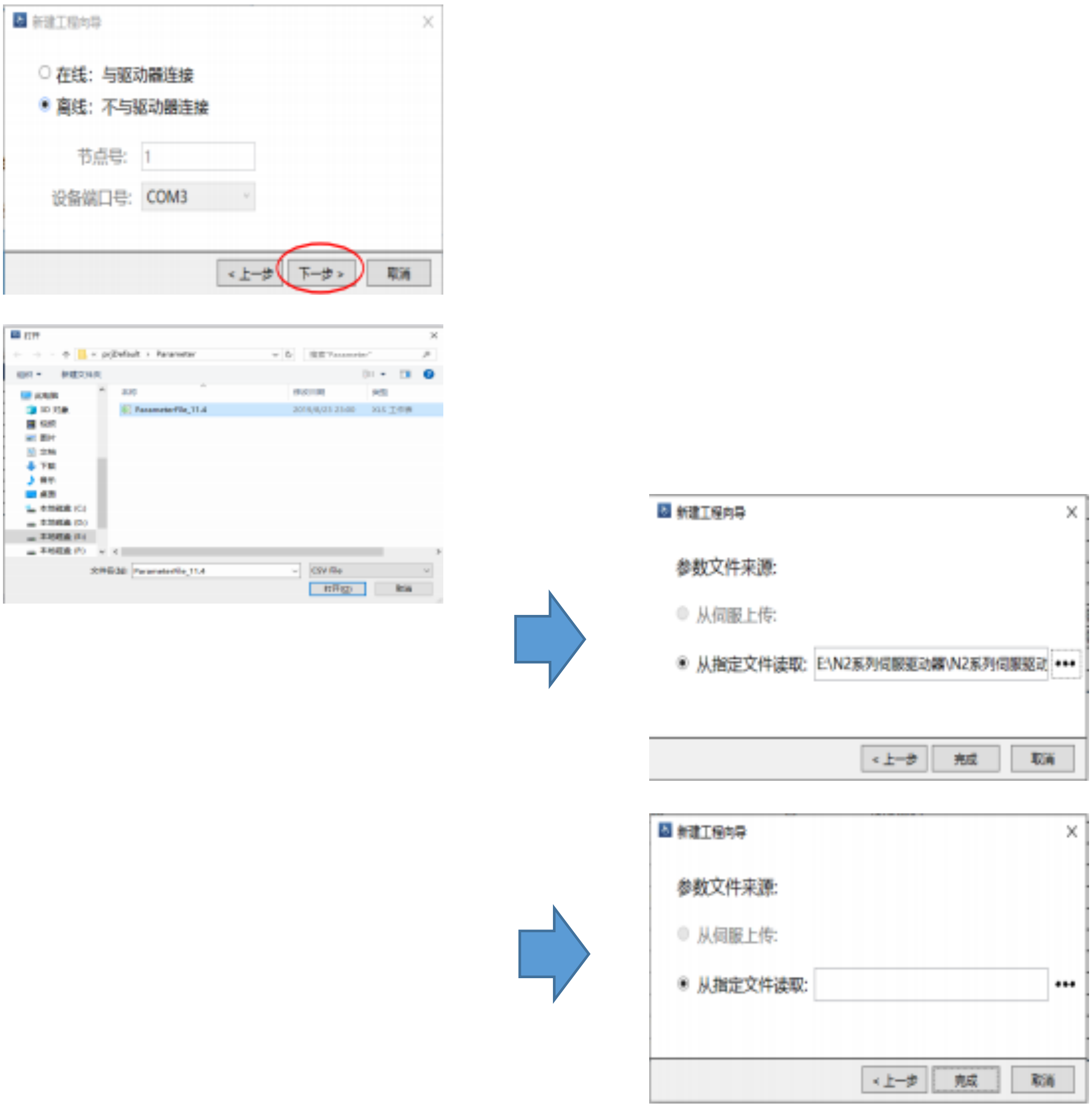
9.3.2 Create a new project

Run AD-setup Servo Tool commissioning software
Click the "**New Project**" button

In the pop-up dialog box, enter the **project name and save path**, the default path is the installation directory \Projects.



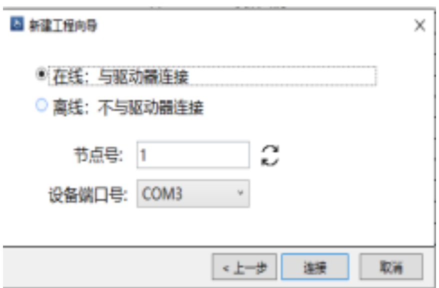
1) Create project offline
Choose to create the project offline **or online. To create a project offline**, you need to use **a template file**
The default path is the installation directory Projects\prjDefault\Parameter\PrjPara.csv



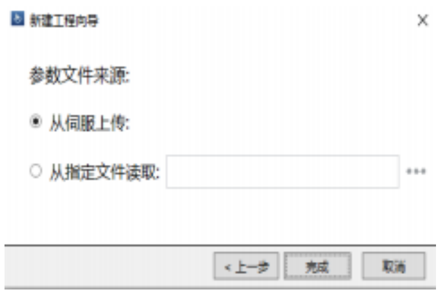
The offline creation project is completed.

2) Online project creation

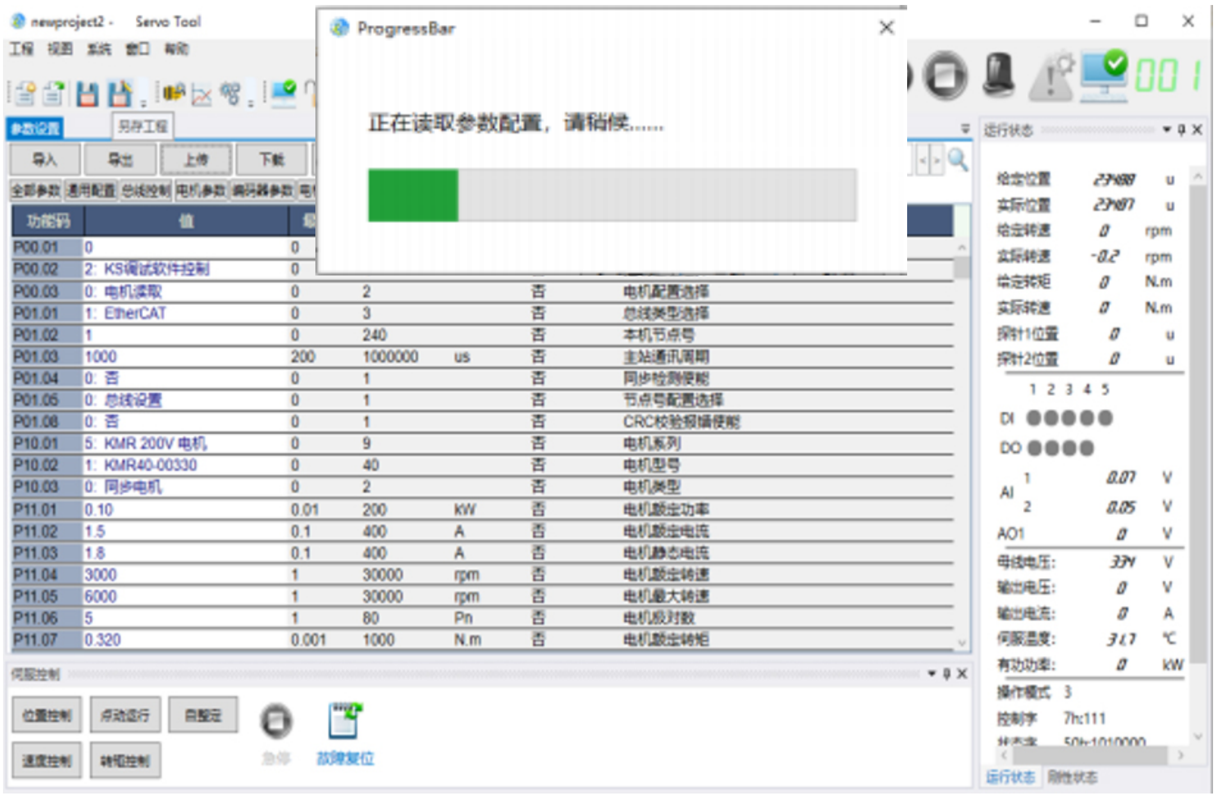
And in case the drive is successfully connected, you can create a project using the online method, filling in the actual connected drive node number and selecting the port number of the USB drive.



Choose to upload parameters from the driver, or use a template file (the online method is usually chosen to upload parameters).



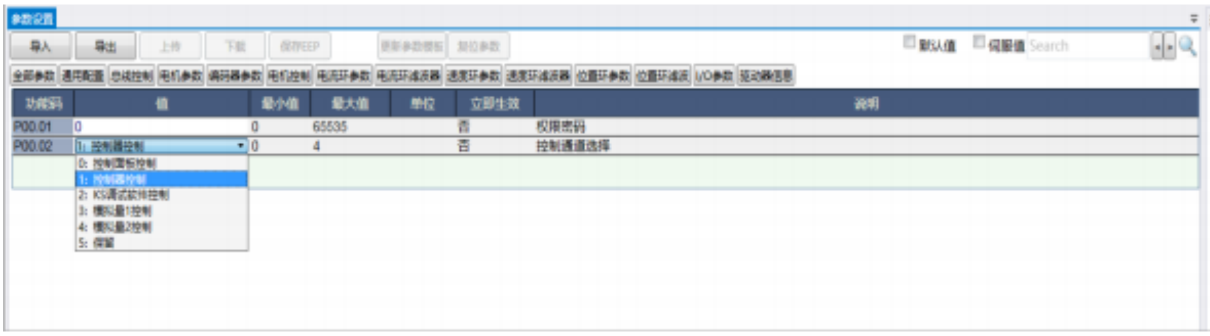
After selecting Upload from Servo and clicking Finish, the software will read all parameters of the upload from the connected drive.



This completes the new project build.

3) General Configuration

In the general configuration options, you can select the current control channel, as well as set the servo current node number, etc.



Name	Details	Remarks
Control channel selection	0: Control panel control 1: Controller control 2: AD commissioning software control 3: Analog 1 control 4: Analog 2 control 5: Reserved	0: Controlled using the LED operation panel. 1: Control by upper controller 2: Control with commissioning software 3: Use analog channel 1 for speed or torque control. 4: Use analog channel 2 for speed or torque control. 5 : Reserved
Permission password	Permission password setting	

4) Bus control

Name	Details	Remarks
Bus Type Selection	0: No bus interface 1: EtherCAT 2: CANOpen	The servo drive can be enabled, run, stop, reset, etc. by selecting the EtherCAT/CAN Open bus communication method, and the relevant control commands, such as position, speed, torque, etc., are issued by the bus.
Local Node Number	Local Node Number	Display local node number
Master communication cycle	Master communication cycle	Master communication cycle setting

5) Motor parameters

In the motor parameters option, you can configure the motor series and model, and other operations. The rated speed, maximum speed, rated power, and rated torque of the motor are automatically presented according to the selected motor, no manual filling is required. By default, no configuration is required for AUCTECH brand servo motor parameters.

6) Encoder parameters

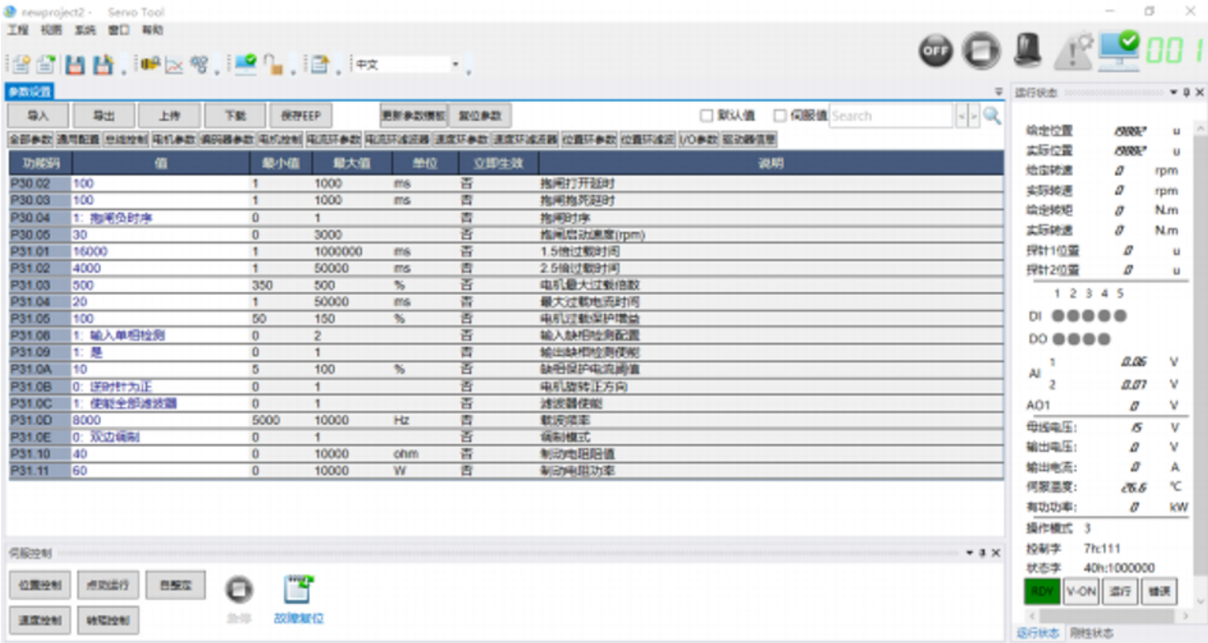
The encoder settings option allows you to configure the encoder type and accuracy.

Projects	Description
Encoder type	Tamagawa, Nikon, Panasonic, etc., please determine the specific type according to the actual motor nameplate junction and selection information
First encoder single-turn resolution	Determined by the encoder type and model number, which can be determined by the actual motor nameplate in conjunction with the selection data. For example, the Tamagawa 23-bit multiturn encoder refers to a single-turn resolution of 23 bits, i.e. 2^{23} pulse units.
First encoder multi-turn resolution	Determined by the encoder type and model, according to the actual motor nameplate combined with the user manual, for example, Tamagawa 23-bit multiturn encoder, multiturn value of 16 bits that is 2^{16} that is 65536 turns
Main ABZ encoder pulse count	Main ABZ encoder pulse count setting
Encoder position angle	Obtained by encoder zeroing self-tuning
Auxiliary encoder settings	Auxiliary encoder settings
Auxiliary encoder type	Auxiliary encoder type setting

Number of auxiliary encoder pulses	Auxiliary encoder pulse number setting
Encoder fault enable	Used for absolute encoder related fault masking and display. When this enable is turned on, alarms such as encoder battery undervoltage, encoder battery disconnection, etc. related to the absolute encoder battery can be displayed, otherwise these alarms will be masked
Acceleration overrun enable	

7) Motor Control

In the motor control option, you can select the motor contracting brake control timing and motor rotation direction and other operations.



8) Three-loop parameter setting

In order to make the drive better adapted to the mechanical load, to drive the motor quickly and accurately and to follow the relevant commands from the host computer, it is necessary to make appropriate adjustments to the servo gain.

The servo gain is set by a combination of several parameters (rigidity table, inertia ratio, position loop PID parameters, velocity loop PID parameters, filter settings, etc.), which affect each other, so the servo gain must be set taking into account the balance between each parameter.

In the AD Servo Tool commissioning software, the three-loop parameter adjustment can be done in two ways:

<1> "Servo tuning" in the parameter list selection.

<2> Go to "Current loop parameters", "Position loop parameters", "Speed loop parameters", etc. in the parameter settings to set The

注意

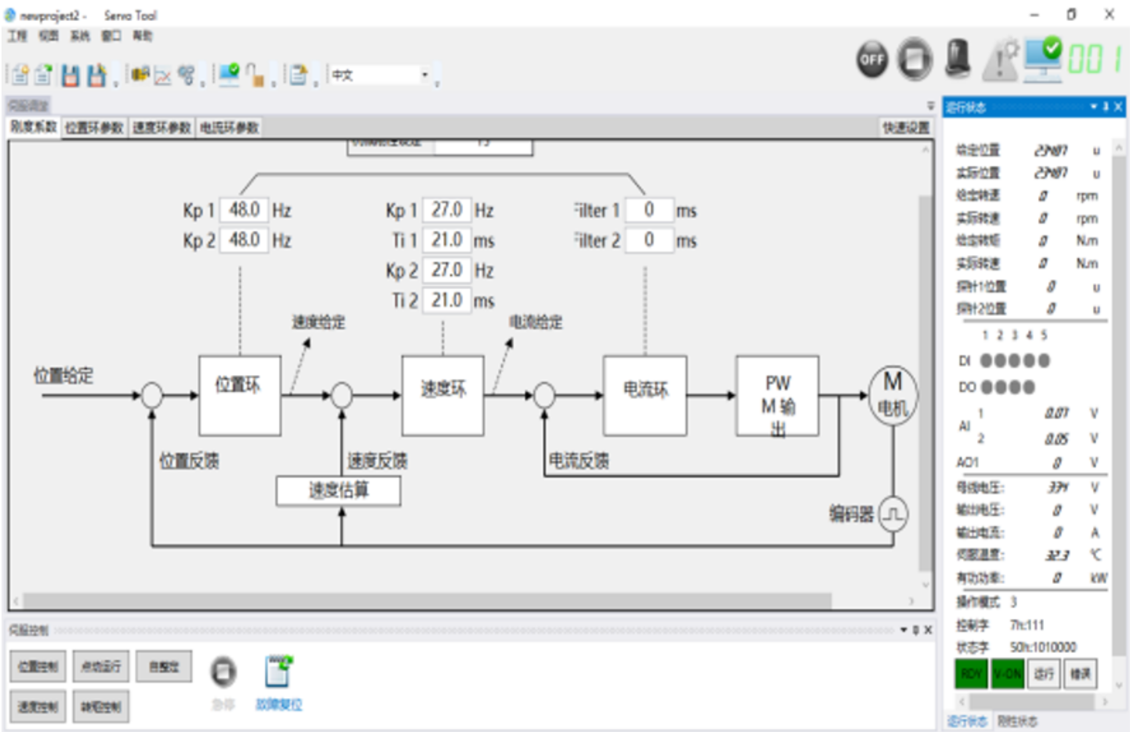
◆ When commissioning the servo, it is necessary to do a good job of emergency stop protection, mechanical protection and other measures to ensure maximum personal safety of the equipment during servo enablement and operation. In order to avoid misoperation such as on-site interference signals, all operating parameters should be reset after the servo trial run to prevent accidental start-up and other situations.

◆ Before adjusting the servo three-loop parameters, please make sure that the motor, encoder and other parameters are correct, and make sure that the emergency stop and other safety protection facilities operate normally and reliably. And before running point test run servo to ensure normal action.

9.3.3 "Three loops of parameters" function setting

Open the software, in the "Parameter List" tab, find "Servo Tuning," and click into it.

In the pop-up page, there are settings for the stiffness coefficient, position loop parameters, speed loop parameters, and torque loop parameters. Through the corresponding settings, the gain adjustment of the



servo three loops can be realized.

1) Stiffness factor

By adjusting the rigidity setting level P63.02, a set of three-loop parameters can be quickly obtained.

2) Position loop parameters

Name	Unit	Remarks
Position loop gain	Hz	For adjusting the position loop response
Position loop feedforward coefficient	%	Feed forward for position adjustment
Soft limit setting	-	This function is not available for bus control
Position loop tracking error detection	-	Whether to detect position loop tracking error
Position loop tracking error setting	Pulse	Default is the encoder's single-turn resolution

3) Speed loop parameters

Name	Unit	Remarks
Speed loop gain 1	Hz	For adjusting the speed loop response
Speed loop integral 1	ms	For adjusting the speed loop response time
Speed tracking error threshold	%	Used to set the error alarm threshold during speed tracking
Tracking error filtering time	ms	Protection filter time for setting speed tracking error
Stall Threshold	%	Threshold value for setting stall protection
Stall filtering time	ms	Filter time for setting stall protection
Stall protection enable	-	For turning stall protection detection on and off

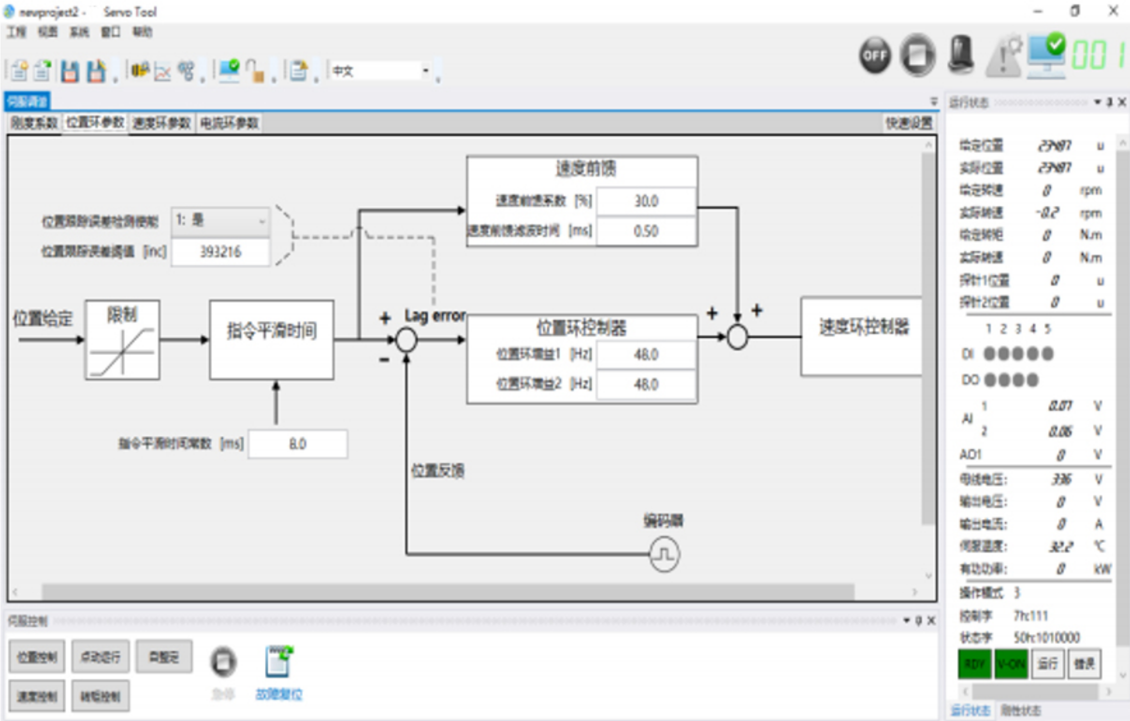
4) Current loop parameters

Name	Unit	Remarks
Torque feedforward selection	-	For turning on and off the torque feedforward function (currently not available)
Current loop gain (Kp)		For adjusting the current loop response
Current loop integral (Ti)	ms	For adjusting the current loop response time
Upper limit of torque giving	%	Used to set the forward maximum output limit of the torque loop.
Lower limit of torque giving	%	Used to set the reverse maximum output limit of the torque loop.

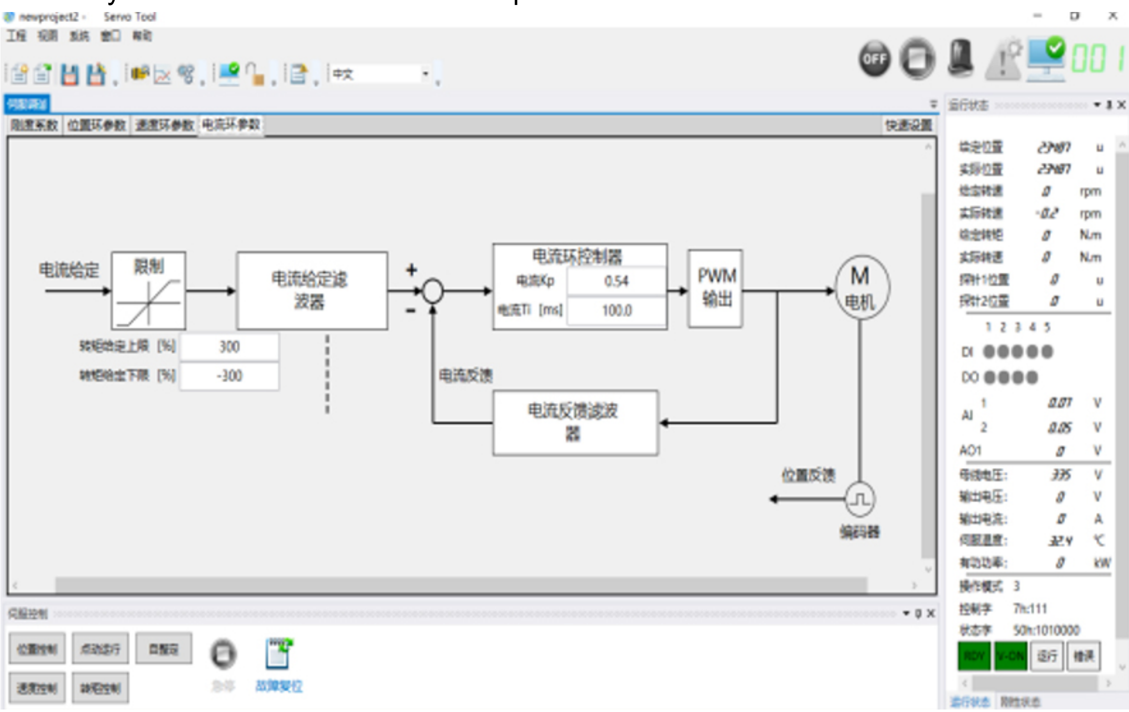
Note: The parameters set in the "Three Loops Parameters" will not take effect immediately.

9.3.4 Find relevant parameters by parameter list

1) You can find the relevant parameters to set by selecting the parameter group.



2) Or enter the keyword search method to find the parameter and set it.



9.3.5 General three-loop parameters that need to be set

1) Position loop parameters

Parameter Address	Name	Unit	Remarks
P60.01	Position loop gain	Hz	For adjusting the position loop response
P60.02	Position loop feedforward coefficient	%	Feed forward for position adjustment
P60.0C	Position loop tracking error setting	Pulse	Default is the encoder's single-turn resolution

2) Speed loop parameters

Parameter Address	Name	Unit	Remarks
P50.01	Speed loop gain 1	Hz	For adjusting the speed loop response
P50.02	Speed loop integral 1	ms	For adjusting the speed loop response time

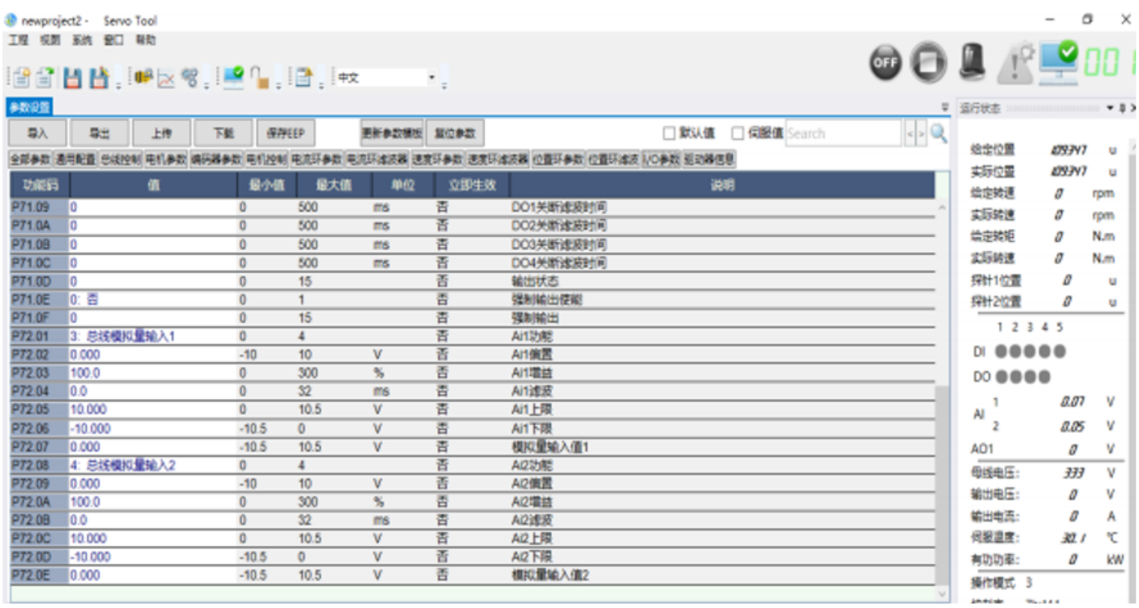
3) Current loop parameters

Parameter Address	Name	Unit	Remarks
P40.09	Upper limit of torque giving	%	Used to set the forward maximum output limit of the torque loop.
P40.0A	Lower limit of torque giving	%	Used to set the reverse maximum output limit of the torque loop.

4) IO parameter setting options, you can configure the DI, DO function and emergency stop input logic

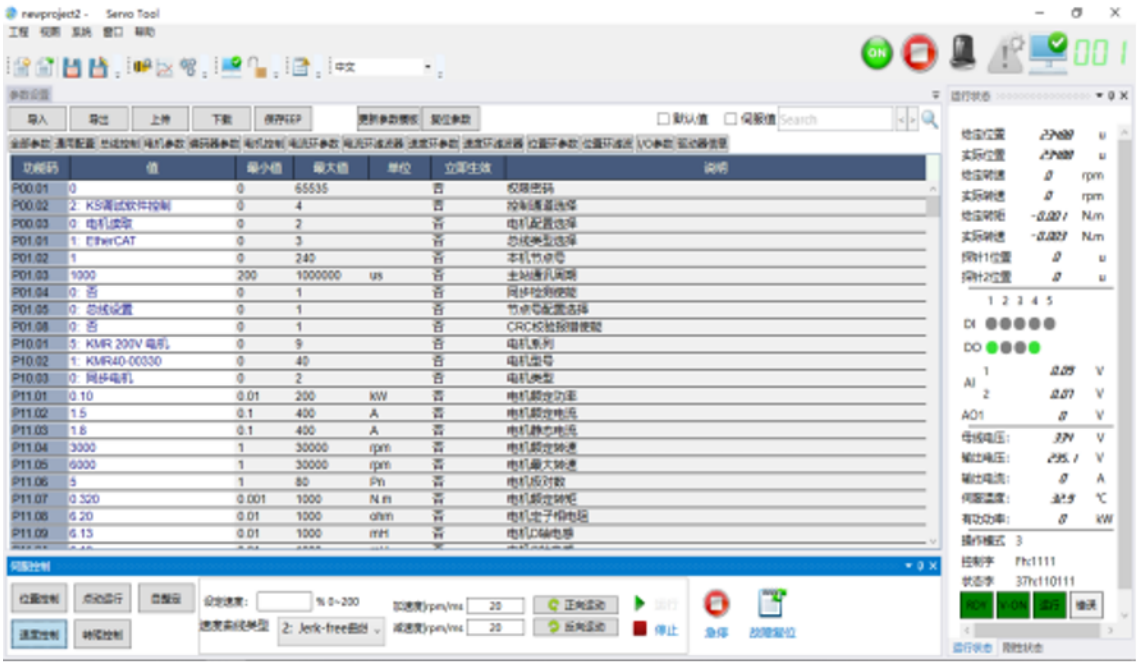
DI input settings		
Serial number	Name	Remarks
1	Servo START NO	Normally open signal, used for servo enable when the command channel uses analog control. Not valid under other control modes.

<table>
<tr><td>2</td><td>Positive motion is prohibited NO</td><td>Forward motion disable normally open signal, when the servo is in forward motion, triggering this signal will cause the servo to stop immediately, and a fault alarm E86.13 will appear.</td></tr>
<tr><td>3</td><td>Reverse motion is prohibited NO</td><td>Reverse motion disable normally open signal, when the servo is in reverse motion, triggering this signal will cause the servo to stop immediately, and a fault alarm E86.14 will appear.</td></tr>
<tr><td>9</td><td>Zero return proximity switch NO</td><td>The zero return proximity switch is a normally open signal that is used as the zero return proximity switch signal when using the servo internal zero return function. (If you use the upper computer to return to zero, you do not need to configure this function, just use the bus IO).</td></tr>
<tr><td>10</td><td>Bus IO input NO</td><td>Bus IO input, normally open signal. The status of this digital input channel is transmitted to the upper controller via the bus. The DI channel corresponds to the address of the PDO object as follows:
<table>
<tr><th>DI channel</th><th>Bus Address</th></tr>
<tr><td>DI1</td><td>60FD.20</td></tr>
<tr><td>DI2</td><td>60FD.21</td></tr>
<tr><td>DI3</td><td>60FD.22</td></tr>
<tr><td>DI4</td><td>60FD.23</td></tr>
<tr><td>DI5</td><td>60FD.24</td></tr>
</table></td></tr>
<tr><td>11</td><td>Probe 1 NO</td><td>Probe 1 normally open signal, note that Probe 1 can only be configured for DI1 channel (Probe i.e. high speed position latching function), it can latch the motor position information when the external DI signal or motor Z signal is changed.</td></tr>
<tr><td>12</td><td>Probe 2NO</td><td>Probe 2 normally open signal, note that Probe 2 can only be configured for DI2 channel (Probe i.e. high speed position latch function), it can latch the motor position information when the external DI signal or motor Z signal is changed.</td></tr>
<tr><td>101~112</td><td colspan="2">1, 101; 2, 102; 3, 103; 4, 104; 5, 105; 9, 109; 10, 110; 11, 111; 12, 112; Same interpretation as above, except that the signal logic is inverted and is normally closed.</td></tr>
</table>



<table>
<tr><th colspan="3">DO Output Function</th></tr>
<tr><th>Serial number</th><td>Name</td><td>Remarks</td></tr>
<tr><td>1</td><td>Servo return to zero completed NO</td><td>Servo zero return completion signal, active high. When the servo internal zero return function is used and zero return is completed, this signal is valid. This signal is cleared when the zero return operation is restarted.</td></tr>
<tr><td>2</td><td>Servo operation enable NO</td><td>Servo run enable signal, active high. This signal is output when the servo drive is enabled. When the enable is turned off, this signal is cleared to zero.</td></tr>
<tr><td>3</td><td>Servo alarm NO</td><td>Servo alarm output, valid at high level. This signal is output when an alarm occurs in the servo. After the alarm is reset, this signal is cleared to zero.</td></tr>
<tr><td>4</td><td>Position tracking overrun NO</td><td>Position tracking over-limit alarm, valid at high level. This signal is output when the servo occurs position tracking error exceeds the limit value. After resetting the alarm, this signal is cleared to zero.</td></tr>
<tr><td>5</td><td>Target location reached NO</td><td>Target position arrival output, active high. This signal is output when the positioning is completed and the target position is reached. When starting a new movement, the change signal is cleared to zero.</td></tr>
<tr><td>6</td><td>Gate output NO</td><td>The brake output signal is active at high level. When enabled, the signal is output after delaying the set time according to the set holding timing. When shutdown is enabled, this signal is cleared according to the set holding timing.</td></tr>
<tr><td>7</td><td>Bus IO output NO</td><td>Bus digital output, active high. When the DO channel is configured for this function, the digital output channel can be switched on and off by the upper controller. The DO channel corresponds to the address of the PDO object as follows:
<table>
<tr><th>DO Channel</th><th>Bus Address</th></tr>
<tr><td>DO1</td><td>60FE_01.16</td></tr>
<tr><td>DO2</td><td>60FE_01.17</td></tr>
<tr><td>DO3</td><td>60FE_01.18</td></tr>
<tr><td>DO4</td><td>60FE_01.19</td></tr>
</table>
Note: 60FE_01 is the sub-index 01 of index 60FE;
When using the upper computer control, 60FE subindex 02, needs to be configured as 16#FFFFFFFF.</td></tr>
<tr><td>101~107</td><td colspan="2">1, 101; 2, 102; 3, 103; 4, 104,; 5, 105; 6, 106; 7, 107
The explanation is the same as above, except that the logic is inverted and the output is active low.</td></tr>
</table>

9.4 Commissioning software servo control



9.4.1 Functional Area Introduction

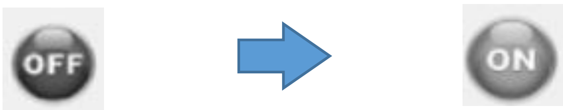
<table>
<tr><th>Menu bar tab</th><th colspan="2">Function</th><th>Description</th></tr>
<tr><td rowspan="19">Servo Control</td><td colspan="2">Fault Reset</td><td>When a drive fault alarm occurs and the control mode is "AD-Setup Commission Software" control, it can be used to reset the fault after it has been eliminated.</td></tr>
<tr><td colspan="2">Forward motion</td><td>When the control mode is "AD Commissioning Software" control, this button is used to give a forward motion command in the speed and torque control mode and to set the direction of motion to forward in the position control mode.</td></tr>
<tr><td colspan="2">Reverse motion</td><td>When the control mode is "AD Commissioning Software" control, this button is used to set the reverse motion command in the speed and torque control mode and to set the direction of motion to reverse in the position control mode.</td></tr>
<tr><td colspan="2">Back and forth motion</td><td>Valid only in position mode. When the control mode is "AD Commissioning Software" control and parameter P90.02 is set to "1: Yes", this button is used to enable position reciprocating operation. When switching to speed control or torque control, P90.02 must be set to "0", otherwise speed and torque modes will not operate properly.</td></tr>
<tr><td rowspan="5">position place Model style</td><td>Run button</td><td>When the control mode is "AD Commissioning Software" control and the operation mode is position mode, this button is used to give the relative position motion command.</td></tr>
<tr><td>Given position</td><td>When commissioning the software servo control, set the distance of movement in position control mode, in unit turns.</td></tr>
<tr><td>Uniform speed setting</td><td>When commissioning the software servo control, set the motion speed in rpm for the position control mode.</td></tr>
<tr><td>Acceleration settings</td><td>When commissioning the software servo control, set the acceleration of motion in rpm/ms for position control mode.</td></tr>
<tr><td>Deceleration settings</td><td>When commissioning software servo control, set the deceleration of motion in rpm/ms for position control mode.</td></tr>
<tr><td rowspan="6">Fast degree Model Style</td><td>Set speed</td><td>When commissioning the software servo control, set the running speed of the speed mode in percent (100% is equal to the rated speed).</td></tr>
<tr><td>Speed profile type</td><td>When commissioning the software servo control, set the speed acceleration curve type.</td></tr>
<tr><td>Acceleration settings</td><td>When commissioning software servo control, set the acceleration of motion in rpm/ms for speed control mode.</td></tr>
<tr><td>Deceleration settings</td><td>When commissioning software servo control, set the deceleration of motion in rpm/ms for speed control mode.</td></tr>
<tr><td>Run button</td><td>When the control mode is "AD Commissioning Software" control and the operation mode is position mode, this button is used to give the relative position motion command.</td></tr>
<tr><td>Stop Button</td><td>This button is used to stop the motion command when the control mode is "AD Commissioning Software" control and the operation mode is torque mode.</td></tr>
<tr><td rowspan="3">twist Rectangles Model Style</td><td>Torque setting</td><td>When commissioning the software servo control, set the target torque in percent (100% equals the rated torque) for the torque control mode.</td></tr>
<tr><td>Speed limit setting</td><td>When commissioning the software servo control, set the speed limit value in torque control mode (in torque control, the motor accelerates all the way to the set target torque, and the speed limit is used to limit the maximum speed at this point) in percent (100% equals the rated torque).</td></tr>
<tr><td>Point-and-shoot</td><td>Used for point operation when commissioning software servo</td></tr>
</table>

		operation	control.
		Self-adjusting	Used for various self-tuning functions when commissioning software servo control.

注意 is only available when the command channel is selected as "AD Commission Software Control".

9.4.2 Position mode control

For position mode control, you need to use the enable button in the interface toolbar to enable the servo first.



Buttons	Description
Fault Reset	When a drive fault alarm occurs and the control mode is "AD Commission Software" control, it can be used to reset the fault after it has been eliminated.
Forward motion	When the control mode is "AD Commissioning Software" control, this button is used to set the direction of motion to positive in the position control mode.
Reverse motion	When the control mode is "AD Commissioning Software" control, this button is used to set the direction of motion to reverse in the position control mode.
Back and forth motion	Valid only in position mode. When the control mode is "AD Commissioning Software" control and parameter P90.02 is set to "1: Yes", this button is used to enable position reciprocating operation. When switching to speed control or torque control, P90.02 must be set to "0", otherwise the speed and torque modes will not operate properly.
Run button	When the control mode is "AD Commissioning Software" control and the operation mode is position mode, this button is used to give the relative position motion command.
Given position	When commissioning the software servo control, set the distance of movement in position control mode, in unit turns.
Uniform speed setting	When commissioning the software servo control, set the motion speed in rpm for the position control mode.
Acceleration settings	When commissioning the software servo control, set the acceleration of motion in rpm/ms for position control mode.
Deceleration settings	When commissioning software servo control, set the deceleration of motion in rpm/ms for position control mode.

General operating procedure for position control:

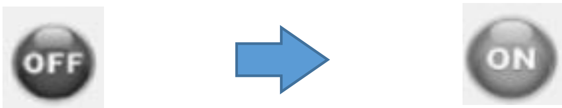
1) Set the reciprocating motion mode, and if necessary, set parameter P90.02 Reciprocating motion mode.
2) Set the position movement distance, speed, acceleration and deceleration.
3) Set the direction of movement.
4) Click the "Run" button, and the servo will stop automatically after running the set movement distance.

注意

◆ However, it is not suitable for some loads with high inertia, and the servo will be in free stop or dragged by the load. Therefore, when using the positioning mode, please be sure to operate with caution and ensure the safety of your equipment.

9.4.3 Speed mode control

For speed mode control, first use the Enable button on the interface toolbar to enable the servo.



Buttons	Description
Fault Reset	When a drive fault alarm occurs and the control mode is "AD Commission Software" control, it can be used to reset the fault after it has been eliminated.
Forward motion	When the control mode is "AD Commissioning Software" control, this button is used to give the forward motion command in the speed control mode.
Reverse motion	When the control mode is "AD Commissioning Software" control, this button is used to give the reverse motion command in the speed control mode.
Set speed	When commissioning the software servo control, set the running speed of the speed mode in percent (100% is equal to the rated speed).
Speed profile type	When commissioning the software servo control, set the speed acceleration curve type.
Acceleration settings	When commissioning software servo control, set the acceleration of motion in rpm/ms for speed control mode.
Deceleration settings	When commissioning software servo control, set the deceleration of motion in rpm/ms for speed control mode.
Run button	When the control mode is "AD Commissioning Software" control and the operation mode is speed mode, this button is used to give the relative speed motion command.
Stop Button	This button is used to stop the motion command when the control mode is "AD Commissioning Software" control and the operation mode is speed mode.

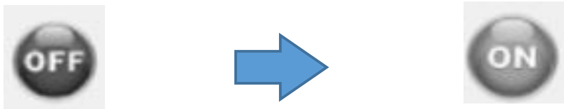
General operating procedure for speed control:
1) Set the speed profile type.
2) Set the speed, acceleration and deceleration values.
3) Select the motion direction button, and then click the "Run" button to make the motor start running in the selected direction and at the set speed.
4) Click the motion direction button again to stop the motor motion; or click the "Stop" button to terminate the motor motion.

注意

◆ When commissioning the servo, it is necessary to do a good job of emergency stop protection, mechanical protection and other measures to ensure maximum personal safety of the equipment during servo enablement and operation. In order to avoid misoperation such as interference signals at the site, all operating parameters should be reset after the servo trial run to prevent accidental start-ups and other situations.

9.4.4 Torque control mode

For torque mode control, first use the Enable button on the interface toolbar to enable the servo.



Buttons	Description
Fault Reset	When a drive fault alarm occurs and the control mode is "AD Commission Software" control, it can be used to reset the fault after it has been eliminated.
Forward motion	When the control mode is "AD Commissioning Software" control, this button is used to give the forward motion command in the torque control mode.
Reverse motion	When the control mode is "AD Commissioning Software" control, this button is used to give the reverse motion command in the torque control mode.
Setting torque	When commissioning the software servo control, set the target torque in percent (100% equals the rated torque) for the torque control mode.
Speed limit setting	When commissioning the software servo control, set the speed limit value in rpm for torque control mode (in torque control, the motor accelerates all the way to the set target torque, and the speed limit is used to limit the maximum speed at this point).
Run button	When the control mode is "AD Commissioning Software" control and the operation mode is torque mode, this button is used to give the torque motion command.
Stop Button	This button is used to stop the motion command when the control mode is "AD Commissioning Software" control and the operation mode is torque mode.

General operating procedure for speed control:

1) Set the target torque and speed limit value (for safety reasons, the speed limit value should be as low as possible during commissioning).

2) Select the motion direction button, and then click the "Run" button to make the motor start running in the selected direction and according to the set torque and speed limit.

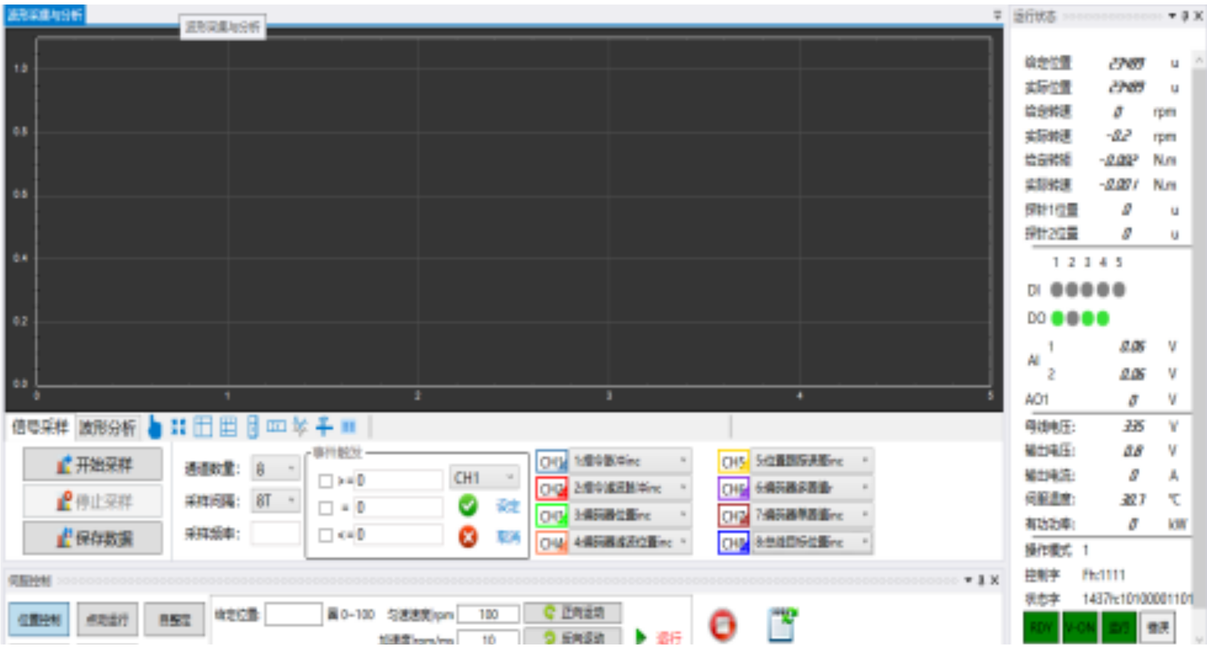
3) Click the motion direction button again to stop the motor motion; or click the "Stop" button to stop the motor motion.

注意

◆ When commissioning the servo, it is necessary to do a good job of emergency stop protection, mechanical protection and other measures to ensure maximum personal safety of the equipment during servo enablement and operation. In order to avoid misoperation such as on-site interference signals, all operating parameters should be reset after the servo trial run to prevent accidental start-up and other situations.

◆ When the actual motor torque is less than the given torque, the servo will speed up to the current set speed limit. And when the actual torque is greater than or equal to the set torque, the servo will keep outputting according to the given torque. If you want to stop the motion, you can cancel the motion direction or set the given torque or speed limit to 0 to stop the motion. Therefore, please consider the torque target value and speed limit value in the context of the machine.

9.5 Waveform acquisition and analysis



Menu bar tab	Function	Description
Signal Sampling	Start sampling	Start sampling the already configured data.
	Stop sampling	Stop the data being sampled.
	Save data	Save the sampled data to a file.
	Number of channels	Configure the number of data channels to be captured.
	Sampling period	1T=50μs The sampling period is proportional to the number of channels, the more channels, the larger the period. It is generally recommended to set "Number of channels + 1".
	Sampling frequency	Automatic calculation based on sampling period, no setup required.
	Event Trigger	Sampling is triggered according to the set conditions.
	Sampling data	To display the configured sample channels, you can click the "CH" button to the left of the sample channel to hide or display the sample channel data in the current curve.

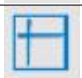
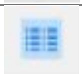
9.5.1 Acquisition Channel List

Summary table of sampling data			
Serial number	**Name**	**Unit**	**Explanation**
1	Command pulse	Pulse	Single position ring gives the command increment value.
2	Command filter pulse	Pulse	
3	Encoder position	Pulse	
4	Encoder filter position	Pulse	
5	Position tracking error	Pulse	0x60FC bus demand position for the previous position loop cycle (channel 9) 0x60FC encoder actual position value for the current position loop cycle (channel 10); can be used to represent system position following dynamic and steady state errors;
6	Encoder multi-turn value	Circle	Actual single-turn value for multi-turn encoder feedback; current loop cycle update
7	Encoder single-turn value	Pulse	Single-turn value of encoder feedback; current loop cycle update
8	Bus target location	Pulse	Absolute target position sent by the controller, communication object 0x607A; communication cycle update
9	Bus demand location	Pulse	Absolute position given by the absolute position decomposition of the controller to the position loop, communication object 0x60FC; position loop cycle update
10	Bus physical location	Pulse	Feedback to the actual motor position of the controller, communication object 0x6063;
11	Bus physical location	uu	Feedback to the controller the actual position of the motor, communication object 0x6064; current loop cycle update
12	Speed given	RPM	The speed feed command, connected to the speed feed filter input;
13	Speed filtering given	RPM	Speed loop feed command, speed feed filter output value;
14	Speed Feedback	RPM	Velocity feedback, calculated for each velocity loop cycle from the actual encoder value, connected to the velocity feedback filter input; the recommended channel for dynamic velocity performance observation;
15	Speed filter feedback	RPM	Speed loop feedback command, speed feedback filter output value;
16	Speed Feedback	RPM	Speed feedback filter values, recommended observation channel for steady speed errors;
17	Speed PID output	A	Output value of the speed loop PID calculation
18	Id Given	A	
19	Id given after filtering	A	
20	Id PID feedback	A	
21	Id PID feedback filtering	A	
22	Id PID output	V	
23	Torque Feeding	A	Current value for a given torque = torque given/torque constant; connected to the input of the torque giving filter; the torque related channels 24, 25, 26 are displayed with the corresponding current rms value;
24	Torque filtering given	A	The output value of the torque-giving filter;
25	Torque feedback	A	Torque feedback value from the sensor; connected to the input of the torque feedback filter
26	Torque feedback filtering	A	The output value of the torque feedback filter;
27	Q-axis PID output	V	The voltage demand value calculated by the current PID of the

			current loop Q-axis;
28	Bus voltage	V	Busbar voltage;
29	A phase feedback current	A	A phase feedback current instantaneous value
30	B-phase feedback current	A	B-phase feedback current instantaneous value
31	C-phase feedback current	A	C-phase feedback current instantaneous value
32	A phase voltage	V	A-phase output voltage
33	B phase voltage	V	B-phase output voltage
34	C phase voltage	V	C-phase output voltage
35	Output Voltage RMS	V	
36	Analog 0 Voltage	V	Analog input Ai0 Voltage
37	Analog 1 Voltage	V	Analog input Ai1 Voltage
38	Last Error Index	-	
39	Servo Enable	-	Servo enable flag bit, 1 when servo enabled, 0 when unenabled
40	Encoder communication status	-	When this channel is 0, it means the communication status is good; if it is not 0, please check whether the communication protocol matches and the cable is good.
41	Control words	-	Control word sent by controller, communication status 0x6040
42	Status word	-	Feedback to controller servo status word, communication status 0x6041
43	DS402 Current control mode	-	Feedback to the controller's servo current control mode, communication status 0x6061
44	EtherCAT communication status	-	EtherCAT communication status, defined as follows: 1: Iint 2: PreOP 4: SafeOP 8: OP
45	Zero deviation angle of micro-action calibration	Pulse	
46	Micro-action zero proportional output	-	
47	Microschool zero credit time	ms	
60	Overcurrent A-phase feedback current	A	Instantaneous value of the A-phase current at the time of the most recent overcurrent error
61	Overcurrent B-phase feedback current	A	Instantaneous value of B-phase current at the time of the most recent overcurrent error
62	Overcurrent C-phase feedback current	A	Instantaneous value of C-phase current at the time of the most recent overcurrent error
63	Overcurrent A-phase voltage	V	
64	Overcurrent B-phase voltage	V	
65	Overcurrent C-phase voltage	V	
66	Overcurrent Q Axis current given	A	The given value of torque at the time of the most recent overcurrent error
67	Overcurrent Q Axis current feedback	A	Torque feedback value at the time of the most recent overcurrent error
68	Overcurrent bus voltage	V	Bus voltage value at the time of the most recent overcurrent error
69	Probe 1 position	Pulse	Communication object 0x60BA

70	Probe 2 position	Pulse	Communication object 0x60BB
88	Inertia recognition speed	-	Inertia recognition speed
89	Inertia recognition torque	-	Inertia recognition torque curve
90	Inertia identification results	-	Inertia identification result curve
91	Self-tuning state	-	
96	Memory 0	-	Internal test variables
97	Memory 1	-	Internal test variables
98	Memory 2	-	Internal test variables
99	Memory 3	-	Internal test variables

9.5.2 Waveform sampling and analysis controls

Icons	Name	Explanation
	Dragging the view	Drag the currently recorded waveform
	Default View	Zoom back to the default view size
	Toggle Cursor Visibility	Show/hide cursors, which can be used to make measurements on waveforms.
	Reset Cursor	Restore the cursor to its default state
	X-axis scaling	Select X-axis for scaling
	Y-axis scaling	Select Y-axis for scaling
	Cursor channel selection	Select the channel object for cursor measurement
	Y-axis coordinate range grouping	Y-axis coordinate grouping
	Curve Information	Curve Information

9.5.3 Waveform Analysis

Menu bar tab	Function	Description
Waveform Analysis	Loading Waveforms	Loads a saved waveform file.
	Frequency domain analysis	Convert waveforms in the frequency and time domains. By default, the waveform is a time domain waveform. When you need to perform frequency domain analysis, you can click this function button to convert the view to a frequency domain waveform, and click this function button again to revert to a time domain waveform. Under the frequency domain waveform, the horizontal coordinate is frequency (in Hz) and the vertical coordinate is decibel (in dB). You can also use the waveform controls to zoom in and out, measure, etc.
	Reset bias	Restores all bias settings to their initial values.
	Sampling data	To display the sampling data in the waveform file, you can click the "CH" button on the left side of the sampling channel to hide or display the sampling channel data in the current curve.
	Data Gain	The raw data channels can be scaled proportionally to the gain multiplier.
	Data Bias	The set offset can be superimposed on the original data channel.

9.6 Self-tuning function

1） Encoder zeroing function: Factory function, if you need to use a third party servo motor on site, please contact AUCTECH.

2） Motor pole number learning: factory use function, if you need to use third party servo motor on site, please contact AUCTECH.

3） Inertia self-tuning:

4） The inertia ratio (P63.01) is the

Note: When there is no reducer, the reduction ratio is 1.

$$\frac{\text{负载总惯量/减速比}^2}{\text{电机转动惯量}}$$

5） The load inertia ratio is an important parameter of servo system, and the correct setting of the load inertia ratio helps to finish the commissioning quickly.

6） The load inertia ratio can be entered manually or identified by the servo drive's inertia self-tuning function.

7） By applying a certain frequency and amplitude of motion to the servo motor and reading the feedback from the implementation, the inertia can be estimated by converting the field load to the inertia of the motor shaft. The result is automatically filled into parameter P63.01.

9.6.1 Notes on inertia self-tuning

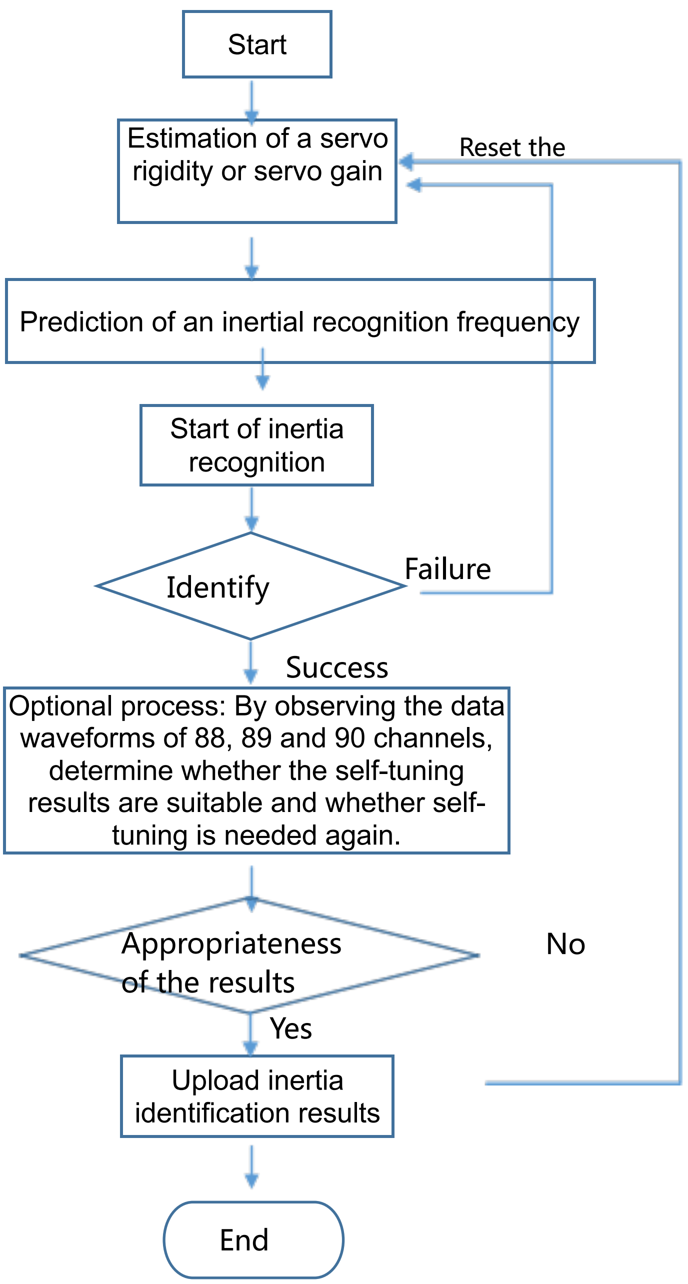
- When using inertia self-tuning, the following conditions need to be met in order to accurately calculate the load inertia ratio:
- The maximum speed of the actual motor used is higher than 500 rpm;
- Acceleration of 3000 rpm/s² or more for acceleration and deceleration of the actual motor used;
- A solid and stable load connection, which cannot change drastically;

- The actual load inertia ratio must not exceed 50 times, otherwise phenomena such as stall overload may occur during the learning process;
- (a) The use of the inertia self-tuning function is not recommended for large transmission backlash, or for elastic loads;
- If the actual load inertia ratio is large and the drive gain or system rigidity is low, it will result in a sluggish motor action and failure to achieve the highest motor

If the speed and acceleration requirements lead to inertia self-tuning failure, the inertia identification should be re-executed after increasing the system rigidity or speed loop gain.

- If the drive gain or system stiffness is low and the inertia recognition frequency is also low, the inertia recognition will also fail, so the system stiffness or speed loop gain should be adjusted appropriately and then the inertia recognition should be performed again (the maximum system stiffness setting for the inertia self-tuning time is 18).
- If vibration or even oscillation occurs during inertia self-tuning, inertia discrimination should be stopped immediately and the system rigidity, servo gain or inertia discrimination frequency should be reduced.
- Before the inertia self-tuning starts, it should be protected by emergency stop and safety limits (3 or more turns of movement between mechanical limits).

9.6.2 Inertia self-tuning process

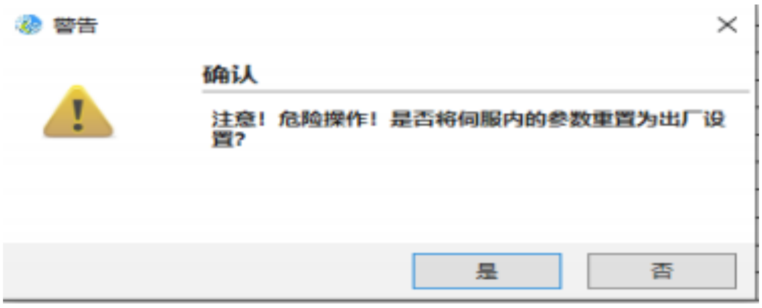


9.7 Reset parameters and update parameters template

9.7.1 Parameter Reset

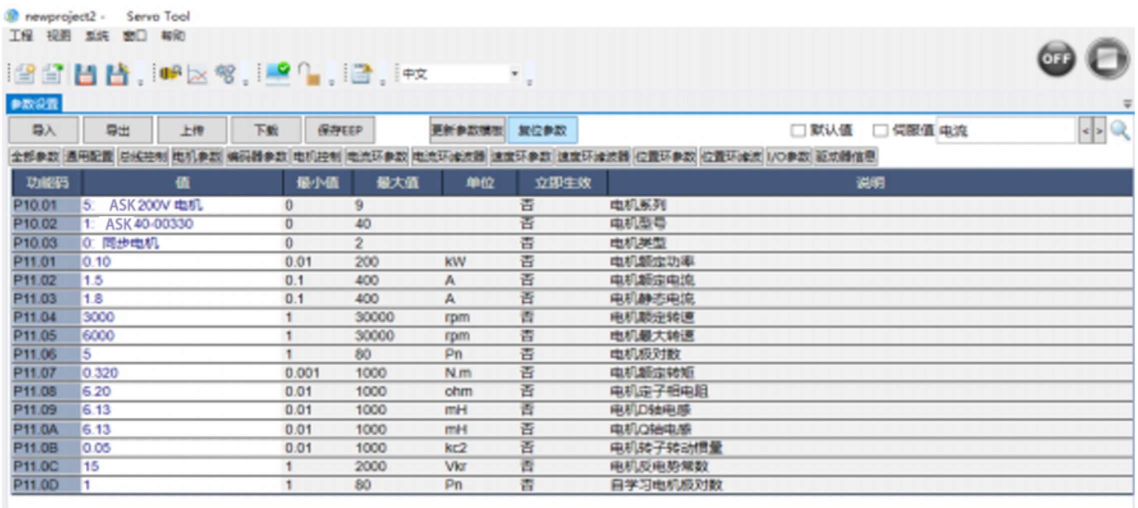
In some cases, it is necessary to perform the operation of restoring the factory value of the parameters. The following describes the steps of resetting the parameters by the commissioning software:

1) After the driver is successfully connected, log in with the password, enter the parameter list tab and select the reset parameter function.



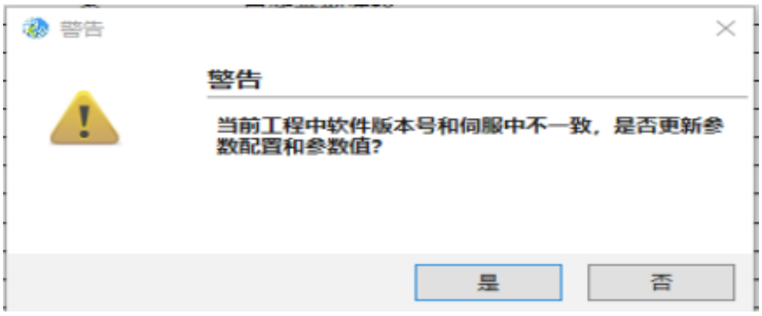
2) Click Reset Parameters, the drive will perform the parameter reset function and a dialog box will pop up to inform the completion status when finished.

3) After the reset is complete, it is recommended to power off and reboot. After reconnecting the drive, click Update Parameter Template and you will see that all parameters in the drive have been restored to factory default parameters.



9.7.2 Update parameter templates

When the parameter template in the project is not consistent with the parameter information in the actual drive, the software will prompt whether to update the parameter template, select "Yes" to automatically synchronize the parameter list in the project with the drive. If you choose "No", you can also use the Update Parameter Template button to update the parameter list manually.



Once the update of the parameter template starts, a progress bar will show the current progress. When the

progress bar is full, a popup will be displayed to indicate whether the upload information is complete or failed.

注意

Updating the parameter template only synchronizes the parameter list in the project with the one in the driver, after the upload is completed, you still need to upload the parameters before you can upload the parameter values in the driver to the PC side.

9.8 Troubleshooting

After the drive is successfully connected, if a fault occurs, you will see the current fault information and historical fault information on the fault information page. The alarm number of the current alarm will be displayed in the toolbar.

If the current control channel is "AD Commission Software Control", the fault reset button can be used to reset the fault. If the controller is controlling, the control word needs to be operated by the host computer to complete the alarm reset.

Please refer to the troubleshooting methods to troubleshoot the cause of the current alarm, refer to the Troubleshooting Section for details.

注意

Some faults such as continuous overcurrent, to protect the internal components of the drive, the alarm message must be removed by power off and restart after troubleshooting.

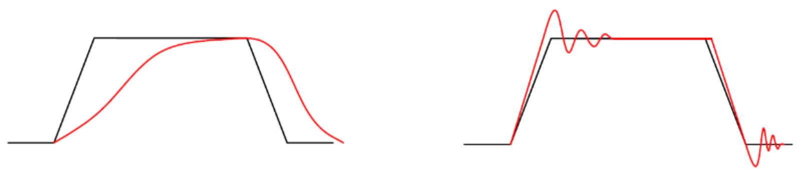
Section 10 AD3 commissioning and trial run

10.1 Overview

The characteristic of servo is to be able to follow the change of command signal quickly and precisely. In actual application, the mechanical characteristics of the servo system will cause the response performance of the servo system to decline. In this case, the gain of the servo system must be adjusted reasonably, so that the system can achieve the purpose of fast and accurate response to the command signal to the maximum extent.

Examples to illustrate the significance of system gains:

Too small system gain | Too much system gain | Suitable system gain



The system gain is set by a combination of several parameters (position loop gain, velocity loop gain, velocity loop integral, filter, inertia ratio, etc.), which interact with each other. Therefore, the gain adjustment of the servo system must consider the balance between the setting values of each parameter.

注意
Before making system gain adjustments, it is recommended to use a spot test run to confirm that the motor can work properly. Gain adjustment process, the adjustment range should be gradually increase or decrease, to avoid excessive changes in the adjustment.

10.1.1 General flow of system gain adjustment

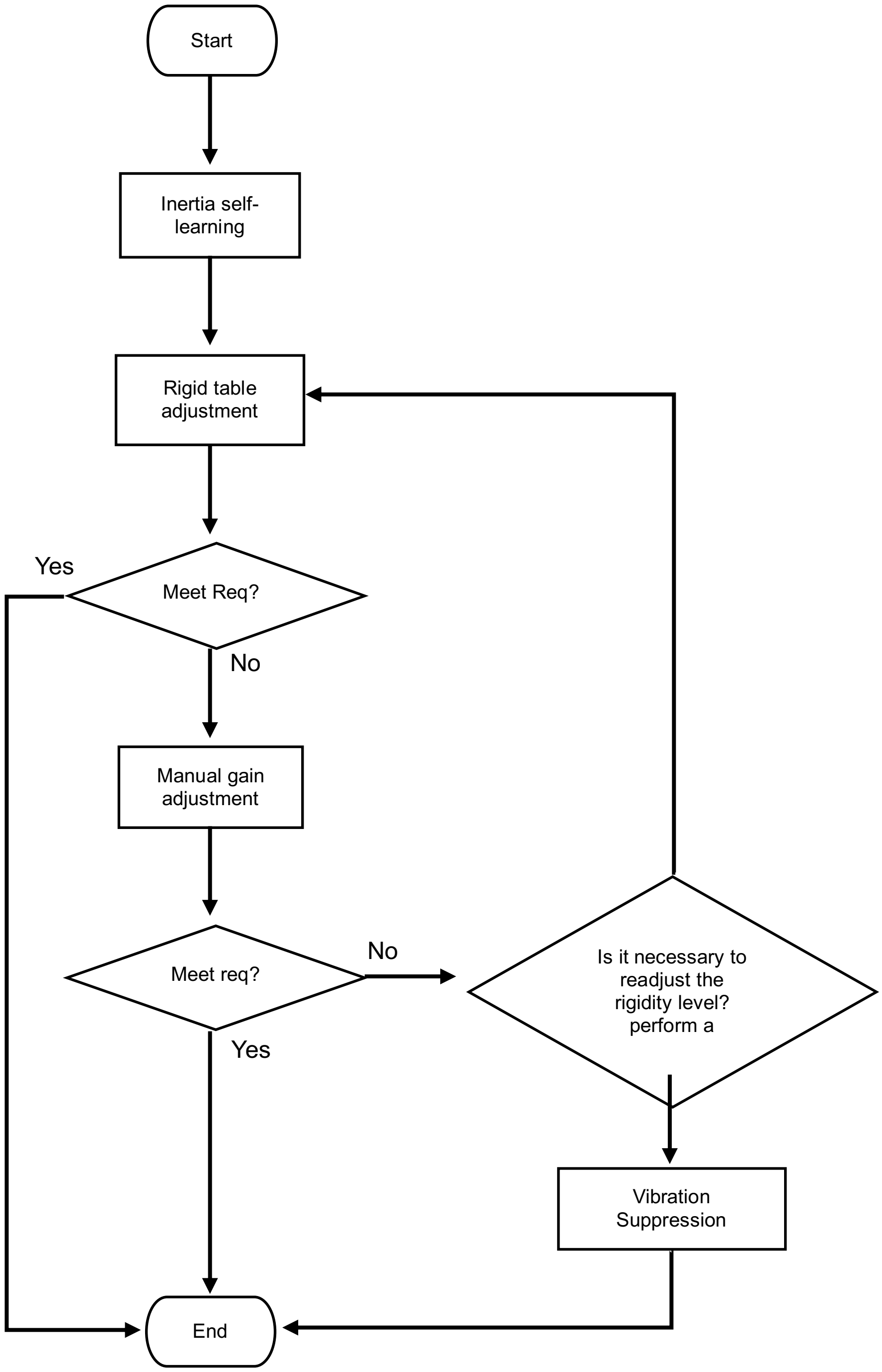


Figure 1 Gain adjustment process

Adjustment Process			Function
1	Inertia self-learning		Automatic calculation of load inertia ratio by drive inertia self-learning function
2	Rigid table adjustment		With the inertia ratio set correctly, a set of gain parameters can be quickly obtained by setting the stiffness level.
3	Manual gain adjustment	Basic Gain	Based on the automatic gain adjustment, the speed and position loop gains are manually fine-tuned to optimize the effect.
		Feedforward gain	Adjust feedforward settings to optimize response performance.
		Filter settings	Filtering settings for position, speed, and torque commands.
4	Vibration Suppression	Mechanical Resonance	Based on the observed frequency waveform, a suitable trap frequency is set to suppress mechanical resonance.
		Low Frequency Resonance	Set low-frequency suppression filter to suppress low-frequency resonance.

Table - Gain adjustment process description

10.2 Pre-run preparation

1) Check the wiring, see "Section 4 Wiring" for details.
2) To check the operating environment, see "Section 1 Safety and Precautions".
3) Is the motor a AUCTECH brand motor? If it is a third-party brand motor, it needs to be zeroed for encoder self-learning.
4) Check the security protection measures.
5) Check the load connection and mechanical drive section.
6) Check if the drive and motor parameters are configured properly.

10.3 Inertia identification

Concept of load-inertia ratio:

$$\text{Load inertia ratio} = \frac{\text{Total mechanical load rotational inertia / (Reduction ratio }^2)}{\text{Motor's own rotational inertia}} * 100\%$$

The load inertia ratio is an important parameter of servo system, and the correct setting of the load inertia ratio helps to finish the commissioning quickly.

The load inertia ratio can be set manually or identified using the inertia self-learning function.

注意
When using the inertia self-learning function, the following conditions need to be met in order to accurately calculate the load inertia ratio: The maximum speed of the actual motor is higher than 500 rpm; Acceleration and deceleration of the actual motor at 3000rpm/s or more; Stable and stable load connection and no drastic changes in load torque; The actual load inertia ratio must not exceed 50 times, otherwise stalls and overloads may occur during the learning process; Please use the inertia self-learning function with caution when applying such loads as the inertia

recognition may fail or cause large vibration when the transmission backlash is large or when the load is elastic;
If the actual load inertia ratio is large and the drive gain is low, it will cause the motor to be sluggish and cannot achieve the highest speed requirement and acceleration requirement of the motor, which will lead to the failure of inertia self-learning, and the inertia self-learning should be performed again after increasing the speed loop gain appropriately;
If the drive gain is low and the inertia recognition frequency is low, it will lead to inertia recognition failure. In this case, the system gain should be increased (system rigidity ≤ 18 is recommended for inertia recognition) and inertia recognition frequency (recommended recognition frequency 200, the maximum shall not exceed 400) and then re-inertia self-learning;
Inertia self-learning process, if vibration or oscillation occurs, inertia recognition should be stopped immediately. and reduce the system gain or inertial discrimination frequency and then re-learn;
Before the inertia self-learning begins, it should do a good job of emergency stop, safety limit and other protective measures, and ensure that the motor has 3 or more turns of forward and backward movable travel to prevent overtravel during the inertia self-learning process, causing accidents!

10.3.1 Inertia self-learning process

Before performing inertia self-learning, please reconfirm and satisfy the following motor motion requirements:

- Between the mechanical limit switches, leave 3 or more turns of movable travel each positive and negative.
- Before performing the inertia self-learning, make sure that the limit switch is installed on the machine and operates properly.
- Allow ±3 turns of moveable travel between mechanical limits to avoid overtravel during inertia recognition, which can cause accidents!
- The load allows for frequent forward and reverse motion.
- Machinery and equipment and liabilities are allowed to carry out forward and reverse motion, the amplitude of forward and reverse motion is about 60°, and the forward and reverse frequency is about 100~500.

Predicted load inertia ratio:
If the inertia ratio P63.01 is the default value and the actual load inertia ratio is greater than 30 times, the inertia self-learning may fail due to slow motor action, and the following two measures can be taken at this time:

1) Preset inertia ratio P63.01 parameter: A larger initial value can be preset; it is recommended to start from 500% and gradually increase in 200% increments until the inertia self-learning is successful.

2) Increase the drive stiffness level P63.02 to make the motor self-learning speed and acceleration meet the inertia recognition requirements.

注意

Too much rigidity is likely to cause motor overload and other failures, please be careful to increase the rigidity, the recommended rigidity for self-learning ≤ 18.

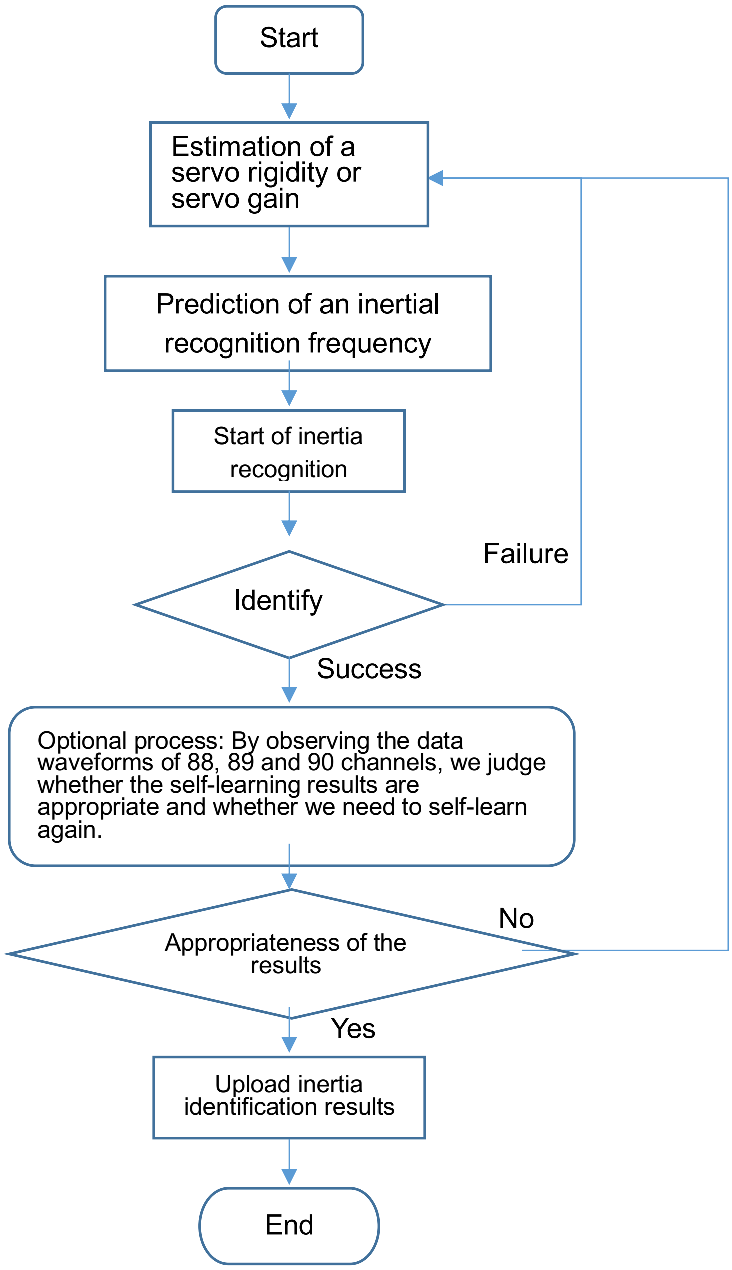


Figure - Inertia self-learning process

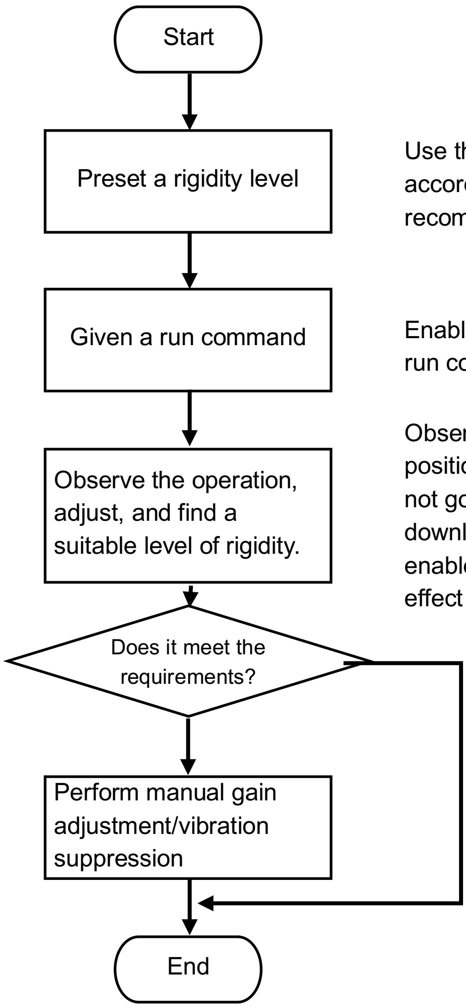
☆ **Associated parameters:**

Parameter group	Serial number	Name	Unit	Data Range	Factory value	Change method	Effective method
P63	01	Inertia ratio	%	0~5000	250	Shutdown settings	Downtime effective
	02	Mechanical rigidity setting	-	0~31	13	Shutdown settings	Downtime effective
	03	Inertia recognition frequency		1~2000	200	Shutdown settings	Downtime effective

10.4 Gain adjustment

10.4.1 Rigid meter fast gain setting

By selecting one of the rigidity levels in the rigidity table, the servo drive will automatically generate a set of matching gain parameters to meet the speed and stability requirements.



Use the default rigidity 13 can be, can be increased according to the actual load situation, but it is recommended that the preset rigidity level ≤ 18.

Enables the servo driver to rotate the motor given a run command.

Observe the operation effect: responsiveness, positioning time, vibration status, etc. If the effect is not good, modify the rigidity level again and download it after breaking the enable. After that, re-enable the operation and observe the operation effect again until the demand is satisfied.

Manual gain adjustment, see section 10.4.2 for details

The rigidity level is taken in the range of 0~31. Level 0 corresponds to the weakest rigidity and the smallest system gain; level 31 corresponds to the strongest rigidity and the largest gain. Depending on the type of load, the following empirical values are available for reference:

Table Empirical values of rigidity levels for general applications

Rigid level experience value	Type of load structure
Level 4~8	Some large machinery, where responsiveness and positioning accuracy are very low.
Level 8~15	Applications with low rigidity such as belts.
Level 15~20	Ball screw, direct link and other occasions with high rigidity requirements.

☆ **Associated parameters:**

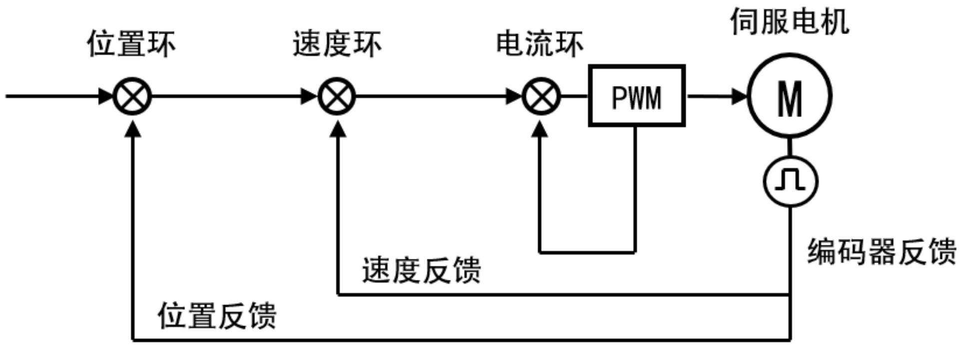
Parameter group	Serial number	Name	Unit	Data Range	Factory value	Change method	Effective method
P60	01	Position loop gain	Hz	0~1000	48	Shutdown settings	Downtime effective
P50	01	Speed loop gain	Hz	0.1~500	27	Shutdown settings	Downtime effective
	02	Speed loop integration time	ms	0.1~370	40	Shutdown settings	Downtime effective
/	/	Current given filtering time	ms	/	/	Shutdown settings	Downtime effective

注意

Be sure to obtain the correct load inertia ratio before using the rigid setting.
This manual was written based on the V11.2 servo firmware version. In this firmware version, the gain and rigidity parameters must be set and validated after disabling. If the firmware version is updated later, please check whether the firmware version supports online setting and online effect.

10.4.2 Manual gain adjustment

When the automatic gain adjustment does not achieve the desired effect, the gain can be manually fine-tuned to optimize the control effect through more detailed adjustment.
The servo system is a closed-loop control system composed of three control loops, from the outside to the inside in the order of position, speed and current loops whose basic control block diagram is shown below:



⚠ 注意

In servo control, the more inside the loop, the higher the responsiveness is required. Please follow this principle in the actual gain adjustment, otherwise it will lead to system instability!

PID structure of the AD3 drive current, speed and position controller:

Current, speed controller

The current and speed controllers in the AD3 series servo system use a PID architecture to ensure fast response while improving anti-disturbance capability. The designed PID controller architecture, after ignoring the filtering and other links in the forward and feedback channels, is shown in the following figure:

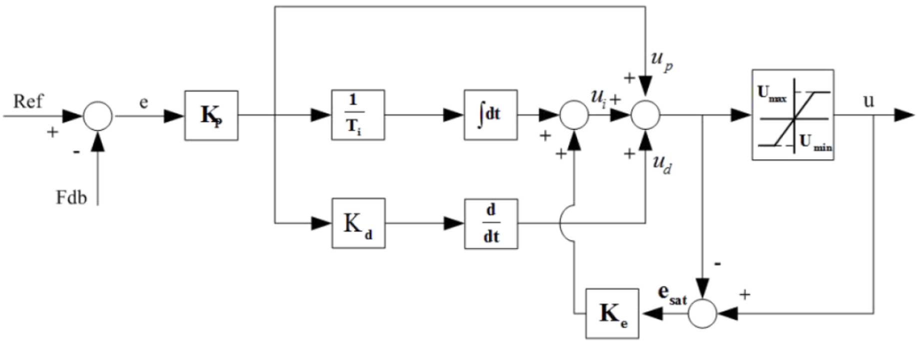


Figure - sketch of current and speed PID controller structure

Position Controller

The position controller in the AD3 series servo system uses a compound feedforward proportional regulator with a proportional + feedforward architecture to ensure fast response to position giving and to eliminate steady-state errors. Ignoring the filtering link in the controller, the framework structure of the designed position controller is shown in the following figure:

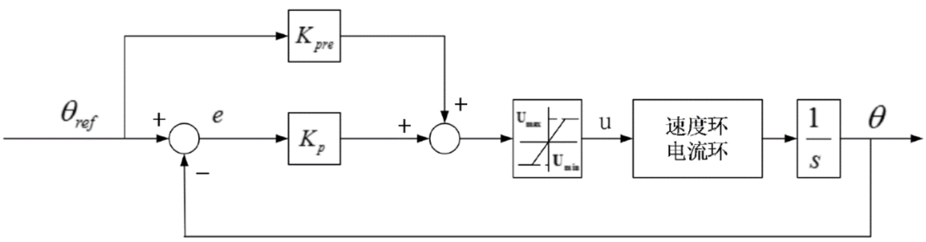


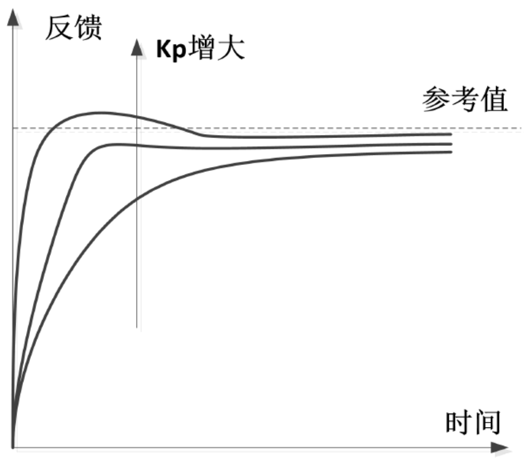
Figure - Position controller structure sketch

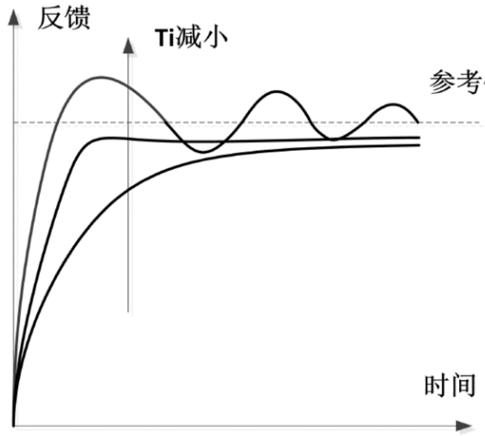
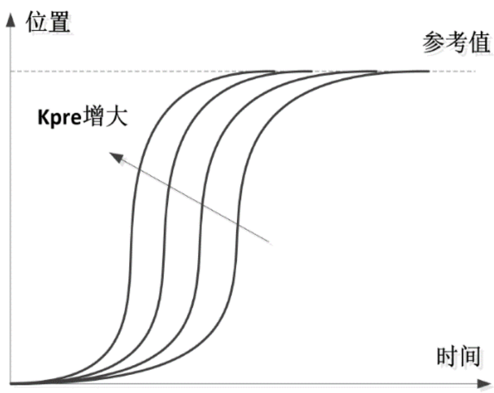
Position servo system does not allow position overshoot and oscillation to avoid production accidents such as crashing and machining scrap. If the integral controller is used, it will appear that when the position is given to reach the target value, the speed is still given to maintain a high value, and the motor runs at high speed thus causing position overshoot. To reduce the position control steady-state error, the proportional gain of the position controller needs to be increased, but too much gain will lead to system instability or oscillation, so the feed-forward control link is added to improve the position response of the servo system and eliminate the steady-state error.

PID parameter commissioning method

When gain adjustment, the more inside the loop, the higher the required responsiveness. Please follow this principle in actual gain adjustment, otherwise it will lead to system instability! Since the default current loop gain of the Servo Drive already ensures sufficient responsiveness, no adjustment is generally required. Only the speed loop, position loop gain and other auxiliary gains need to be adjusted. Therefore, when adjusting the gain in the position control mode, in order to ensure system stability, it is necessary to increase the position loop gain and also increase the speed loop gain, and ensure that the position loop response is lower than the speed loop response.

The role of each parameter in the PID is as follows:

PID parameter adjustment and role	
Name	Adjustment instructions
Proportional gain parameter Kp (position loop gain parameter; velocity loop gain parameter; current loop gain parameter)	Parameter role: Speeds up the response of the system and improves the regulation accuracy of the system. Adjustment method: With the increase of Kp, the response speed of the system is accelerated, and the regulation accuracy of the system is improved. However, the system is easy to produce overshoot, and the stability of the system becomes worse, even leading to system oscillation. too small a value of Kp, the regulation accuracy decreases, the response speed becomes slower, and the regulation time is longer, making the dynamic and static performance of the system worse. The trend of the step response when the proportional gain is varied is shown in the following figure: 
Integration time parameter Ti (velocity loop integration time parameter; current loop integration time parameter)	Parameter role: Elimination of system steady-state errors. Adjustment method: The smaller Ti is, the faster the steady-state error of the system will be eliminated, but Ti cannot be too small, otherwise the integration saturation phenomenon will occur in the early stage of the response process. But Ti is too large, the steady-state error of the system will be difficult to eliminate and affect the regulation

<table>
<tr><td></td><td>accuracy of the system. In addition, in the forward channel of the control system, as long as there is an integration link can always achieve a steady-state without static difference. From the point of view of phase an integration link has 90° of phase delay, which may destroy the stability of the system.
The trend of the step response when the integration time constant is varied is shown in the following figure:

</td></tr>
<tr><td>Differential parameter Kd (velocity loop differential parameter; current loop differential parameter)</td><td>Parameter role:
Improving the dynamic performance of the system, the main role of which is to suppress the deviation in any direction during the response and to forecast the deviation changes in advance.
Adjustment method:
Since the control loop of the AD3 servo system has a high-speed refresh rate, the use of a differential link is generally not required.</td></tr>
<tr><td>Feedforward gain coefficient Kper (position feedforward)</td><td>Parameter role:
Improves the position response of the system and eliminates steady-state errors.
Adjustment method:
Increasing the feedforward coefficient can improve the position tracking performance and eliminate the steady-state error faster, but too large a feedforward coefficient will still cause system instability. Decreasing Kper can improve the stability of the system, but the system response will become slower.
The effect of the feedforward scaling factor on the position tracking performance is shown in the following figure:

</td></tr>
</table>

☆ Associated parameters:

Current loop parameter adjustment

Serial number P40.01	Name	Current loop Kp			Setting effective	Break Enable	Data Range	0.1~99.99
	Access Properties	RW	Unit	0.01	Related Models	ALL	Factory settings	0.54
Serial number P40.02	Name	Current ring Ti			Setting effective	Break Enable	Data Range	0.1~999.9
	Access Properties	RW	Unit	0.1	Related Models	ALL	Factory settings	100

In general, the current loop does not need to be adjusted. The current curve in speed mode, or torque mode can be observed to analyze its followability, jitter, oscillation, and burr, and decide whether it needs to be fine-tuned according to actual needs.

Speed loop parameter adjustment

Serial number P50.01	Name	Speed loop gain 1			Setting effective	Break Enable	Data Range	0.1~500
	Access Properties	RW	Unit	Hz	Related Models	ALL	Factory settings	27
Serial number P50.02	Name	Speed ring integration time 1			Setting effective	Break Enable	Data Range	0.1~370
	Access Properties	RW	Unit	ms	Related Models	ALL	Factory settings	40

The velocity loop gain parameter can determine the velocity loop following performance when the load inertia ratio is set correctly. Increasing this parameter can speed up the positioning time and bring better speed following and stability without generating noise and vibration. If whistling or noise is generated, the parameter setting needs to be reduced.

The speed loop integration time can be used to eliminate the speed loop deviation. Reducing the integration time can strengthen the integration effect and speed up the positioning time, but too small a setting value is likely to cause mechanical vibration. If the setting value is too high, the deviation of the speed loop will not return to zero.

Position ring parameter adjustment

Serial number P60.01	Name	Position loop gain			Setting effective	Break Enable	Data Range	0~1000
	Access Properties	RW	Unit	Hz	Related Models	ALL	Factory settings	48
Serial number P60.02	Name	Position loop feedforward coefficient			Setting effective	Break Enable	Data Range	0~1000
	Access Properties	RW	Unit	%	Related Models	ALL	Factory settings	50

The position loop gain determines the frequency of position command changes that the position loop can follow. Increasing the setting value helps speed up the positioning time and improves the ability to resist external disturbances when the motor is stationary. However, too large a setting value is likely to cause system instability, oscillation, overload and other phenomena.

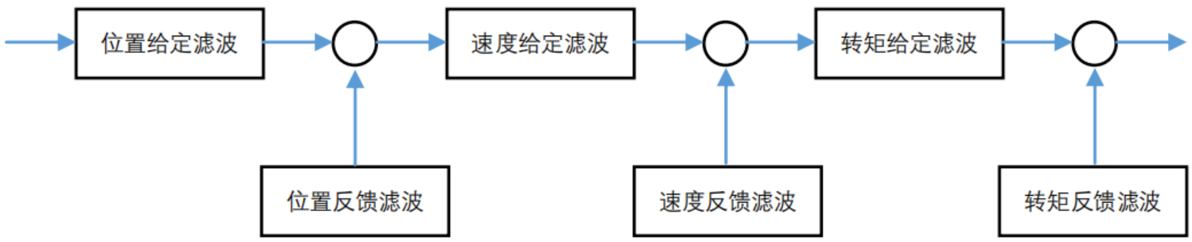
10.4.3 Vibration Suppression

The mechanical system has a certain resonance frequency, and when the servo gain is increased, it may resonate near the mechanical resonance frequency, resulting in the gain not being able to continue to increase.

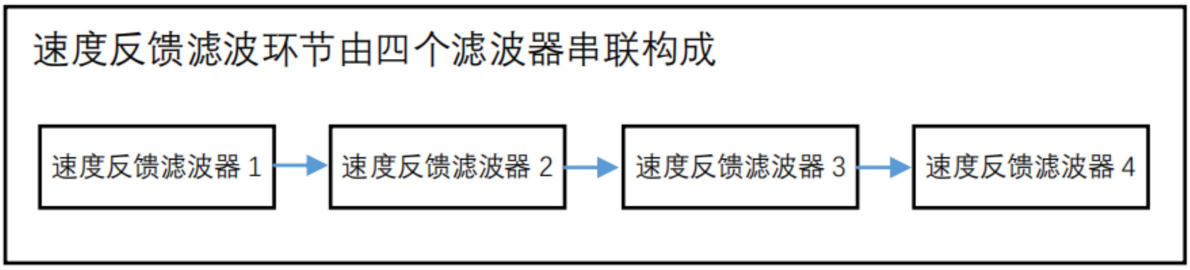
Suppressing mechanical resonance can be achieved by setting the filter reasonably, but if the filter parameters are set incorrectly, it will lead to system vibration or even damage the motor.

1) Filter structure

The AD3 servo system has 6 filters: torque feed, torque feedback, speed feed, speed feedback, position feed, and position feedback, and each filter contains 4 separate filter modules connected in series. Take the speed feedback filter set as an example, as shown in the following figure:



Note: Currently, the position giving and position feedback filter group is not valid, only the relevant interface is reserved.



Structure of the filter

2) Filter Function Introduction

The AD3 servo system contains a low-pass filter and a trap filter. The functions of these two filters are described below.

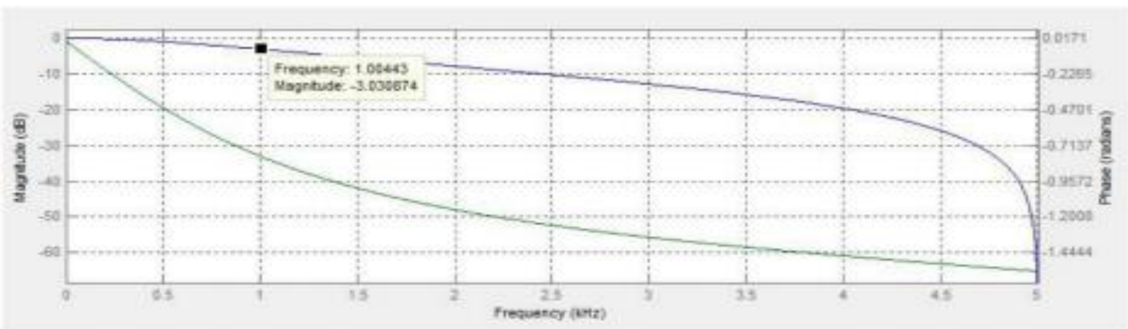
Low-pass filter

An ideal low-pass filter is a filter that allows signals below the cutoff frequency to pass, but not above it. The actual digital filter, however, attenuates the amplitude of the signal at a rate equal to the square of the cutoff frequency when the signal frequency is higher than the cutoff frequency.

The figure below shows the Byrd diagram of a first-order low-pass filter with a cutoff frequency of 1 kHz. The higher the input signal frequency, the stronger the filter's attenuation of the signal, and the greater the phase delay.

Second-order low-pass filters are more effective in attenuating signals after the cutoff frequency, but the phase delay at the cutoff frequency position is also greater. Third-order low-pass filters may cause overshoot and are not recommended for customers in servo systems.

AD3 Second-order low-pass filters are generally used in servo systems.

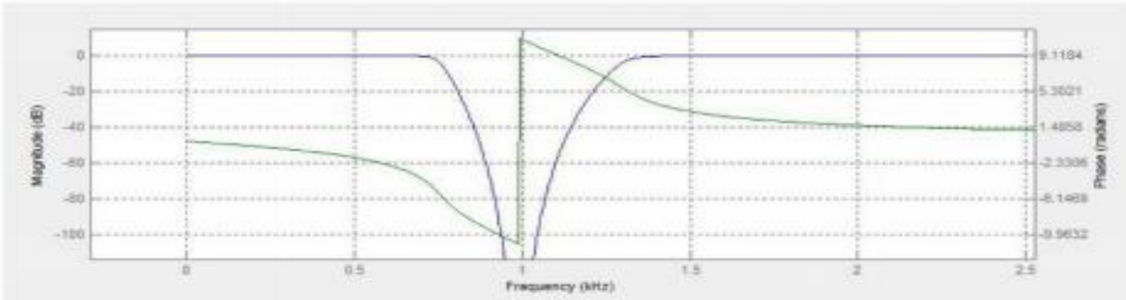


Bode diagram of low-pass filter

Notch filter

A notch filter, also known as a bandstop filter, is a filter that can pass most of the frequency components but attenuates some range of frequency components to very low levels.

The figure below shows the Byrd diagram of the second-order notch filter. The center frequency of the trap is 1 kHz, and the filter has the strongest attenuation effect on the signal near this frequency, and basically has no effect on the signal far from the center frequency. The greater the trap depth, the stronger the attenuation effect on the center frequency point.



Trap filter Bode diagram

Filter parameter setting

The speed feedback filter is composed of four filter modules in series: speed feedback filters 1, 2, 3 and 4. Each filter module has 4 control parameters, as follows:

P52.01	0: 不使用滤波器	0	4		否	第1速度反馈滤波器类型
P52.02	1000	200	5000	Hz	否	速度反馈1截止频率
P52.03	100	3	5000	Hz	否	速度反馈1陷波频率
P52.04	5	3	50	db	否	速度反馈1陷波深度

☆ Associated parameters:

Generally, notch filters are only used after vibration has occurred in the motor and the vibration frequency has been detected.

During the commissioning process, if you need to enable the filter, it is generally recommended to use the filter in the speed feedback or current feedback link. And speed giving with current giving. Caution:

- Before setting the filter, you need to rectify the inertia ratio, rigidity (position loop and velocity loop gain) parameters, and then configure the filter reasonably on the basis of the appropriate parameters.
- By default, a first-order low-pass filter with a cutoff frequency of 1000 Hz is added to the speed feedback link to facilitate proper filtering of interference or noise signals.
- If oscillation occurs, try increasing the filter cutoff frequency or turning off the filter enable.
- For industrial robots and enabling speed feedback low-pass filters, a cut-off frequency of not less than 2500 Hz is recommended.
- If the servo is in the position control mode, excluding the change of position and unsuitable parameters of the three rings, if the fluctuation of the speed is less than ±1.5‰, the default filter configuration can be used without modification. If the fluctuation is more than ±1.5

Parameter number P52.01	Name	Speed feedback filter type 1			Setting effective	Break Enable	Data Range	0~4
	Accessibility	RW	Unit	-	Related Models		Factory setting	0
	0:Do not enable the filter 1:First-order low-pass filter 2:Second-order low-pass filter 3:Second-order low-pass filter with zero point 4:Trap filter							
Parameter number P52.02	Name	Speed feedback 1 Cutoff frequency			Setting effective	Break Enable	Data Range	200~5000
	Accessibility	RW	Unit	Hz	Related Models		Factory settings	200
	This parameter is used to set the cutoff frequency of the velocity feedback filter type 1 when it is set as a low-pass filter. This parameter has no meaning when the Filter Type parameter is set to No Enable or Trap Filter.							
Parameter number P52.03	Name	Speed feedback 1 Trap frequency			Setting effective	Break Enable	Data Range	3~5000
	Accessibility	RW	Unit	Hz	Related Models		Factory settings	100
	When Speed Feedback Filter Type 1 is set to Trap Filter, this parameter is used to set its trap center frequency. This parameter has no meaning when the Filter Type parameter is set to Not Enabled or Low Pass Filter.							
Parameter number P52.04	Name	Speed feedback 1 Trap depth			Setting effective	Break Enable	Data Range	3~50
	Accessibility	RW	Unit	db	Related Models		Factory settings	5
	This parameter is used to set the trap depth of the velocity feedback filter type 1 when it is set as a trap filter. This parameter has no meaning when the Filter Type parameter is set to Not Enabled or Low Pass Filter.							

10.5 Encoder zero point correction

If the motor used is a servo motor of a brand other than AUCTECH, and the encoder is one of Tamagawa, Nikon, Panasonic or EnDat protocol, the encoder zero-point correction must be performed before the official operation. If you use a servo motor without encoder zero point correction, it will lead to lower performance of the drive, malfunction alarm, and serious risk of flying and other hazards to personal safety! Be sure to pay attention to.

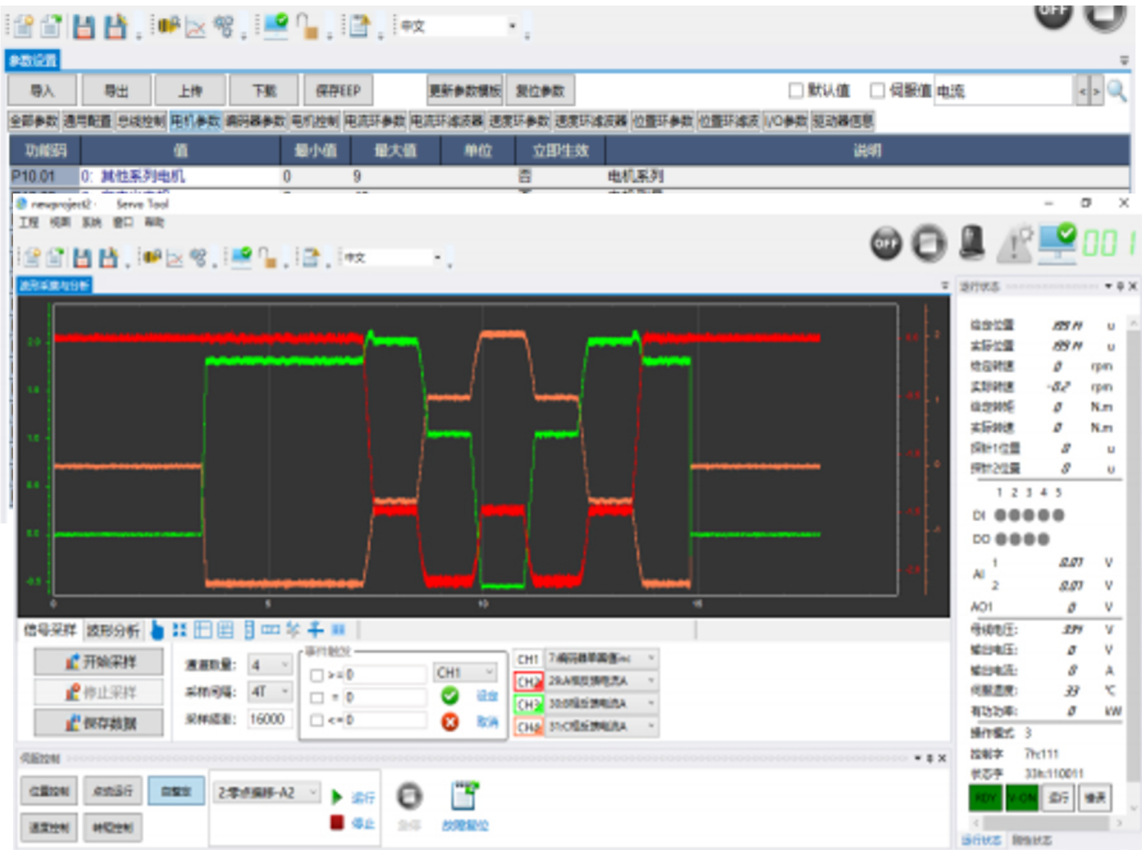
The following zero-point calibration is described for each encoder protocol type:

Tamagawa, Nikon, Panasonic encoder zero point correction

Make sure the motor is in bare shaft condition (the shaft is completely off the load to ensure zero calibration accuracy).

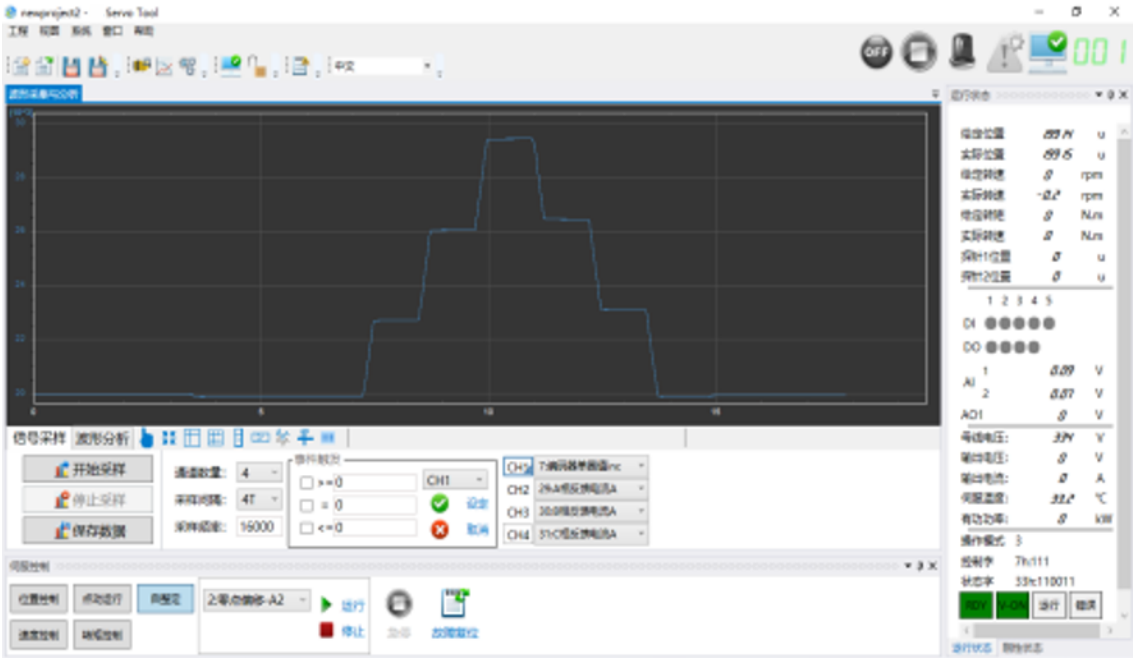
After properly wiring and connecting the servo motor to the AD3 driver, use the AD Set-up ServoTool commission software on the PC to connect the AD3 driver. Select "AD Set-up Commission Software Control" for P00.02 control channel and download the parameters.

Confirm that the servo is currently alarm-free, accurately input and confirm the motor parameters of the third-party servo motor, P10.01~P11.0C; P20.01~P20.03 Download the parameters after the parameters are correct, and restart the servo control power.

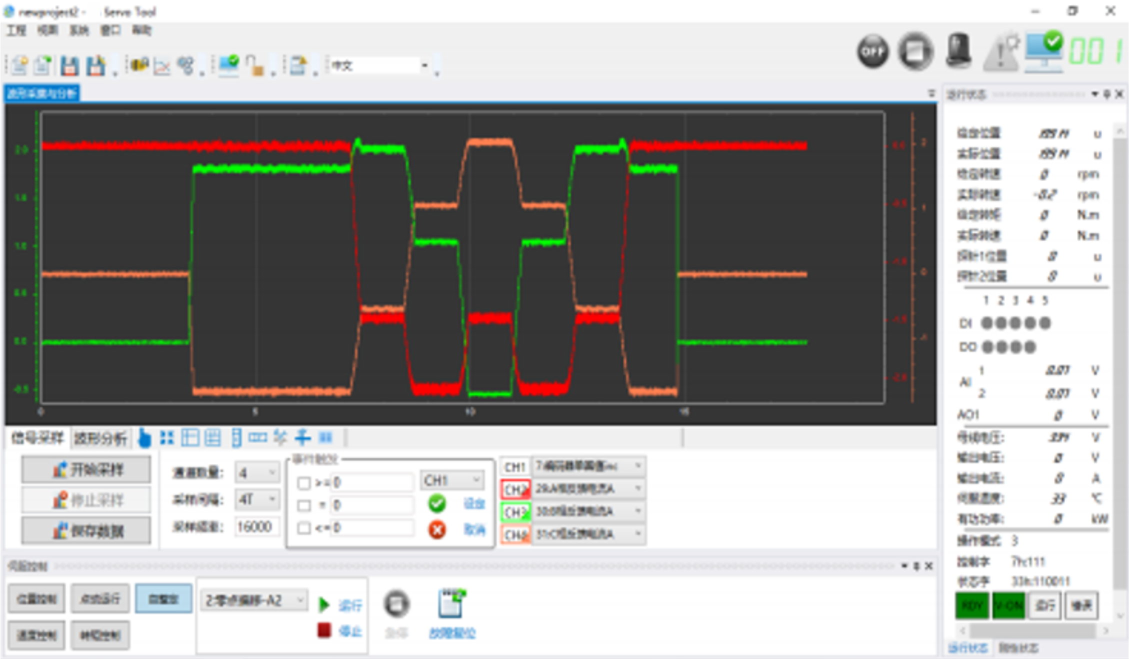


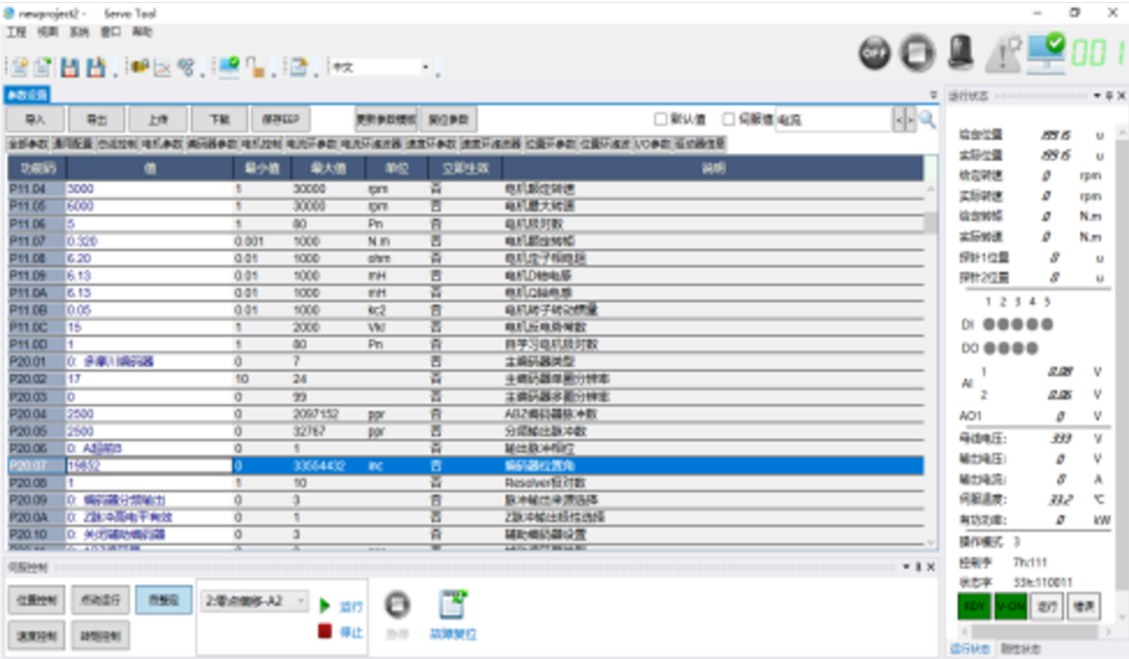
After reconnecting, switch to the "Servo Control" page, find the self-tuning area, select mode 2 "Zero Offset-A2", click the Run button below, and the servo motor will perform zero self-tuning.

The normal encoder zero state is that the servo motor will first automatically enable, then the motor shaft will turn counterclockwise 3 times (about 15° each time), then clockwise 3 times (about 15° each time), then the zeroing process will be completed, and the zeroing result will be written into the EEPROM of the motor



encoder, when the drive is re-powered, the result will be read from the encoder EEPROM, the zeroing result can be uploaded in The zero result can be uploaded in P20.07 for viewing.





This method ensures that after a successful zero calibration, the motor can be driven directly without the need for another zero calibration, even if the motor is replaced by another AD3 drive. However, occasionally there may be some reasons for the failure of zero calibration, then there will be a corresponding alarm, please refer to the troubleshooting section for details.

In some cases, the current loop Kp is too large, which may cause motor oscillation during zero calibration, resulting in false alarms such as out-of-phase, overload and so on. In this case, you can reduce the current loop Kp value (experience value Kp=0.54,Ti=100), and then download the zero calibration procedure again, and it will be successful.

If the third-party motor of Panasonic encoder is only for trial, the above method is not recommended because once the zero calibration result is written to the encoder EEPROM by "Zero Offset-A2", only the Servo Drive

of Coopers & Lybrand can recognize the zero calibration result in the future, and the original Panasonic drive may not recognize it.
Therefore, if the third-party motor is only for trial use, and later to use the original drive back to the case. We recommend using the "6: Zero Offset" zero calibration method, which follows the same procedure as the "Zero Offset-A2" method, except that the zero calibration result of the "6: Zero Offset" method is not written to the EEPROM of the motor encoder, but to the EEPROM of the drive. The result is not written to the EEPROM of the motor encoder, but to the EEPROM of the drive. When the drive is re-powered, the result is read internally and the data in the original encoder EEPROM is not erased, so when the third party motor is replaced with the original drive, it can continue to operate normally. However, the problem is that the third party motor must be used one-to-one with a drive that has been zeroed using the "6: Zero Shift" calibration! Please be sure to pay attention to.

10.6 Third-party motor usage

In practice, if you need to match the third-party servo motor, you need to strictly follow the following steps. Otherwise, the motor will not be used normally, and in serious cases, it will cause a serious danger to the safety of personal equipment such as flying, so please pay attention to it!
1) Verify that the servo motor type is a three-phase AC permanent magnet synchronous servo motor and that the voltage level matches the AD3 drive.
2) Confirm that the servo motor encoder type is one of the Tamagawa, Nikon, or Panasonic protocols.
3) Verify that the encoder pinout is securely connected according to the AD3 driver pinout definition, as described in the Wiring section.
4) Confirm that the power line phase sequence is correct (in some cases, the power line phase sequence will be opposite due to different manufacturers' customization, so be sure to pay attention when using)
5) Modify the parameters related to motor settings in the driver and download and save them.
6) After connecting the servo drive, use "58Ks" advanced password to log in. Upload parameters: Modify the control channel to "AD Debug Software Control", modify the motor configuration to "User Settings", download the parameters and restart with power off.

7) Confirm that the motor parameter data is filled in correctly
8) Modify the motor series as "0 Other series motors"
9) Modify the motor model to "0 Custom Motor"
10) Motor type is "0 synchronous motor"
11) According to the data provided by the third party motor manufacturer, fill in the motor parameters P11.01~P11.0C correctly.
Note in particular that the inductance and resistance in the AD3 drive motor parameters are phase-to-phase values; the unit of inertia is kgcm²; and the unit of counter potential is V/1000rpm.

P10.01	1: ASK200V 电机	0	9		否	电机系列
P10.02	7: ASK80-02430	0	40		否	电机型号
P10.03	0: 同步电机	0	2		否	电机类型
P11.01	0.75	0.01	200	kW	否	电机额定功率
P11.02	4.2	0.1	400	A	否	电机额定电流
P11.03	5.0	0.1	400	A	否	电机静态电流
P11.04	3000	1	30000	rpm	否	电机额定转速
P11.05	5000	1	30000	rpm	否	电机最大转速
P11.06	5	1	80	Pn	否	电机极对数
P11.07	2.390	0.001	1000	N.m	否	电机额定转矩
P11.08	0.58	0.01	1000	ohm	否	电机定子相电阻
P11.09	2.75	0.01	1000	mH	否	电机D轴电感
P11.0A	2.75	0.01	1000	mH	否	电机Q轴电感
P11.0B	1.57	0.01	1000	kc2	否	电机转子转动惯量
P11.0C	37	1	3000	Vkr	否	电机反电势常数

12) Make sure the encoder parameters are filled in correctly.
Fill in the P11.01~P11.0C encoder parameters correctly according to the data provided by the third party motor manufacturer.
If the encoder is a multi-turn absolute encoder and the actual position of the multi-turn is to be recorded, parameter P21.01 needs to be set to "1".
Modify the position tracking threshold size, typically to the resolution of one revolution of the encoder. For example, a 23-bit encoder is set to 8388608, a 20-bit encoder is set to 1048576, and a 17-bit encoder is set to 131072.

P20.01	0: 多摩川编码器	0	7		否	主编码器类型
P20.02	23	10	24		否	主编码器单圈分辨率
P20.03	16	0	99		否	主编码器多圈分辨率
P21.01	1: 是	0	1		否	编码器多圈故障使能
P60.0C	8388608	0	1073741824	inc	否	位置跟踪误差阈值

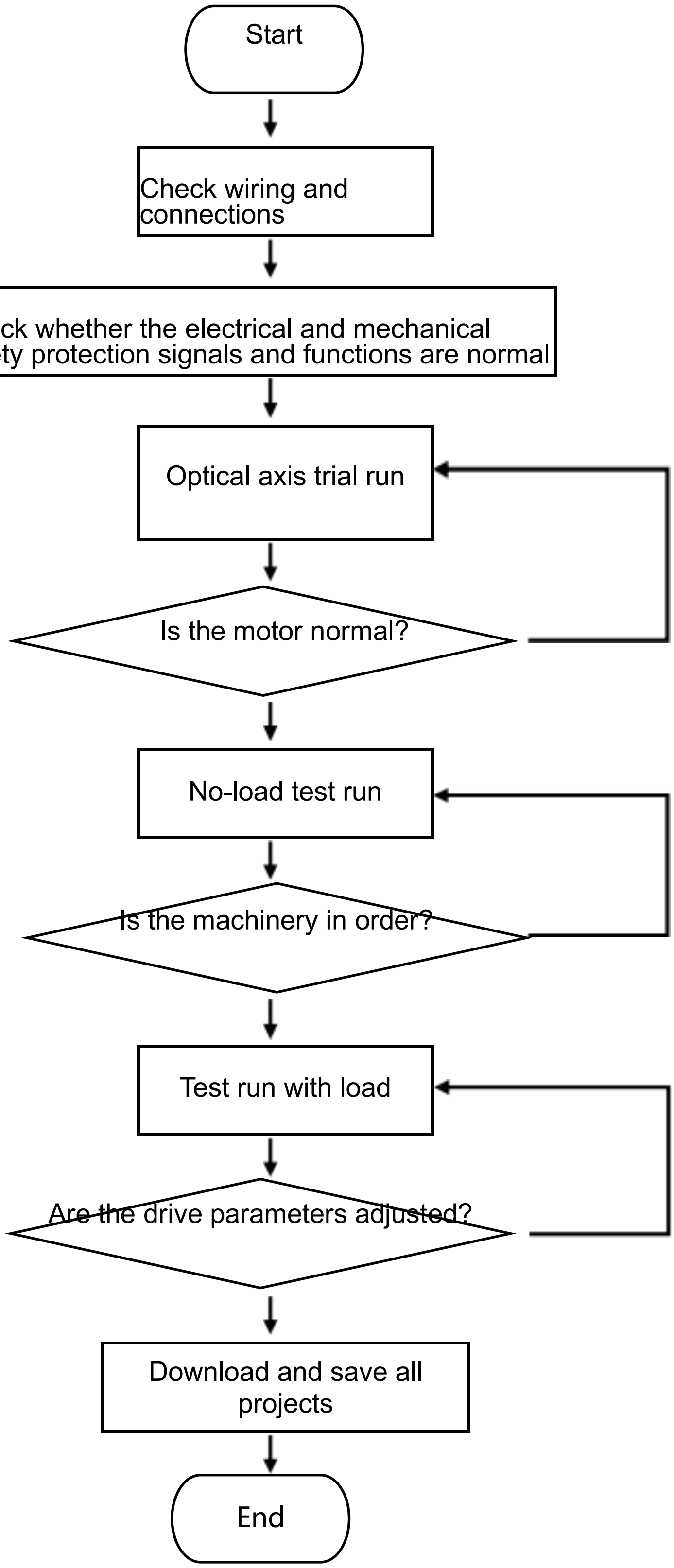
13) Download the parameters and restart the servo drive power.
14) Perform encoder zeroing operation (operate according to encoder zeroing chapter)
15) No-load test run.
16) Test run with load.

⚠ 注意

When using a third-party motor, be sure to verify that the motor current, overload factor, voltage level, and other parameters match the AD3 drive.

10.7 Trial run with AD ServoTool commission software

In order to check the effect of servo parameter adjustment and mechanical condition, please use ADServoTool commissioning software for a test run first to ensure that the drive parameters, electrical connections, signals, and mechanical aspects are correct.
For the trial run, follow these steps:

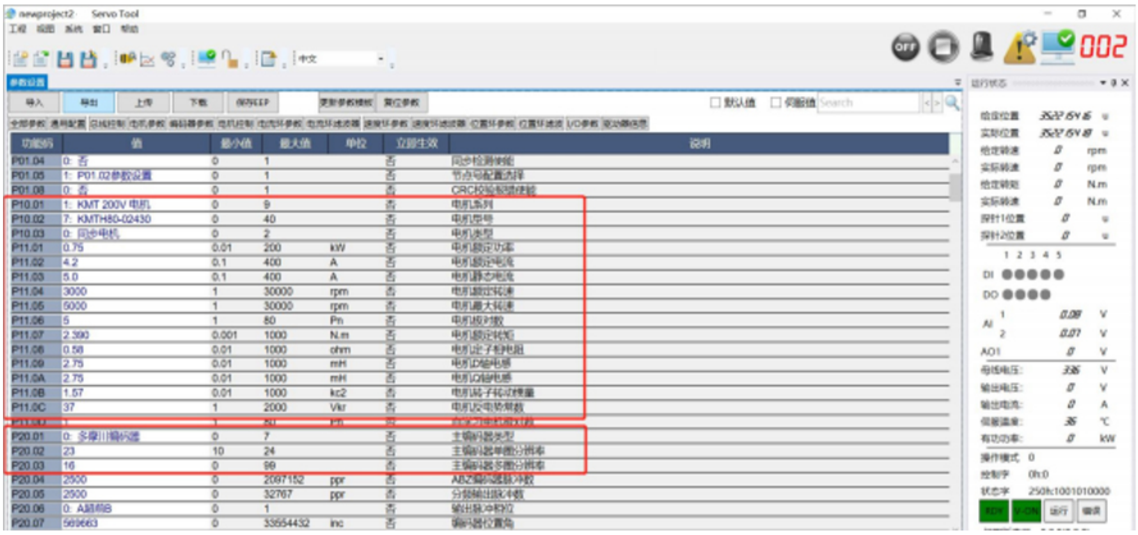


After making sure the wiring and connections are correct, use the "ADServoTool" software on the PC side to connect the drive.

After uploading the parameters, change the control channel selection to "AD Commission Software Control"

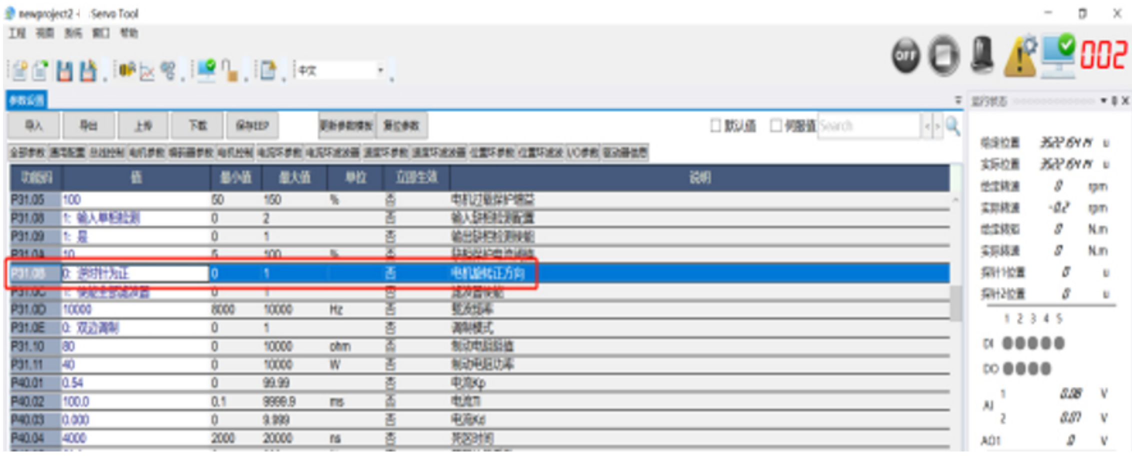
and download and save.

Upload the parameters again and confirm that the motor data and encoder-related settings are consistent with

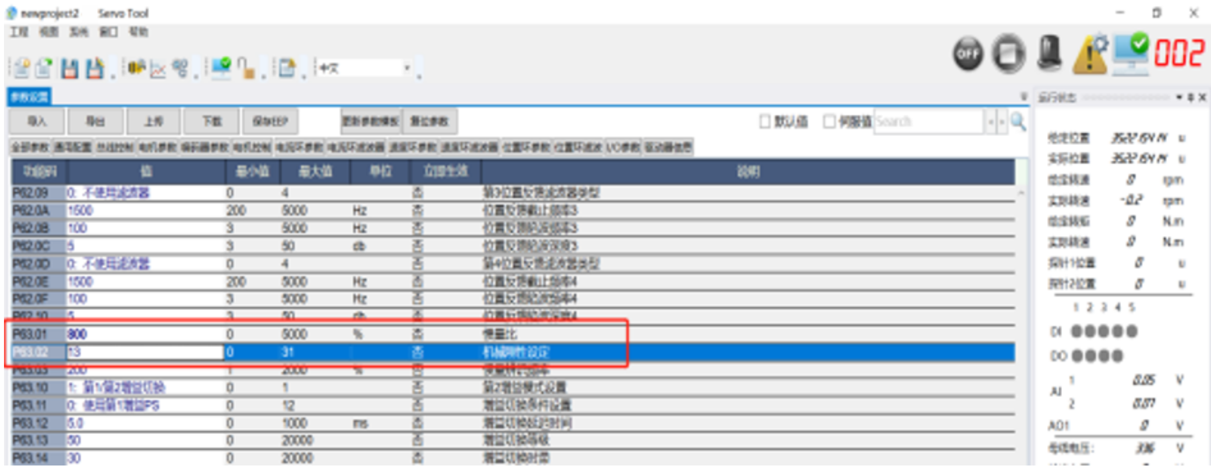


the actual motor.

Confirm that the direction of motor rotation is the same as the actual desired direction.



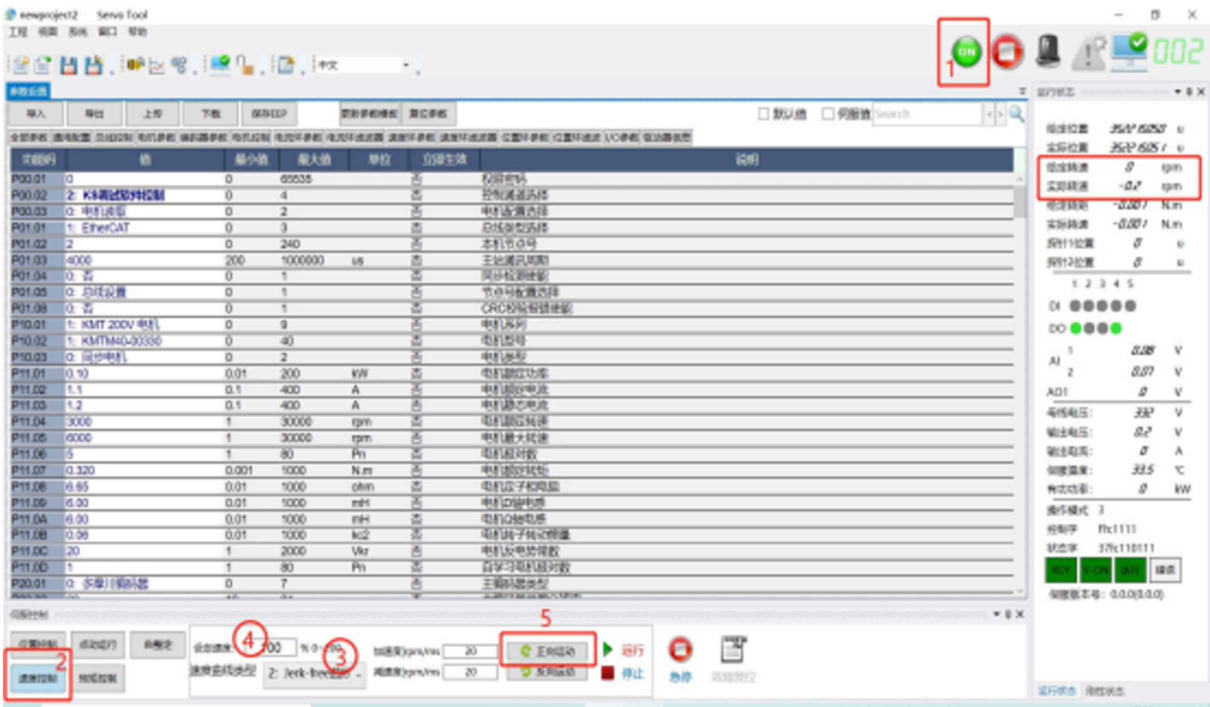
To check whether the stiffness setting and inertia ratio are within a reasonable range, please refer to the table "Experienced values of stiffness level for general applications".



Select the appropriate operating mode according to the load.

- **Speed runs using commission software:**

Speed mode operation means that the servo motor runs continuously according to the set acceleration and



deceleration speed with the target speed.

Click the toolbar "Enable" button to enable the servo.

a) Select the operation mode as "Speed Mode".

b) Set the speed curve type and acceleration/deceleration speed.

c) Fill in the running speed (or drag the scroll bar below to set) in percentage 100% = rated motor speed, it is recommended to set a lower running speed for easier observation, e.g. 2% or 5%.

d) Triggering the forward (or reverse) button will move at the set speed, and clicking the forward (or reverse) button again will stop the movement command.

e) After starting the motion, you can see the current given speed and the actual speed in the actual status area on the right side.

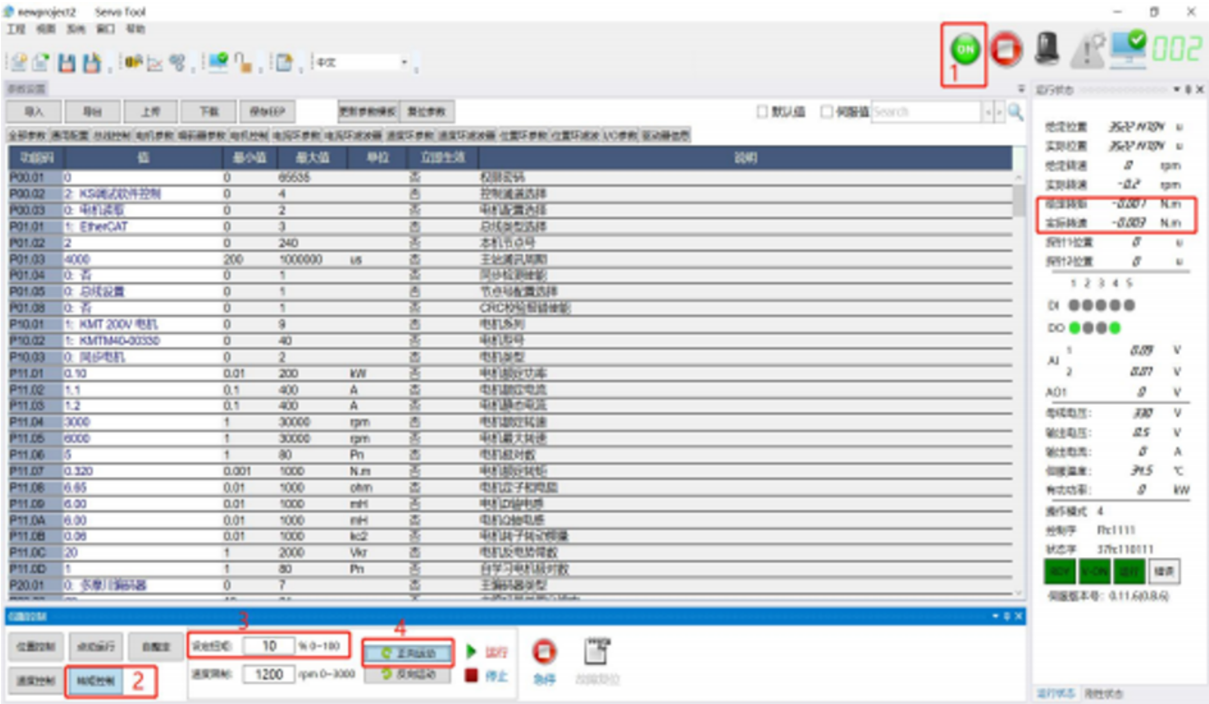
⚠ **注意**

The speed operation mode is suitable for applications with no mechanical limits and no mechanical interference, such as conveyor belts, conveying rollers, rewinding and unwinding. The motion mode cannot be used in applications with mechanical limits, such as screws, in order to prevent overtravel or collision of machinery by misoperation, which may cause harm to personal equipment.

- **Torque runs using commission software:**

Torque operation mode means, after setting the target torque and speed limit value. If the actual torque does not reach the target torque, it will continuously accelerate to the set speed limit value. If the actual torque reaches or exceeds the target torque, the motor will output according to the set torque, and the speed and position on the motor shaft will be determined by the actual external load at this time. For example, if the target torque is set at 10% and the external load force is also at 10%, the motor shaft will be stationary; if the external load force is greater than 10%, the motor shaft will be dragged to move in the direction of the overload force.

During the commissioning of some stations, the torque mode is used to simulate the actual operation. In this case, it is important to pay attention to the correct setting of torque and speed limits.



a) Click the toolbar "Enable" button to enable the servo.

b) Select the operation mode "Torque Mode" in the function area.

c) Set the running torque and speed limit, the unit of running torque is percentage, 100% = motor rated torque. The speed limit is the maximum speed in torque mode, generally used to protect machinery or materials when the set torque is not reached. The unit is RPM.

d) Triggering the forward (or reverse) button will move according to the set target torque and speed limit, and clicking the forward (or reverse) button again will stop the movement command.

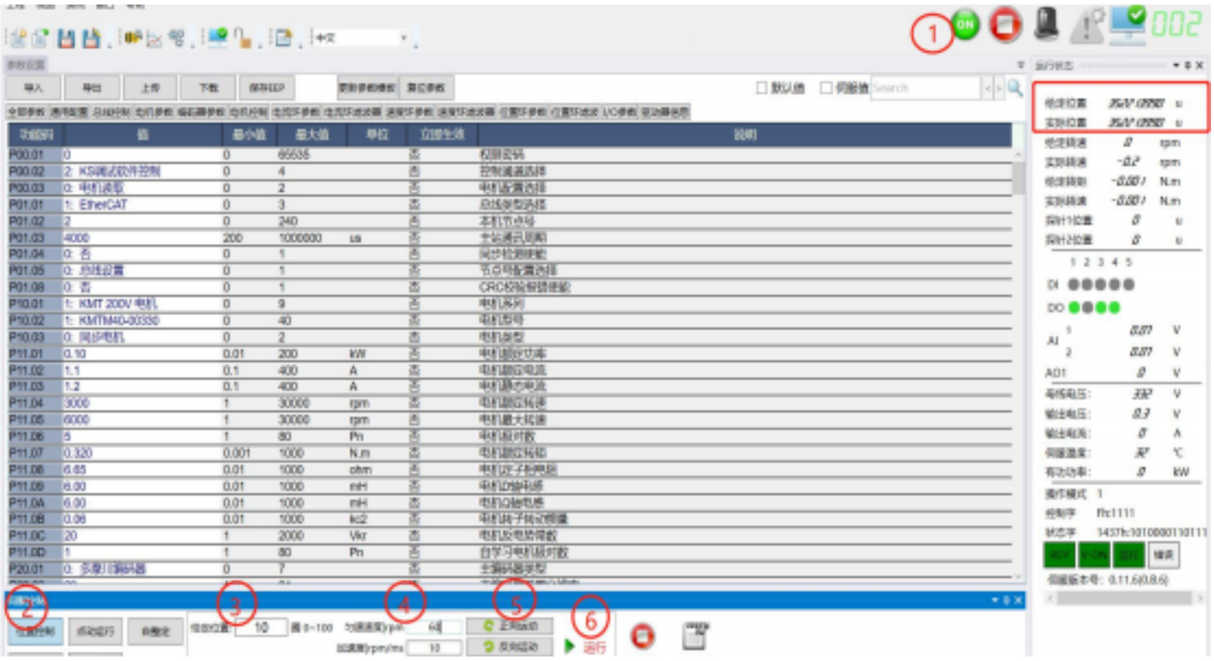
e) After starting the movement, the current given torque and the actual torque can be seen in the actual status area on the right side.

⚠ 注意

In the torque operation mode, please make sure to set the torque target value and speed limit value correctly, otherwise the machine may be overtraveled or collided due to misoperation, which may cause harm to personal equipment.

- **Position mode operation using commission software:**

Position mode means relative positioning control according to the set target position,target speed, acceleration and deceleration, etc. It is suitable for applications with mechanical limit requirements.



a) Click the "Enable" button on the toolbar to enable the servo.
b) Select the operation mode as "Position Mode" in the ribbon.
c) Set the relative target distance in laps, with a maximum setting of 100 laps.
d) Target speed and acceleration/deceleration setting, note that the acceleration/deceleration unit is rpm/ms.
e) Trigger the forward (or reverse) button to select the direction of relative positioning movement.
f) Trigger the "Run" button in the blinker to perform relative positioning movement according to the set target distance and speed.

⚠ 注意

In 0.9.3 and previous versions of the commission software, once the relative positioning motion is started, the motion cannot be interrupted. If it must be interrupted in an emergency, the motion can be stopped by breaking the enable, or by triggering the external emergency stop button. However, the stopping risks associated with free stopping of the load need to be considered at this point. To avoid such situations, please use the latest version of AUCTECH COM's commissioning software!

10.8 Sampling and analysis of data by commission software

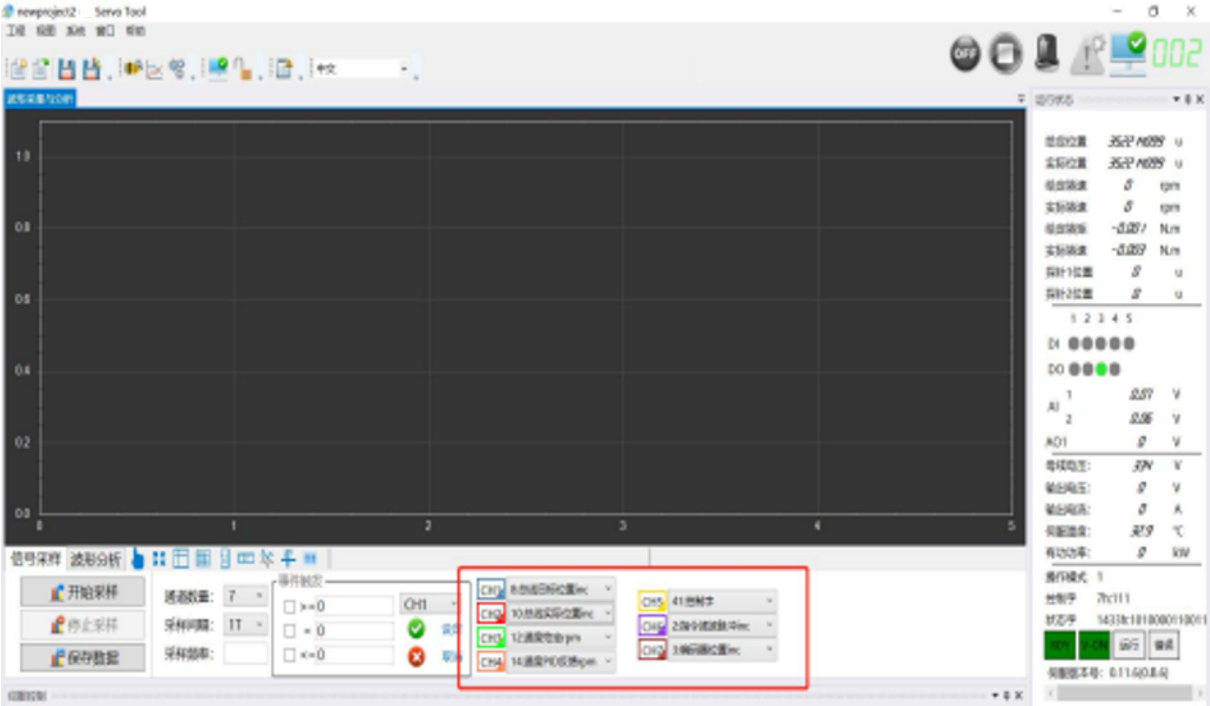
10.8.1 Signal Sampling

Usually, the commission process needs to analyze the curve data to determine whether the gain parameters have optimization space and adjustment direction. The following describes the steps of signal sampling:

1. Open the debug software, connect the servo driver, and find the "Signal Sampling" page. Configure the data channels to be acquired.
2. In general, we monitor the following channels to help analyze whether the system gain is appropriate.

Passage	Explanation
8	The target location under the bus, unit inc
9	The driver automatically interpolates the "target position from the bus" into the subdivided demand position according to the bus control cycle and the position loop cycle, in inc
10	Actual feedback position, in inc
12	Speed loop feed speed in rpm
16	Actual feedback speed in rpm
23	Current loop feed current in A
25	Actual feedback current in A

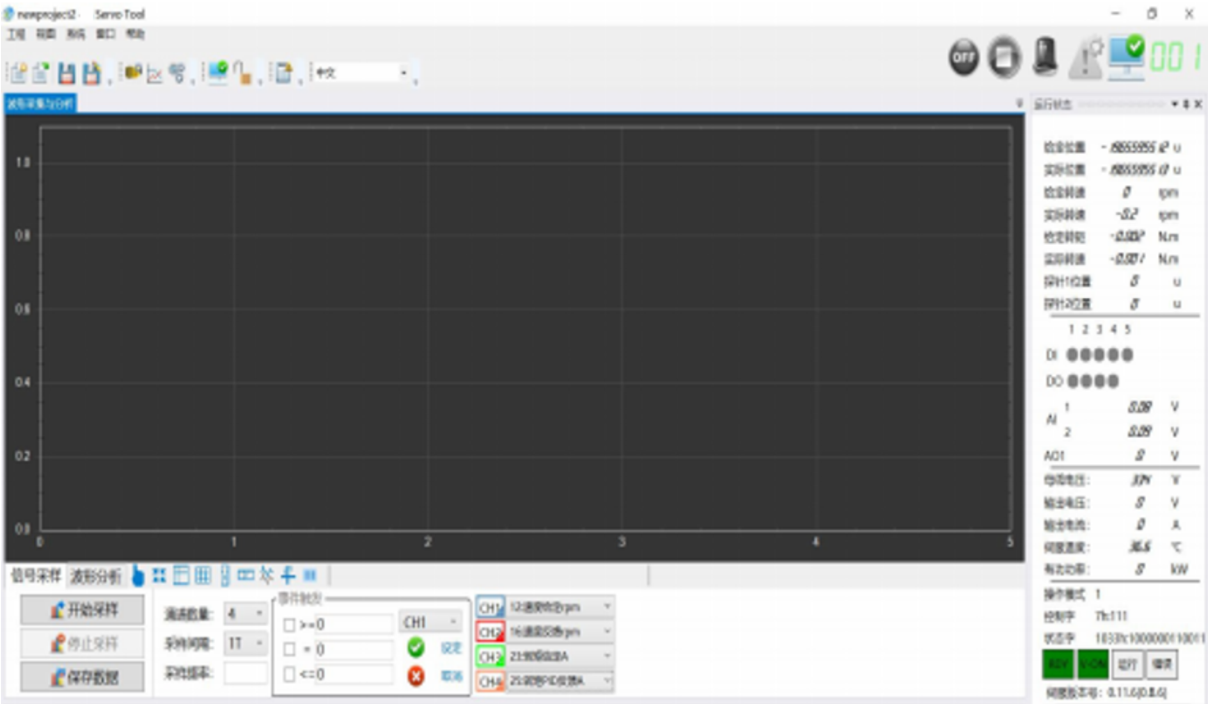
Note: Channel 8 is only available when the host computer is in control and is meaningless when using the AD commission software.



10.8.2 Example of speed loop gain adjustment

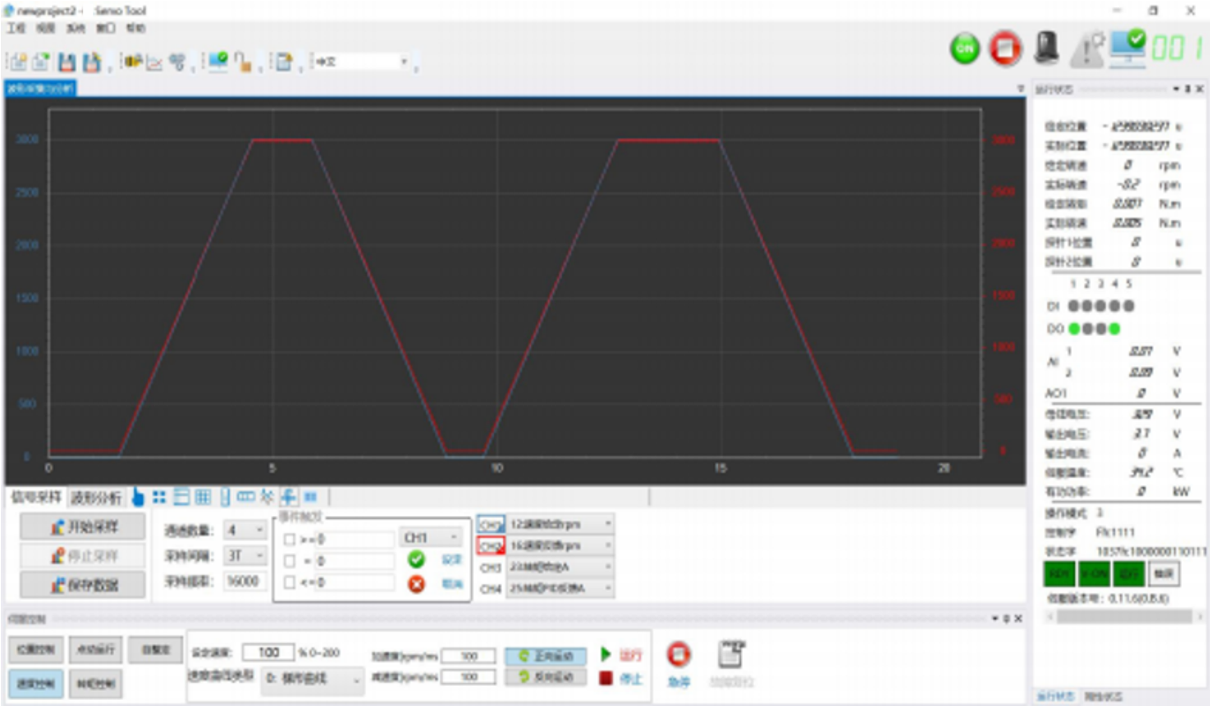
The following is an example of how to better adjust the speed loop gain by collecting and analyzing data curves.

1) After successfully connecting the servo driver, configure the relevant channels, select 12, 16, 23 and 25 channels for data acquisition, and click the "Start Sampling" button for data sampling.



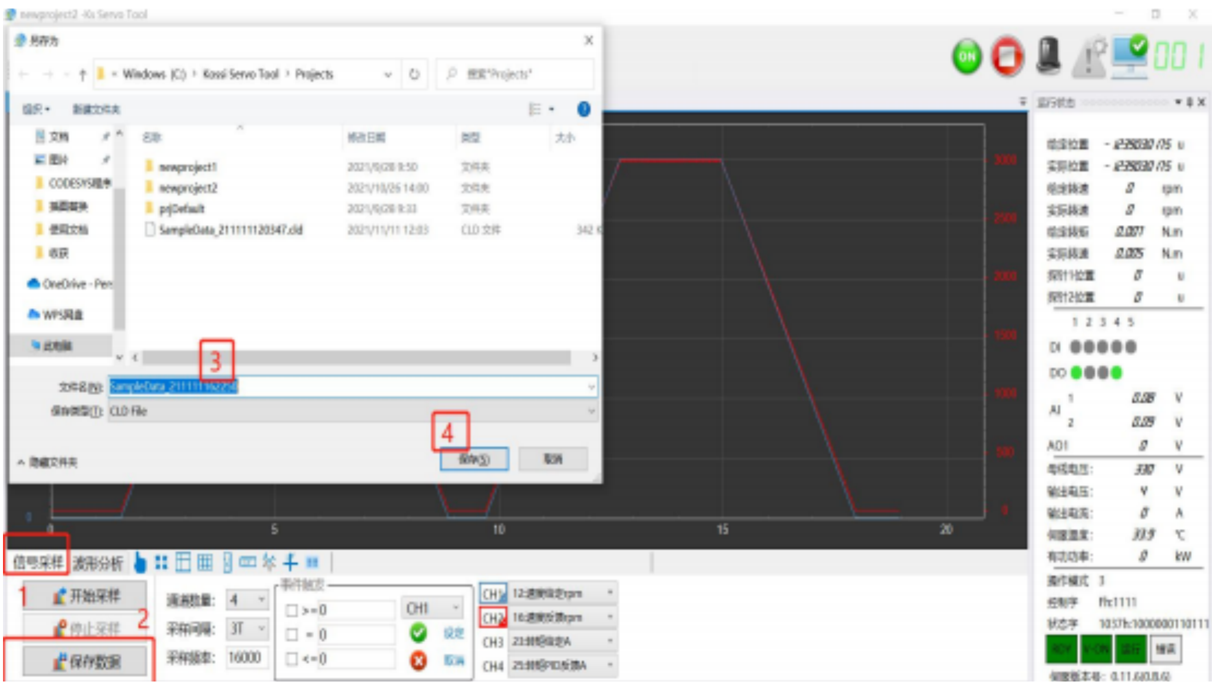
2) In the servo control page, select the speed mode after enabling, set the target speed and curve type and acceleration/deceleration.

Here we set 100% target speed; the curve is trapezoidal curve; acceleration and deceleration can be set to 100rpm/ms because it is no-load. Click the forward button to trigger the motion, and the data on the



monitoring page below will change accordingly.

3) Save the collection data.



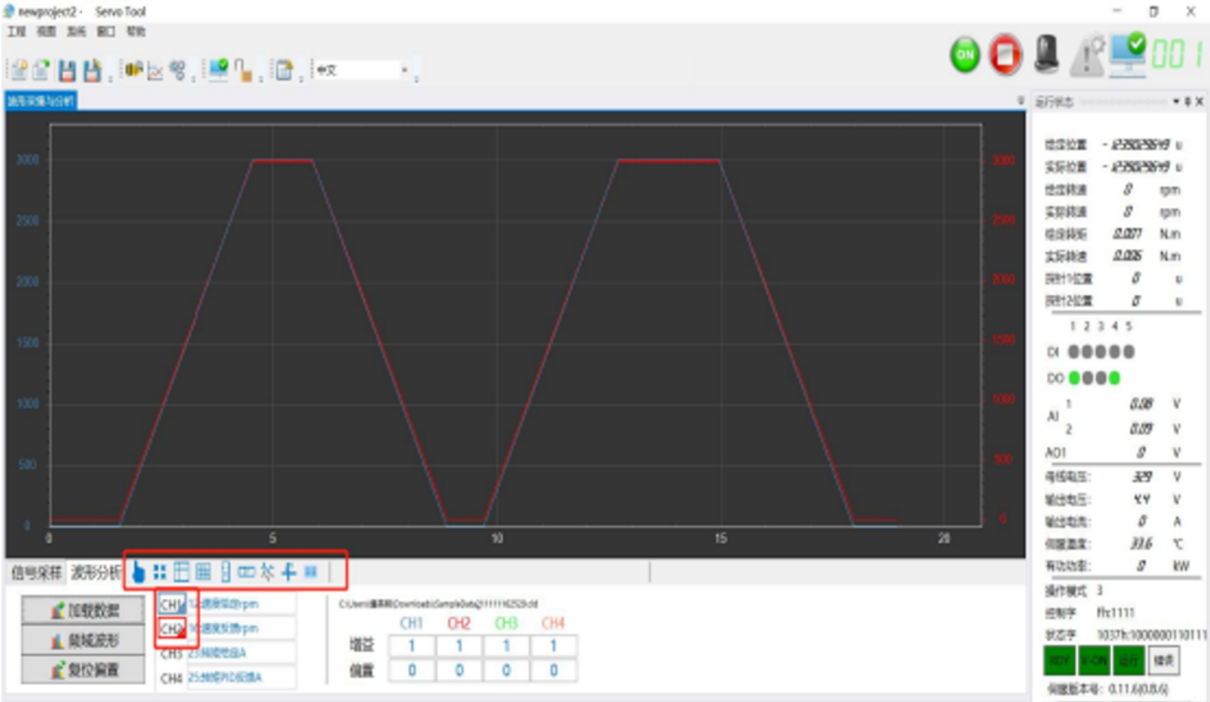
a) Stop the current sampling b) Save the current sampling data c) Select the path and name the save file name. By default it will be saved in the current project folder with the current system date as the file name. d) Save as a sample file.

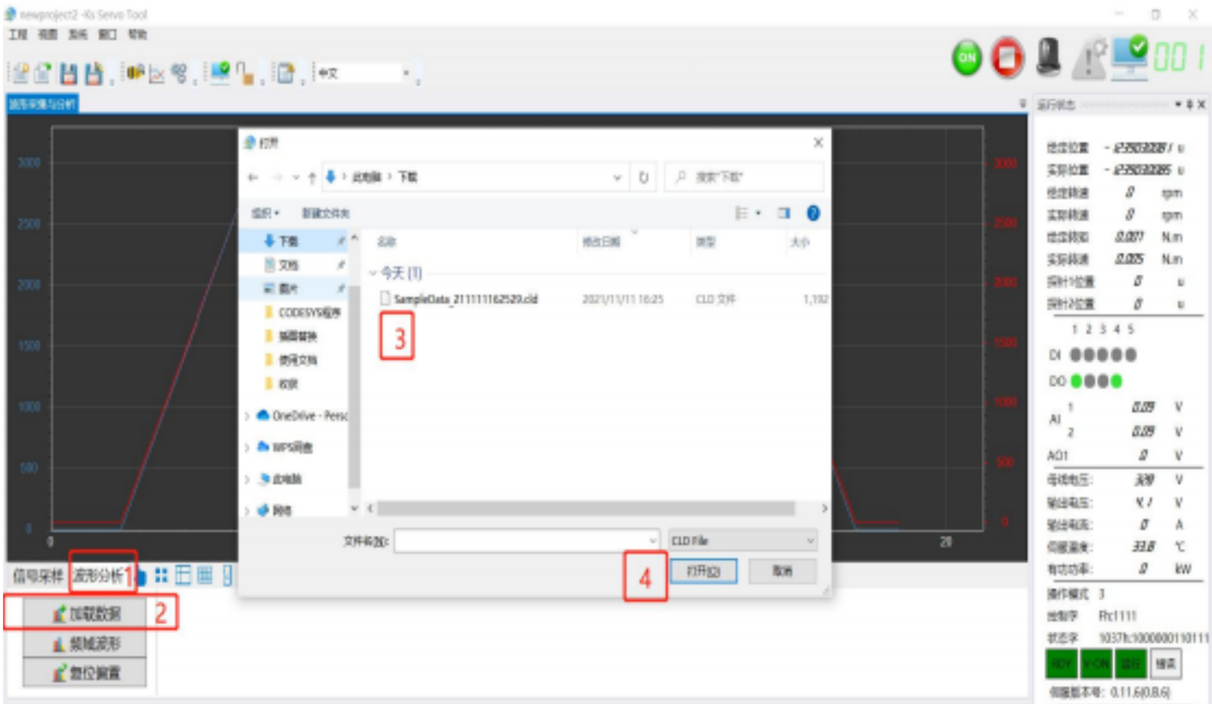
⚠ **注意**

The maximum number of data points in a single save file is 600,000; beyond this size, only 600,000 data points can be saved until the end of the sampling period (data points, one data point per channel per sampling period. The shorter the sampling period and the more samples, the shorter the total recording time).

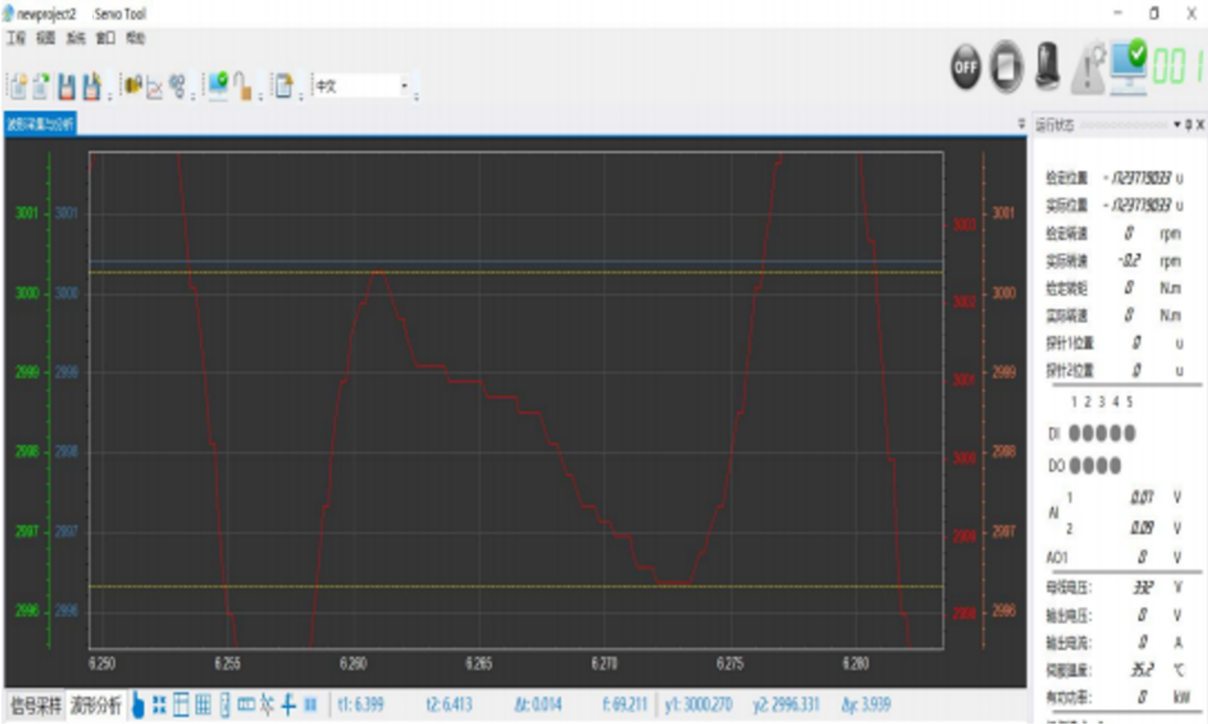
4) Waveform Analysis

After sampling the waveform file, it can be imported for detailed analysis.



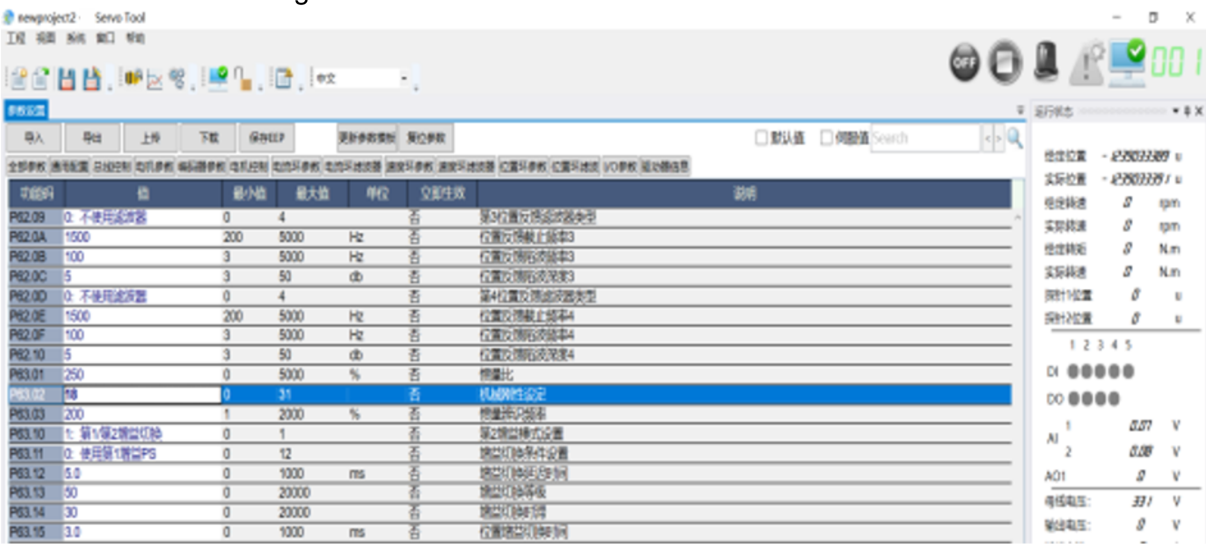


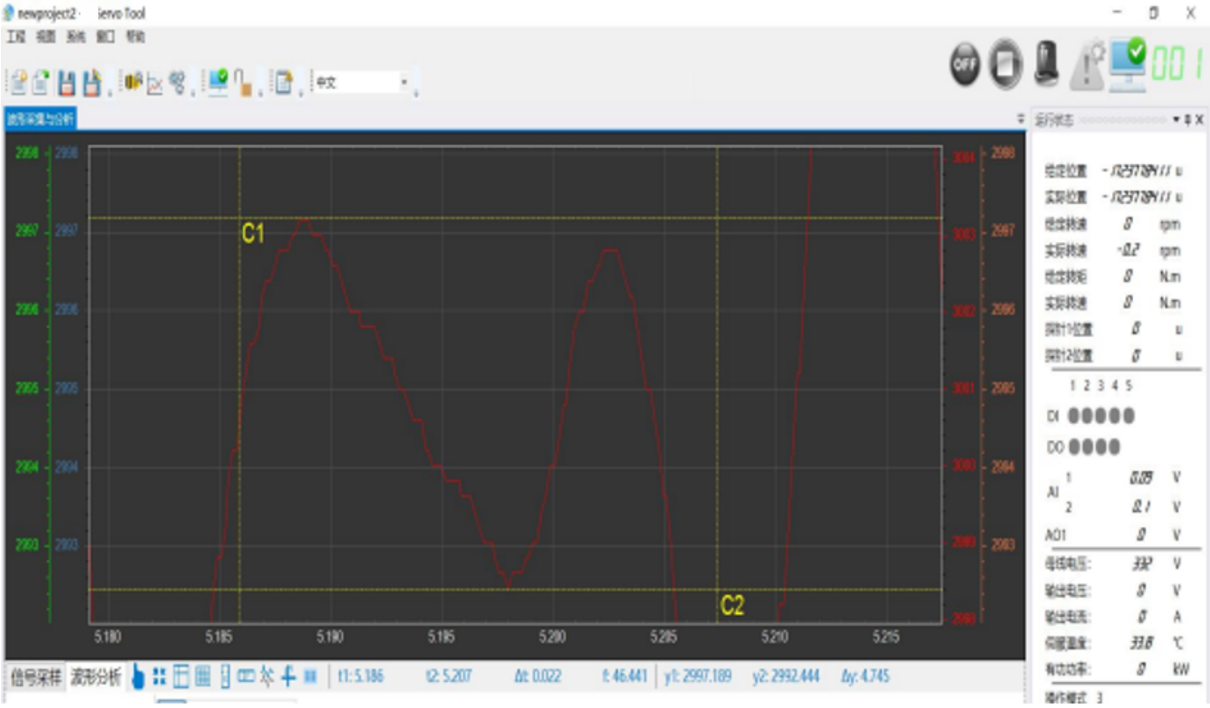
Click the "CH" icon on the left side of the data channel to check the data to be analyzed. The tool controls below can be used to zoom in and out, restorecursor measurement, align data coordinates, and other operations on the waveform.



The cursor measurement shows that the overshoot is 5‰ and there is no repeated adjustment, and it converges to the target speed within 132ms, so it is within the acceptable range and generally no optimization is needed.

However, we try to increase the system rigidity to 18, download and save. Run it again at the same speed and observe the effect of the changes.





After changing the rigidity of the system, the performance changed significantly and the overshoot was reduced to 2.6‰.

⚠ **注意**

This is only a demonstration of the adjustment under no-load condition, the actual system rigidity with load is too large, but more likely to cause overshoot and oscillation, please consider the appropriate system gain according to the actual situation when adjusting.

10.8.3 General experience of waveform analysis

1) For current waveform analysis

When the servo is in position mode or velocity mode, the current feed mainly depends on the first two links, so it is only necessary to observe that the actual current waveform does not oscillate, has no burr, and can follow the current feed waveform better. That is, the current loop response is considered good and no optimization is needed.

When a burr occurs, the first thing to analyze is whether it is caused by the given current. If it is not caused by the given current, then you need to analyze whether the grounding is good, whether there is resonance and so on. The current loop TI can be adjusted appropriately, or the current feedback can be second order filtered.

2) For speed waveform analysis

The main consideration is whether the actual speed feedback follows well, whether there is overshoot, oscillation. Whether the speed convergence time is too long, etc. If the actual speed feedback has a more serious burr, we need to analyze whether the grounding is good, whether there is resonance and so on. The speed loop TI can be adjusted appropriately, and second-order filtering can be applied to the speed feedback.

3) For position waveform analysis

Generally, when the velocity loop gain is adjusted correctly, the position loop is guaranteed, and only the actual position response needs to be considered at this point.

Section 11 Fault information and handling

11.1 Troubleshooting

Failure at start-up and handling

Start normal process

Drive wiring is correct, motor connection is normal

LED start-up process display

Power-on initialization

Drive is ready

Main power is on

The general phenomenon of abnormal starting and how to deal with it.

Failure phenomenon	Reason	Confirmation method
Digital tube does not light up	Control power supply voltage failure	Measure the AC voltage between L1c, L2c, normal should be AC220V.
	Firmware burn-in switch position error	Check that the firmware burn-in switch is at 0.
	Servo drive failure	Please contact AUCTECH after-sales service.
LED left one uppermost horizontal not light	Initialization failure or internal driver failure.	Please contact AUCTECH after-sales service.
LED left a middle cross not light	L1, L2 main power supply is not connected, or LED is damaged.	Measure the AC voltage between L1 and L2, see product information section for standard values.
LED with fault code flashing	Refer to the troubleshooting section to find the cause and troubleshoot	

注意

After the above troubleshooting, restart the power supply, the LED panel should be the display when the main power has been turned on.

11.2 Fault Code List

11.2.1 Fault classification

Servo Drive failures and warnings are graded according to severity and can be divided into three categories, category 1, category 2, and category 3. On the severity level, category 1 > category 2 > category 3, the specific classification is as follows:

Class 1 Non-resettable faults.

Class 2 Resettable faults.

Category 3 Resettable warnings.

Resettable means that the fault display can be cleared after a reset signal is given.

There are two ways of resetting the operation:

Reset using the AD commissioning software interface reset button, valid only when controlled by AD commissioning software.

The reset operation of bit7 of control word 6040 using the upper computer is valid only when the upper computer is controlling.

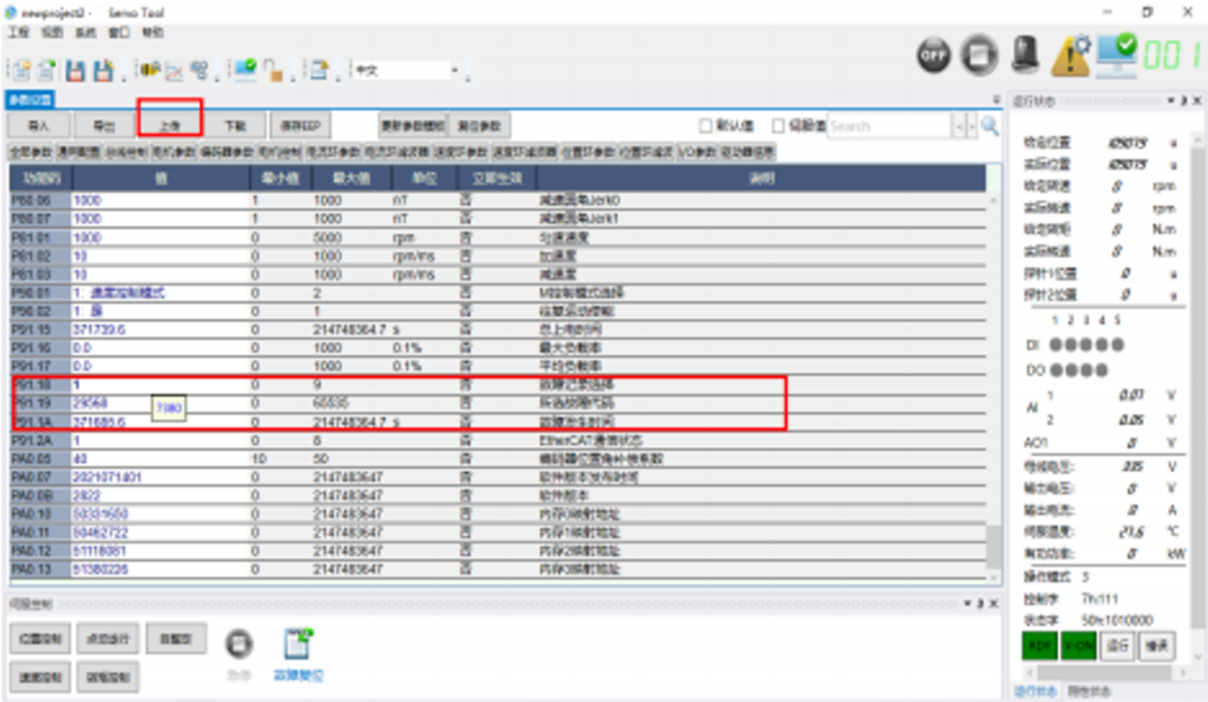
11.2.2 Fault and warning logs

The AD3 Servo Drive has a fault log function that records the last 10 faults and warning codes, as well as the system time when the fault occurred. After the fault or warning is reset, the fault record will still save the change fault and warning.

The AD commission software allows access to the fault code records as follows:

Use AD commission software to view historical fault records

Use USB to connect the driver with the commission software on the PC.



1) Click Upload Parameters to upload the driver information.
2) The history of faults can be displayed in the three parameters P91.18, P91.19 and P91.1A.

Parameter Code	Examples	Explain by example
P91.18	0	The most recent fault, with larger numbers representing earlier faults, the maximum number being 9.
P91.19	29568	This is shown as a decimal number, need to manually convert to hexadecimal, decimal 29568 that is, 7380 in hexadecimal, that is, E73.80 Encoder connection failure.
P91.1A	660135.9	The system time in seconds at the moment of the fault.

11.2.3 List of fault codes

LED Display	Fault Definition	Fault Type	Fault stopping time sequence (*1)	CiA402 fault code
no.SS	Emergency stop effective	-	-	/
no.STO	STO function in effect	-	-	/
E.2230	Busbar overcurrent	Resettable fault	1	2230h
E.2310	Continuous overcurrent	Non-resettable fault	1	2310h
E.2320	Output overcurrent	Non-resettable fault	1	2320h
E.2340	Software Overcurrent	Resettable fault	1	2340h
E.2350	Module overload (I²T)	Non-resettable fault	1	2350h
E.3130	Input out of phase	Resettable fault	0	3130h
E.3210	Servo overvoltage	Resettable fault	0	3210h
E.3220	Servo undervoltage	Resettable fault	1	3220h
E.3380	Output phase sequence error	Resettable fault	1	3380h
E.3381	Output out of phase	Resettable fault	1	3381h
E.4310	Servo overtemperature	Resettable	0	4310h
E.5210	Power ID error	Non-resettable fault	1	5210h
E.5280	Driver internal error 1	Non-resettable fault	1	5280h
E.5281	Driver internal error 2	Non-resettable fault	1	5281h
E.5282	Driver internal error 3	Non-resettable fault	1	5282h
E.5283	Inertia identification error	Resettable fault	0	5283h
E.5284	Parameter check error	Resettable fault	0	5284h
E.5480	Servo overload	Resettable fault	1	5480h
E.7180	Motor overload (I²T)	Resettable fault	0	7180h
E.7181	Motor contracting brake failure	Resettable fault	0	7181h
E.7182	Braking resistor overload	Resettable fault	0	7182h
E.7380	Encoder connection error	Non-resettable fault	1	7380h
E.7381	Encoder battery undervoltage	Non-resettable fault	0	7381h
E.7382	Encoder battery disconnected	Non-resettable fault	0	7382h
E.7383	Encoder overheating	Non-resettable fault	0	7383h
E.7384	Encoder count error	Non-resettable fault	1	7384h
E.7385	Encoder overspeed	Non-resettable	1	7385h

		fault		
E.7386	Internal encoder failure	Non-resettable fault	1	7386h
E.7387	Motor information error	Non-resettable fault	1	7387h
E.7388	Missing encoder zero point	Non-resettable fault	1	7388h
E.7581	EtherCAT Communication Failure	Resettable fault	0	7581h
E.7582	Wrong sync period setting	Resettable fault	0	7582h
E.7591	EtherCAT communication initialization error	Resettable fault	0	7591h
E.7592	ECAT EEPROM error	Resettable fault	0	7592h
E.8480	Same direction speeding	Resettable fault	1	8480h
E.8481	Reverse speeding	Resettable fault	1	8481h
E.8482	Exceeds maximum speed	Resettable fault	0	8482h
E.8483	Excessive speed tracking error	Resettable fault	0	8483h
E.8484	Super poor acceleration	Resettable fault	1	8484h
E.8485	Motor stall	Resettable fault	1	8485h
E.8611	Excessive position deviation	Resettable fault	0	8611h
E.8612	Instruction given to detect exceptions	Resettable fault	0	8612h
E.8613	Positive motion prohibition	Resettable fault	0	8613h
E.8614	Reverse motion prohibition	Resettable fault	0	8614h
E.8615	Limit abnormal signal	Resettable fault	0	8615h
E.9834	Ai configuration error	Resettable fault	0	9834h
E.9835	Limit signal abnormal	Resettable fault	0	9835h
E.9837	Downward pressure exceeds tolerance	Resettable fault	1	9837h
E.9838	Lower pressure overshoot	Resettable fault	1	9838h
E.9839	Pressure retention time out	Resettable fault	0	9839h
E.9840	Pressure setting too small	Resettable fault	0	9840h
E.9841	Pressure setting is too large	Resettable fault	0	9841h
E.9842	Excessive pressure in lower pressure operation	Resettable alarm	0	9842h
E.9843	Sensor failure	Resettable fault	0	9843h

⚠ **注意**

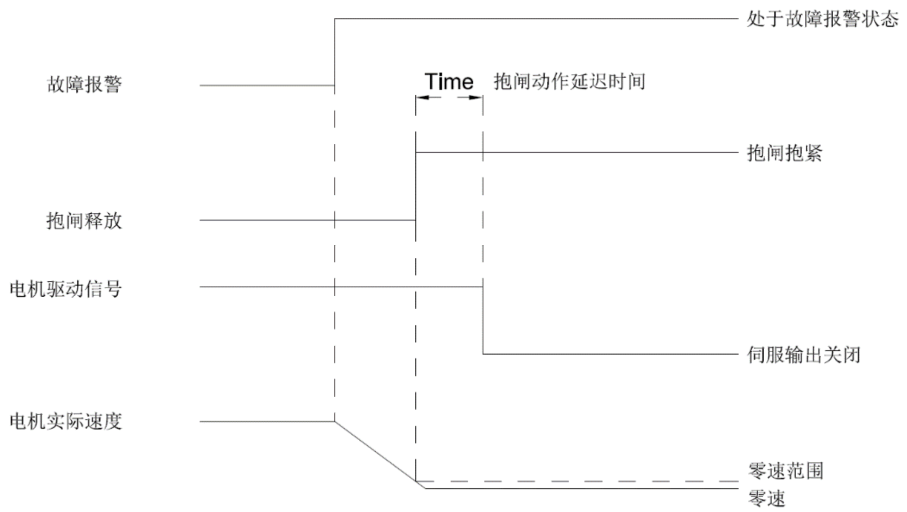
SS is used to indicate that the servo is in emergency stop status, which is a normal status display and does not represent servo failure.

STO is used to indicate that the servo is in STO status, which is a normal status display and does not represent servo failure.

11.2.4 Explanation of Fault Stop Timing

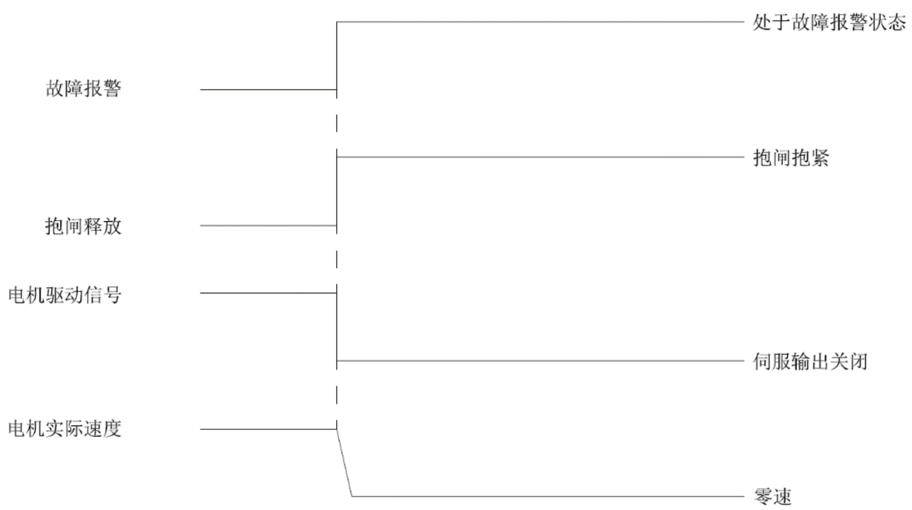
Fault Stop Timing 0: means that the drive is still controllable when this fault occurs. After a fault occurs, the drive internally uses an emergency stop to reduce the motor speed to the zero-speed range, after which the contracting brake is shut off (if the motor has a contracting brake) before finally shutting down the motor output.

Fault Stop Timing 0 Timing Chart



Fault Stop Timing 1: means that the drive is not controllable at the time of this fault. Immediately after the fault occurs, the drive will shut down the contracting brake (if the motor has a contracting brake) and shut down the motor output at the same time.

Fault Shutdown Timing 1 Timing diagram:



11.2.5 Troubleshooting methods

1) LED display: no.SS

Fault definition: Emergency stop in effect

Generation mechanism: Servo emergency stop input is valid and triggers the servo emergency stop function.

Reason	Treatment
Servo emergencies stop function is triggered Parameter logic parameter setting error	Checking that the external emergency stop button has not been pressed. Checking external emergency stop lines for broken wires or other causes. Check that the emergency stop input signal logic is consistent with the valid logic configured in the servo drive. Check that the emergency stop wiring is correct according to the wiring section in the user manual. Check that the parameter 0x3070:06 emergency stop normally open/normally closed logic is set correctly.

2) LED display: no.STO

Fault definition: STO function in effect

Mechanism: Since the STO function is normally closed, signal triggering, line interruption, unconnected terminals, and incorrect use of high- and low-level logic will cause the STO function to take effect, thus causing the state.

Reason	Treatment
Servo STO function is triggered	Checking that the external STO button is triggered. Checking the external STO line for broken wires or other causes. Whether the STO terminal is loose or missed. Check that the STO wiring is correct according to the wiring section in the user manual.

3) LED display: 2230

Fault definition: busbar overcurrent

Mechanism: The servo internally detects that the current on the DC bus is greater than the drive's specified overcurrent point.

Reason	Treatment
DC bus voltage is too high	Checking whether the grid voltage is too high. Check for rapid shutdown of large inertia loads, or no energy braking.
There is a short circuit on the outside	Test the servo power output wiring for short circuit, short circuit to ground, and short circuit to brake resistor.
Encoder failure	Checking that the encoder is not damaged and that the grounding is correct. Check whether the encoder cable shield is well grounded and whether there are strong interference sources near the cable.
Servo internal device damage	Please contact the after-sales staff for maintenance by professional technicians. This error needs to be checked and eliminated after power off and reboot

4) LED display: 2310

Fault definition: continuous overcurrent

Generation mechanism: The servo internally detects multiple module overcurrents in a short period of time.

Reason	Treatment
There is a short circuit on the outside	Test the servo power output wiring for short circuit, short circuit to ground, and short circuit to brake resistor.

Encoder failure	Check that the encoder is not damaged and that the grounding is correct; Check whether the encoder cable shield is well grounded and whether there are strong interference sources near the cable.
Motor parameters or wiring errors	The actual motor used does not match the motor parameters set by the user, e.g. the actual motor is 4-pole and the configuration is 5-pole. Or the motor encoder is 17 bits and the configuration is 23 bits, etc. The motor encoder is not zeroed, or the zeroing data is missing. Motor wiring faults, such as power line phase shorts, etc.
External load causes	The load inertia ratio is too large, causing the motor to fly after this fault is easily caused.
Servo internal device damage	Please contact the after-sales staff for maintenance by professional technicians. This error needs to be eliminated by checking for errors and then powering off and restarting.

5) LED display: 2320

Fault definition: Output overcurrent

Generation mechanism: The servo internally detects that the phase current is greater than the overcurrent point specified by the driver.

Reason	Treatment
DC bus voltage is too high	Checking whether the grid voltage is too high; Check for rapid shutdown of large inertia loads, or no energy braking.
There is a short circuit on the outside	Test the servo power output wiring for short circuit, short circuit to ground, and short circuit to brake resistor.
Encoder failure	Check that the encoder is not damaged and that the grounding is correct; Check whether the encoder cable shield is well grounded and whether there are strong interference sources near the cable.
Exception for speed setting command **Motor parameters or wiring errors**	Check if the speed setting command is normal The actual motor used does not match the motor parameters set by the user, e.g. the actual motor is a 4-pole motor and the configuration is a 5-pole motor. Or the motor encoder is 17 bits and the configuration is 23 bits, etc. The motor encoder is not zeroed, or the zeroing data is missing. Motor wiring faults, such as power line phase shorts, etc.
External load causes	The load inertia ratio is too large, causing the motor to fly after this fault is easily caused. Load jamming.
Servo internal device damage	Please contact the after-sales staff for maintenance by professional technicians. This error needs to be eliminated by checking for errors and then powering off and restarting.

6) LED display: 2340

Fault definition: software overcurrent

Generation mechanism: The servo output phase current sampling value is greater than the overcurrent point specified by the servo driver.

Reason	Treatment
There is a short circuit on the outside	Test the servo power output wiring for short circuit, short circuit to ground, and short circuit to brake resistor.

Encoder failure	Check that the encoder is not damaged and that the grounding is correct. Check whether the encoder cable shield is well grounded and whether there are strong interference sources near the cable.
Motor failure	The actual motor used does not match the motor parameters set by the user, e.g., the actual motor is 4-pole, and the configuration is 5-pole. Or the motor encoder is 17 bits, and the configuration is 23 bits, etc. The motor encoder is not zeroed, or the zeroing data is missing. Motor wiring fault, such as power line is missing phase or phase sequence error: check whether the servo power output wiring phase sequence is normal, whether the phase is missing.
Servo internal device damage	Please contact the after-sales staff for maintenance by professional technicians. This error needs to be eliminated by checking for errors and then powering off and restarting.

7) LED display: 2350
Fault definition: Module overload (I^2T)
Mechanism: The temperature rise of the module is greater than 75 degrees, and the temperature rise is greater than 60 degrees when used in derating.

Reason	Treatment
Power Module Overload	Replacement of higher power servo drives;
Motor power cable failure	Check the wiring on the servo output side according to the operating procedures to exclude leakage, disconnection, phase sequence error, short circuit, etc.
Motor blocking	Check whether the motor load is too large, or there is mechanical jamming, or the contracting brake is not opened properly.

8) LED display: 3130
Fault definition: input out of phase
Generation mechanism: There is a problem with the servo main power input.

Reason	Treatment
The main power input circuit wiring is abnormal, missed connection or there is a broken wire	Check the wiring on the input side of the servo main power supply according to the operating procedures, and exclude the phenomenon of leakage, broken wire and false connection.
Servo main power input terminal is loose	Check whether the terminal connection is stable, whether the terminal wiring is loose or falsely connected, and measure whether the power supply voltage is within a reasonable range.
The configuration of the drive detection parameters does not match the actual power supply	The driver parameter P31.08 does not match the actual power supply, for example, if the parameter is configured as "input three-phase detection", but the actual power supply is single-phase, it will cause a fault alarm.

9) LED display: 3210
Fault definition: Servo overvoltage
Generation mechanism: AC 400V servo drive, DC bus voltage higher than 810V, and last 6ms; AC200V level servo drive, DC bus voltage higher than 410V, and last 6ms.

Reason	Treatment

High power supply input voltage	Detect the phase to phase voltage of the servo input main power supply, whether it is higher than the maximum working voltage allowed for the drive
Excessive fluctuations in power supply voltage	Check the input power supply, reset the fault alarm after the supply voltage is restored to normal, and restart the servo driver
Servo braking when the braking energy is too large, not connected to the braking resistor, or braking resistor resistance value is too large, or braking resistor damage, etc.	Check if the braking resistor is normal and the connection is firm Select the appropriate braking resistor resistance value and power

10) LED display: 3220

Fault definition: Servo undervoltage

Generation mechanism: AC 400V servo drive, DC bus voltage below 380V, and last 2ms; AC200V level servo drive, DC bus voltage below 160V, and last 2ms.

Reason	Treatment
Power input voltage too low	Test the phase-to-phase voltage of the servo input main power supply to see if it is below the minimum operating voltage allowed for the drive.
Servo work, the instantaneous load is too large, exceed the rated overload power time limit	Please use according to the maximum overload factor and overload time limit of the actual drive.
Instantaneous power failure, or the power supply voltage fluctuates too much	Check the input power, and after the supply voltage is normal, reset the fault alarm and restart the servo drive.
Loose power terminals	Check the wiring on the input side of the servo main power supply according to the operating procedures to exclude loose and false connections.
Load devices with large starting currents in the same power system	Improve the power supply system to ensure that the servo drive power environment meets its specification values.
Servo internal device damage	Please contact after-sales staff for maintenance by professional technicians

11) LED display: 3380

Fault definition: output phase sequence error

Mechanism: The actual running direction of the servo motor is opposite to the given direction, or the actual running electric angle deviates too much from the given electric angle.

Reason	Treatment
Servo output power line sequence error	Check the servo power output wiring according to the operating procedures to exclude phase sequence errors, omissions, and Disconnection, etc.
Incorrect encoder resolution setting	Check encoder single-turn resolution configuration. The encoder is self-tuning with an electrical angle of 45 degrees per sub-turn. Electrical angle = Encoder increment value / number of pulses per revolution * 360 * number of motor pole pairs
Wrong configuration of motor pole pairs	Check the number of motor pole pairs
Mechanical blockage or excessive load	Check whether the mechanical rotation is normal and the load is reasonable

Check 0x3021:04 parameter settings	Adjust the 0x3021:04 parameter appropriately, not to exceed 150%

12) LED display: 3381

Fault definition: Output out of phase

Mechanism: The servo driver's three-phase current output is abnormal.

Reason	Treatment
The servo output circuit wiring is abnormal, or there is leakage, broken wire, loose false connection, and other phenomena	Check the wiring of the servo output circuit according to the operating procedures to exclude leakage, broken wire, misconnection, loose false connection, and other phenomena.
Loose servo output terminal	Check the wiring of the servo output circuit according to the operating procedures to exclude leakage, broken wire, misconnection, loose false connection, and other phenomena.
Three-phase output unbalance	Check whether the motor winding is normal and whether the resistance value between the three phase windings is equal.
Motor and driver mismatch	When the rated motor current is less than 1/5 of the rated drive current, the output phase loss detection function may be abnormal, so please replace the matching drive. If such a situation is needed for temporary commissioning, set the parameter P31.09 "Output out-of-phase detection enable" to "0" to block this fault alarm.

13) LED display: 4310

Fault definition: Servo over temperature

Generation mechanism: For AC200V class driver, the internal temperature of servo exceeds 85℃; for AC200V class driver, the internal temperature of servo exceeds 90℃.

Reason	Treatment
High ambient temperature	Reduce the ambient temperature and enhance ventilation and heat dissipation.
Abnormal servo cooling system	Check whether the cooling fan is running normally, whether the speed and airflow are normal, and if there is any abnormality, the cooling fan needs to be replaced. Check whether the heat dissipation channel is blocked by foreign objects, and whether there are cables or foreign objects around the heat dissipation space to block the heat dissipation effect.
The actual braking power of the built-in braking resistor is too large	Follow the instructions to calculate whether the actual braking power meets less than the maximum heat dissipation power. If the actual braking power is too large, please external braking resistor
Temperature detection circuit failure	Contact after-sales staff for maintenance by professional technicians.

14) LED display: 5210

Fault definition: Power ID error

Mechanism: Unrecognized driver board ID number, possible causes include hardware damage or assembly error.

Reason	Treatment
Power ID detection fault	Please contact the after-sales staff for maintenance by professional technicians.

15) LED display: 5280

Fault definition: Driver internal error 1

Generation mechanism: drive internal hardware or software failure, please contact after-sales.

Reason	Treatment
Servo drive internal failure	Please contact after-sales staff for maintenance by professional technicians

16) LED display: 5281

Fault Definition: Driver Internal Error 2

Generation mechanism: drive internal hardware or software failure, please contact after-sales.

Reason	Treatment
Servo drive internal failure	Please contact after-sales staff for maintenance by professional technicians

17) LED display: 528

Fault Definition: Driver Internal Error 3

Generation mechanism: drive internal hardware or software failure, please contact after-sales.

Reason	Treatment
Servo drive internal failure	Please contact after-sales staff for maintenance by professional technicians

18) LED display: 5283

Fault definition: Inertia recognition error

Mechanism: The fault is caused when the deviation between the actual torque feedback value and the torque value required by the given acceleration theory is large or the actual inertia ratio is greater than 50 times during the self-tuning process.

Reason	Treatment
Excessive load inertia ratio	Please select or optimize the load inertia ratio according to the actual situation, as detailed in the relevant section of the adjustment.
Wrong setting of inertia recognition frequency	According to the actual load situation, choose the appropriate inertia identification frequency, see the relevant content of the adjustment chapter for details.
Inappropriate rigidity gain setting for inertia discrimination	Select the appropriate system gain for inertia identification according to the actual load conditions, as described in the adjustment chapter.

19) LED display: 5284

Fault definition: Parameter check error

Mechanism: The drive checks the parameters stored in the drive EEPROM during power-up, and this fault is caused when an abnormal parameter is detected.

Reason	Treatment
Power-on self-test, servo storage parameters exceed the allowable range.	After this failure, please sample channels 71, 72 and 74 through the debug software signal sampling function, save the samples and observe the results. Please contact the after-sales staff for maintenance by professional technicians.

20) LED display: 5480

Fault definition: Servo overload

Mechanism: When the actual servo output power exceeds 1,1 times the rated power, the duration exceeds 120 seconds.

Reason	Treatment
Output power exceeds rated power by 1.1 times and lasts 120S	Please select or optimize the load or replace the servo drive with a higher power according to the actual situation.
Motor power line failure	Check the wiring on the servo output side according to the operating procedures to eliminate short circuits, missed connections, broken wires, wrong phase sequence, etc.
Motor blocking	Check whether the motor is overloaded or mechanically jammed, or the contracting brake is not opened properly.

21) LED display: 7180

Fault definition: Motor overload (I^2T)

Generation mechanism: I^2T operation for servo phase currents, I^2T energy and energy threshold calculation for 1.x, 2.x, 3.x times the overload condition greater than its corresponding overload time.

Reason	Treatment
Motor power and load mismatch	Check if the motor power meets the load requirements.
Motor blocking	Check whether the motor is overloaded or mechanically jammed, or the contracting brake is not opened properly.
Motor power line phase sequence fault	Check if the motor power wire sequence is correct.

22) LED display: 7181

Fault definition: motor holding fault

Mechanism: Under-voltage or under-current contracting brake or motor without contracting brake

Reason	Treatment
Contracting brake under voltage or under current	Check the contracting brake mechanism and contracting brake power.
Motor without contracting brake	Shield contracting brake fault by parameter P21.06

23) LED display: 7182

Fault definition: Overload of braking resistor

Mechanism: Servo internal calculation of the braking resistor I^2T energy accumulation is greater than 20 times the power of the equipped dynamic resistor, and lasts for 1 second.

Reason	Treatment
Improperly selected braking resistor	Follow the instructions in the specifications to select the appropriate braking resistor.

Improper setting of braking resistor parameters	The braking resistor configuration parameters in the drive do not match the actual braking resistor specifications. AC200V, 400W and below drives do not have built-in braking resistors, but rely on internal capacitors to absorb part of the braking energy. Therefore, the default configuration of the braking resistor parameter is 40W, 80Ω (it is not recommended to set to 0. Because once set to 0, there is a risk of damaging the drive capacitors if used with an overloaded braking resistor for a long period of time). If this alarm occurs in this case, please connect a suitable external braking resistor.

24) LED display: 7380

Fault definition: Encoder connection error

Mechanism: The servo and encoder cannot establish normal communication.

Reason	Treatment
Encoder parameter error	Check the encoder parameter settings to see if they match the actual encoder.
Encoder cable failure	Check whether the encoder cable is broken, missed, misconnected, and whether the wire sequence is correct, etc.
Encoder cable not connected or loose connector	Check the encoder cable connection.
The encoder cable is too long and the encoder wire diameter used is too thin. Resulting in too high line impedance and significant voltage attenuation	Replace the cable with a length matching the wire gauge, see the encoder cable section for details.
Oxidation of the metal layer of the encoder connector, resulting in poor contact	Replace the connector.
Servo component damage	If the motor or drive components are damaged, please contact after-sales staff for maintenance by professional technicians.

25) LED display: 7381

Fault definition: encoder battery undervoltage

Generation mechanism: Absolute encoder battery undervoltage.

Reason	Treatment
Absolute encoder battery voltage too low	Replace the battery.

26) LED display: 7382

Fault definition: Encoder battery disconnected

Generation mechanism: The absolute encoder detects no battery power.

Reason	Treatment
Absolute encoder battery voltage is too low, or the battery is disconnected from the encoder	Battery replacement; Check the connection between the absolute encoder battery and the encoder for broken wires, missed connections, etc.

27) LED display: 7383

Fault definition: Encoder overheating

Generation mechanism: The internal temperature of the encoder exceeds the alarm value.

Reason	Treatment
High internal temperature of the encoder	Improve motor heat dissipation conditions, or reduce the ambient temperature around the motor.

28) LED display: 7384

Fault definition: Encoder count error

Generation mechanism: Encoder counting error.

Reason	Treatment
Encoder count error	Servo power off and restart, if the fault can not be cleared, you need to contact professional technicians to replace the encoder.

29) LED display: 7385

Fault definition: Encoder overspeed

Generating mechanism: The error is fed back by the motor encoder. Possible causes are the actual speed of the motor exceeding the allowable range of the encoder, or the hardware of the encoder itself is damaged.

Reason	Treatment
Actual speed before servo power up is too high	The motor should be kept stationary until the servo is powered on.
Motor Speeder	See motor stall troubleshooting
Instruction given error	Check if the position, speed and torque commands are given correctly.
Sudden load changes	Check if the external load connection is good and check the cause of the sudden change of external load.
Encoder internal error	Servo power off and restart, if the fault can not be cleared, you need to contact professional technicians to replace the encoder.

30) LED display: 7386

Fault definition: internal failure of the encoder

Generation mechanism: Anomaly is detected inside the encoder.

Reason	Treatment
Encoder internal error	Servo power off and restart, if the fault can not be cleared, you need to contact professional technicians to replace the encoder.

31) LED display: 7387

Fault definition: Motor information error

Mechanism: The servo does not detect the electronic nameplate of the motor, or the electronic nameplate data is wrong.

Reason	Treatment
Use of third-party motors	When using third-party motors, you need to log in with advanced password and modify parameter P00.03 to "User Settings" and enter the relevant parameters according to the actual motor information, please refer to the chapter "Motor Configuration" of the commissioning software for details.
Electronic nameplate not written	Login to the advanced password, change parameter P00.03 to "User Settings" and configure the relevant motor and encoder parameters according to the actual motor, see the chapter "Motor Configuration" in the commissioning software for details.
The electronic nameplate data is wrong	Try to use the above steps to solve the problem. If the problem still exists after power off and restart, please contact after-sales service for maintenance by professional technicians.

32) LED display: 7388

Fault definition: Motor encoder zero point is missing

Mechanism: The servo does not detect the encoder magnetic declination data, or the motor stores incorrect information.

Reason	Treatment
Use of third-party motors	When using third-party motors, encoder zeroing is required, see the "Using Third-Party Motors" section for details.
Motor not zeroed by encoder	Refer to the Encoder Zeroing chapter for zeroing the encoder.
Incorrect encoder zero data	Try to use the above steps to solve the problem. If the problem still exists after power off and restart, please contact after-sales service for maintenance by professional technicians.

33) LED display: 7581

Fault definition: EtherCAT communication failure

Mechanism: When enabled, the EtherCAT bus between the Servo Drive and the host computer does not communicate properly.

Reason	Treatment
Controller exception	(1) Check whether the controller communication state machine is switched to a non-OP state when the servo is enabled; (2) Check the real time of the controller when the parameter "EtherCAT frame loss detection enable" is set to 1 in 0x3001:04. (2) If the parameter "EtherCAT frame loss detection enable" is set to 1, check the real-time performance of the controller.
Poor contact or disconnection of communication cable	Check that the communication cable connection is secure and reliable.
Communication cable not grounded or poorly grounded	Use communication cables with shields that are well grounded.
Poor network port contact	Poor contact caused by deformation of the golden finger of the mesh port, please contact the after-sales service for maintenance by professional technicians.

34) LED display: 7582

Fault definition: wrong synchronization period setting

Mechanism: The bus cycle time cannot divide the speed loop cycle time.

Reason	Treatment
The bus cycle time cannot be divided by the speed loop cycle time when controlled by the host computer (speed loop cycle time = current loop cycle time (100 microseconds for unilateral modulation, 50 microseconds for bilateral modulation) * speed loop cycle time)	Change the bus cycle time of the host computer or modify the number of speed loop cycles (recommended setting 3~5).

35) LED display: 7590

Fault definition: Drive communication error 1

Generation mechanism: Driver communication initialization error.

Reason	Treatment
Internal drive error	Please contact after-sales for maintenance by professional technicians.

36) LED display: 7591

Fault definition: EtherCAT communication initialization error

Cause: Error during drive EtherCAT communication initialization.

Reason	Treatment
EtherCAT communication chip EEPROM setting information is incorrect	Check that the servo communication parameter P01.01 is "EtherCAT". You can also reconfigure the XML via TwinCAT software, see chapter "Using the AD3 Servo Drive with a Pepperl+Fuchs host computer" for details.
EtherCAT board damaged	Please contact after-sales for maintenance by professional technicians.
Servo drive internal damage	Please contact after-sales for maintenance by professional technicians.

37) LED display: 7592

Fault definition: ECAT EEPROM

Mechanism: Error returned when reading or writing ECAT EEPROM through ESC interface, possible causes are read/write permission failure, or EEPROM hardware failure.

Reason	Treatment
EtherCAT slave modification EEPROM permission is disabled by the controller	Check parameter P01.05 "Node number configuration selection". Some master controllers, such as Pepperl+Fuchs, do not allow the slave to change the node number. Therefore, when using such controllers, please take care to change P01.05 "Node number configuration selection" to bus configuration.
EtherCAT Hardware Failures	Please contact after-sales for maintenance by professional technicians.

38) LED display: 8480

Fault definition: Same direction overspeed

Mechanism: When the actual speed is in the same direction as the given speed, the speed error value is more than 20% of the rated value of the motor.

Reason	Treatment
Motor Speeder	See "Motor Stall" troubleshooting.
Motor parameters are wrong	Check whether the motor parameters are set correctly, such as the number of pole pairs, encoder single-turn value, etc.
Wrong encoder parameters	Check whether the encoder parameter setting is consistent with the actual motor.
Encoder failure	Check whether the encoder is damaged, the wiring is correct, the grounding is good, etc.
Excessive positive load	Check if the actual motor power meets the load demand.
Improper parameter setting	Check that the P50.17 stall filter time parameter is set correctly.

39) LED display: 8481
Fault definition: reverse overspeed
Mechanism: When the actual speed is reversed from the given speed, the speed error value is more than 20% of the rated value of the motor.

Reason	Treatment
Motor Speeder	See "Motor Stall" troubleshooting.
Motor parameters are wrong	Check whether the motor parameters are set correctly, such as the number of pole pairs, encoder single-turn value, etc.
Wrong encoder parameters	Check whether the encoder parameter setting is consistent with the actual motor.
Encoder failure	Check whether the encoder is damaged, the wiring is correct, the grounding is good, etc.
Excessive reverse load	Check if the actual motor power meets the load demand.
Improper parameter setting	Check that the P50.17 stall filter time parameter is set correctly.

40) LED display: 8482
Fault definition: exceeding the maximum speed
Mechanism: The actual speed exceeds the maximum speed of the motor and the duration exceeds the alarm value.

Reason	Treatment
Motor Speeder	See "Motor Stall" troubleshooting.
Motor parameters are wrong	Check whether the motor parameters are set correctly, such as the number of pole pairs, encoder single-turn value, etc.
Wrong encoder parameters	Check whether the encoder parameter setting is consistent with the actual motor.
Encoder failure	Check whether the encoder is damaged, the wiring is correct, the grounding is good, etc.
Instruction given error	Check if the position, speed and torque commands are given correctly.
Sudden load changes	Check the cause of the sudden external load change.

41) LED display: 8483
Fault definition: excessive speed tracking error
Generating mechanism: The absolute value of speed error is still greater than the speed error threshold after filtering time.

Reason	Treatment
Excessive acceleration	Check that the acceleration given by the command does not exceed the response of the load, causing the actual speed to lag significantly behind the given speed.
Improper parameter setting	Check that parameters P50.14 "Speed following error threshold" and P50.15 "Following error filtering time" are set properly. Increase parameter P50.01 "Speed loop gain 1" appropriately to speed up the motor response.
Excessive load	Check that the selected motor torque meets the load requirements.
Output out of phase	Refer to the "output out of phase" fault handling.

42) LED display: 8484
Fault definition: Excessive acceleration

Mechanism: The acceleration calculated inside the servo is greater than the set acceleration threshold for 300 current loop cycles, or the encoder data frame is wrong for 300 consecutive times.

Reason	Treatment
Excessive acceleration	Check that the acceleration given by the command does not exceed the response of the load, causing the actual speed to lag significantly behind the given speed.
Encoder failure	Check whether the encoder is damaged and the wiring is normal. Check whether the encoder cable shield is well grounded and whether there are strong interference sources near the cable.
Encoder interface short circuit	Check the encoder and cable for short circuit between pins, short circuit to ground or strong interference, etc.

43) LED display: 8485
Fault definition: motor stall
Mechanism: Motor speed continuous stall filtering time exceeds the stall threshold (when the speed is below 10% of the rated speed, the stall threshold is the rated speed)
(30% of the speed).

Reason	Treatment
Motor power cable failure	Check the servo output side wiring according to the operating procedures to exclude short circuit, leakage, broken wire, loose false connection, phase sequence connection reversal, etc.
Motor blocking	Check whether the motor is overloaded, or the machinery is stuck, or the contracting brake is not opened properly.
Servo internal device damage	Contact after-sales for maintenance by professional technicians.

44) LED display: 8611
Fault definition: Excessive position deviation
Mechanism: The position deviation is greater than the set position deviation threshold and lasts for 100ms.

Reason	Treatment
Excessive acceleration	Check that the acceleration given by the command does not exceed the response of the load, causing the actual speed to lag significantly behind the given speed.
Improper parameter setting	Check whether the parameter P60.0C "Position following error threshold" is set properly, generally set to the Inc value corresponding to one revolution of the motor encoder, e.g. 8388608 for 23-bit encoder; 131072 for 17-bit encoder. Increase parameters P60.01 "Position loop gain" and P60.02 "Position loop feedforward" as appropriate.
Motor blocking	Check whether the motor is overloaded, or the machinery is stuck, or the contracting brake is not opened properly.
Excessive load	Check that the selected motor torque meets the load requirements.
Output out of phase	Refer to the "output out of phase" fault handling.

45) LED display: 8612
Fault Definition: Command Giving Abnormality Detection
Mechanism: In position or velocity control mode, detect whether the given acceleration is less than parameter P60.11, when the given command has a large abrupt change
This fault will be triggered with the purpose of preventing risks such as flying servos.

Reason	Treatment

Position command given mutation	Check if the given command is appropriate.
Speed giving command mutation	Check if the given command is appropriate.
In torque mode, the difference between the current moment and the previous moment speed limit value exceeds the rated speed	Check if the given command is appropriate.
Parameter P60.11 is set too large	Reduce parameter P60.11 "Command detection acceleration time" as appropriate.
EtherCAT communication frame loss	Check if the communication is good in real time.
The zero return deviation data is lost, causing the difference between the given position and the current position to be too large.	Check whether the actual feedback position is consistent with the mechanical position

46) LED display: 8613

Fault definition: Forward motion prohibited

Generation mechanism: Forward motion disable function is triggered.

Reason	Treatment
Forward motion disable function is triggered	Check that the DI function group functions and DI logic are correctly configured. Check that the DI channels configured for the forward motion disable function are consistent with the actual wiring. Verify that the external DI input wiring is in order, that the wiring is good, and that there are no poor contacts, etc.

47) LED display: 8614

Fault definition: Reverse motion prohibited

Generation mechanism: The reverse motion disable function is triggered.

Reason	Treatment
Reverse motion disable function is triggered	Check that the DI function group functions and DI logic are correctly configured. Check that the DI channels configured for the reverse motion disable function are consistent with the actual wiring. Verify that the external DI input wiring is in order, that the wiring is good, and that there are no poor contacts, etc.

48) LED display: 8615

Fault definition: abnormal limit signal

Generating mechanism: Positive and negative limit limits triggered simultaneously or logic error

Reason	Treatment
Forward and reverse limit limit triggered simultaneously	Check if the limit signal wiring is correct and loose.

Motor running direction is opposite to the logic of the trigger limit signal, such as forward running, reverse limit trigger	(1) Check whether the normally open and normally closed logic of the corresponding DI port of the limit signal is consistent with the actual one. (2) Check whether the limit signal and the actual running direction are consistent. (3) Check whether there is a large source of interference at the site or whether the power supply is stable. (4) Check if the driver DI input port is abnormal.

49) LED display: 9834

Fault definition: Ai configuration error

Generation mechanism: Two Ai are configured simultaneously as pressure feedback inputs.

Reason	Treatment
Both Ai's are configured simultaneously as pressure feedback inputs	Check parameter P72.01 and P72.08 settings

50) LED display: 9837

Fault definition: Downward pressure out of tolerance

Generating mechanism: Positive and negative limit limits triggered simultaneously or logic error

Reason	Treatment
After the position reaches the press-fit position + tolerance, the pressure sensor has no feedback to prevent pressing the pressed workpiece.	(1) Increase the tolerance setting. (2) Make sure the pressure sensor feedback is good. (3) Check the pressure sensor cable connection. (4) Check the parameter P72.01 and P72.08 settings for pressure control feedback.

51) LED display: 9842

Fault definition: excessive pressure in downward pressure operation

Generation mechanism: Sensor feedback error or analog setting error

Reason	Treatment
Excessive pressure value detected during downward pressure	Adjustment of mechanical structure
Sensor feedback error	Acceleration and deceleration time 0xB00D and 0xB025 setting values
Analog setting error	(1) Calibrate the zero point of the analog signal. (2) Check if the tolerance setting is small.

11.3 List of object groups

Parameters	Indexes. Sub-indexes	Name	Function	Setting method	Effective method
P42.01	0X3042.01	Type 1 Torque Feedback Filter	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P42.02	0X3042.02	Torque feedback cutoff frequency1		Operation settings	Disconnect enable is effective
P42.03	0X3042.03	Torque feedback trap frequency1		Operation settings	Disconnect enable is effective
P42.04	0X3042.04	Torque feedback trap depth 1		Operation settings	Disconnect enable is effective
P42.05	0X3042.05	2nd Torque Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P42.06	0X3042.06	Torque feedback cutoff frequency 2		Operation settings	Disconnect enable is effective
P42.07	0X3042.07	Torque feedback trap frequency 2		Operation settings	Disconnect enable is effective
P42.08	0X3042.08	Torque feedback trap depth 2		Operation settings	Disconnect enable is effective
P42.09	0X3042.09	3rd Torque Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P42.0A	0X3042.0A	Torque feedback cutoff frequency3		Operation settings	Disconnect enable is effective
P42.0B	0X3042.0B	Torque feedback trap frequency 3		Operation settings	Disconnect enable is effective
P42.0C	0X3042.0C	Torque feedback trap depth 3		Operation settings	Disconnect enable is effective

P42.0D	0X3042.0D	Torque Feedback No. 4 Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P42.0E	0X3042.0E	Torque feedback cut-off frequency 4		Operation settings	Disconnect enable is effective
P42.0F	0X3042.0F	Torque feedback trap frequency 4		Operation settings	Disconnect enable is effective
P42.10	0X3042.10	Torque feedback trap depth 4		Operation settings	Disconnect enable is effective
P50.01	0X3050.01	Speed loop gain 1	Set the proportional gain of the speed loop. This parameter determines the response of the speed loop, the larger it is the faster the response of the speed loop, but too large a setting may cause vibration and requires attention. In position mode, if you want to increase the position loop gain, you need to increase the speed loop gain at the same time.	Operation settings	Disconnect enable is effective
P50.02	0X3050.02	Speed ring integration time 1	Set the integration time constant of the speed loop. The smaller the value is set, the stronger the integration effect is, and the deviation value at the time of stopping is closer to 0. When the Ti setting is small, the system response is fast, but oscillation may occur when it is too small; when the Ti setting is large, the system response is slow.	Operation settings	Disconnect enable is effective
P50.03	0X3050.03	Speed ring Kd1	Differential time Kd: generally not adjusted, according to the default setting, this parameter can quickly respond to the system feedback and the given deviation change. the larger the value of Kd, the faster the response, but too large may cause oscillation. When set to 0, the differentiation is invalid.	Operation settings	Disconnect enable is effective

P50.04	0X3050.04	Speed loop gain 2	2nd speed loop gain.	Operation settings	Disconnect enable is effective
P50.05	0X3050.05	Speed ring integration time 2	2nd velocity loop integration time constant.	Operation settings	Disconnect enable is effective
P50.06	0X3050.06	Speed ring Kd2	2nd velocity loop differential time coefficient.	Operation settings	Disconnect enable is effective
P50.10	0X3050.10	Torque feedforward control selection	0: No torque feedforward 1: Internal torque feedforward 2: 60B2h torque feedforward Only 2 options are currently supported.	Operation settings	Disconnect enable is effective
P50.11	0X3050.11	Speed control cycle	Sets the ratio of the speed control cycle to the current control cycle. This parameter is mainly used to adjust the control period of the speed loop. Velocity loop period = (P50.11*1000000)/(P31.0D*)(2-P31.0E)) microseconds. When using bus control, the master communication period 0x3001:03 needs to be an integer multiple of the speed loop period.	Operation settings	Disconnect enable is effective
P50.12	0X3050.12	Upper speed limit	This parameter is used to set the upper limit of the speed given value as a percentage of the rated speed of the motor. In the position control and speed control modes, the speed given in forward rotation is limited to the range of this parameter.	Operation settings	Effective immediately
P50.13	0X3050.13	Lower speed limit	This parameter is used to set the lower limit of the speed given value as a percentage of the rated speed of the motor. In position and speed control mode, the speed given in forward rotation is limited to the range of this parameter.	Operation settings	Effective immediately
P50.14	0X3050.14	Speed tracking error threshold	This parameter is used to set the threshold value of the speed tracking error, the base value is the current speed given. When the difference between speed feed and speed feedback reaches or exceeds the threshold value set by this parameter and the	Operation settings	Effective immediately

			duration exceeds the filter time set by 0x3050:15 (e.g. flying car), the servo drive will stop and report a fault.		
P50.15	0X3050.15	Tracking error filtering time	This parameter is used to set the filtering time for speed tracking error protection, which is generally not adjusted and set according to the default value.	Operation settings	Effective immediately
P50.16	0X3050.16	Stall Threshold	This parameter is used to set the threshold value for stall protection, the base value is the current speed given. When the difference between speed feed and speed feedback reaches or exceeds the threshold value set by this parameter and the duration exceeds 0X3050:17 set filter time (e.g. flying car), the servo drive will stop and report a fault.	Operation settings	Effective immediately
P50.17	0X3050.17	Stall filtering time	This parameter is used to set the filtering time of stall protection, which is generally not adjusted and set according to the default value.	Operation settings	Effective immediately
P50.18	0X3050.18	Stall protection enable	This parameter is used to set whether stall protection fault detection is performed. 0: No 1: Yes	Operation settings	Effective immediately
P50.19	0X3050.19	Overspeed filtering time	This parameter is used to set the filtering time of overspeed protection, which is generally not adjusted and set according to the default value.	Operation settings	Effective immediately
P51.01	0X3051.01	1st speed given Filter Type	Default does not turn on speed given filter 0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P51.02	0X3051.02	Speed given cutoff frequency1	This parameter is used to set the low-pass cutoff frequency of the speed-given filter module 1 (this parameter is meaningful when the 0x3051:01 parameter is set to	Operation settings	Disconnect enable is effective

			1 or 2 or 3; when the 0x3051:01 parameter is set to 0 or 4, the value of this parameter has no meaning.)		
P51.03	0X3051.03	Speed given trap frequency 1	Speed given trap frequency 1 is used to set the trap center frequency of the 1st speed given filter, and speed given trap depth 1 is used to set the trap depth of the 1st speed given filter (When 0x3051:01 is selected as 4, these two parameters are meaningful; when 0x3051:01 is selected as 0, 1, 2, 3, the values of these two parameters have no meaning.)	Operation settings	Disconnect enable is effective
P51.04	0X3051.04	Speed given trap depth 1	As described in 0x3051:04, used to set the trap depth of the 1st speed given Notch filter, the greater the trap depth, the stronger the attenuation effect on the center frequency point.	Operation settings	Disconnect enable is effective
P51.05	0X3051.05	2nd speed given Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P51.06	0X3051.06	Speed given cutoff frequency2		Operation settings	Disconnect enable is effective
P51.07	0X3051.07	Speed given trap frequency 2		Operation settings	Disconnect enable is effective
P51.08	0X3051.08	Speed given trap depth 2		Operation settings	Disconnect enable is effective
P51.09	0X3051.09	3rd speed given Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P51.0A	0X3051.0A	Speed given cutoff frequency3		Operation settings	Disconnect enable is effective
P51.0B	0X3051.0B	Speed given trap frequency 3		Operation settings	Disconnect enable is effective

P51.0C	0X3051.0C	Speed given trap depth 3		Operation settings	Disconnect enable is effective
P51.0D	0X3051.0D	4th speed given Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P51.0E	0X3051.0E	Speed given cut-off frequency 4		Operation settings	Disconnect enable is effective
P51.0F	0X305.0F	Speed given trap frequency 4		Operation settings	Disconnect enable is effective
P51.10	0X3051.10	Speed given trap depth 4		Operation settings	Disconnect enable is effective
P52.01	0X3052.01	1st speed feedback Filter Type	(a) The 1st velocity feedback filter is turned on by default as a first-order low-pass filter; 0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P52.02	0X3052.02	Speed feedback 1 cutoff frequency	By default, the 1st velocity feedback filter is turned on as a first-order low-pass filter with a cutoff frequency of 1000hz. The smaller the setting, the smaller the speed feedback fluctuation, but also the greater the feedback delay. The cutoff frequency is 5000Hz with no filtering effect.	Operation settings	Disconnect enable is effective
P52.03	0X3052.03	Speed feedback 1 trap frequency		Operation settings	Disconnect enable is effective
P52.04	0X3052.04	Speed feedback 1 trap depth		Operation settings	Disconnect enable is effective
P52.05	0X3052.05	2nd speed feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective

P52.06	0X3052.06	Speed feedback 2 cut-off frequency		Operation settings	Disconnect enable is effective
P52.07	0X3052.07	Speed feedback 2 trap frequency		Operation settings	Disconnect enable is effective
P52.08	0X3052.08	Speed feedback 2 trap depth		Operation settings	Disconnect enable is effective
P52.09	0X3052.09	3rd speed feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P52.0A	0X3052.0A	Speed feedback 3 cut-off frequency		Operation settings	Disconnect enable is effective
P52.0B	0X3052.0B	Speed feedback 3 trap frequency		Operation settings	Disconnect enable is effective
P52.0C	0X3052.0C	Speed feedback 3 trap depth		Operation settings	Disconnect enable is effective
P52.0D	0X3052.0D	4th speed feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P52.0E	0X3052.0E	Speed feedback 4 cut-off frequency		Operation settings	Disconnect enable is effective
P52.0F	0X3052.0F	Speed feedback 4 trap frequency		Operation settings	Disconnect enable is effective
P52.10	0X3052.10	Speed feedback 4 trap depth		Operation settings	Disconnect enable is effective
P60.01	0X3060.01	Position loop gain	P60.01 and P60.02 parameters mainly adjust the proportional gain and feedforward gain of the position regulator. When the position control gain value is increased, the position response can be improved and the amount of position control error can be reduced. However, if the setting is too large, vibration and noise will be generated.	Operation Settings	Disconnect enable is effective

P60.02	0X3060.02	Position feedforward coefficient	Set the value of the position feedforward coefficient, the feedforward speed percentage, usually set to no more than 100%. In position control mode, increasing the feedforward value improves the amount of position following error. Decreasing the feedforward value can reduce the vibration phenomenon in the operation of the mechanism. When the proportional gain is too large, the motor rotor will oscillate at this time, and the proportional gain is adjusted down until the motor rotor no longer oscillates. When the external torque increases, the proportional gain is too low to meet the reasonable position tracking error requirement. In this case, the feed-forward gain can effectively reduce the position dynamic tracking error.	Operation settings	Disconnect enable is effective
P60.0B	0X3060.11	Position tracking error detection enable	This parameter is used to set whether to perform position tracking error fault detection. 0:Turn off position tracking error fault detection 1:Enabling position tracking error fault detection	Operation settings	Disconnect enable is effective
P60.0C	0X3060.12	Position tracking error threshold	This parameter sets the threshold value of the position tracking error in the position control loop, with the base value being the encoder single-turn resolution. When the difference between position giving and position feedback reaches or exceeds the threshold value (e.g. flying car, motor shaft jamming), the servo drive will stop and report a fault.	Operation settings	Effective immediately
P60.0D	0X3060.13	Soft limit function setting	0: Do not enable the soft limit function.	Operation settings	Disconnect enable is effective
P60.0E	0X3060.14	Soft limit maximum	Maximum software absolute position limit.	Operation settings	Effective immediately
P60.0F	0X3060.15	Soft limit min.	Minimum software absolute position limit.	Operation settings	Effective immediately

P61.01	0X3061.01	Position 1 is given Filter Type	0:No filter is used 1:First-order low-pass filtering 2: Second-order low-pass filtering 3:Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P61.02	0X3061.02	Position given cutoff frequency 1		Operation settings	Disconnect enable is effective
P61.03	0X3061.03	Position given trap frequency 1		Operation settings	Disconnect enable is effective
P61.04	0X3061.04	Position given trap depth 1		Operation settings	Disconnect enable is effective
P61.05	0X3061.05	Position 2 is given Filter Type	0:No filter is used 1:First-order low-pass filtering 2: Second-order low-pass filtering 3:Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P61.06	0X3061.06	Position given cutoff frequency 2		Operation settings	Disconnect enable is effective
P61.07	0X3061.07	Position given trap frequency 2		Operation settings	Disconnect enable is effective
P61.08	0X3061.08	Position given trap depth 2		Operation settings	Disconnect enable is effective
P61.09	0X3061.09	Position 3 is given Filter Type	0:No filter is used 1:First-order low-pass filtering 2: Second-order low-pass filtering 3:Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P61.0A	0X3061.10	Position given cutoff frequency 3		Operation settings	Disconnect enable is effective
P61.0B	0X3061.11	Position given trap frequency 3		Operation settings	Disconnect enable is effective
P61.0C	0X3061.12	Position given trap depth 3		Operation settings	Disconnect enable is effective
P61.0D	0X3061.13	Position 4 is given Filter Type	0:No filter is used 1:First-order low-pass filtering 2: Second-order low-pass filtering 3:Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective

P61.0E	0X3061.14	Position given cutoff frequency 4		Operation settings	Disconnect enable is effective
P61.0F	0X3061.0F	Position given trap frequency 4		Operation settings	Disconnect enable is effective
P61.10	0X3061.10	Position given trap depth 4		Operation settings	Disconnect enable is effective
P62.01	0X3062.01	Position 1 Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P62.02	0X3062.02	Position feedback cutoff frequency 1		Operation settings	Disconnect enable is effective
P62.03	0X3062.03	Position feedback trap frequency 1		Operation settings	Disconnect enable is effective
P62.04	0X3062.04	Position feedback trap depth 1		Operation settings	Disconnect enable is effective
P62.05	0X3062.05	Position 2 Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P62.06	0X3062.06	Position feedback cutoff frequency 2		Operation settings	Disconnect enable is effective
P62.07	0X3062.07	Position feedback trap frequency 2		Operation settings	Disconnect enable is effective
P62.08	0X3062.08	Position feedback trap depth 2		Operation settings	Disconnect enable is effective
P62.09	0X3062.09	Position 3 Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P62.0A	0X3062.0A	Position feedback cutoff frequency3		Operation settings	Disconnect enable is effective
P62.0B	0X3062.0B	Position feedback trap frequency 3		Operation settings	Disconnect enable is effective

P62.0C	0X3062.0C	Position feedback trap depth 3		Operation settings	Disconnect enable is effective
P62.0D	0X3062.0D	Position 4 Feedback Filter Type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second order with zero point low pass 4: Notch filter	Operation settings	Disconnect enable is effective
P62.0E	0X3062.0E	Position feedback cutoff frequency 4		Operation settings	Disconnect enable is effective
P62.0F	0X3062.0F	Position feedback trap frequency 4		Operation settings	Disconnect enable is effective
P62.10	0X3062.10	Position feedback trap depth 4		Operation settings	Disconnect enable is effective
P63.01	0X3063.01	Inertia ratio	Load inertia ratio, when the external mechanical load converted to the mechanical inertia of the motor shaft, divided by the motor's own rotational inertia, to obtain the inertia ratio. This value can be entered manually or filled in automatically by the inertia self-learning method. Note: This drive supports a maximum of 20 times the load inertia ratio when applied to rough position accuracy control applications. Please consider carefully in the mechanical design selection stage.	Operation settings	Disconnect enable is effective
P63.02	0X3063.02	Mechanical rigidity setting	Mechanical rigidity level setting, the level from 0 ~ 31, 0 represents the weakest gain, 31 represents the strongest gain. Each rigidity level corresponds to a set of three-loop gain data.	Operation settings	Disconnect enable is effective
P63.03	0X3063.03	Inertia recognition frequency		Operation settings	Disconnect enable is effective
P70.01	0X3070.01	Input DI1 function	NO for normally open logic and options without NO for normally closed logic; 0: No DI function defined 1: Servo operation NO 2: Positive movement is prohibited NO	Operation settings	Effective immediately

			3: Reverse movement is prohibited NO 6: Retention 9: Zero return proximity switch NO 10: Bus IO input NO 11: Probe 1NO 12: Probe 2NO 101: Servo operation 102: Forward motion is prohibited 103: Reverse movement is prohibited 106: Reserved 109: Zero return proximity switch 110: Bus IO input 111: Probe 1 112: Probe 2		
P70.02	0X3070.02	Input DI2 function	Same as DI1 input function configuration description.	Operation settings	Effective immediately
P70.03	0X3070.03	Input DI3 function	NO for normally open logic and options without NO for normally closed logic; 0: No DI function defined 1: Servo operation NO 2: Positive movement is prohibited NO 3: Reverse movement is prohibited NO 6: Retention 9: Zero return proximity switch NO 10: Bus IO input NO 101: Servo operation 102: Forward motion is prohibited 103: Reverse movement is prohibited 106: Reserved 109: Zero return proximity switch 110: Bus IO input (11, 12, 111, 112 less than DI1)	Operation settings	Effective immediately
P70.04	0X3070.04	Input DI4 function	Same as DI3 input function configuration description.	Operation settings	Effective immediately
P70.05	0X3070.05	Input DI5 function	Same as DI3 input function configuration description.	Operation settings	Effective immediately
P70.06	0X3070.06	Emergency stop logic	This parameter is used to select the logic setting for the emergency stop: 6: Normally open logic: Emergency stop is set to normally open logic, for the	Operation settings	Effective immediately

			valid input state, the servo is in the emergency stop state. 106: Normally closed logic: The emergency stop is set to normally closed logic, for high resistance state and valid input state, the servo is in the emergency stop state.		
P70.07	0X3070.07	Digital input filtering time	This parameter is used to set the filtering time of the digital quantity.	Operation settings	Effective immediately
P70.08	0X3070.08	Input Status	The logic state of DI is displayed. The bit4~bit0 of this parameter binary corresponds to the logic state of DI5~DI1 respectively.	Operation settings	Effective immediately
P70.09	0X3070.09	Analog input enable	0: No 1: Yes This parameter setting allows you to determine whether to turn on the input analog function of DI~DI5. When this function is turned on, the DI logic can be given through parameter P70.0A; when this function is turned off, the DI logic is given through the corresponding DI physical interface.	Operation settings	Effective immediately
P70.0A	0X3070.10	Analog Inputs	When parameter P70.09 is 1, the DI analog input function is enabled. The bit4~bit0 of this parameter binary corresponds to the logic given by DI5~DI1 respectively, which determines whether the function logic set by DI is triggered or not.	Operation settings	Effective immediately
P71.01	0X3071.01	Output DO1 function	0: No DO function defined 1: Servo return to zero completed NO 2: Servo operation enable NO 3: Servo alarm NO 4: Position tracking overrun NO 5: The target location reaches NO 6: Contracting brake output NO 7: Bus IO output NO 101: Servo return to zero completed NC 102: Servo operation enable NC 103: Servo alarm NC	Operation settings	Effective immediately

			104: Position tracking overrun NC 105: Target location reached NC 106: Contracting brake output NC 107: Bus IO output NC		
P71.02	0X3071.02	Output DO2 function	Same as 0x3070:01 parameter description.	Operation settings	Effective immediately
P71.03	0X3071.03	Output DO3 function	Same as 0x3070:01 parameter description.	Operation settings	Effective immediately
P71.04	0X3071.04	Output DO4 function	Same as 0x3070:01 parameter description, DO4 is configured to hold the brake normally open output by default 0: No DO function defined 1: Servo return to zero completed 2: Servo operation enable 3: Servo alarm 4: Position tracking overrun 5: Target location reached 6: Contracting brake output NO 7: Bus IO output 101: Servo return to zero completed 102: Servo operation enable 103: Servo alarm 104: Position tracking overrun 105: Target location reached 106：Contracting brake output NC 107: Bus IO output	Operation settings	Effective immediately
P71.05	0X3071.05	DO1 turn-on filtering time	Setting of the signal turn-on filtering time at DO1 output.	Operation settings	Effective immediately
P71.06	0X3071.06	DO2 turn-on filtering time	Setting of the signal turn-on filter time at DO2 output.	Operation settings	Effective immediately
P71.07	0X3071.07	DO3 turn-on filtering time	Setting of the signal turn-on filter time at DO3 output.	Operation settings	Effective immediately
P71.08	0X3071.08	DO4 turn-on filtering time	Setting of the signal turn-on filtering time at DO4 output.	Operation settings	Effective immediately
P71.09	0X3071.09	DO1 shutdown filter time	Setting of the signal shutdown filter time at the DO1 output.	Operation settings	Effective immediately
P71.0A	0X3071.0A	DO2 shutdown filter time	Setting of the signal shutdown filter time at the DO2 output.	Operation settings	Effective immediately
P71.0B	0X3071.0B	DO3 shutdown filter time	Setting of the signal shutdown filter time at the DO3 output.	Operation settings	Effective immediately

P71.0C	0X3071.0C	DO4 shutdown filter time	Setting of the signal shutdown filter time at the DO4 output.	Operation settings	Effective immediately
P71.0D	0X3071.0D	Output Status	The current output logic state of DO1-DO4 is displayed, and the value of Bit0-Bit3 in binary corresponds to the actual output state of DO1-DO4 ports in turn, taking DO1 terminal as low level and DO2~DO4 terminals as high level as an example: the corresponding binary code is "1110".	Operation settings	Effective immediately
P71.0E	0X3071.0E	Forced output enable	The setting of this parameter allows the DO output terminal logic to be selected as the functional logic of the DO configuration, or the user can directly control the DO output logic via 0x3071:0F; 0: No, the DO output is controlled by the internal function logic set by 0x3070:01~0x3070:04. 1: Yes, the user controls the DO output logic directly via 0x3070:0F.	Operation settings	Effective immediately
P71.0F	0X3071.0F	Forced output	When 0x3071:0E parameter is set to 1, the user directly controls the DO output logic through this parameter. Bit0-Bit3 of the value binary control the actual output of DO1-DO4 ports in turn, with DO1 terminal as low level and DO2~DO4 terminals as high level for example: corresponding to the binary code "1110".	Operation settings	Effective immediately
P80.01	0X3080.01	Speed profile type	0: Trapezoidal curve 1: sin2 curve (not supported at this time) 2: Jerk-free curve 3: Jerk-limited curve	Operation settings	Effective immediately
P80.02	0X3080.02	Acceleration	The parameter gives the acceleration and deceleration of the speed profile.	Operation settings	Effective immediately
P80.03	0X3080.03	Deceleration	This parameter gives the acceleration and deceleration of the speed profile.	Operation settings	Effective immediately
P80.04	0X3080.04	Accelerated rounded corners Jerk0	This parameter is used to set the value of the acceleration rounding Jerk0.	Operation settings	Effective immediately

P80.05	0X3080.05	Accelerated rounded corners Jerk1	This parameter is used to set the value of the acceleration rounding Jerk1.	Operation settings	Effective immediately
P80.06	0X3080.06	Deceleration rounding Jerk2	This parameter is used to set the value of the deceleration circle angle Jerk2.	Operation settings	Effective immediately
P80.07	0X3080.07	Deceleration rounding Jerk3	This parameter is used to set the value of the deceleration circle angle Jerk3.	Operation settings	Effective immediately
P81.01	0X3081.01	Uniform velocity	This parameter is used for the uniform segment speed for a given position profile.	Operation settings	Effective immediately
P81.02	0X3081.02	Acceleration	This parameter group is used for velocity planning for position mode control when the channel is not controlled by the controller.	Operation settings	Effective immediately
P81.03	0X3081.03	Deceleration	This parameter group is used for velocity planning for position mode control when the channel is not controlled by the controller.	Operation settings	Effective immediately
P82.01	0X3082.01	Back to zero mode	No function at the moment, please use CiA402 standard object setting (to be associated).	-	-
P82.02	0X3082.02	Return to zero bias	No function for now, please use CiA402 standard object setting.	-	-
P82.03	0X3082.03	Return to zero speed1	No function at the moment, please use CiA402 standard object setting (to be associated).	-	-
P82.04	0X3082.04	Return to zero speed 2	No function at the moment, please use CiA402 standard object setting (to be associated).	-	-
P83.01	0X3083.01	Emergency stop selection code	Please set it via 0x605A.	-	-
P83.02	0X3083.02	Emergency stop acceleration	No function at the moment, please use CiA402 standard object setting (to be associated).	-	-
P90.01	0X3090.01	M control mode selection	This parameter is used to set the control operation mode of the Servo Drive when the command channel of the Servo Drive is selected as Panel Control, AD Commissioning Software Control, Analog 1, or Analog 2. This parameter is invalid under controller control. 0: Torque control mode	Operation settings	Effective immediately

			1: Speed control mode 2: Position control mode		
P90.02	0X3090.02	Reciprocating motion enables	This parameter is used for the setting of the reciprocating motion and is controlled in the panel control and AD commissioning software. 0: No 1: Yes	Operation settings	Effective immediately
P91.15	0X3091.15	Total power-up time	Total system power-up time, cumulative display. This function code is used to record the total time the servo drive has been running. When multiple consecutive power-ups and power-downs occur in a short period of time for the drive, the total power-up time record may be off by a few minutes.	-	-
P91.16	0X3091.16	Maximum load factor	Reserved parameters, no function for now.	-	-
P91.17	0X3091.17	Average load factor	Reserved parameters, no function for now.	-	-
P91.18	0X3091.18	Fault log selection	Selects in order to display the faults that occurred in the servo drive and the system power-up time when the faults occurred. A total of 10 records of the most recent faults can be recorded, where 0 is the most recent fault.	Operation settings	Effective immediately
P91.19	0X3091.19	Selected fault code	The fault code selected by 0x3091:18 is displayed. Note that the values displayed in the error code table are in hexadecimal.	Operation settings	Effective immediately
P91.1A	0X3091.1A	Fault occurrence time	Displays the system power-up time when the selected fault record occurred for 0x3091:18.	Operation settings	Effective immediately
P91.2A	0X3091.2A	EtherCAT Communication Status	1: INT communication initialization 2: PreOP 3: SafeOP, the controller can read the communication object of the servo driver TPDO normally 4: OP, this state can be normal operation communication state	-	-
PA0.07		Software Version Release Date		-	-

PA0.0B	P0A.11	Software Version	This parameter mainly shows the fixed parameters of the servo, which are usually set directly by the manufacturer and need not be set by the user.	-	-