SLANVERT

N3 Servo System Instruction Manual

Servo drive	Servo motor
N3RE- SA-E	KMT

Thank you for your purchasing our servo products

This manual records the use and maintenance of "N3" series servo drivers, please read this manual carefully before the installation, wiring, use, maintenance and inspection of the product. Please keep this manual safe and deliver it to the end user.

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Chapter 1 Safety precautions

■ Safety Instructions

- Read and comply with these safety precautions when installing, operating, and maintaining the product.
- To ensure the safety of the human body and equipment, follow the label on the product and all the safety precautions described in this document when installing, operating, and maintaining the product.
- The terms "caution", "warning" and "danger" in this document do not represent the complete safety precautions to be followed, but are only supplements to all safety precautions.
- The terms "caution", "warning" and "danger" in this document do not represent the complete safety precautions to be followed, but are only supplements to all safety precautions.
- Due to illegal operation of products caused by personal safety accidents, property losses, etc., our company will not assume any legal responsibility.

Safety class definition	
⚠ Danger	If not used according to regulations, it will lead to fire, serious injury, and even death!
⚠ Caution	If not used according to regulations, it will lead to fire, serious injury, and even death!
⚠ Warning	If not used according to regulations, it may cause moderate or minor injury to the person, as well as damage to the equipment!

Product arrival and storage	
⚠ Warning	● If the product and product accessories are damaged when unpacking, please do not install it. Please contact our company or your supplier as soon as possible. ● Carefully check whether the arriving product matches the model of the ordered product, and whether the product and product accessories are complete.
⚠ Caution	● Do not place the product on top of each other too much, as this may cause injury or failure. ● Do not store in a place exposed to direct sunlight, a place where the ambient temperature exceeds the storage temperature conditions, a place where the relative humidity exceeds the storage humidity conditions, a place with a large temperature difference, condensation, a place close to corrosive gases,

	flammable gases, dust, Places with a lot of dust, salt and metal dust, places with dripping water, oil and chemicals, places where vibration or shock can be transmitted to the main body, otherwise it may cause fire, electric shock or machine damage. ● Do not handle cables or motor shafts; otherwise, injuries or faults may occur.

System design time	
⚠ Danger	● When the rated load current is exceeded or the load short circuit leads to a long time of overcurrent, the product may smoke or catch fire, and safety devices such as fuses or circuit breakers should be set outside.
⚠ Warning	● Be sure to design a safety circuit to ensure that the product system will continue to work safely in the event of an external power failure or product failure. ● To ensure the safe operation of the equipment, design external protection circuits and safety mechanisms for output signals related to major accidents.
⚠ Caution	● Be sure to install an emergency brake circuit, a protection circuit, an interlock circuit for forward and reverse operation and an upper and lower position interlock switch to prevent machine damage in the external circuit of the product. ● The product may turn off all output when it detects a system exception. When part of the controller circuit is faulty, its output may be uncontrolled. In order to ensure normal operation, it is necessary to design an appropriate external control circuit. ● When the relay, transistor and other output units of the product are damaged, its output can not be controlled to ON or OFF state. ● The product is designed to be used in indoor, overvoltage class II electrical environment. The power system level should have lightning protection devices to ensure that the lightning overvoltage is not applied to the power input end, signal input end, control output end and other ports of the product, so as to avoid damage to the equipment.

Product installation time	
⚠ Danger	● Only professional maintenance personnel who have received training and sufficient electrical knowledge are allowed to install this product. ● For open equipment, please install it in the control cabinet with door lock (Product cabinet shell protection > IP20). Only the operator who has been trained in electrical equipment and has sufficient electrical knowledge can open the product cabinet.
⚠ Warning	● Before disassembling and installing the product, disconnect all external power supplies used by the system. If the power supply is not completely disconnected, it may lead to electric shock or product failure and misoperation! ● Drive the product in the power OFF for more than 5 minutes, the power indicator is off, the control power is disconnected, and then disassemble the drive product. Otherwise it will cause electric shock due to residual voltage. ● Do not use the product in the following places: dust, soot, conductive dust, corrosive gas, flammable gas; Exposed to high temperature, dew, wind and rain; Where there is vibration or shock. Electric shock, fire, misoperation can also lead to product damage and deterioration!
⚠ Caution	● During installation, avoid metal shavings and wire ends falling into the ventilation holes of the product. This may cause fire, failure, or misoperation. ● Ensure that no foreign matter is found on the ventilation surface after installation. Otherwise, heat dissipation may be blocked, which may cause fire, faults, and misoperations. ● When installing, it should be tightly connected with the respective connectors, and the product connection hook should be firmly locked. If the product is improperly installed, it may cause misoperation, failure and fall off.

Product wiring	
Danger	● Only professional maintenance personnel who have been trained in electrical equipment and have sufficient electrical knowledge can perform wiring for this product.
Warning	● Before connecting cables, disconnect all external power supplies to the system. If not completely disconnected, electric shock, device fault, or misoperation may occur. ● Install the terminal cover delivered with the product before powering on the device or running the device after cable distribution. If the terminal cover is not installed, electric shock may occur. ● Check the type of the interface to be connected and then connect the cable correctly. If incorrect interfaces are connected or cables are incorrectly routed, the product or external device may be faulty. ● Cable terminals should be insulated. Ensure that the insulation distance between cables is not reduced after the cables are installed on the terminal. Otherwise, electric shock or equipment damage may occur. ● When connecting cables, avoid metal shavings and wire ends falling into the controller's ventilation holes. This may cause fire, failure, or misoperation. ● Bolts on the terminal block should be tightened within the specified torque range. Untightened terminal bolts may result in short circuit, fire, or misoperation. Over-tightening of bolts may damage bolts and products, resulting in falling off, short circuit, fire, or misoperation.
Caution	● The external cable specifications and installation mode of the device must comply with the local power distribution regulations. ● To ensure the safety of the device and operators, cables with sufficient diameters must be grounded reliably. ● For connections between connectors and external devices, press, crimp, or weld properly using the tools specified by the manufacturer. A poor connection may result in short circuit, fire, or misoperation. ● If the product is labeled with an anti-foreign matter label, prevent foreign matter, including wiring, from entering the product during wiring. Do not remove the label during wiring. Before starting the system operation, be sure to remove the label to facilitate heat dissipation. ● Do not bind the control cables and communication cables with the main circuit or power power cables. The distance between the cables should be

	more than 100mm. Otherwise, noise may cause misoperation. ● For applications with serious interference, the input or output cables of high-frequency signals should be screened to improve the anti-interference ability of the system.

Before the product is energized	
⚠ Danger	● Before power on, please make sure that the product is installed properly, the wiring is firm, and the motor device is allowed to restart. ● Before powering on the device, ensure that the power supply meets product requirements to avoid product damage or fire. ● Do not open the door of the cabinet or the protective cover of the product, touch any terminal of the product, or remove any device or part of the product when the power is on, otherwise there is a risk of electric shock. ● Before power on, please ensure that there are no people around the product, motor and machinery, otherwise it may lead to injury or death!
⚠ Warning	● After the wiring and parameter setting is complete, please run the machine to confirm that the machine can operate safely; otherwise, personnel may be injured or the equipment may be damaged! ● Before powering on, ensure that the rated voltage of the product is consistent with the power supply voltage. If the power supply voltage is used incorrectly, there is a risk of fire!

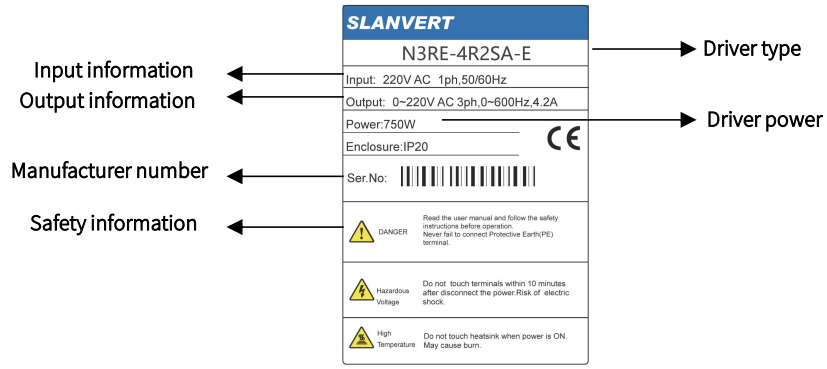
During operation and maintenance	
⚠ Danger	● Only professional maintenance personnel who have received relevant training of electrical equipment and have sufficient electrical knowledge can carry out the operation and maintenance of the product. ● Do not touch the terminal when the power is on. Otherwise, electric shock or misoperation may occur. ● Do not touch the rotating parts of the motor or equipment when it is running. Otherwise, serious personal accidents may occur.
⚠ Warning	● Disconnect the external power supply to the system when cleaning products or tightening bolts on the terminal block or connectors. Failure to do so may result in electric shock. ● Before disassembling or connecting or removing communication cables, disconnect all external power supplies used by the system. If not completely disconnected, it may lead to electric shock or misoperation. ● Drive the product in the power OFF for more than 5 minutes, the power indicator is off, the control power has been disconnected, and then disassemble the drive product. Otherwise it will cause electric shock due to residual voltage.
⚠ Caution	● Before performing operations such as online modification, forcible output, RUN, and STOP, read the user manual carefully and confirm the safety of the operations. ● Before loading and unloading expansion cards, modules and other components, be sure to cut off the power supply!

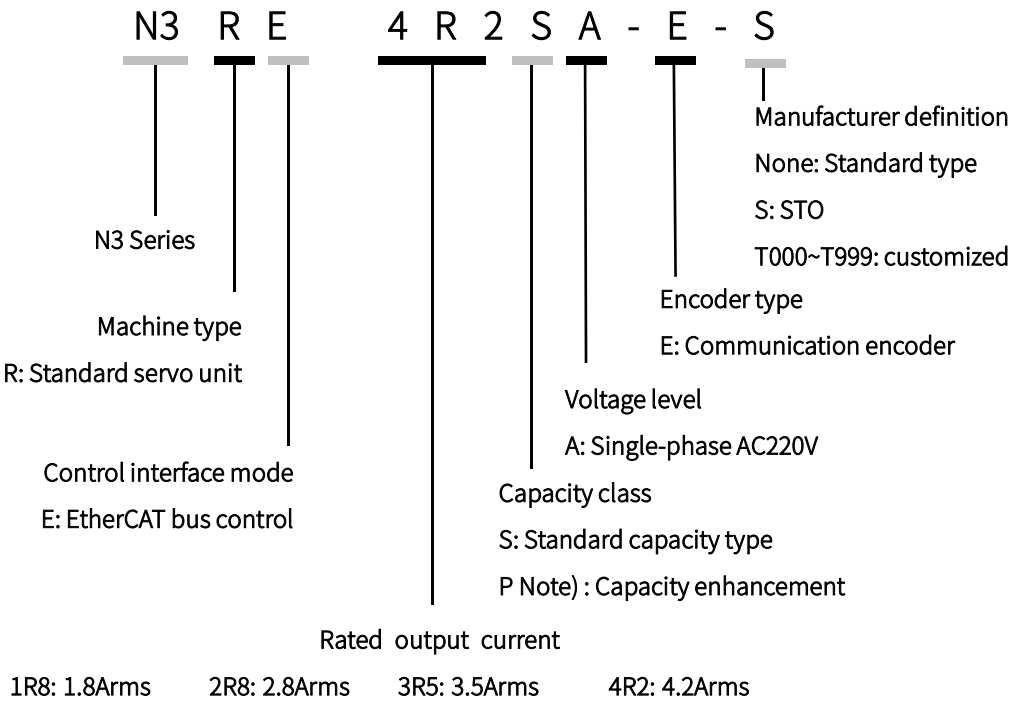
obsolescence	
⚠ Caution	● Please dispose as industrial waste; When the battery is discarded, it should be carried out separately according to the laws formulated by each region to avoid property damage or casualties! ● Waste products should be processed and recycled in accordance with industrial waste treatment standards to avoid environmental pollution.

Chapter 2 Product information

2.1 Introduction to the servo driver

2.1.1 Nameplate and model description



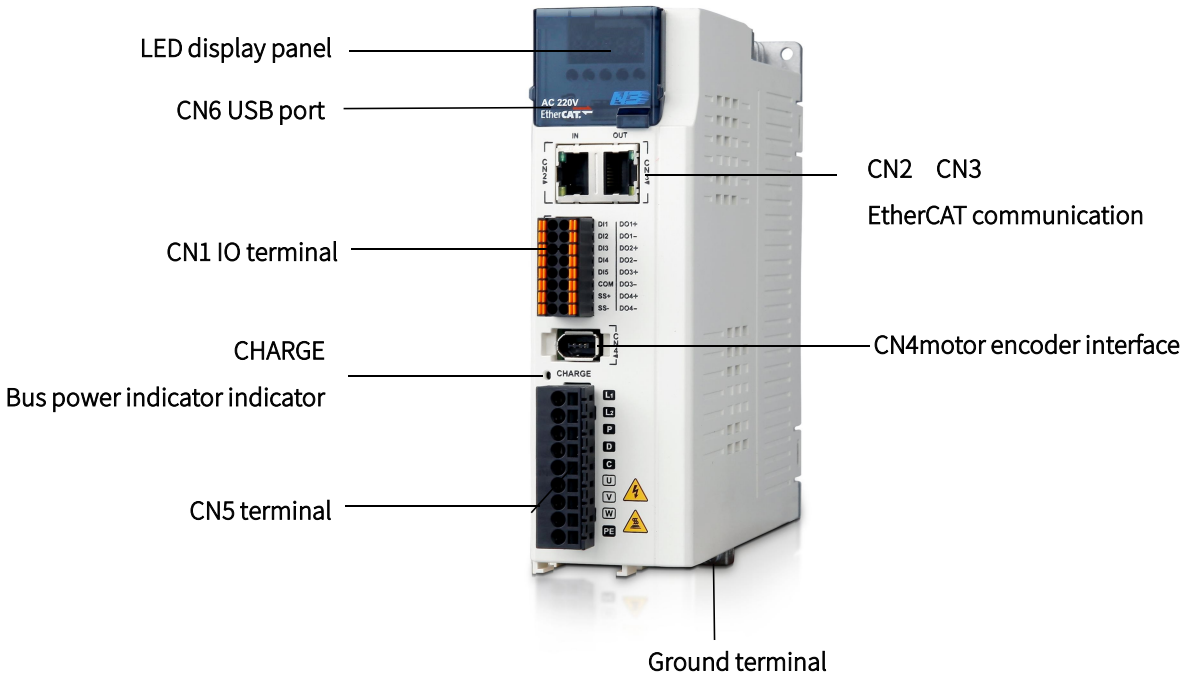


Note:

1) The naming rules are only used for model analysis and cannot be used for ordering. Please consult the company before ordering.

2) Under the same current capacity, increase the capacitance capacity to have a stronger output power, suitable for more frequent current impact occasions.

2.1.2 Drive Components



Name		Instructions
CN6 USB debug/write port		Servo debugging or firmware burn interface.
CN2 communication bus input interface		Bus communication, input interface.
CN3 communication bus output interface		Bus communication, output interface.
CN1 I/O terminal		DI, DO, scram, lock and other signal connection.
CN4 motor body encoder interface		Encoder input interface of servo motor body.
CN5 terminal	L1, L2 (Power input terminal)	L1 and L2 pins supply AC220V power.
	P, D, C (brake resistance connection terminal)	Q, D, C are brake resistance interfaces.
	U, V, W (motor power terminal interface)	Motor power connection terminal
	PE ground terminal	Used for servo driver body grounding, and servo motor power line grounding.

Name	Instructions
LED digital tube	5-bit 8-segment nixie tube for display of operation-related information, parameters and functions.
CHARGE Bus work indicator light	When the DC bus capacitor is charging, the indicator lights up. Do not touch the live terminal part of the servo driver and do not disassemble the servo driver before the indicator light is completely turned off.

危险

- There is strong current on the CN5 interface. Take protective measures.
- By default (when the internal brake resistor is used), terminals P and D of the CN5 port need to be shorted.
- DO When the output is connected to the relay, please use the relay diode and pay attention to its polarity, otherwise it will not be able to output normally or even damage the driver.
- DO output voltage is DC30V;
- DO The maximum continuous current of a single output is 50mA DC.
- Use a current-limiting resistor when connecting the upper optocoupler signal in the DO loop;
- COM terminal can only use one input mode of PNP or NPN.
- The I/O signal of the CN1 port of the N3 driver needs to be connected to an independent DC24V.

2.1.3 Servo driver specification

1) Electrical specifications

- Servo drive specifications☒AC200V~AC240V ☒50/60Hz☒

Model number	1R8SA	2R8SA	4R2SA	7R6SA*	120SA*
Main power/control power	AC200V~AC240V ☒50/60Hz				
power	200W	400W	750W	1kW	1.5kW
Single-phase input current	2.5A	4.1A	6.1A	9.6A	12.8A
Output rated current	1.8A	2.8A	4.2A	7.6A	12A
Maximum output current	7.2A	9.8A	12.6A	30A	50A
Overload coefficient	400%	350%	300%	250%	250%
IO	5-channels DI; Four DO channels; 1 channel SS; 1 channels STO(*)				
Built-in brake resistance	×	×	40W☒80Ω	80W☒25Ω	80W☒25Ω
Minimum resistance of external brake resistance	50Ω	50Ω	50Ω	20Ω	15Ω
Size Information W*H*D (mm)	40*175*150	40*175*150	50*175*150	56*170*174	80*170*183
Size specification	C1	C1	C2	C3	C4

- Servo drive specifications☒AC345V~AC440V ☒50/60Hz☒

Model number	3R5SC*	5R4SC*	8R4SC*	120SC*
Main power/control power	AC345V~AC440V ☒50/60Hz			
power	1kW	1.5kW	2kW	3kW
Single-phase input current	2.4A	3.6A	5.6A	8A
Output rated current	2.5A	5.4A	8.4A	11.9A
Maximum output current	10A	15A	25A	40A
Overload coefficient	200%	200%	200%	200%
IO	5-channels DI; Four DO channels; 1 channel SS; 1 channels STO(*)			
Built-in brake resistance	80W☒100Ω	80W☒100Ω	50W☒80Ω	50W☒80Ω
Minimum resistance of external brake resistance	80Ω	60Ω	45Ω	40Ω
Size Information W*H*D (mm)	56*170*174	56*170*174	80*170*183	80*170*183
Size specification	C3	C3	C4	C4

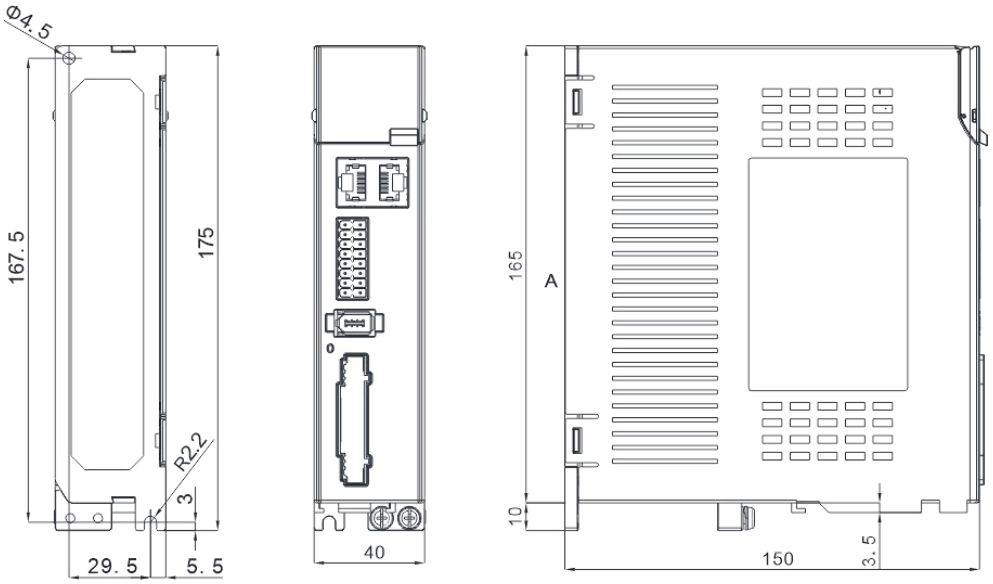
- Servo drive specifications☒AC345V~AC440V ☒50/60Hz☒

Model number	170SC*	210SC*	260SC*
Main power/control power	AC345V~AC440V ☒50/60Hz		
power	5kW	6kW	7.5kW
Single-phase input current	12A	16A	21A
Output rated current	16.5A	20.8A	25.7A
Maximum output current	50A	75A	75A
Overload coefficient	200%	250%	200%
IO	5-channels DI; Four DO channels; 1 channel SS; 1 channels STO(*)		
Built-in brake resistance	100W☒35Ω	100W☒35Ω	100W☒35Ω
Minimum resistance of external brake resistance	35Ω	25Ω	25Ω
Size Information W*H*D (mm)	90*253.6*232.8	90*253.6*232.8	90*253.6*232.8
Size specification	C5	C5	C5

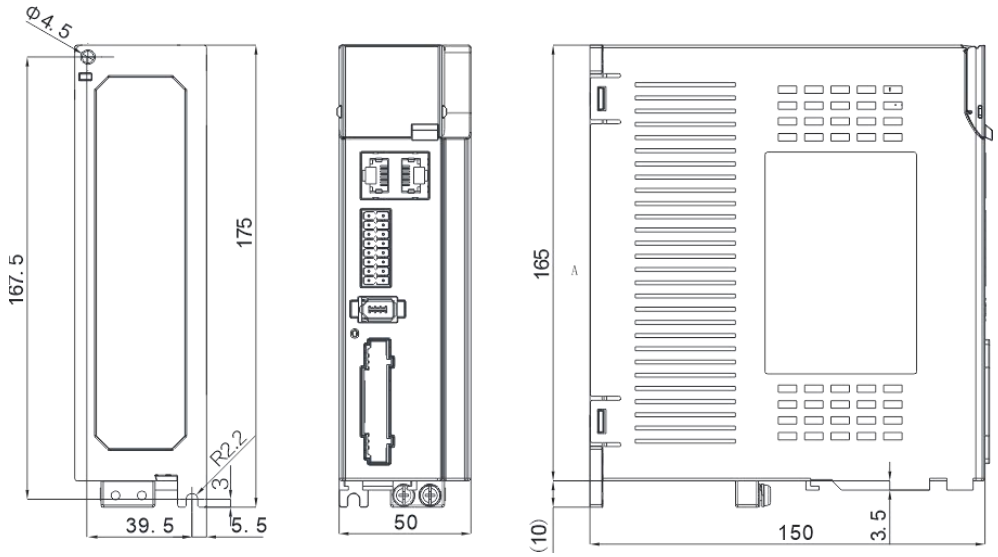
Note: * for the model under development, the specific details can be consulted with the company.

2) Specifications and dimensions drawing

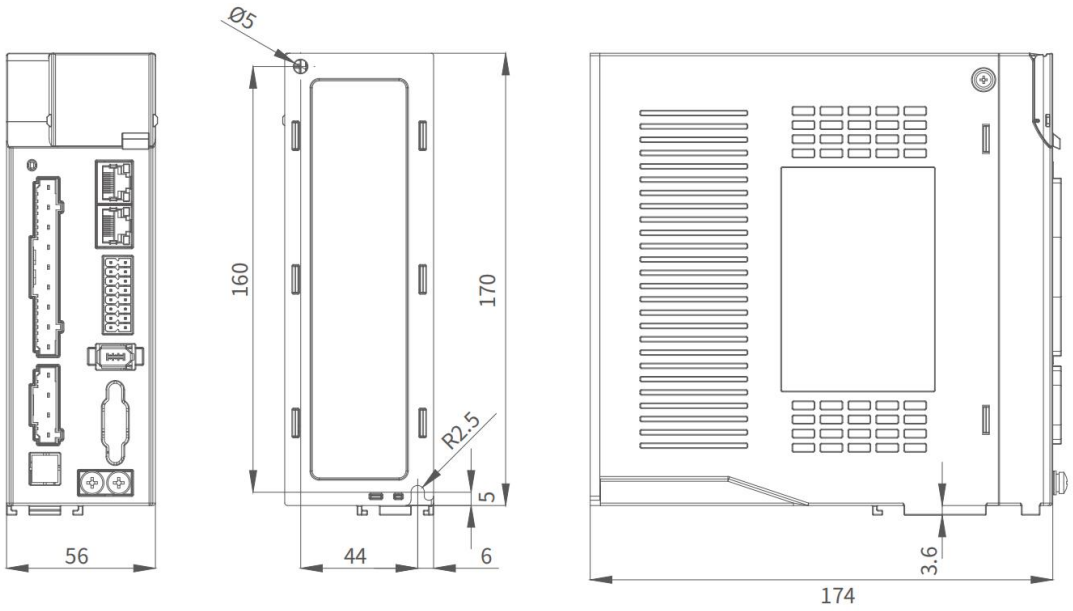
- AC220V class driver C1 specifications (Size W*H*D: 40*175*150)



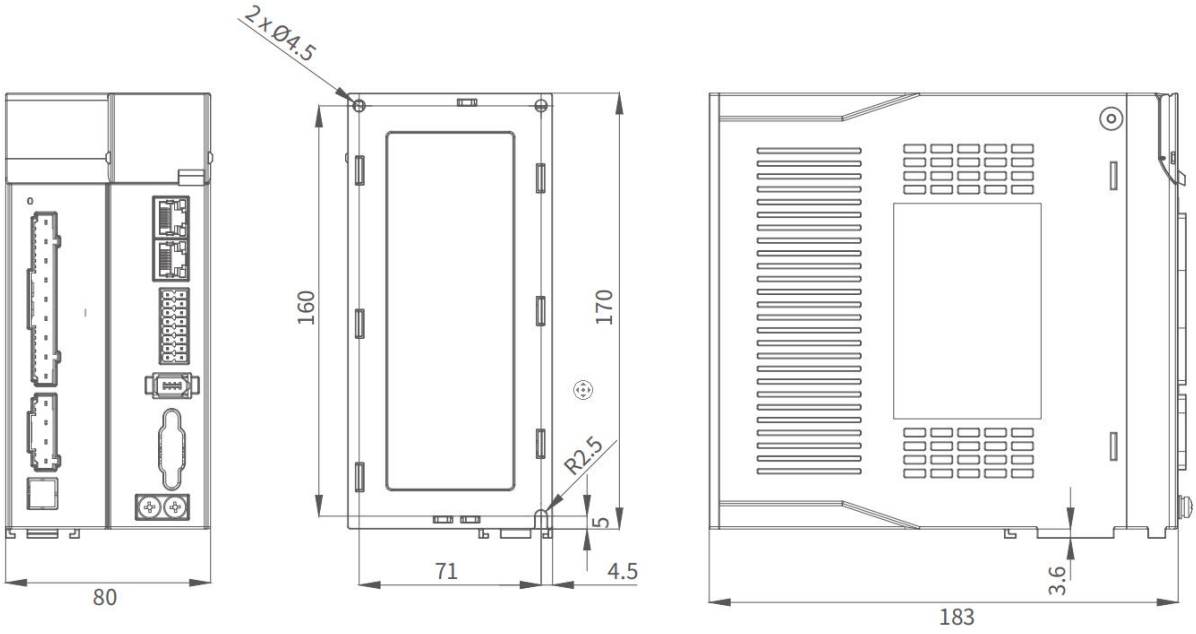
- AC220V class driver C2 specifications (Size W*H*D: 50*175*150)



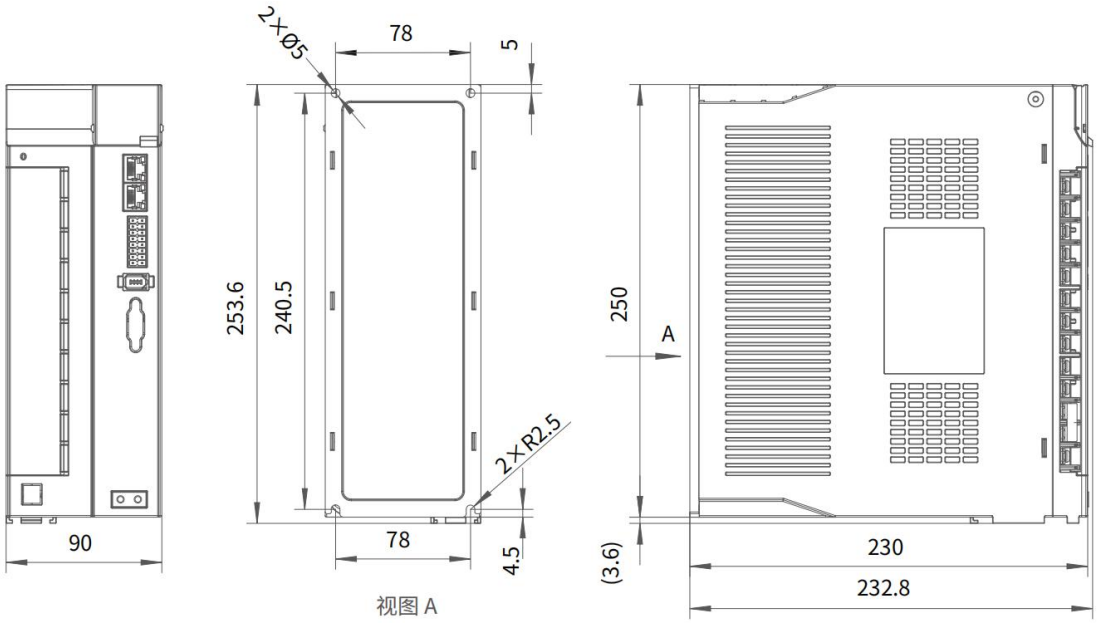
- AC220V/380V class driver C3 specifications (Size W*H*D：56*170*174)



- AC220V/380V class driver C4 specifications (Size W*H*D：80*170*183)



- AC220V/380V class driver C5 specifications (Size W*H*D：90*253.6*232.8)



3) Basic specifications

item			Description
basic specification	Control way		IGBT PWM control, sine wave current drive mode
	Encoder feedback		Communication encoder: Tamagawa protocol
	Control mode		Periodic synchronous position Mode (CSP)
			Periodic Synchronization Speed Mode (CSV)
			Cycle Synchronous Torque Mode (CST)
			Return-to-zero mode (HM)
			Change the CSP/CSV/CST
	Conditions of use	Service temperature	0~45
		Storage temperature	-20~65
		Use/store humidity	No dew below 90%RH
		Vibration resistance	4.9m/s^2
		Impact strength	19.6m/s^2
		Class of protection	IP20
		altitude	Less than 1000m; Over 1000m, the derate is reduced by 1.1% for every 100m increase The maximum altitude is 2000m
bus communication	EtherCAT Basic performance of slave station	Communication protocol	EtherCAT protocol
		Support service	CoE (PDO SDO)
		Synchronous mode	Dc-distributed clock
		Physical layer	100BASE-TX
		Baud rate	100Mbit/s
		Duplex mode	Full duplex
		Extension structure	Circular, linear
		Transmission medium	Shielded Class 5 or higher network cables
		Transmission distance	Maximum 100m between two nodes (good environment, high quality cable)
IO signal	DI		5 channels, 200μs hardware response, configurable bus DI or internal functions.
	DO		4 channels, single maximum withstand voltage DC30V, maximum continuous current DC50mA, can be configured as bus DO or gate output control, or internal function
built-in Feature	Over range (OT) prevention function		The P-OT forward overdrive and N-OT reverse overdrive stops immediately
	Protection function		Over current, over voltage, under voltage, overload, abnormal main circuit detection, heat sink overheating, overload, over speed, encoder abnormal, CPU abnormal, parameter abnormal, etc
	Safety function		Scram function
	LED display function		5-bit 8-segment LED display
	USB communication		Debugging, diagnosis, monitoring and firmware burning operations

item		Description
	Electronic nameplate function	Internally integrated drive and motor ID for automatic identification of drive and motor information.
	other	Gain adjustment, filter, vibration suppression, probe latching and other functions

2.1.4 Calculation of braking energy consumption absorption and braking resistance selection

The servo drive uses internal capacitors to absorb the regenerative energy that occurs under conditions such as motor deceleration. If the internal capacitor cannot fully absorb the regenerative energy, it can be absorbed through the internal brake resistance (note that there is no brake resistance in individual models). However, if the regenerative energy generated by the motor is too large, it will cause the internal brake resistance to burn out, will stop the regenerative action, and the bus overvoltage alarm will occur. At this time, please change the action mode to reduce the regenerative energy, or install an external brake resistor to improve the regenerative energy processing capacity.

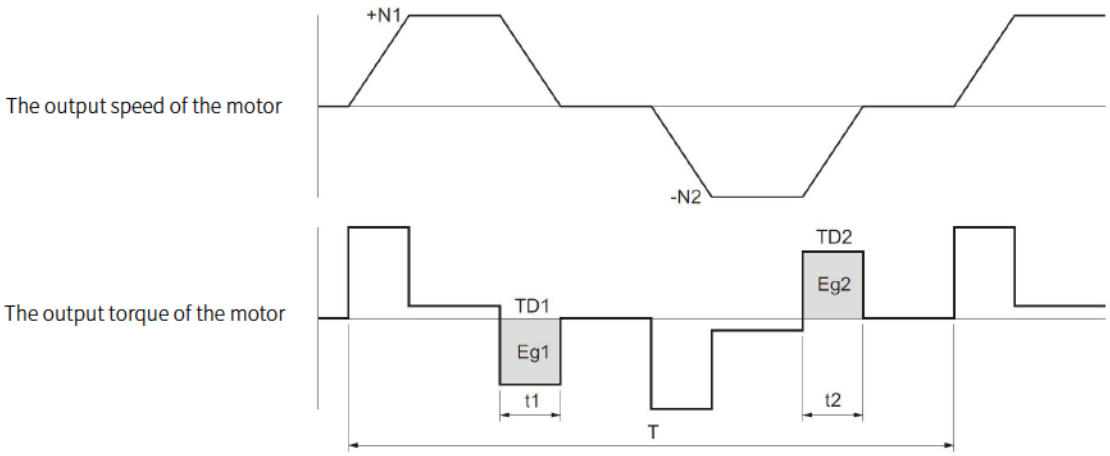
Note☒

- 400W and below servo drivers do not have built-in brake resistors. Please refer to the Driver Specifications section for details.
- The regenerative absorption capacity of the servo drive varies with the model.
- Whether the internal brake resistance of the servo drive is available, and how the capacitance regenerative absorption capacity is, please refer to the following table:

N3 drive Amount of internal regeneration absorption					
Driver type	Built-in brake resistance	External braking Resistance value	power	Brake resistance type	The drive capacitance is absorbable Maximum braking energy Ec(J)
N3RE- 1R8SA (200W)		50Ω	100W	RXLG-100W 50RJ	20
N3RE-2R8SA (400W)		50Ω	100W	RXLG-100W 50RJ	20
N3RE-3R5SA (600W)	40W☒80Ω	50Ω	200W	RXLG-200W 50RJ	20
N3RE-4R2SA (750W)	40W☒80Ω	50Ω	200W	RXLG-200W 50RJ	20

1) Calculation of regenerative energy

- horizontal axis regeneration energy calculation method



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

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

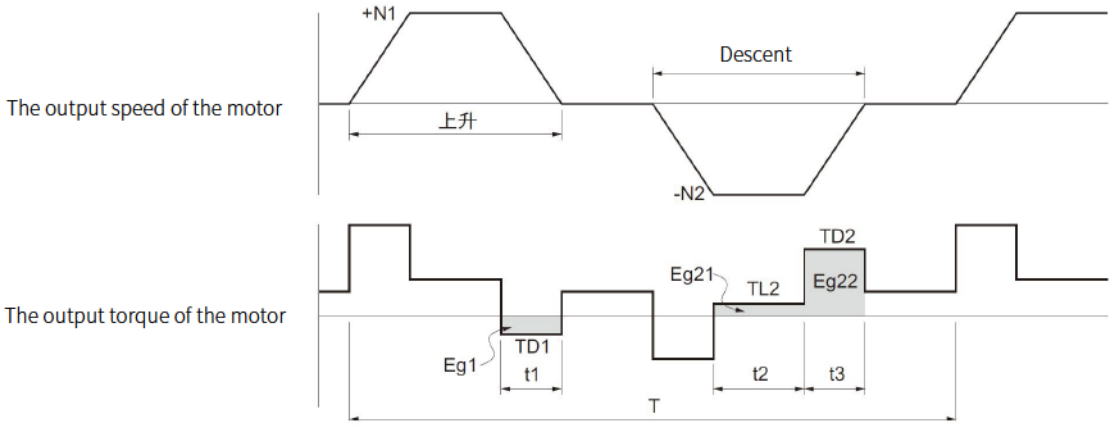
N1 N2 ☒Speed at the beginning of deceleration☒r/min☒

TD1 TD2 ☒Retarding torque ☒N m☒

t1 t2 ☒Deceleration time ☒s☒

Note: Due to the loss of motor coil resistance and driver, the actual regenerative energy is only about 90% of the calculated value above

- 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 on descent ☒N M☒

t1 t3 ☒Deceleration time ☒s☒

t2 ☒Constant running time during descent ☒s☒

Note: Due to the loss of motor coil resistance and driver, the actual regenerative energy is only about 90% of the calculated value above

2) Brake resistance selection

If the above Eg1 or Eg2 is lower than the regenerative energy Ec absorbed by the internal capacitor of the servo drive, the regenerative energy can be processed by the internal capacitor alone.

If the above Eg1 or Eg2 is lower than the regenerative energy Ec absorbed by the internal capacitor of the servo drive, the regenerative energy can be processed by the internal capacitor alone.

$$Eg = (Eg1 - Ec) + (Eg2 - Ec) \quad [J]$$

$$Pr = Eg / T \quad [W]$$

Pr ☒Regenerative power that must be absorbed in 1 cycle operation (unit W)

Eg: Regenerative energy that must be absorbed in 1 cycle action (unit J)

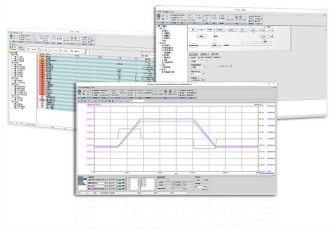
Ec: Regenerative energy that can be absorbed by the capacitor inside the drive (unit J)

T : Action cycle time (unit s)

Note: $Eg1 - Ec < 0$ ☒the value is 0, $Eg2 - Ec < 0$☒the value is 0

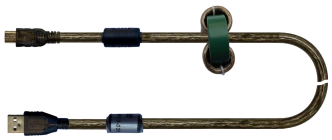
2.1.5 Driver accessories

1) debugging software(Servo Tool)



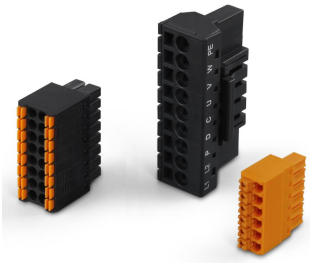
Model No.	Description
KST-SW.02	Servo system debugging software

2) debugging cable



Model No.	Description
KSL-M13-030	N3 series Mini USB debugging cable 3m with magnetic ring.

3) Set of terminals



Model No.	Description
KSA-TB17.01	N3 Series C1&C2 specification terminals
KSA-TB17.02	N3 Series C1&C2 specifications with STO terminals
KSA-TB21.01	N3 Series C3&C4 specification terminals
KSA-TB21.02	N3 Series C3&C4 specifications with STO terminals
KSA-TB28.01	N3 Series C5specification terminals
KSA-TB28.02	N3 Series C5 specifications with STO terminals

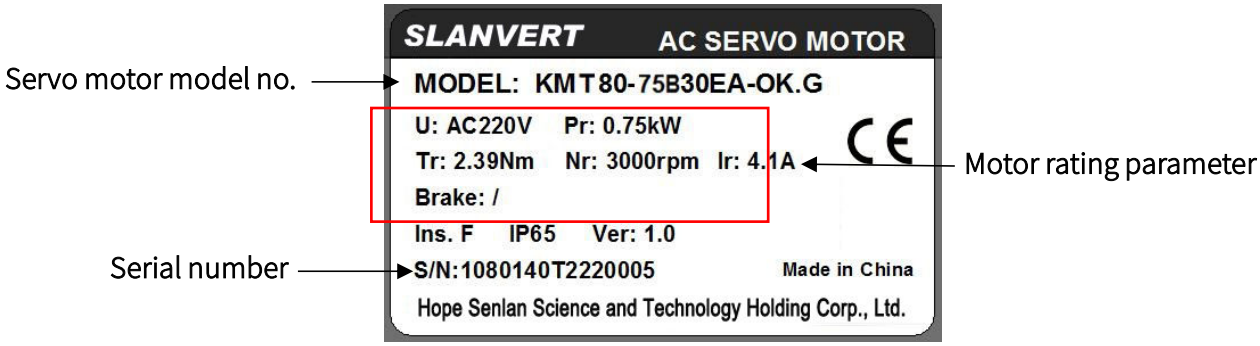
4) Communication cable

Model No.	Description
KSL-CAT-003.01	EtherCAT Communication cable 0.3M
KSL-CAT-005.01	EtherCAT Communication cable 0.5M
KSL-CAT-010.01	EtherCAT Communication cable 1M
KSL-CAT-030.01	EtherCAT Communication cable 3M
KSL-CAT-050.01	EtherCAT Communication cable 5M

Note:Standard length is had 3m,5m,7m,10m,15m,20m.other lengths can be customized according to actual needs.

2.2 KMT Servo motor

2.2.1 Nameplate and model description



KMT M 130 H - 85B 15 EA - B O K . -

KMT Series servo motor

Grade of moment of inertia
None: Standard type
L: Low inertia
M: medium inertia
H: High inertia

Flange grade
40mm 60mm 80mm 100mm
130mm 180mm 200mm 230mm

Voltage level
None: AC200V
H: AC380V

Rated power: W
B: X10
C: X100
D: X1000
For Example: 40B=400W

Rated speed
15: 1500rpm 20:2000rpm 25: 2500rpm 30:3000rpm

Encoder type
E8:17-bit multi-turn absolute magnetic encoder;
EA: 23-bit multi-turn absolute optical encoder
(The battery needs to maintain the absolute value of multiple rings).

Lock option
None: No holding device is included
B: Including locking device

Oil seal option
None: does not contain oil seal
O: Oil seal

Key axis option
None: optical axis
K: With key, with threaded hole

None: Standard
G: Plastic case navigation, only 40/60/80 flange
H: Metal flight plug, 180 flanges only

Type (Only for 80 flanges and E8 size encoders)
None: Separate body
X: whole

Note:

1) The naming rules are only used for model analysis, and cannot be used

For ordering, please consult the company before ordering;

2☒There is no oil seal, there is no brake, will cause the motor characteristics are different, please note;

3) Motor data may be changed, please confirm with the company when used for design purposes

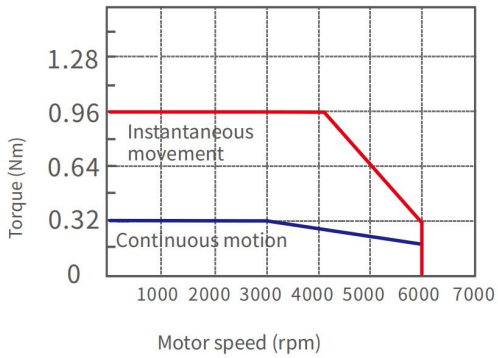
2.2.2 Motor specification

- 40 Flange motor data

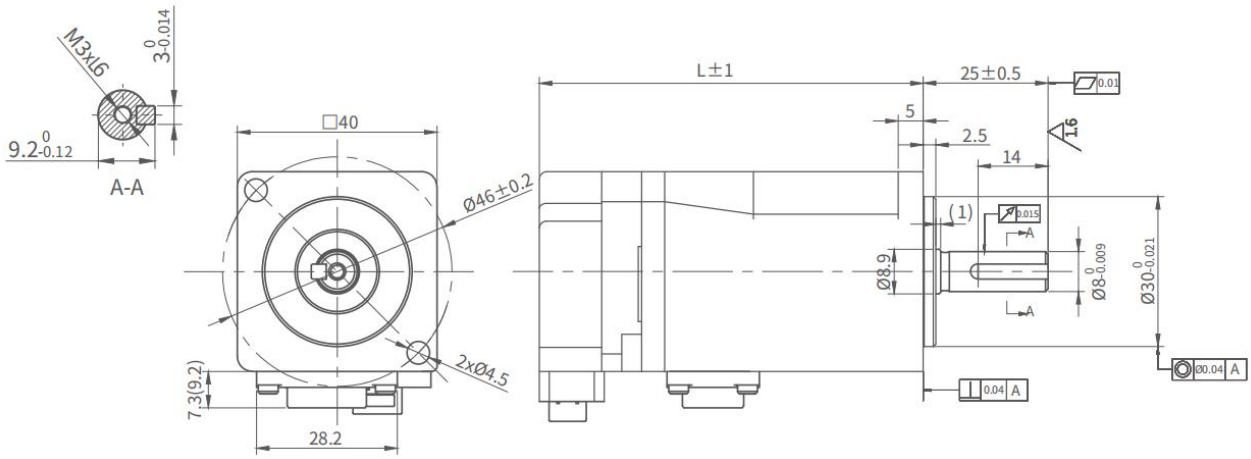
Motor Model No. / item	KMT40-10B30
Voltage U(AC)	220V
Rated power P(kW)	0.1
Rated current Ir(Arms)	0.93
Rated torque Tr(N M)	0.32
Rated speed Nr(rpm)	3000
Max Current Imax(Arms)	2.79
Maximum torque Tmax(N M)	0.96
Max speed N Max(rpm)	6000
Torque coefficient Kt(N M/A)	0.342
Moment of inertia Jm(10^{-4}Kg.m^2)	0.073(0.075)
Electrical time constant te(ms)	0.81
Mechanical Time Constant tm(ms)	1.128
Weight (kg)	0.4(0.6)
Heat sink size (mm)	Of aluminum 200X200X6
Contracting brake voltage Ub (DC)	DC24V
Contracting brakecurrent Ib (A)	0.208
Contracting brake torque Tb(N M)	☒3.2
Recommended cable cross-sectional area (mm^2)	0.5
Recommended drive model	N3RE-1R8SA-E

- 40 flange torque speed characteristic diagram

› KMT40-10B30



- 40 Flange motor dimensions



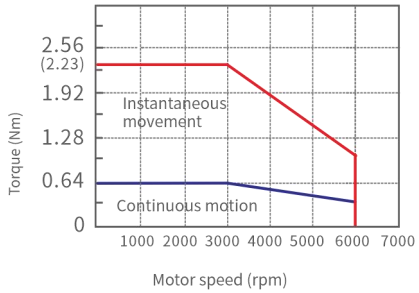
Motor Model No.	L Size without Contracting brake (mm)	L size has Contracting brake Size(mm)
KMT40-10B30E8/EA	76.9	104.6

- 60 Flange motor data

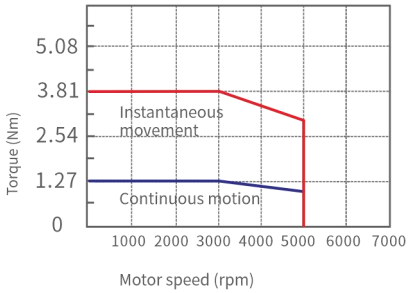
Motor Model No. / Item	KMT60-20B30	KMT60-40B30
Voltage U(AC)	220V	
Rated power P(kW)	0.2	0.4
Rated current Ir(Arms)	1.6	2.3
Rated torque Tr(N M)	0.64	1.27
Rated speed Nr(rpm)	3000	3000
Max Current Imax(Arms)	5.5	6.45
Maximum torque Tmax(N M)	2.23	3.81
Max speed N Max(rpm)	6000	5000
Torque coefficient Kt(N M/A)	0.459	0.605
Moment of inertia Jm(10^{-4}Kg.m^2)	0.28(0.30)	0.56(0.58)
Electrical time constant te(ms)	1.95	2.66
Mechanical Time Constant tm(ms)	1.432	1.151
Weight (kg)	0.81(1.26)	1.3(1.55)
Heat sink size (mm)	Aluminum 250X250X6	
Contracting brake voltage Ub(DC)	DC24V	
Contracting brake current Ib(A)	0.32	
Contracting brake torque Tb(N M)	☒1.5	
Recommended cable cross-sectional area (mm^2)	0.5	0.5
Recommended drive model	N3RE-1R8SA-E	N3RE-2R8SA-E

- 60 flange torque speed characteristic diagram

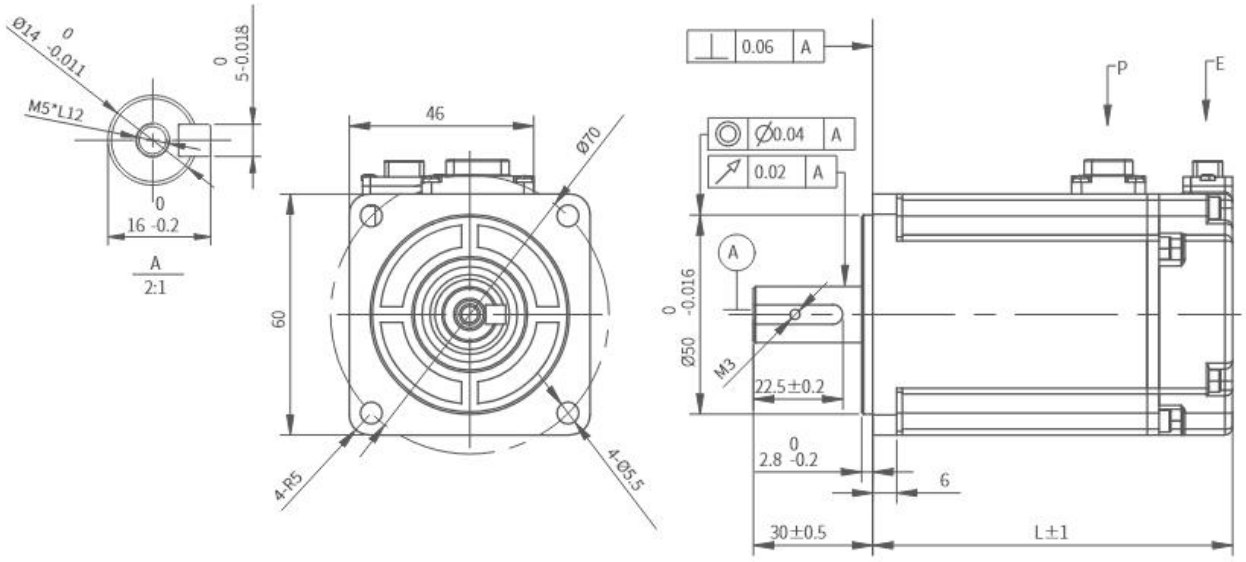
› KMT60-20B30



› KMT60-40B30



- 60 flange motor dimensions drawing



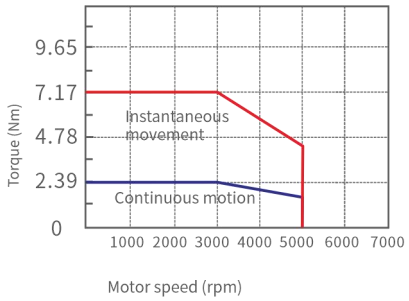
Motor Model No.	L Size without Contracting brake (mm)	L size has Contracting brake Size(mm)
KMT60-20B30E8/EA	73	104.2
KMT60-40B30E8/EA	90.5	121.7

- 80 Flange motor data

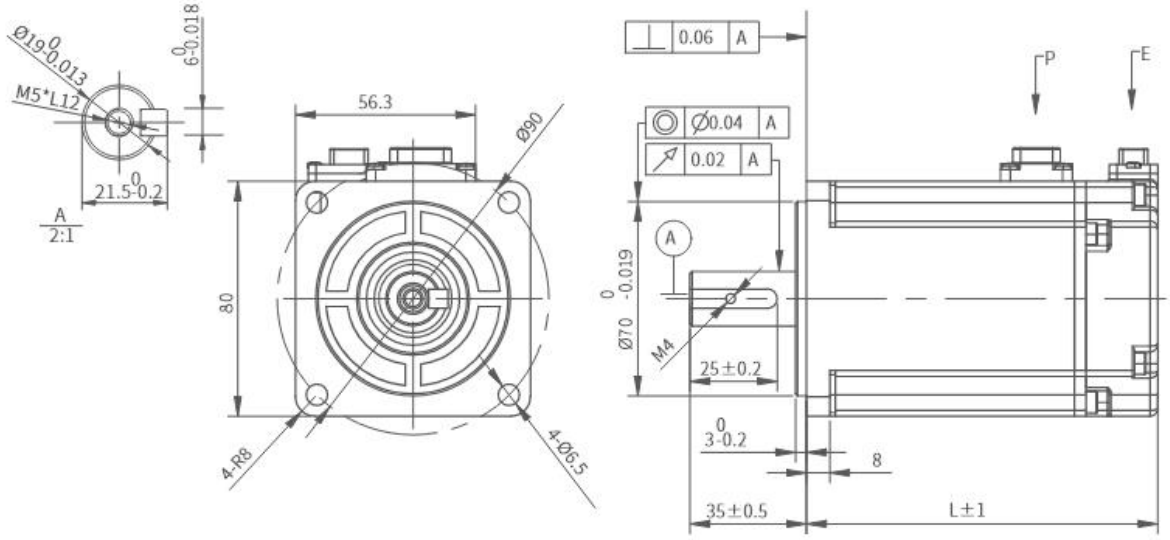
Motor Model No. / item	KMT80-75B30
Voltage U(AC)	220V
Rated power P(kW)	0.75
Rated current Ir(Arms)	4.1
Rated torque Tr(N M)	2.39
Rated speed Nr(rpm)	3000
Max Current Imax(Arms)	13.4
Maximum torque Tmax(N M)	7.17
Max speed N Max(rpm)	5000
Torque coefficient Kt(N M/A)	0.645
Moment of inertia Jm(10^{-4}Kg.m^2)	1.5(1.65)
Electrical time constant te(ms)	4.73
Mechanical Time Constant tm(ms)	0.919
Weight (kg)	2.2(2.8)
Heat sink size (mm)	aluminum 250X250X6
Contracting brake voltage Ub(DC)	DC24V
Contracting brake current Ib(A☒	0.48
Contracting brake torque Tb(N M)	☒3.2
Recommended cable cross-sectional area (mm^2)	0.5
Recommended drive model	N3RE-4R2SA-E

- 80 Flange torque speed characteristic diagram

  - KMT80-75B30



- 80 flange motor dimensions



Motor Model No.	L Size without Contracting brake (mm)	L Size without Contracting brake (mm)
KMT80-75B30E8/EA	93	123

2.3 Cables and Accessories

2.3.1 Power Cables

LM - 030 - B A4 - 1 .

Motor power cable

cable length
For example:3m=030
Maximum support 60 m =600

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

Type of motor side connector
AF: Applicable to the front outlet of 40/60/80 flanged plastic-case in-line connector without lock motor (AB is the rear outlet)*
BF: For 40/60/80 flanged motor with lock gate in the front connector (AB is the rear outlet)*
A2: For 40/60/80 flanged plastic case aviation connectors without lock motors
B2: Plastic case aviation connectors for 40/60/80 flanged motors with locking gates
A4: Suitable for 100/130 flanged metal aviation connectors without lock motors
B4: Metal aviation connectors for 100/130 flanged motors with locking gates
A7: Metal aviation connectors for 180-flange motors
AG ☒Metal aerial plug connector for motors with 180.H flange without holding brake
BG ☒Metal aerial plug connector for motors with 180.H flange with holding brake

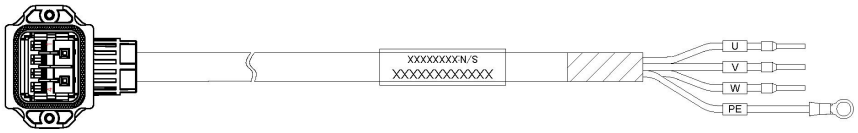
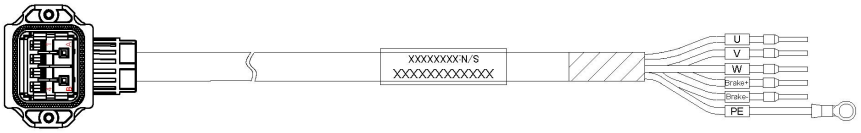
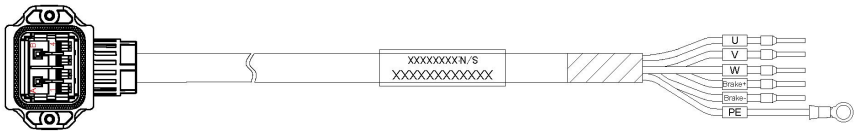
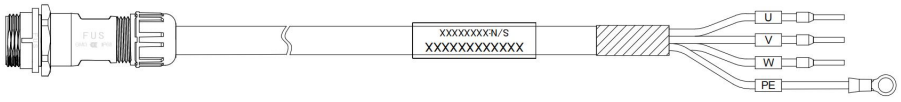
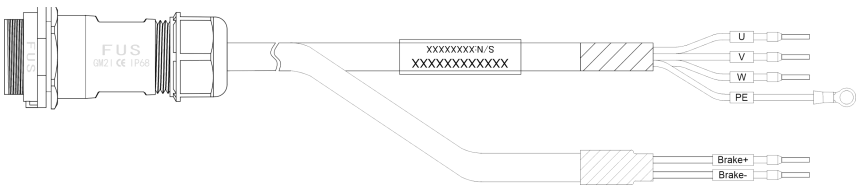
Wire specification
0 = PVC ordinary fixed cable (black)
2 = PVC high flexible cable (10 million bends)
3 = PUR Waterproof, oil-proof, corrosion-resistant flexible cable
5 = PVC high layer flexible cable with shielding (10 million bends)

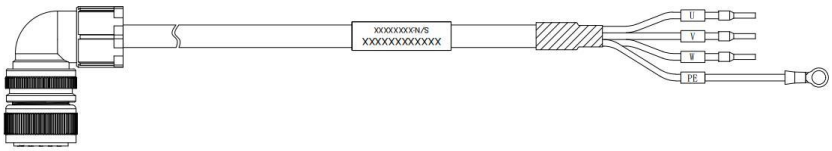
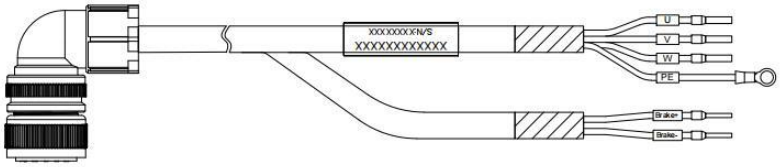
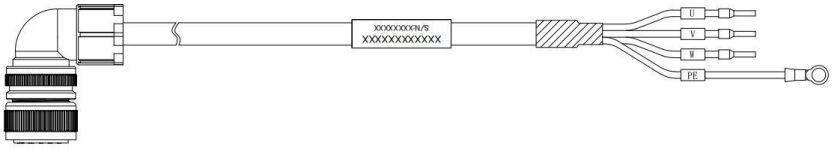
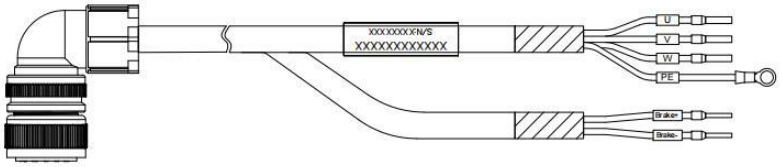
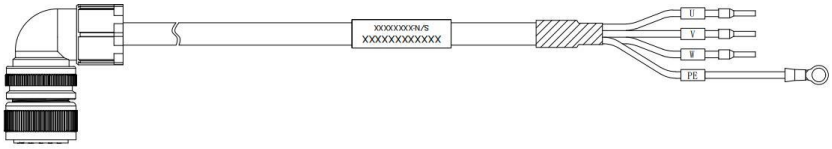
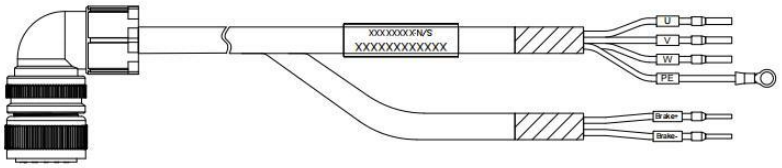
Manufacturer definition
None = The driver side is swung and does not connect to a connector
S = Suitable for N3 driver

Note: 1, the standard cable length is 3m, 5m, 7m, 10m, 15m, 20m, other lengths need to be customized.

Type of motor side connector	Cable side connector model
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
AG/BG	CMS3108A22-A6SI

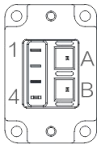
1) Power cable specification

Model No.	Content
LM-***-SAF- .S	 Connector type：SC-MC6S-AE20-01 Terminal：E0508(3PCS) +RVS1.25-4(1PCS)
LM-***-SAB- .S	 Connector type：SC-MC6S-AE20-01 Terminal：E0508(3PCS) +RVS1.25-4(1PCS)
LM-***-SBF- .S	 Connector type：SC-MC6S-AE20-01 Terminal： E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SBB- .S	 Connector type：SC-MC6S-AE20-01 Terminal： E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SA2- .S	 Connector type：CP-GM1311/S-4B Terminal： E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SB2- .S	 Connector type：CP-GM2111/S-6B Terminal： E0508(5PCS) + RVS1.25-4(1PCS)

LM-***-BAG- .S	 Connector type：CMS3108A22-A6SI Terminal： E1508(3PCS) +RVS 2-4(1PCS)
LM-***-BBG- .S	 Connector type：CMS3108A22-A6SI Terminal：E1508(3PCS)+E0508(2PCS)+RVS2-4(1PCS)
LM-***-CAG- .S	 Connector type：CMS3108A22-A6SI Terminal：E2508(3PCS) +RVS 3.5-4(1PCS)
LM-***-CBG- .S	 Connector type：CMS3108A22-A6SI Terminal：E2508(3PCS)+E0508(2PCS) +RVS5.5-4(1PCS)
LM-***-DAG- .S	 Connector type：CMS3108A22-A6SI Terminal：E4009(3PCS) +RVS 3.5-4(1PCS)
LM-***-DBG- .S	 Connector type:CMS3108A22-A6SI Terminal：E4009(3PCS)+E0508(2PCS) +RVS 5.5-4(1PCS)

2) Power cable pin definition

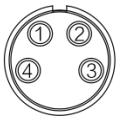
40/60/80 flange motor plastic housing plug-in connector



SC-MC6S-AE20-01

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

40/60/80 flange motor plastic shell aviation connector



CP-GM1311/S-4B

CP-GM1311/S-6B

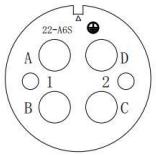
CP-GM1311/S-4B:

pin	1	2	3	4
Signal	V	U	W	PE

CP-GM1311/S-6B:

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

180.H flanged metal aircraft connectors for electric motors



CMS3108A22-A6SI

CMS3108A22-A6SI

pin	A	B	C	D	1	2
Signal	U	V	W	PE	Brake+	Brake-

2.3.2 Encoder Cable

LE - 030 - 1 P 2 - 1 .

Motor encoder cable

Cable length
For example, 3m = 030
Maximum support 60m =600

Encoder specification
Fill in according to the selected motor encoder type
1: absolute value of one turn (4 cores)
(Used when the encoder is incremental)
4: Multi-turn absolute type (6-core, with battery sling 2, without battery)
(Used when the encoder is absolute)

Type of motor side connector
PF: Front outlet of 40/60/80 flanged motor with straight plastic shell connector (PB is rear outlet)*
P2:40/60/80 plastic case avionics connector for French motors
P4:100/130/180.H flanged motor connector of metal
P6:180/200/230 flanged motor connector of metal

Special requirements
0 = PVC ordinary fixed cable (black)
2 = PVC high flexible cable (10 million bends)
3 = PUR Waterproof, oil-proof, corrosion-resistant flexible cable
5 =PVC high layer flexible cable with shielding (10 million bends)

Manufacturer definition
None = The driver side is swung and does not connect to a connector
S = For N2 series drive
V = For N3 series drive

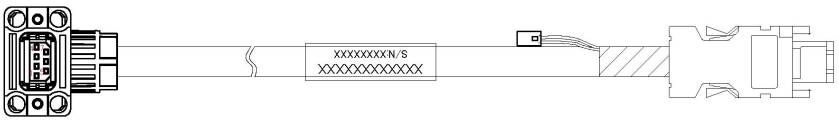
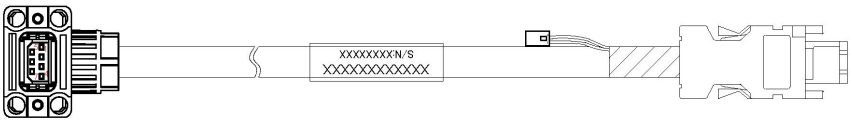
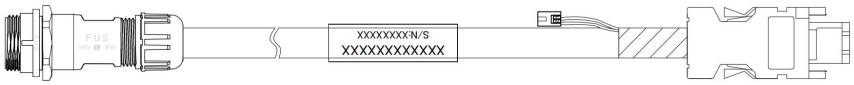
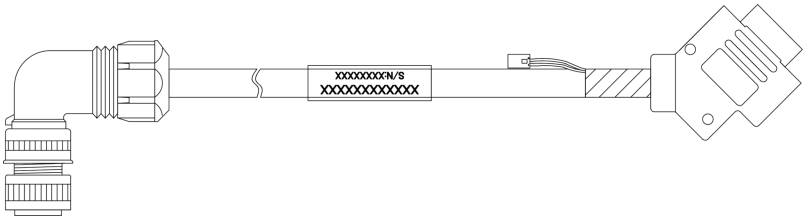
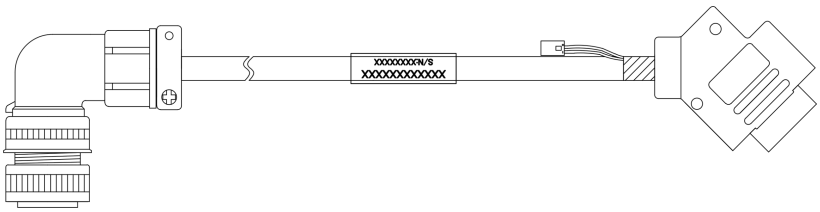
Type of motor side connector	Cable side connector Model No.
PF/PB	SC-MC7S-A820-P1
P2	CP-GM1311/S-9
P4	CMS3108A20-29SI
P6	YD28-7

Note:

1, the standard cable length is 3m, 5m, 7m, 10m, 15m, 20m, other lengths need to be customized.

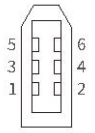
2. * The cable length of the MCCB is up to 40 meters.

1) Encoder cable specifications

Model No.	Content
LE-***-4PF-*.V	 Connector type: ☒SC-MC7S-A820-P1 Connector type☒KSA-1394a6P.01 Battery box lead
LE-***-4PB-*0.V	 Connector type: SC-MC7S-A820-P1 Connector type☒KSA-1394a6P.01 Battery box lead
LE-***-4P2- .V	 Connector type: CP-GM1311/S-9 Connector type☒KSA-1394a6P.01 Battery box lead
LE-***-4P4- .S	 Connector type: CMS3108A20-29SI Connector type☒KSA-DB9p.02 Battery box lead
LE-***-4P6- .S	 Connector type: YD28-7 Connector type☒KSA-DB9p.02 Battery box lead

2) Encoder cable pin definition

N3 driver side pin definition

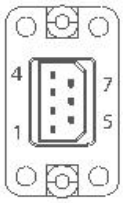


KSA-1394a6p.01

KSA-1394a6p.01☒

Pins	1	2	3	4	5	6
Signal	5V	GND	--	--	SD+	SD-

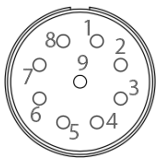
40/60/80 flange motor plastic housing plug-in connector



SC-MC7S-A820-P1 :

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

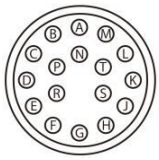
40/60/80 flange motor plastic shell aviation connector



CP-GM1311/S-9:

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

100/130/180.H flange Metal aircraft connectors for electric motors

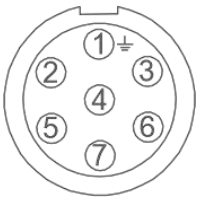


CMS3108A20-29SI

CMS3108A20-29SI:

Pins	G	H	J	K	L	S	T
Signal	0V	5V	PE	SD+	SD-	BAT+	BAT-

180/230 flange Metal aircraft connectors for electric motors

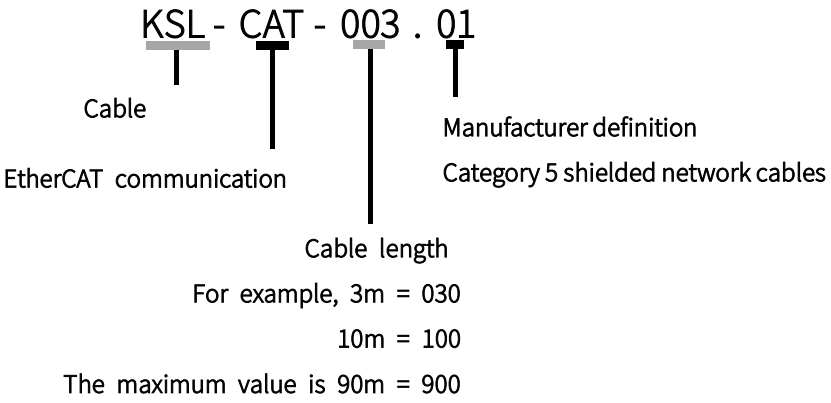


YD28-7

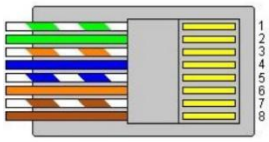
YD28-7:

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

2.3.3 Communication Cables

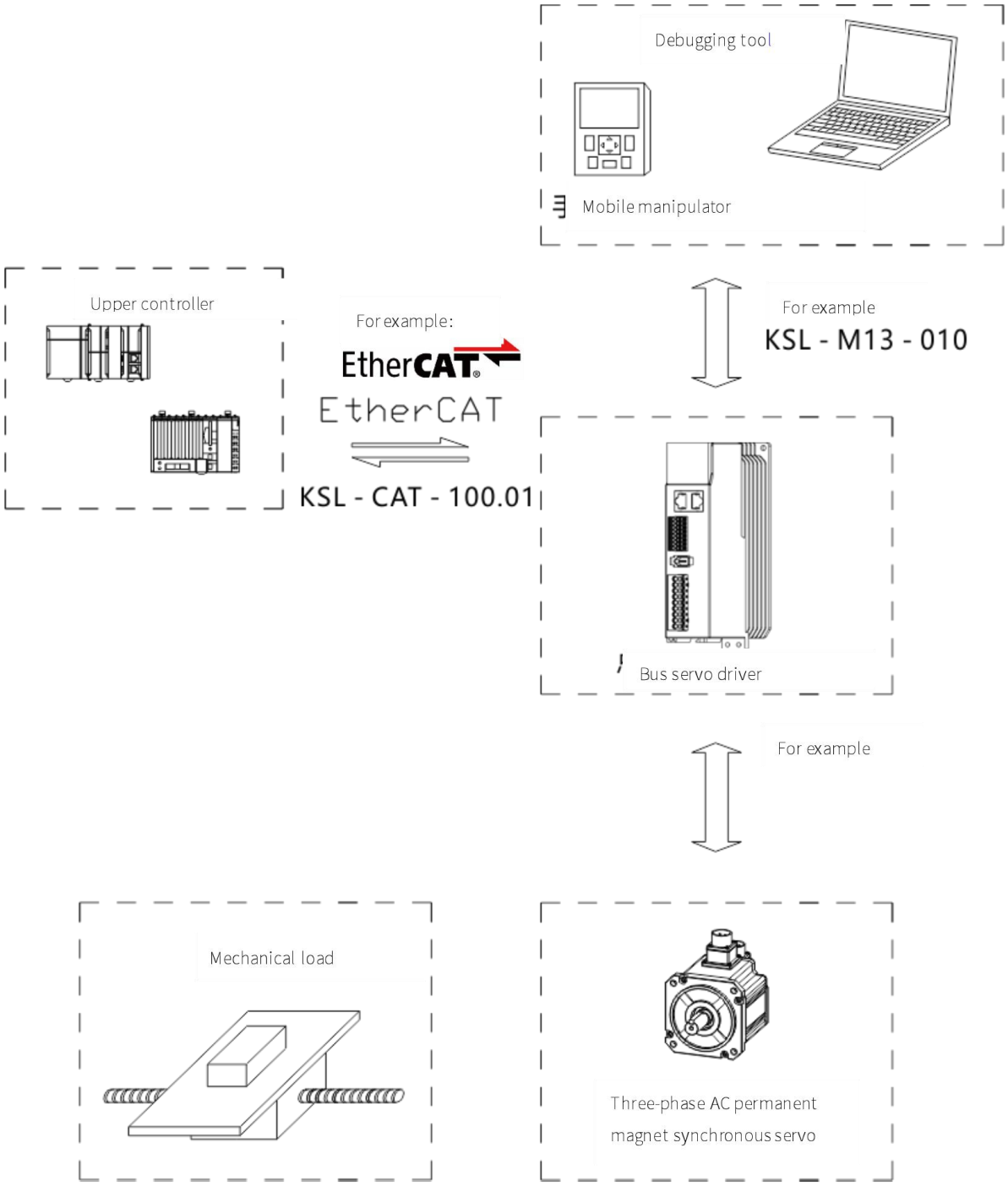


1) Bus communication cable pin definition



pins	1	2	3	4	5	6	7	8	shell
signal	TD+	TD-	RD+	/	/	RD-	/	/	shield

2.4 Servo system composition



2.5 Recommended Model list

Motor		Cable		N3 Driver
Flange	Motor Model No.	Power cable Model No.	Encoder cable Model No.	Drive Model No.
40	KMT40-10B30E -OK	LM- -SAF/SAB- .S	LE- -4PF/4PB- .V	N3RE-1R8SA-E
	KMT40-10B30E -BOK	LM- -SBF/SBB- .S		
	KMT40-10B30E -OK.G	LM- -SA2- .S	LE- -4P2- .V	N3RE-1R8SA-E
	KMT40-10B30E -BOK .G	LM- -SB2- .S		
60	KMT60-20B30E -OK	LM- -SAF/SAB- .S	LE- -4PF/4PB- .V	N3RE-1R8SA-E
	KMT60-20B30E -BOK	LM- -SBF/SBB- .S		
	KMT60-40B30E -OK	LM- -SAF/SAB- .S	LE- -4PF/4PB- .V	N3RE-2R8SA-E
	KMT60-40B30E -BOK	LM- -SBF/SBB- .S		
	KMT60-20B30E -OK.G	LM- -SA2- .S	LE- -4P2- .V	N3RE-1R8SA-E
	KMT60-20B30E -BOK.G	LM- -SB2- .S		
	KMT60-40B30E -OK.G	LM- -SA2- .S	LE- -4P2- .V	N3RE-2R8SA-E
	KMT60-40B30E -BOK.G	LM- -SB2- .S		
80	KMT80-75B30E -OK	LM- -SAF/SAB- .S	LE- -4PF/4PB- .V	N3RE-4R2SA-E
	KMT80-75B30E -BOK	LM- -SBF/SBB- .S		
	KMT80-75B30E -OK.G	LM- -SA2- .S	LE- -4P2- .V	N3RE-4R2SA-E
	KMT80-75B30E -BOK.G	LM- -SB2- .S		

Chapter 3 Installation instructions

3.1 Installation of servo driver

3.1.1 Installation Site

- Please install in the installation cabinet free from sun and rain;
- Do not use hydrogen sulfide, chlorine gas, ammonia, sulfur, chlorinated gas, acid, alkali, salt and other corrosive and flammable gases.
- Use this product near combustible materials;
- Please do not install in high temperature, humidity, dust, metal dust environment;
- Vibration-free place;
- Installation site pollution level: PD2.

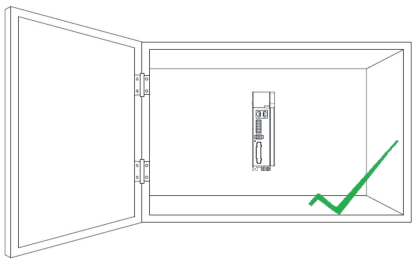
3.1.1.1. Installation Environment

Item	Description
Use ambient temperature	0 ~ +45 (non-freezing)
Use Ambient humidity	Less than 90%RH (no condensation)
Storage temperature	-20~65 (non-freezing)
Storage Storage humidity	Less than 90%RH (no condensation)
Vibration	Below 4.9m/s2
strike	Below 19.6m/s2
Class of protection	IP20
Altitude	Below 1000m (over 1000m, 1.1% derating per 100m rise, maximum altitude 2000m)

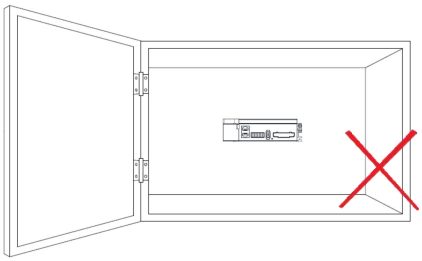
3.1.2 Installation precautions

- Ensure that the installation direction is perpendicular to the wall. Use natural convection or fans to cool the servo drive. Through 2 to 4 places (according to the number of mounting holes varies according to the capacity) Mounting holes are used to firmly fix the servo drive on the mounting surface.When installing, place the servo drive front facing the operator and perpendicular to the wall.

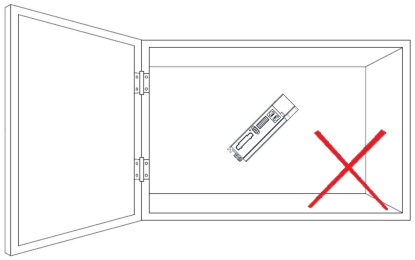
Vertical installation



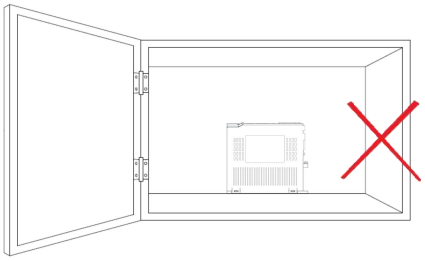
Horizontal installation



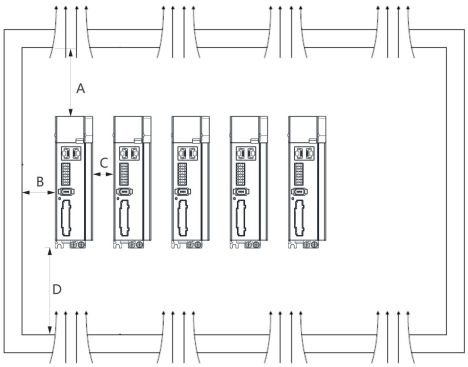
Inclined installation

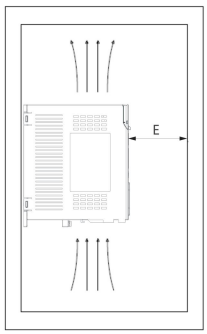


Flat wise installation



- Cooling To ensure cooling by fan and natural convection, please refer to the figure below and leave enough space around the servo drive space. Please install a cooling fan on the upper part of the servo drive, in order to prevent the ambient temperature of the servo drive from being locally too high Phenomenon, it is necessary to keep the temperature in the electric cabinet uniform.





Note: A size > 120mm,B size > 50mm,C size > 30mm,D/E size > 120mm in the product specification

- installed side by side:

It is recommended to leave a horizontal distance of more than 30mm on each side (V1 format, no fan structure, and side heat sink)

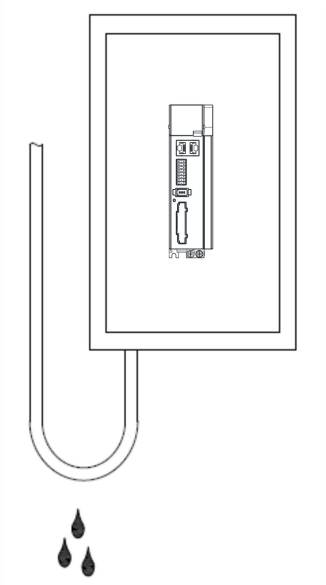
Heat dissipation, so there must be a 30mm gap). Leave a gap of at least 50mm between the first and last two drivers and the side of the cabinet.

- Grounding:

Be sure to ground the grounding terminal, otherwise there may be a risk of electric shock or interference resulting in misoperation.

- Cable routing requirements:

When connecting cables to the driver, avoid liquid sticking to the surface of the cable, which may cause liquid to flow into the driver.



3.2 Installation of servo motor

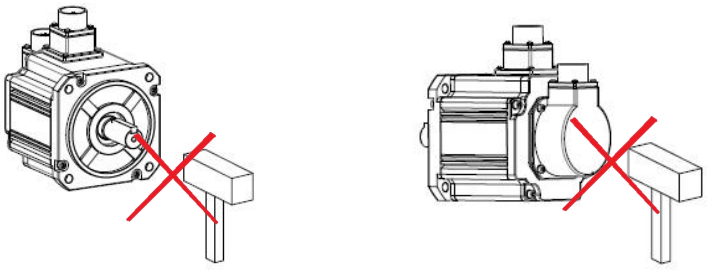
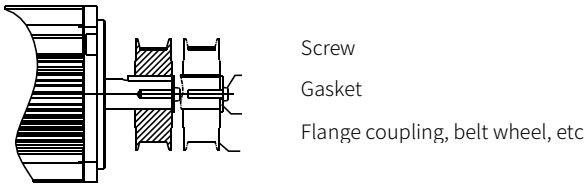
3.2.1 Installation site

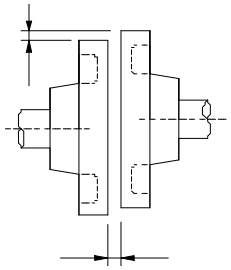
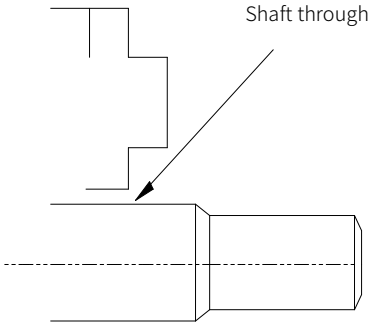
- Do not use this product in the vicinity of corrosive and combustible gases such as hydrogen sulfide, chlorine gas, ammonia, sulfur, chlorinated gas, acid, alkali, salt, etc.
- In the grinding fluid, oil mist, iron powder, cutting, etc., please choose the model with oil seal;
- Place away from heat sources such as furnaces;
- Do not use the motor in a closed environment. The closed environment will lead to high motor temperature; Shorten service life.

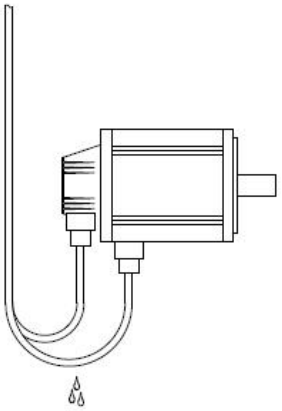
3.2.2 Installation Environment

Item	Description
Use ambient temperature	0~40 (non-freezing)
Use Ambient humidity	20%~90%RH (no condensation)
Storage temperature	-20 ~60 (maximum temperature guaranteed: 80 72 hours)
Storage Storage humidity	20%~90%RH (no condensation)
Vibration	Below 49m/s2
strike	Below 490m/s2
Class of protection	H1, H4: IP65(shaft through part, except motor connector connection terminal part) Other: IP67(except shaft through part, motor connector connecting terminal part)
altitude	If the value is below 1000m, the rate above 1000m shall be reduced.

3.2.3 installation precautions

<table>
<tr><th>item</th><th>description</th></tr>
<tr><td>Antirust treatment</td><td>◆ Please wipe the "rust inhibitor" on the extension end of the servo motor shaft before installation, and then perform related anti-rust treatment.</td></tr>
<tr><td rowspan="2">Encoder attention</td><td>◆ During installation, it is forbidden to impact the shaft extension end and the encoder protective cover, otherwise it will cause the encoder glass optical code disk to break.
  </td></tr>
<tr><td>◆ When installing pulleys on servo motor shafts with keyways, use screw holes at shaft ends.
◆ To install the pulley, first insert a double-headed nail into the screw hole of the shaft, then use a washer on the surface of the coupling end and gradually lock it in with a nut Pulley.
 
Screw
Gasket
Flange coupling, belt wheel, etc
◆ for servomotor shafts with keyways, use screw holes at shaft ends; For shafts without keyways, frictional coupling or similar is used Method.
◆ When removing the pulley, the pulley ejector is used to prevent the bearing from being strongly impacted by the load.
◆ For safety, install a protective cover or similar device, such as a pulley mounted on the shaft, in the rotating area.
◆ When connecting with the machine, please use the coupling and keep the axis of the servo motor in a straight line with the axis of the machine. When installing the servo motor, make it meet the centering accuracy requirements as shown on the left. If the centering is not sufficient, it will cause vibration, which may sometimes damage bearings and encoders.</td></tr>
</table>

<table>
<tr><td></td><td> 
Taking measurements at four locations throughout the circumference,
The difference between the maximum and minimum values is guaranteed to be less than 0.03mm</td></tr>
<tr><td>installation direction</td><td>◆ The servo motor can be installed in the horizontal or vertical direction.</td></tr>
<tr><td>Oil-water game</td><td>◆ Do not immerse ordinary servo motor or cable in oil or water.
◆ When used in places with water droplets, oil droplets or condensation, special treatment of the motor is required to meet the protection requirements; However, the motor needs to meet the protection requirements for the shaft through the factory, and the motor model with oil seal should be specified. (The shaft through part refers to the gap of the shaft extending from the end face of the motor)
◆ In the application of liquid, please install the motor wiring port downward (as shown below) to prevent liquid from flowing along the cable to the motor body;
 


◆ Specify a servomotor with oil seal for use where oil drips may fall on the shaft through. Conditions of use of servo motor with oil seal:
◆ Ensure that the oil level is lower than the lip of the oil seal when using;
◆ When the servo motor is mounted vertically, do not allow oil to accumulate on the lip of the oil seal.</td></tr>
<tr><td>Cable tension</td><td>◆ Do not bend the cable in a small radius or exert excessive tension on the cable. In particular, the core wire diameter of the encoder signal line is usually only 0.2~0.3mm, and it should not be stretched too tight when wiring to prevent the cable core from being torn off.</td></tr>
</table>

Chapter 4 Chapter IV Wiring

4.1 General wiring diagram and port

- C1&C2 Standard

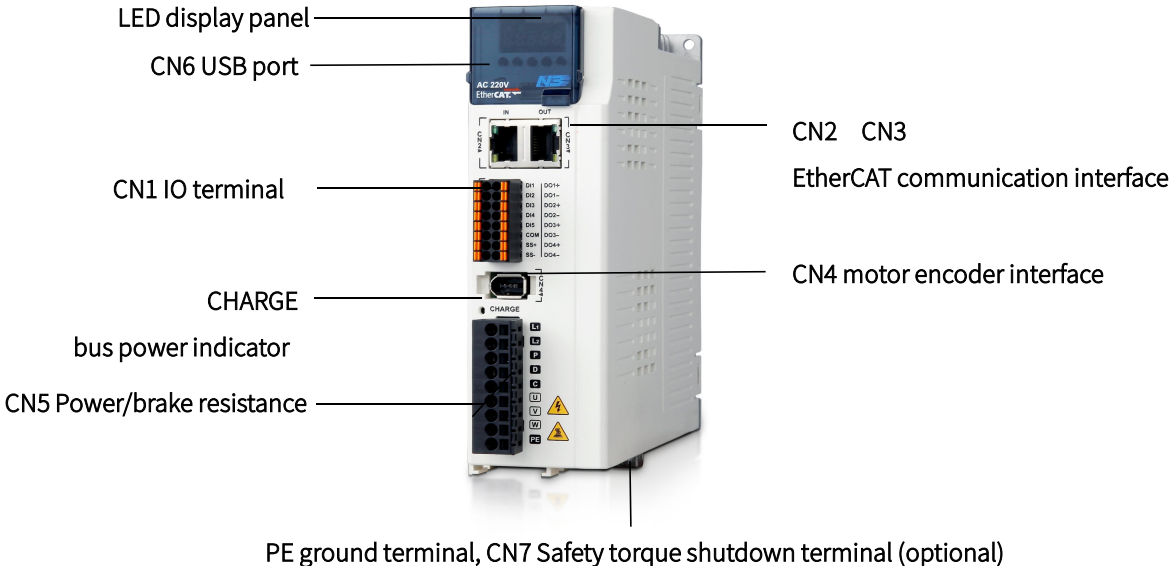


Figure 4.1.1 - C1&C2 Driver terminal layout

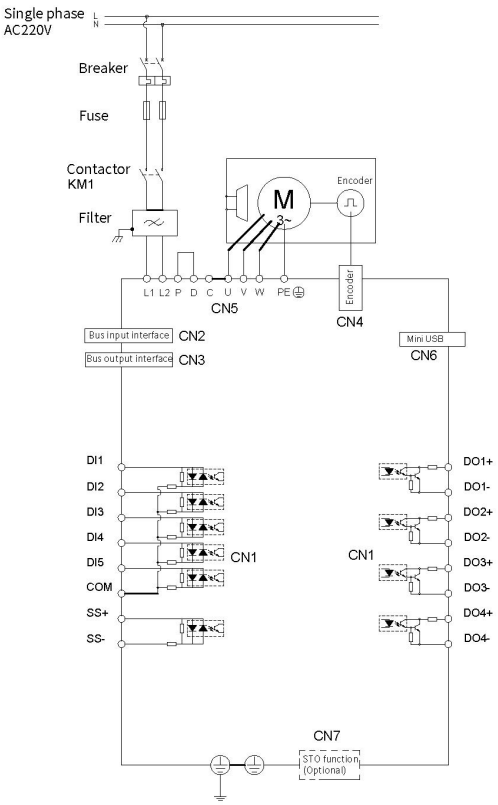


Figure 4.1.2 -C1&C2 General wiring diagram

AC220V C1 and C2 specifications Driver terminals

Includes 1R8SA/2R8SA/3R5SA/4R2SA models

Terminal Number	Markers	Name	Function
CN6	USB	USB communication interface	Computer debug communication port.
CN2	IN	EtherCAT communication IN	EtherCAT communication In.
CN3	OUT	EtherCAT communication OUT	EtherCAT communication OUT
CN1	IO	IO signal	DI\DO\SS and other functions.
CN4	Encoder	Main encoder feedback interface	Servo motor body encoder access.
CN5	L1 L2	Power input terminal	L1/L2 is the control power input and needs to be connected to the single-phase AC220V power supply
	P D C	Brake resistance terminal	By default, P and D are shorted using short splice. In this case, the braking resistance inside the drive is used to absorb braking energy. When an external brake resistor is needed, the short splice between P and D should be cancelled and the external brake resistor should be connected to P and C.
	U V W	Motor power output terminal	Motor power line interface.
	PE	PE ground terminal	Used for servo driver body grounding, and servo motor power line grounding.
CN7	STO	Safe torque off terminal	STO function (Only drive versions with security features have ⏚ this port.)
PE		Ground connection	Motor grounding, drive grounding.

Form 4.1.1 - AC220V driver C1/C2 specifications Terminal definition

- C3&C4 Standard

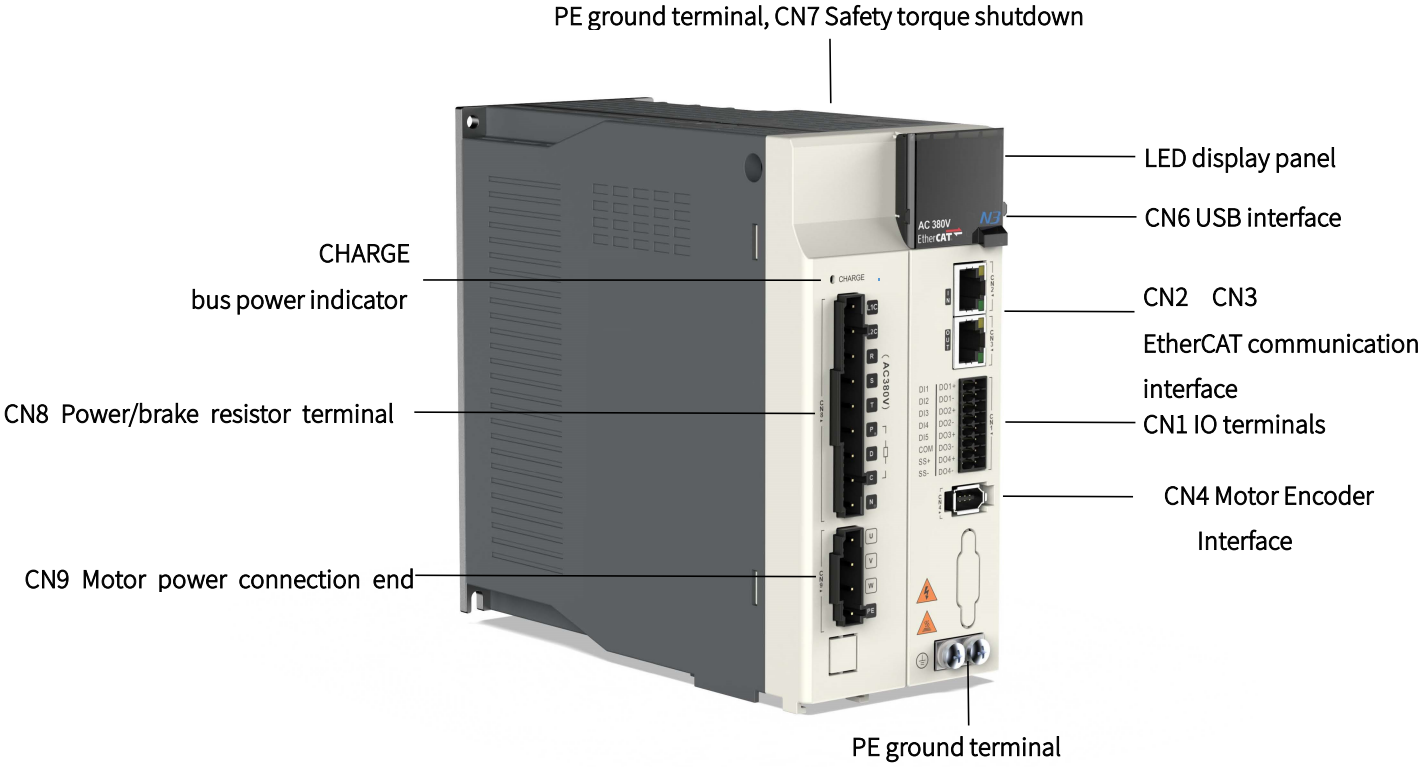


Figure 4.1.3 - C3&C4 Driver terminal layout

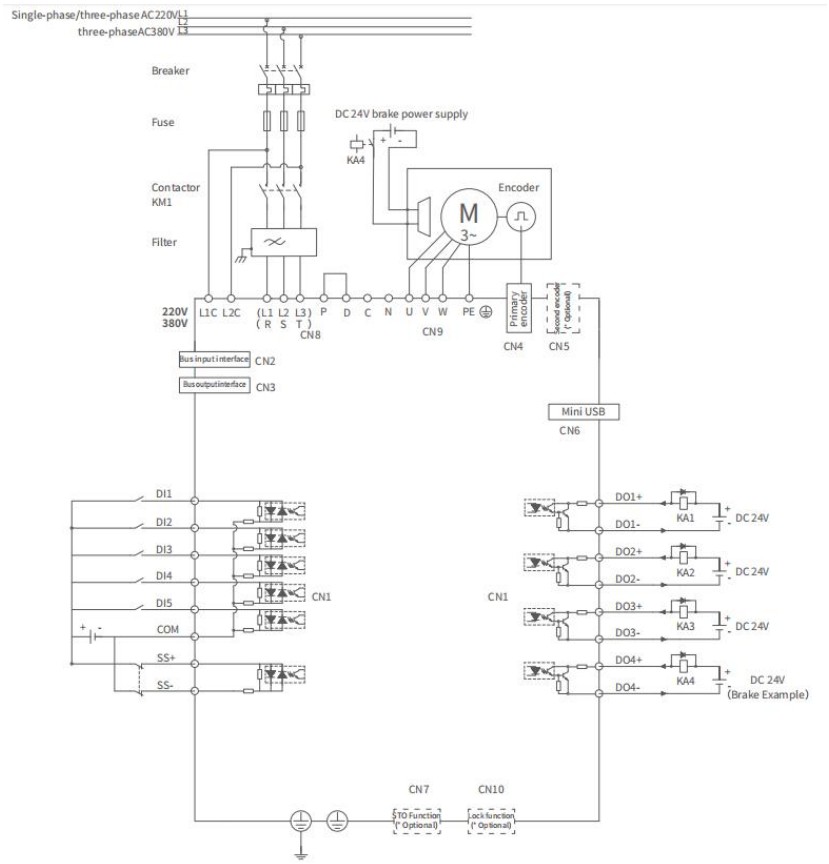


Figure 4.1.4 - C3&C4 General wiring diagram

Single-phase/3-phase AC220V & 3-phase AC380V Class C3, C4 Specifications Driver Terminal Definition Includes7R6SA/120SA/3R5SC/5R4SC/8R4SC/120SC models

Terminal Number	Markers	Name	Function
CN6	USB	USB communication interface	Computer debug communication port.
CN2	IN	EtherCAT communication IN	EtherCAT communication In.
CN3	OUT	EtherCAT communication OUT	EtherCAT communication OUT
CN1	IO	IO signal	DI\DO\SS and other functions.
CN4	-	Main encoder feedback interface	Servo motor body encoder access.
CN8	L1C L2C	Control circuit power input terminal	Input the control circuit power with reference to the nameplate rated voltage level.
	L1 L2 L3 (R S T)	Main circuit power input terminal	Input the main circuit power with reference to the rated voltage level of the nameplate. (L1, L2, L3 for AC220V, R, S, T for AC380V. For single-phase, connect any two phases of L1, L2, L3.)
	P D C	Brake Resistor Terminal	By default, P and D are shorted with shorting tabs, and the braking resistor inside the driver is used for braking energy absorption. If an external braking resistor is required, the shorting tabs between P and D should be canceled, and the external braking resistor should be connected to P and C.
	P N	Servo Bus Terminals	DC bus terminals for multiple servos with common DC bus.
CN9	U V W	Motor power output terminal	Motor power cord connector.
	PE	PE ground terminal	For servo drive body grounding, and servo motor power line grounding.

CN7	STO	Safe Torque Off Terminal	STO function (This port is only available on drive versions with security features.)
PE	⏚	grounding	Motor ground, drive ground.

Form 4.1.2 - Single-phase AC220V & Three-phase AC380V Drive C3/C4 specifications terminal definition

- C5 Standard

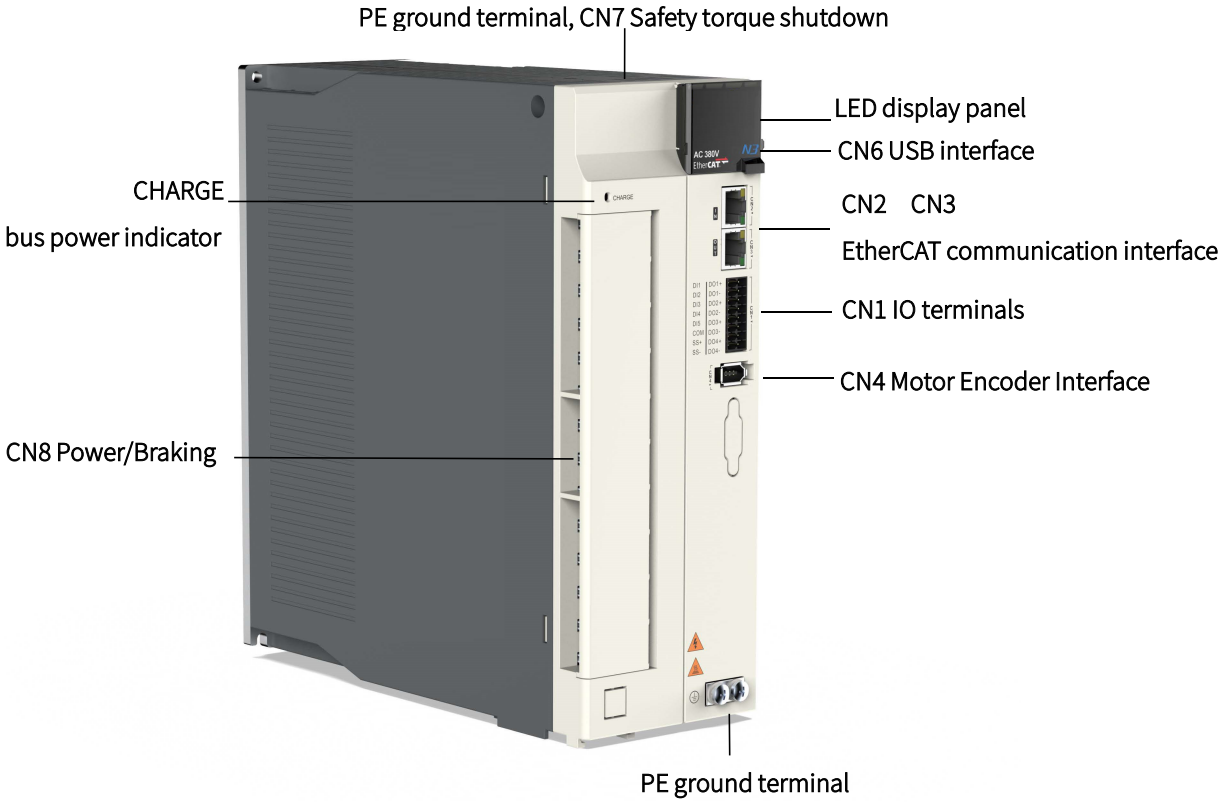


Figure 4.1.5- C5 Driver terminal layout

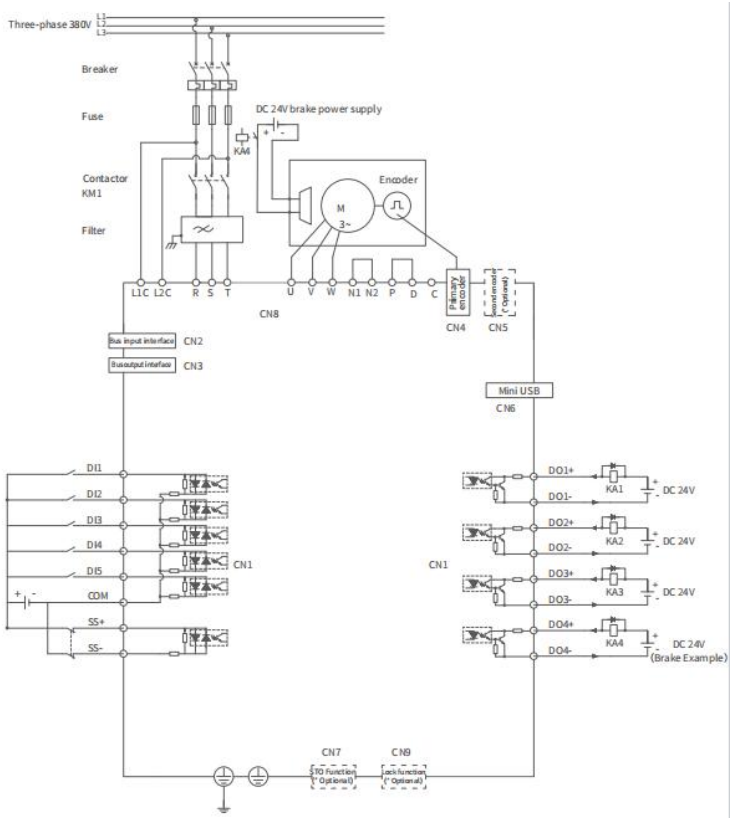


Figure 4.1.6 - C5 General wiring diagram

AC380V Class C5 Specifications Driver Terminal Definition

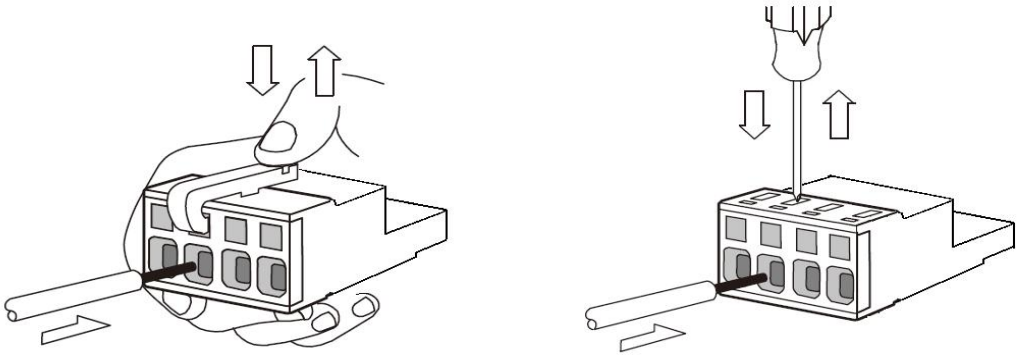
Includes170SC/210SC/260SC models

Terminal Number	Markers	Name	Function
CN6	USB	USB communication interface	Computer debug communication port.
CN2	IN	EtherCAT communication IN	EtherCAT communication In.
CN3	OUT	EtherCAT communication OUT	EtherCAT communication OUT
CN1	IO	IO signal	DI\DO\SS and other functions.
CN4	-	Main encoder feedback interface	Servo motor body encoder access.
CN8	L1C L2C	Control circuit power input terminal	Input the control circuit power with reference to the nameplate rated voltage level.
	R S T	Main circuit power input terminal	Input the main circuit power with reference to the nameplate rated voltage level.
	U V W	Brake Resistor Terminal	Motor power cord connector.
	N1 N2	Servo Bus Terminals	The default is to connect a short wire between N1 and N2, when you need to suppress the high harmonics of the power supply, remove the short wire and connect an external DC reactor between N1 and N2.
	P D C	Motor power output terminal	By default, P and D are shorted with shorting tabs, and the braking resistor inside the driver is used for braking energy absorption. If an external braking resistor is required, the shorting tabs between P and D should be canceled, and the external braking resistor should be connected to P and C.
	P N1	PE ground terminal	DC bus terminals for multiple servos with common DC bus.

CN7	STO	Safe Torque Off Terminal	STO function (This port is only available on drive versions with security features.)
PE	⏚	grounding	Motor ground, drive ground.

Form 4.1.3 - AC380V drive C5 specification terminal definition

4.1.1 Use of wiring tools



4.2 Connection of servo drive main loop and control loop

4.2.1 Main circuit connection

- AC220V Class C1/C2 Specifications

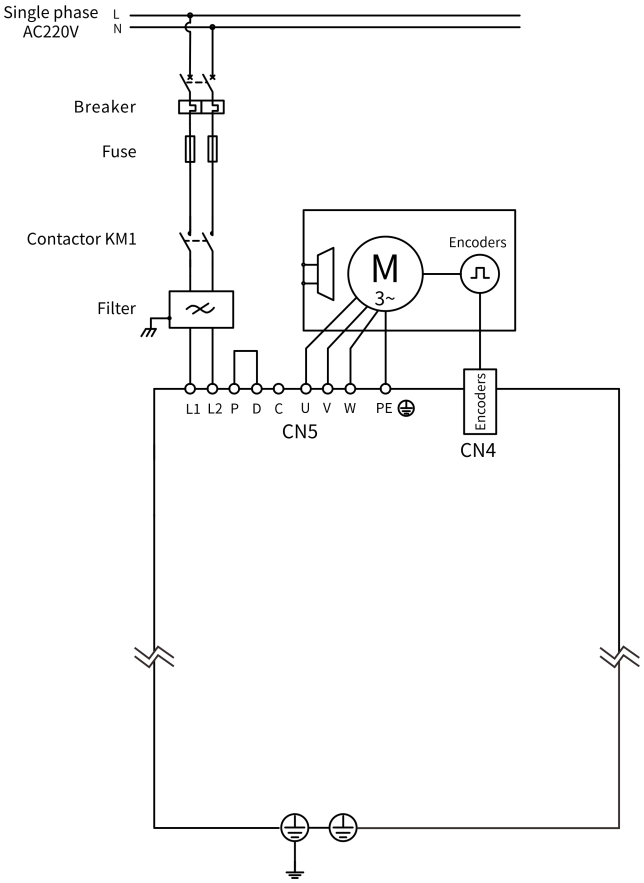


Figure 4.2.1- C1&C2 Main circuit connection diagram

- AC220V/AC380V Class C3/C4 Specifications

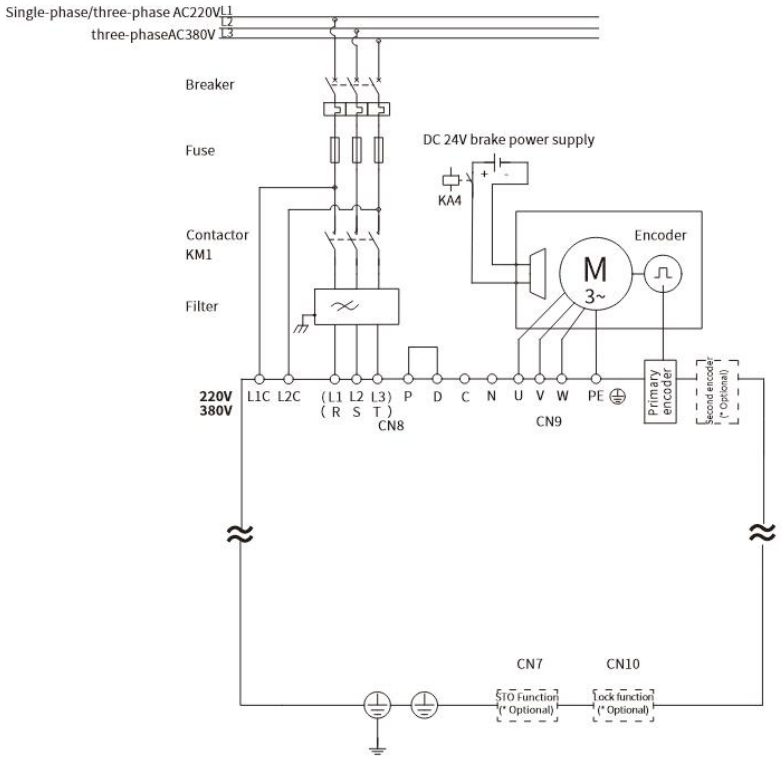


Figure 4.2.2- C3&C4 Main circuit connection diagram

- AC380V Class C5 Specifications

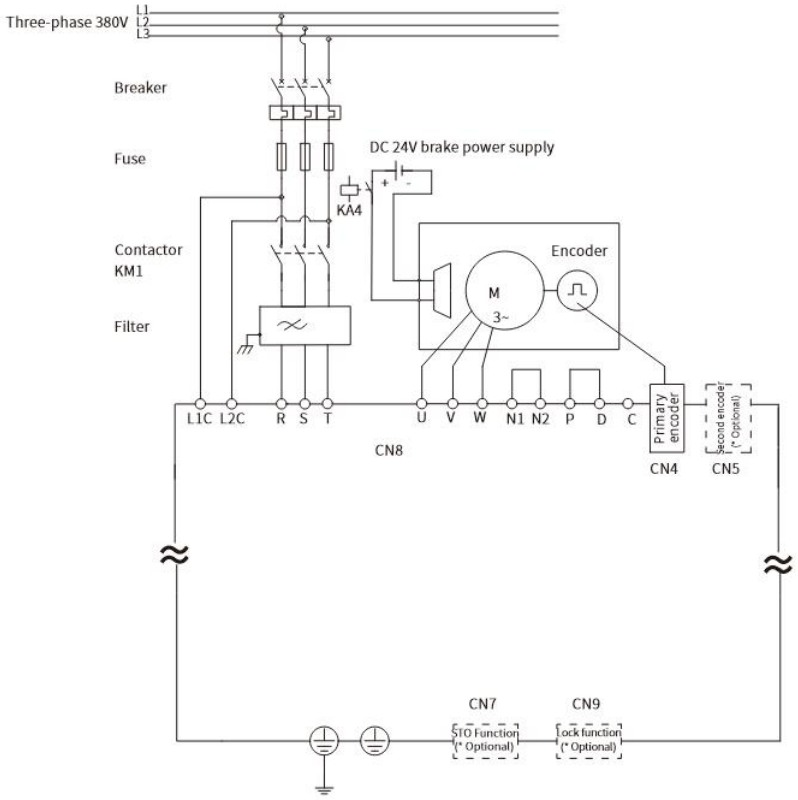


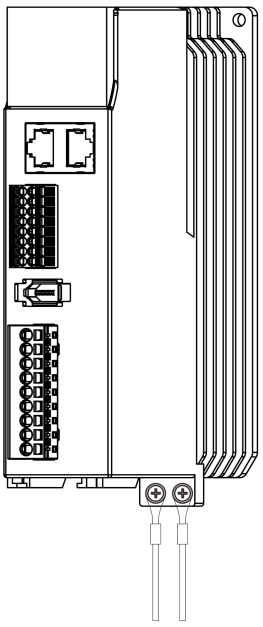
Figure 4.2.3- C5Main circuit connection diagram

Note: After a power failure for a long time, power on and off quickly several times

4.2.2 Capacitor Recharging

After a long storage time, the capacitor needs to be charged to avoid damage to the capacitor. Limit the possibility of high current leakage of capacitors. This is achieved by quickly powering on and off several times.

4.2.3 Grounding the System



Driver Motor connection

Warn:

- To prevent electric shock, be sure to ground the servo drive and the servo motor.
- According to the relevant standards of the electrical equipment, use level D grounding (grounding resistance less than 100Ω) for 200V and use level D grounding (grounding resistance less than 100 ω) for 400V
- Class C ground (ground resistance less than 10Ω)
- Use a cable with a diameter larger than the applicable cable and as short as possible.
- When multiple drivers are used, do not ground them in series. Otherwise, misoperation of the drivers and surrounding control devices may occur.

4.2.4 System Cabling

N3 Driver input main loop recommended wire diameter

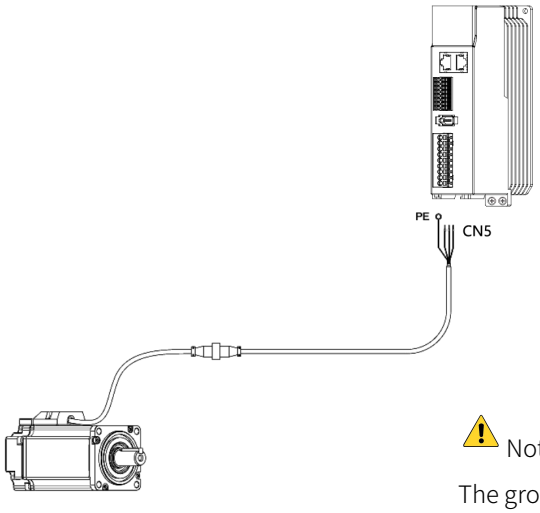
Size specification	Model No.	Rated input current	L1 and L2 Recommended cable specifications		PE grounding	
			mm²	AWG	mm²	AWG
C1	1R8SA	2.5A	0.75	18	0.75	18
C1	2R8SA	4.1A	0.75	18	0.75	18
C2	3R5SA	5.2A	0.75	18	0.75	18
C2	4R2SA	6.1A	1.5	16	1.5	16

4.3 Servo drive and KMT series servo motor power connection

4.3.1 Comparison table of recommended models of driver and AC220V KMT motor

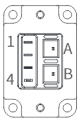
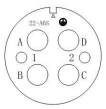
KMT motor model No.	N3 drive model No.	Motor UVW recommended wiring specifications		Motor PE recommended wiring Specification		Recommendation Contracting brake Wiring specification	
		mm²	AWG	mm²	AWG	mm²	AWG
KMT40-10B30	N3RE-1R8SA	0.5	20	0.5	20	0.5	20
KMT60-20B30	N3RE-1R8SA	0.5	20	0.5	20	0.5	20
KMT60-40B30	N3RE-2R8SA	0.5	20	0.5	20	0.5	20
KMT80-75B30	N3RE-4R2SA	0.5	20	0.5	20	0.5	20

4.3.2 The servo motor does not include the power connection of the brake holding device

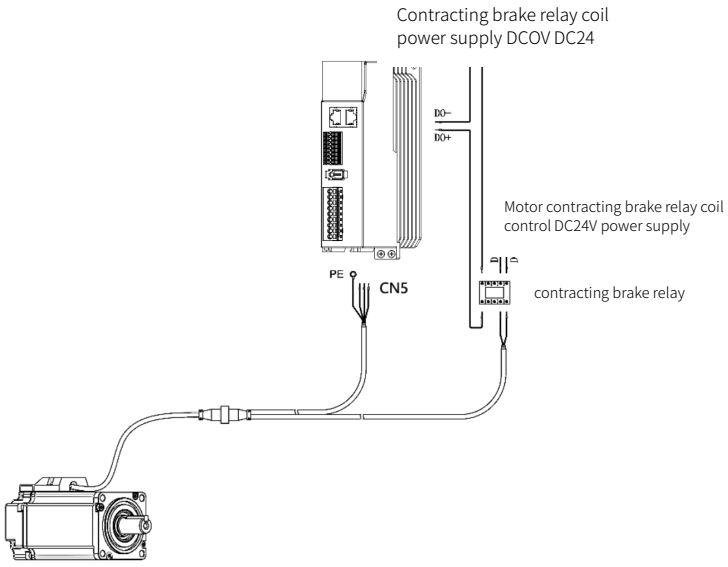


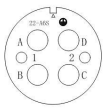
⚠ Note:

The ground wire must be firmly connected!

Connector outline	Terminal Adaptive motor frame	Terminal pin definition
 SC-MC6S-AE20-01	KMT series with plastic case in line connector 40 flange motor, 60 flange motor, 80 flange motor.	 Terminal symbol: 1 2 3 4 A B signal: U V W PE Brake- Brake+
 CP-GM1311/S-4B	KMT series with plastic case navigation connector 40 flange motor, 60 flange motor, 80 flange motor.	 Terminal symbol: 1 2 3 4 signal: V U W PE
 CMS3108A22-A6SI	KMT Series, Metal Shell In-Line Connectors 180.H flange motor	 端子符号: A B C D 1 2 信号: U V W PE Brake+ Brake-

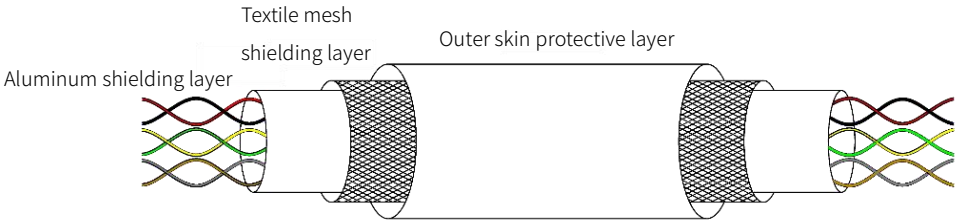
4.3.3 The servo motor contains the power connection of the brake holding device



Connector outline	Adaptive motor frame	Terminal pin definition
SC-MC6S-AE20-01	KMT series with plastic case in line connector 40 flange motor 60 flange motor 80 flange motor	Terminal symbol: 1 2 3 4 A B; signal: U V W PE Brake- Brake+
CP-GM1311/S-4B	KMT series with plastic case navigation connector 40 flange motor 60 flange motor 80 flange motor	Terminal symbol: 1 2 3 4 5 6; signal: V U W PE Brake+ Brake-
CMS3108A22-A6SI	KMT Series, Metal Shell In-Line Connectors 180.H flange motor	 端子符号: A B C D 1 2; 信号: U V W PE Brake+ Brake-

4.4 The servo drive is connected to the servo motor encoder

The encoder cable must be twisted pair shielded cable



Form 4.4 Recommended cable information

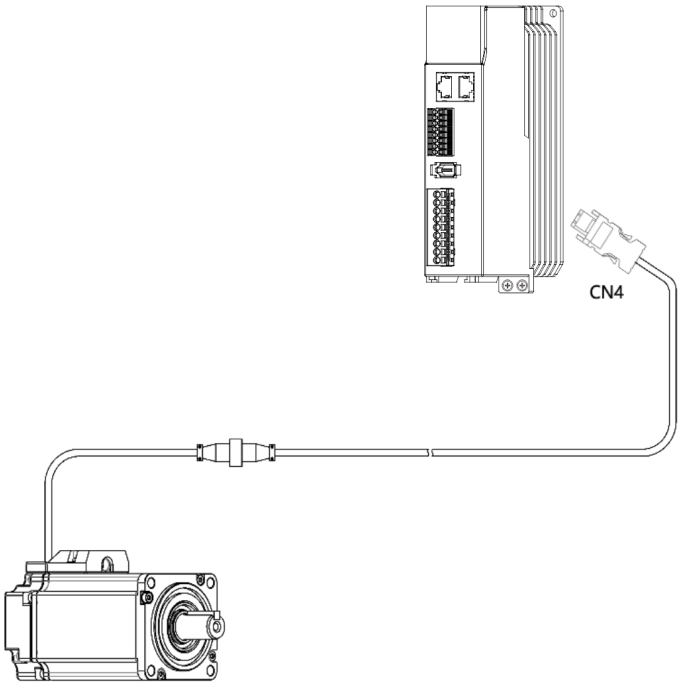
Line diameter size	Ω/km	Theoretical allowable cable length
26 AWG (0.13mm^2)	143	10
25 AWG (0.15mm^2)	89.4	16
24 AWG (0.21mm^2)	79.6	18
23 AWG (0.26mm^2)	68.5	20
22 AWG (0.32mm^2)	54.3	25

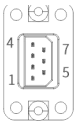
Note:

The above table is for ideal conditions. In actual use, factors such as wire quality, wiring standards, interference, laying environment, connector quality, and press (welding) connection quality should be considered.

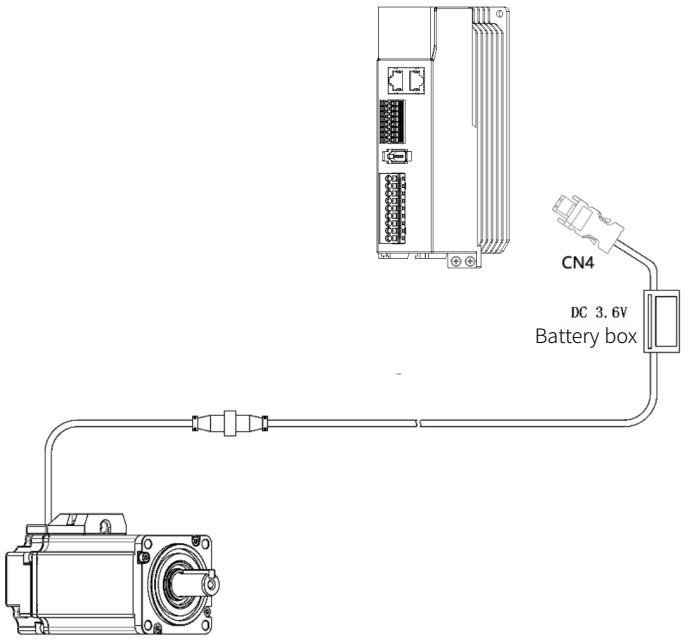
If the cable length exceeds 20m, contact our technical personnel to confirm.

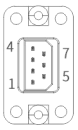
4.4.1 Connection of bus incremental encoder



Connector outline	Adaptive motor frame	Terminal pin definition
SC-MC7S-A820-P1	KMT series with plastic case in line connector 40 flange motor 60 flange motor 80 flange motor	 Terminal Symbol 1 2 3 4 5 6 7 Signal PE 5V 0V SD+ SD- BAT+ BAT-
CP-GM1311/S-P	KMT series with plastic case navigation connector 40 flange motor 60 flange motor 80 flange motor	Terminal Symbol 1 2 3 6 7 8 9 Signal SD+ SD− BAT+ 5V 0V BAT− PE
CMS3108A20-29SI	KMT Series, Metal Shell In-Line Connectors 100 flange motor 130 flange motor 180.H flange motor	端子符号 G H J K L S T 信号 0V 5V PE SD+ SD− BAT− BAT+

4.4.2 Connection of bus absolute encoder



Connector outline	Adaptive motor frame	Terminal pin definition
SC-MC7S-A820-P1	KMT series with plastic case in line connector 40 flange motor 60 flange motor 80 flange motor	 Terminal Symbol 1 2 3 4 5 6 7 Signal PE 5V 0V SD+ SD- BAT+ BAT-
CP-GM1311/S-P	KMT series with plastic case navigation connector 40 flange motor 60 flange motor 80 flange motor	Terminal Symbol 1 2 3 6 7 8 9 Signal SD+ SD− BAT+ 5V 0V BAT− PE
CMS3108A20-29SI	KMT Series, Metal Shell In-Line Connectors 100 flange motor 130 flange motor 180.H flange motor	端子符号 G H J K L S T 信号 0V 5V PE SD+ SD− BAT−BAT+

BAT+ Absolute value Positive battery value

BAT- Absolute value Negative of the battery

4.4.3 Encoder battery information and precautions

here is a risk of leakage of the battery after long time use, it is recommended to replace the battery every 2 years! If the battery is used incorrectly, it may cause battery leakage and corrosion of components, or cause battery explosion and other dangerous situations, so be sure to comply with the following:

◆ Correctly connect the positive and negative terminals of the battery, and pay attention to the + and - directions when placing the battery in the battery case.

◆ If the batteries used for a long time or discarded batteries are placed in the machine, there may be battery leakage, which will not only corrode the surrounding components,And because it has electrical conductivity, there is a risk of short circuit. Please replace it regularly (Reference period: It is recommended to replace it every two years).

◆ Do not decompose the battery to prevent the electrolyte from flying and affecting personal safety.

◆ Do not put the battery into fire or use it in a high temperature environment. If the battery is subjected to continuous heating, there is a risk of explosion.

◆ Do not short circuit the battery. Short circuit of the positive and negative electrodes of the battery may cause fire, explosion, etc.

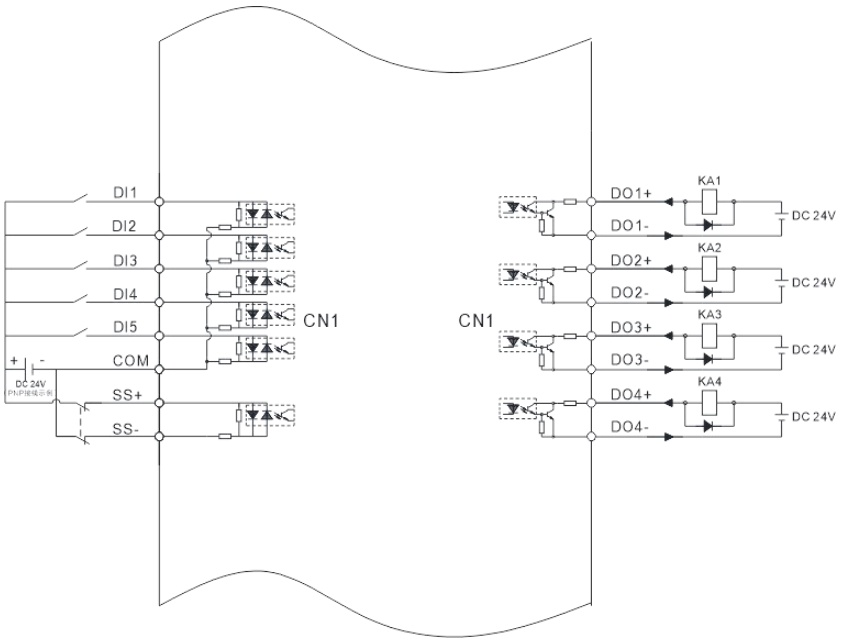
◆ This battery is a disposable lithium battery, do not charge it, otherwise it may cause leakage, explosion and other risks.

◆ Dispose of the replaced battery according to local regulations.

Form 4.4.3 - Encoder battery information description

Battery specification	Project and unit	Rated value		
		Minimum value	Typical value	Maximum value
Output: DC3.6 V 2700mAh ER14505H DC3.6V 2700mAh Battery specification: ER14505H	Battery voltage (V)	3.2	3.6	5
	Battery alarm voltage (V)	2.6		
	Battery failure Voltage (V)	2.85	3	3.2
	Battery operating environment ( )	0	/	40

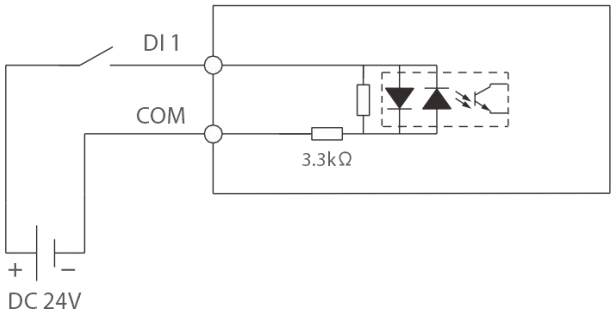
4.5 I/O Connections to the driver CN1 terminal



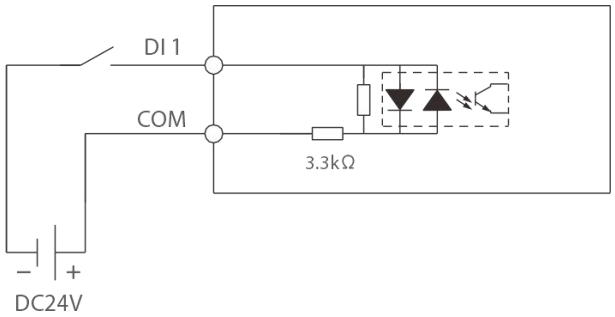
4.5.1 Digital Input

pin		Default function	interpretation	remark
CN1	DI1	Positive motion Prohibition (POT)	The DI channel status is fed back to the upperbit controller through the bus	Bus mapping address 60FD.20
	DI2	Reverse motion Prohibition (NOT)	The DI channel status is fed back to the upperbit controller through the bus	Bus mapping address 60FD.21
	DI3	Return to zero approach switch	The DI channel status is fed back to the upperbit controller through the bus	Bus mapping address 60FD.22
	DI4	Bus IO input NO	The DI channel status is fed back to the upperbit controller through the bus	Bus mapping address 60FD.23
	DI5	Bus IO input NO	The DI channel status is fed back to the upperbit controller through the bus	Bus mapping address 60FD.24

1) PNP signal input wiring when external DC24V power supply is used



2) NPN signal input wiring when external DC24V power supply is used



Note:

PNP and NPN signals cannot be mixed at the same time!

4.5.2 Digital Output

pin		Default function	interpretation	remark
CN1	DO1	Bus IO output NO	The upper controller controls the output state of the DO channel through the bus.	Bus mapping address 60FE:01.16
	DO2	Bus IO output NO	The upper controller controls the output state of the DO channel through the bus.	Bus mapping address 60FE:01.17
	DO3	Bus IO output NO	The upper controller controls the output state of the DO channel through the bus.	Bus mapping address 60FE:01.18
	DO4	Bus IO output NO	The upper controller controls the output state of the DO channel through the bus.	Bus mapping address 60FE:01.19

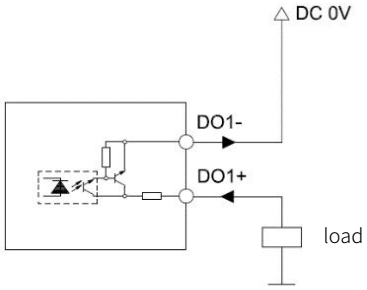
Note:

The maximum DO voltage is DC 30V

DO Single output current Maximum DC 50mA

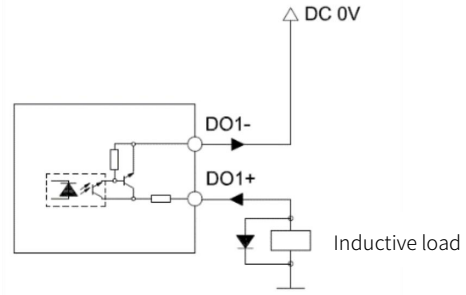
The following uses DO1 as an example to illustrate the DO connection and usage. DO2 connection and usage are the same as DO1.

1) Use common load to access the DO

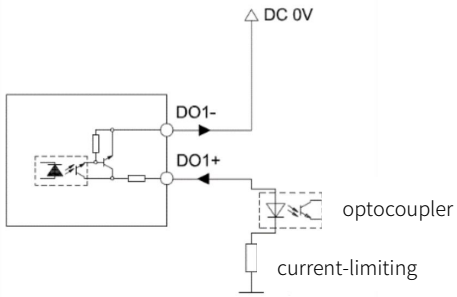


Outside DC 5-24V

2) When using inductive load to access DO, please use a continuous current diode and pay attention to its polarity



Outside DC 5-24V



Outside DC 5-24V

3) When using an optocoupler to access DO, the current limiting resistor should be inserted in the loop in series

4) The use of continuous current diodes

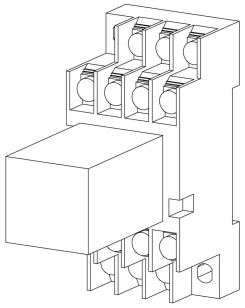
In order to protect the servo drive, when using the DO output of the servo drive, be sure to connect the Schottky diode (hereinafter referred to as the continuous current diode) in the external loop.

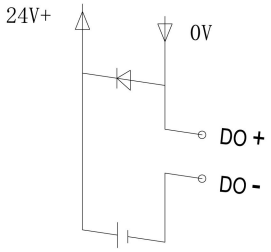
Recommended continuous current diode model: SB2100

Manufacturer:QIANGMAO

Technical parameters: 100V/2A

The wiring diagram is as follows:



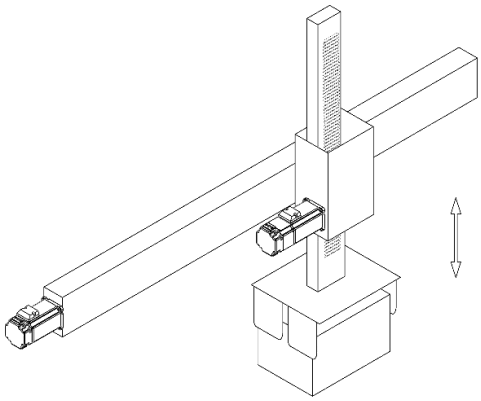


Relay coil

Power supply DC24V

4.5.3 contracting brake control

contracting brake application situation



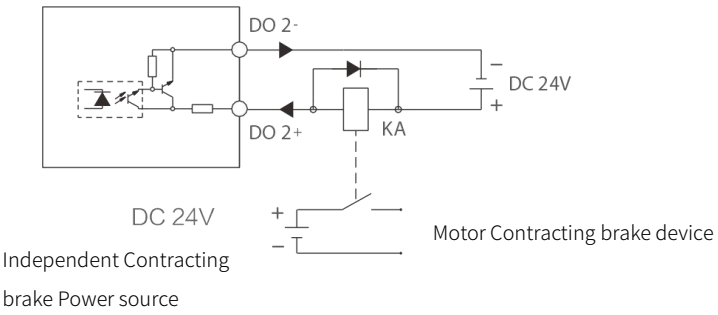
- The brake holding mechanism built into the servo motor is a special mechanism used to fix the current position of the shaft in the case of power failure, and cannot be used for braking purposes, only when the motor is kept in a stopped state.
- When the holding gate is not marked, the coil has no polarity distinction. If marked as permanent magnet lock, please note the polarity and cannot be reversed.
- Please set the lock timing and lock parameters correctly according to the actual working conditions.

- When the servo motor with built-in locking mechanism is running, the locking mechanism may make a slight clicking sound, which has no effect on the function.
- When the lock coil is energized, magnetic flux leakage may occur at the shaft end and other parts. When using instruments such as magnetic sensors near the motor, it is important to consider their effects.
- Due to the large current of the servo motor's lock coil, the contracting brake of the solid N3 driver needs to be realized by an external relay:

Note:

Pay attention to current flow when using, and use an external loop with a continuation diode.

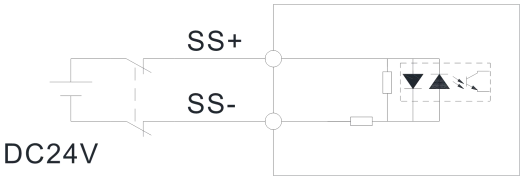
Also check whether the DO output parameters of the driver are set to lock the gate output control and correspond to the actual wiring port.



4.5.4 SCRAM Input

Pin		Default function	interpretation	remark
CN1	SS-	The emergency stop function is always open logic	When this signal is triggered, the servo will perform an emergency stop action.	Normally open logic is used by default, but normally closed logic is recommended in practice.
	SS+			

Example of normally closed logic wiring:

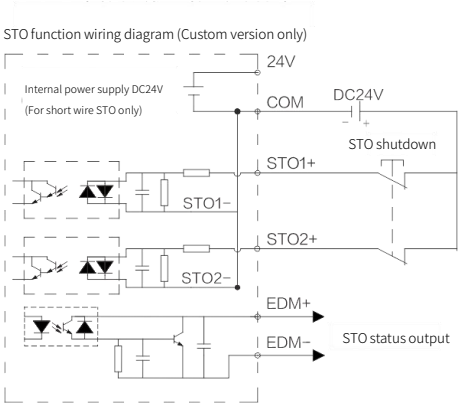


4.6 STO Cabling

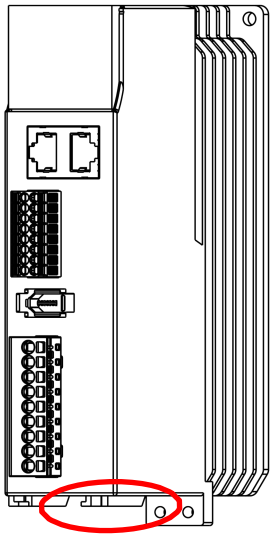
The STO function is the safe torque off, which can prevent the motor from generating torque when it is at rest or from accidentally starting.

Note:

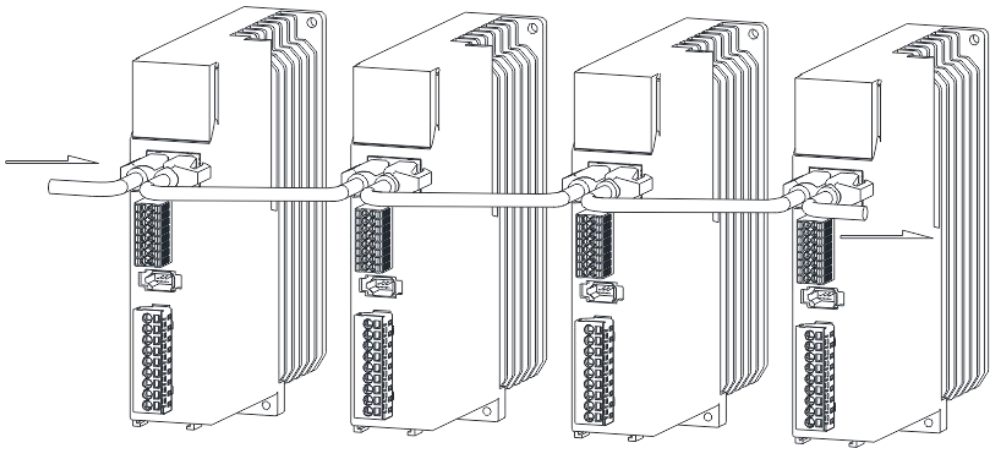
If the STO function is activated during the motor movement, the motor will continue to rotate until stopped according to inertia, so please use the STO function correctly combined with the load condition (STO function is optional, please check whether the order model supports it).

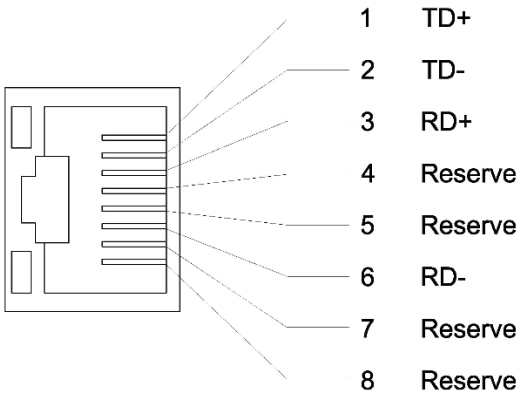


Driver internal power supply 24V power supply can only be used for short-circuiting, not external load. If the STO port needs to connect to external components, external 24V power supply must be used.



4.7 EtherCAT communication connection



RJ45 Pin	definition	Description	Pin distribution
1	TD+	Data sending +	
2	TD-	Data sending -	
3	RD+	Data reception +	
4	/	/	
5	/	/	
6	RD-	Data reception -	
7	/	/	
8	/	/	
Shell	Shield	Shield	

4.8 Brake resistance connection

The use of brake resistance is divided into internal brake resistance and external brake resistance two forms, by default, the driver uses the internal brake resistance to absorb brake energy.

By default, when the motor is in the braking power generation state, the braking energy generated needs to be absorbed by the drive capacitance and the internal braking resistance. If the braking energy is large, the internal capacitor and braking resistance of the driver cannot be absorbed in time, the DC bus voltage will be too high, causing the driver fault alarm. At this time, it is necessary to select a suitable external brake resistance to absorb braking energy to ensure the stable operation of the drive.

Figure: CN5 terminal wiring when the internal brake resistor is used

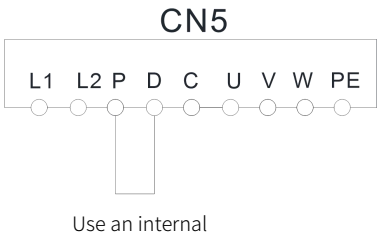


Figure 4.8.1-C1&C2 Standard Type Using Internal Braking Resistor Wiring Diagrams

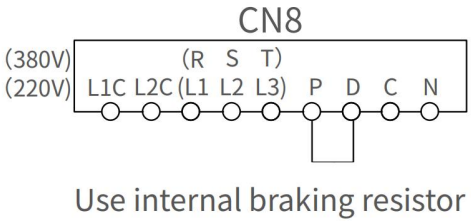


Figure 4.8.2-C3&C4 Standard Type Using Internal Braking Resistor Wiring Diagrams

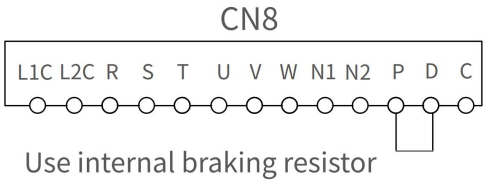


Figure 4.8.3-C5 Standard Type Using Internal Braking Resistor Wiring Diagrams

Note:

1. Some driver models do not have built-in brake resistors, see the Driver Specification information section for details

Figure: CN5 terminal wiring when external brake resistors are used

2. If there is no factory parameter p30.11 of the built-in braking resistor, the braking resistor power should be set to zero by default.

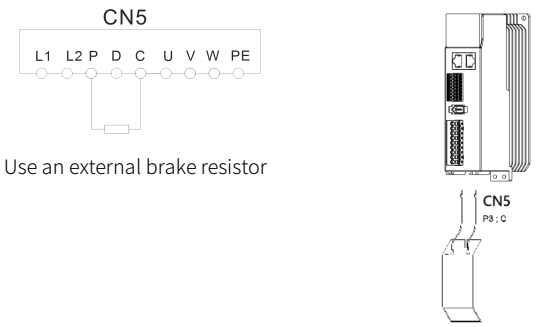


Figure 4.8.4-C1&C2 standard type using external braking resistor wiring diagram

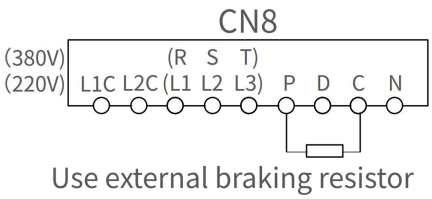


Figure 4.8.5-C3&C4 standard type using external braking resistor wiring diagram

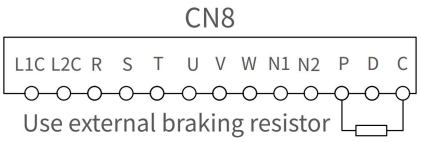


Figure 4.8.6-C5 standard type using external braking resistor wiring diagram

Note:

Note the following when using an external brake resistor:

- Please be sure to cancel the short splice between P and D before connecting the external brake resistor between P and C terminals, otherwise it will cause the drive Damaged.
- The resistance value of the brake resistor cannot be smaller than the minimum resistance value allowed by the driver. Otherwise, the driver fault alarm may be generated or the driver may be damaged.
- Please configure the brake resistance parameters correctly. If you fill in the brake resistance resistance value and power incorrectly, the driver will alarm incorrectly or the brake resistance will be damaged.
- If serious, it may cause fire.
- Install the brake resistors on non-combustible materials such as metal.

Braking energy calculation and braking resistance selection

(For specific selection, please refer to Section 2 Product Information, Brake Energy Absorption Description section)

Form - Brake energy absorption and drive allowable minimum resistance

The amount of regenerative absorption inside the N3 drive					
Driver Model No.	Built-in brake resistance	External braking Resistance value	power	Brake resistance type	The drive capacitance is absorbable Maximum braking energy Ec(J)
N3RE- 1R8SA ☒200W☒		50Ω	100W	RXLG-100W 50RJ	20
N3RE-2R8SA (400W)		50Ω	100W	RXLG-100W 50RJ	20
N3RE-3R5SA (600W)	40W☒ 80Ω	50Ω	200W	RXLG-200W 50RJ	20
N3RE-4R2SA (750W)	40W☒ 80Ω	50Ω	200W	RXLG-200W 50RJ	20

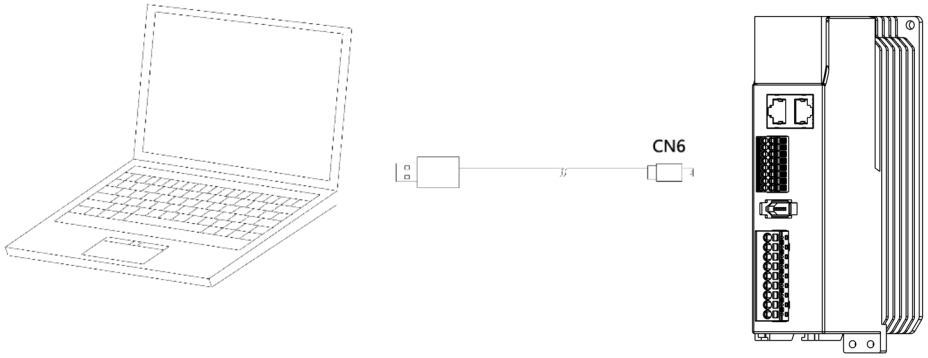
4.9 Mini USB software debugging and firmware upgrade connection

By default, the DIP switch on the operation panel is set to 0. In this position, the drive is in normal working mode. When the firmware upgrade is written, the switch needs to be flipped to the "1" position.

Note:

When the switch is toggle to 1, the drive cannot be used normally. Turn the switch back to 0 after the firmware upgrade is successful.

The N3 drive uses the CN6 (Mini USB) interface to communicate with the computer on which the debug software or firmware burning environment is installed.



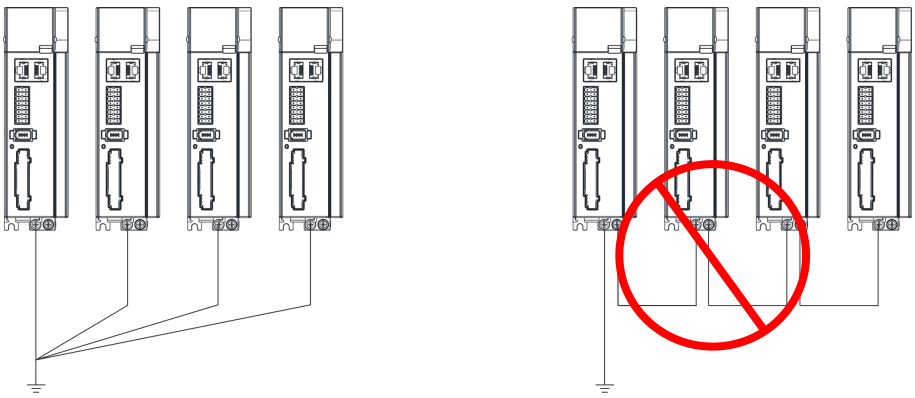
Note:

- Industrial USB data cable with magnetic ring and shielding layer is required for debugging cable, otherwise it is easy to connect the problem caused by on-site interference, it is recommended to buy our special data cable.
- Because the space height of the CN1 port is limited, use a Mini USB port with a connector height ☒10mm. Do not use too large a MINI USB connector to prevent damage to the CN6 port of the drive.

4.10 System grounding

Note:

- To prevent accidental electric shock, ensure that grounding measures are implemented.
- Make sure that the motor and driver are securely grounded.
- According to the relevant standards of the electrical equipment, the 200V driver should be grounded at level D (the ground resistance is less than 100Ω) and the 400V driver
- Use class C ground (with a ground resistance less than 10 ohms).
- Use a ground cable with a recommended diameter or higher, and keep it as short as possible.
- When multiple drivers are grounded, they must be grounded individually or in common, rather than in series.



4.11 Anti-interference policy of electrical wiring

To suppress interference, please take the following measures:

- The power cable and encoder cable should be less than 20m and the maximum length should not exceed 25m. The encoder cable is twisted pair shielded cable.
- Use a cable with a diameter larger than 2mm² for grounding cables.
- You are advised to use the ground type D or higher (the ground resistance is less than 100 ohMs).
- A single point grounding must be used
- Please use a noise filter to prevent RF interference. When used in the civil environment or in the environment with strong power interference noise, please use the power line
- Install the noise filter on the input side.
- To prevent misoperation caused by electromagnetic interference, the following processing methods can be adopted:

  1☒ Install the noise filter near the servo drive as much as possible.

  2☒ Install surge suppressor on the coil of relay and electromagnetic contactor.

  3☒ When wiring, please lay the strong current line and the weak line separately, and maintain a distance of more than 30cm. Do not put in the same pipe or tie together.

  4☒ Do not share the same power supply with welding machines, discharge processing equipment, etc. Install a noise filter on the input side of the power line when there is a high-frequency generator nearby.
- Install magnetic rings on the control power supply, power cable and encoder cable.

Recommended magnetic ring material: manganese zinc magnetic ring

Manufacturer: New Kangda magnetic material

The control cable is connected to the driver after 3 turns on the magnetic ring;

The U\V\W three-phase power cable is connected to the driver after 3 turns on the magnetic ring, pay attention to the PE ground wire can not be wound into the magnetic ring;

The encoder cable is connected to the driver after 3 turns on the magnetic ring;

4.12 General Wiring Diagram

- C1/C2 ☒☒

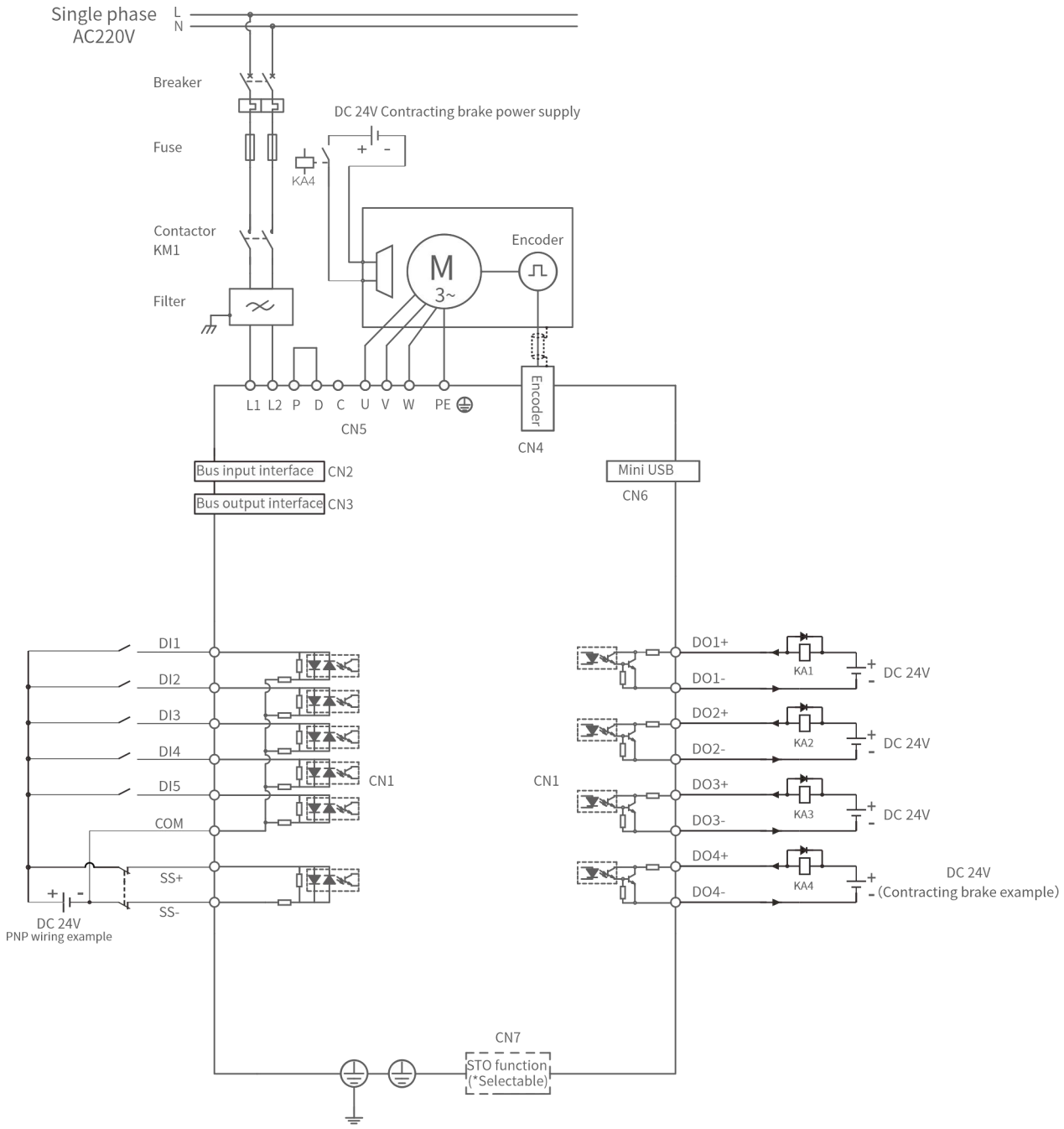


Figure 4.12.1-C1&C2 general wiring diagram

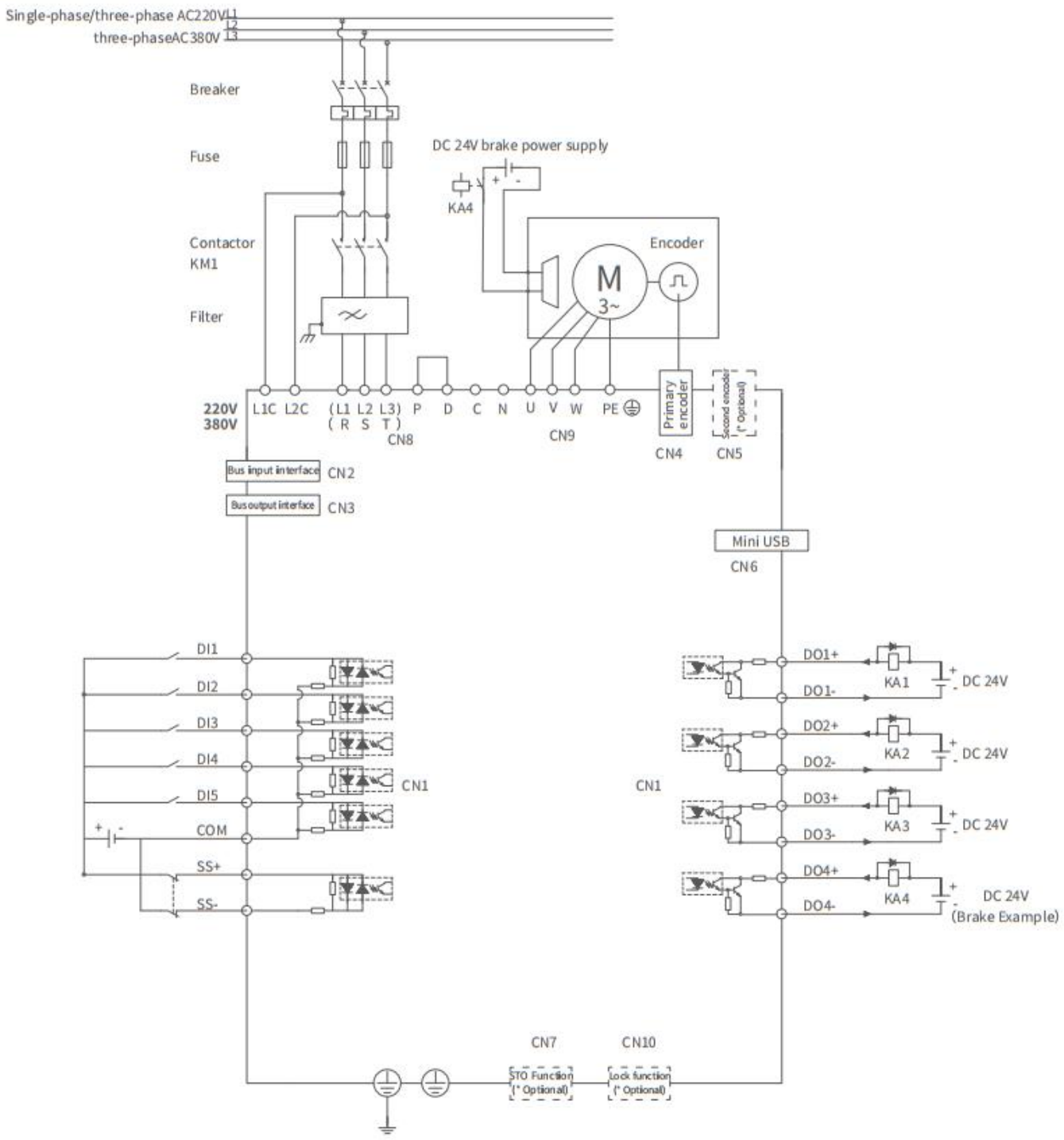


Figure 4.12.2-C3&C4 general wiring diagram

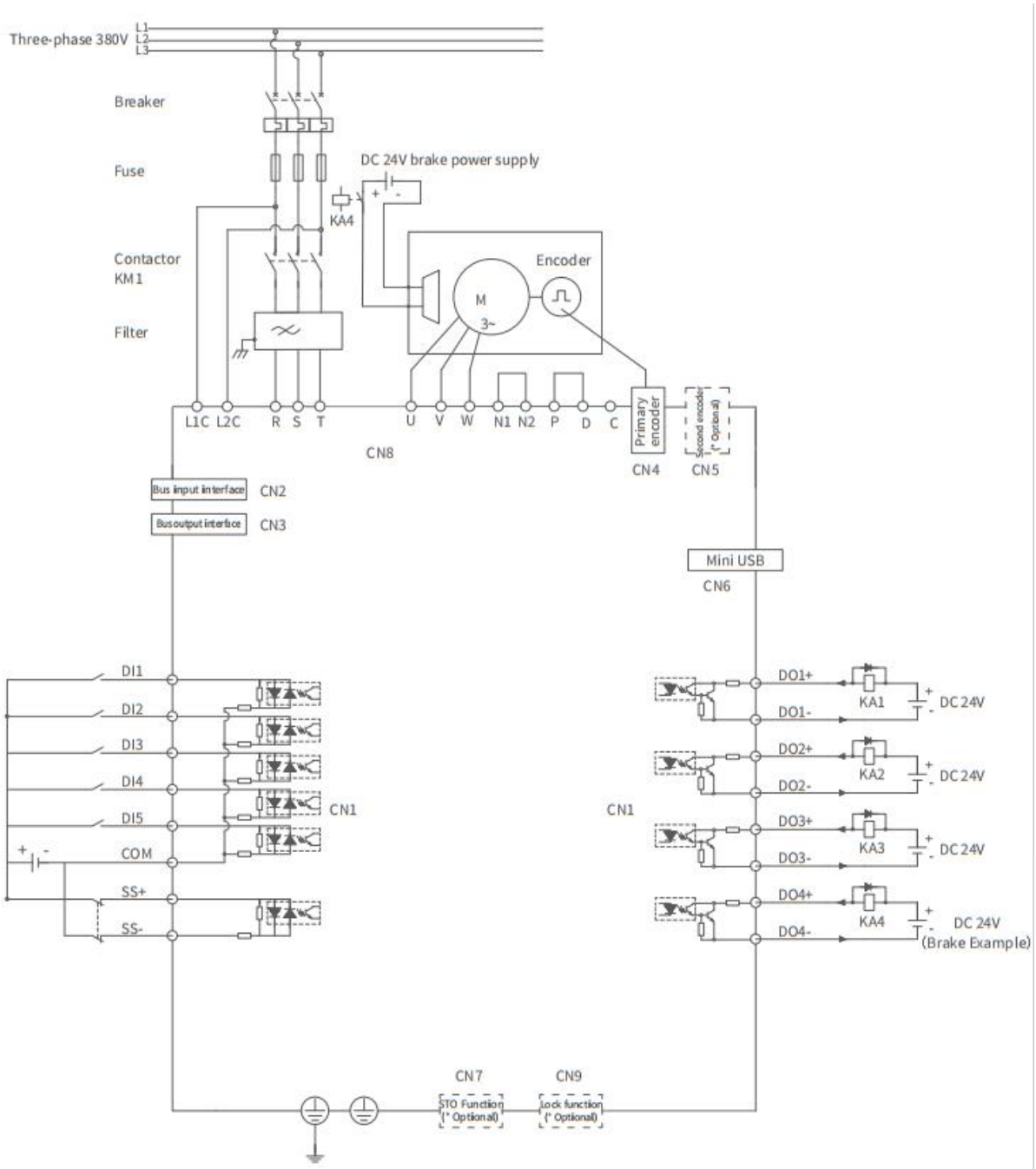
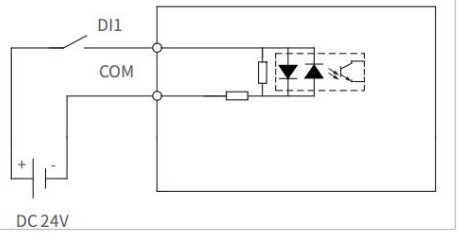
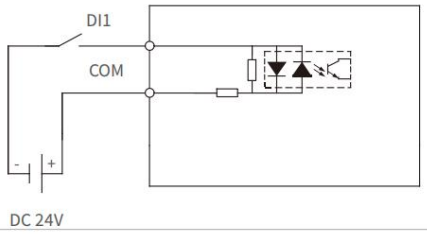


Figure 4.12.3-C5 general wiring diagram

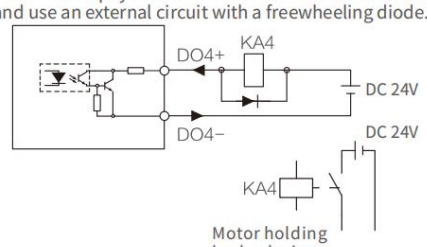
PNP signal input wiring when using external DC24V power supply



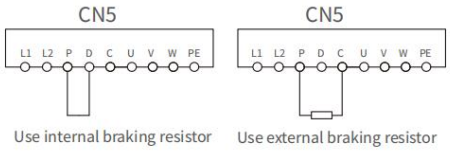
NPN signal input wiring when using external DC24V power supply



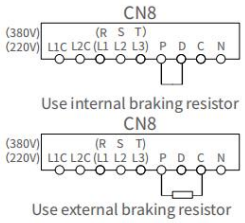
DO output wiring-brake example
Note: Please pay attention to the current flow direction and use an external circuit with a freewheeling diode.



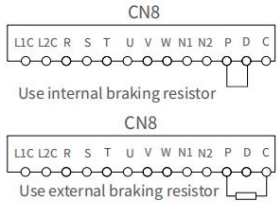
Wiring when using internal and external braking resistors respectively
Note: When using an external braking resistor, the short circuit between P and D needs to be cancelled.



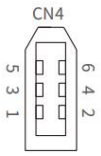
Wiring when internal and external brake resistors are used respectively
Note: When using an external brake resistor, you need to cancel the short splice between P and D.
Only available for C3/C4 specification drives



Wiring when internal and external brake resistors are used respectively
Note: When using an external brake resistor, you need to cancel the short splice between P and D.
Only available for C5 specification drives

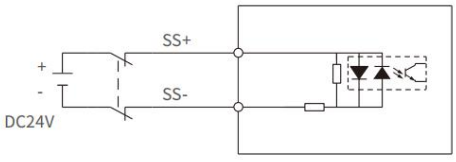


Motor encoder CN4 interface pin definition

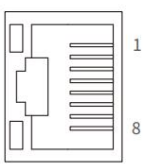


	Communication encoder
1	5V
2	GND
3	CLOCK+
4	CLOCK+
5	SD+
6	SD-
Housing	Shielded

Emergency stop wiring diagram (normally closed wiring example)

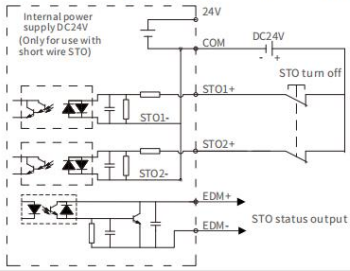


EtherCAT Network port definition



1	TD+
2	TD-
3	RD+
4	Reserve
5	Reserve
6	RD-
7	Reserve
8	Reserve

STO function wiring diagram (customized version only)



Chapter 5 Panel display

5.1 Composition and introduction of the panel

5.1.1 Panel Composition

Name	Function
5 digit 8 segment LED digital tube	Display all kinds of drive information, parameter Settings, general functions, etc.
Panel operation key	For switching, changing, setting and other operations.
Firmware write switch	Firmware write switch, in normal use to the upper "0" position.
Mini USB communication port	Communicate with computers that have debug software or firmware burn environments installed.
Download port	Connect to firmware writer

5.1.2 Nixie Tube display

Mode	Top-level menu	Submenu example
Monitor display class	dP. 002	r. 10
Parameter setting class	P10. 01	68
Fault alarm class	En. 001	E. 52. 10
Control function class	Fn. 001	JoG
Normal state	rdy	None

5.1.3 Panel Operation Buttons

Key	Key name	Function
MODE	Mode select \ return key	◆ Return to the parent directory; If the directory is already in the top-level directory, the mode switchover function is used ◆ Exit edit state ◆ Browse the parameter page and hold down for 2 seconds to switch between large and small groups ◆ Mode+ : The EtherCAT card reset.
	Increment key	◆ Add a number or index in the order of -0123456789; When long numbers are displayed,Move up one page to display the content. ◆ Special control, such as forward turning, speed adjustment, etc. ◆ Browse the status, if it is the alarm content, you can directly on the alarm.
	Digit reduction key	◆ Decreases the number or index (number order: 9876543210-); When long numbers are displayed,Move down one screen page to display the content. ◆ Special controls, such as reversing, adjusting speed, etc. ◆ Browse the status, if it is the alarm content, you can directly under the alarm.
	Shift key	◆ Access the submenu from the upper menu when browsing. ◆ In the editing state, the edit bit moves to the left.
SET	Enter key	◆ In the parameter editing state, confirm the save Settings (long press 2s to save).

5.2 Panel Content

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

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 nidigitube on the far left of the panel is used to display the current status of the servo, as follows: Indicates that the internal self-check of the servo is normal and initialization is successful. Indicates that the main power supply of the servo is connected. Indicates that the servo is ready Indicates that the servo is running.
Parameter display	Displays the function code and function code Settings.
Fault indication	Display servo fault alarm code
Monitoring information	Displays information such as the current operating parameters of the servo.

5.2.1 Power-on Initialization Process

- When the servo is normal

When the servo fault alarm or initialization fails, the screen displays the fault code and blinks

Example: When the encoder connection is disconnected, the display will appear 73.80 fault code and blink at a frequency of 0.5S.

5.2.2 Panel Display Switching Method

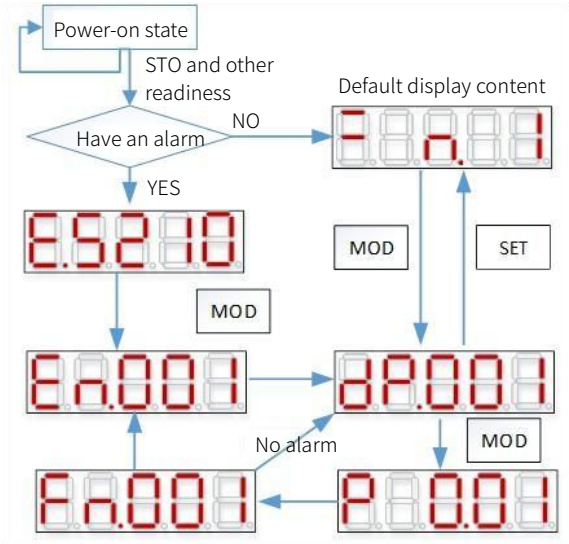


Figure 5.2.2 - Panel shows how to switch between menus

5.2.3 Parameter display

The N3 series drive has 27 sets of parameters, allowing you to quickly locate parameters by group. See the Parameter Objects section for a list of parameters.

Parameter group display:

display	Name	Content
PXX.YY	Functional code group	XX : Function code group number. YY : Function code group number

For example, P10.01

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

Different length data and negative number display:

4 bits or less signed, or 5 bits or less unsigned data, displayed on a single page (a page of 5-bit nixie tube). For signed numbers, the highest digit "-" indicates a negative number.

For example: -9999 Display:

For example: 65535

4 bits or more signed, or 5 bits or more unsigned data, from high to low in multiple pages (maximum three pages), each 4 bits for one page, press to turn up, press to turn down. For example: -2147483647

The first digit tube on the left shows the current number of pages (high four pages, middle four pages, low four pages).

Higher four Middle four Lower four digits

Display of decimal points

For example: 10.2:

5.2.4 Parameter setting display

Display	Name	Display occasion
donE	Done	Function completed successfully
P.INIt	P.INIT	Parameter initialization
ok	OK	Parameter setting successful
not	NOT OK	Parameter setting failed

5.2.5 Fault Display

The panel displays the current or historical fault information. For details about fault analysis and troubleshooting, see Chapter 11 Troubleshooting.

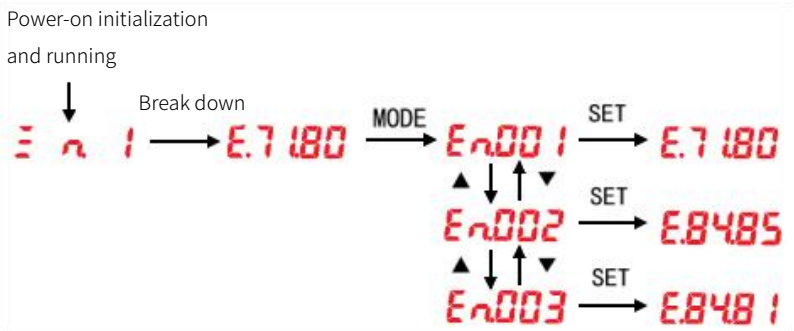
If a single fault occurs, the panel pops out the corresponding fault code and blinks until the fault is confirmed and reset. If multiple faults occur at the same time, the last fault code is displayed. You can view multiple fault codes occurring simultaneously one by one by turning the EN.001 page.

P91.18 allows you to select 10 groups of fault codes that have occurred recently. The fault codes are displayed in P91.19.

For example, the single fault code is 73.80

Display	Name	Content
E.7380	Encoder connection error	73☒Failure code set 80 The number in the fault code group

For example, if multiple faults occur at the same time, the time sequence is E8481. E8485; E7180.



5.2.6 Monitoring Parameter Display

The dp group in the panel status can be used to display the running status of the drive

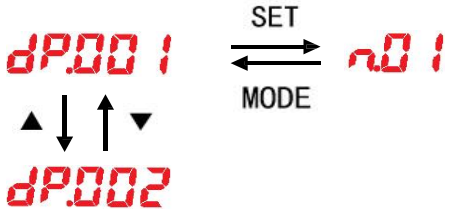


Figure 5.2.6 - Monitor display switch

The following table shows the dp monitoring group information:

Function code	Name	Unit	implication	For example
dp.001	Node number	-	The local node number is displayed here as the EtherCAT slave address when the EtherCAT bus writes the station number.	The number of the local node is n.01 The address of the slave station is "1".
dp.002	Actual speed	rpm	Actual speed of servo motor	
dp.003	Given speed	rpm	Current set speed	
dp.004	Current output	A	Effective output current value	
dp.005	Voltage output	V	Output voltage RMS value	
dp.006	Dc bus voltage	V	Dc bus voltage	
dp.007	encoder	inc	The actual feedback value of the encoder. The communication object is 0X6064	
dp.008	Pulse setting	inc	The position loop gives the incremental pulse	
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 Operations on the Panel

5.3.1 Parameter setting

Parameters can be set using the panel of the servo drive, see the Parameter Objects section for details. In the parameter setting group, hold down MOD to quickly locate parameters by group.

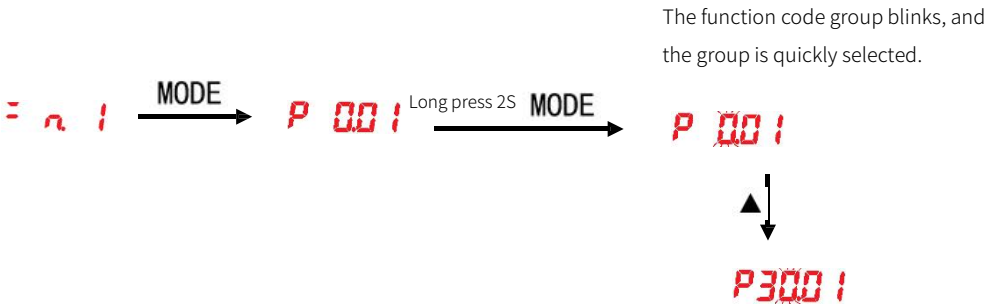


Figure 5.3.1.1 - Quick selection of parameter groups

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

Note:

Before modifying a parameter, you must use the password to log in. Otherwise, the parameter will fail to be saved. For details about how to log in with a password, see section Login with a Password.

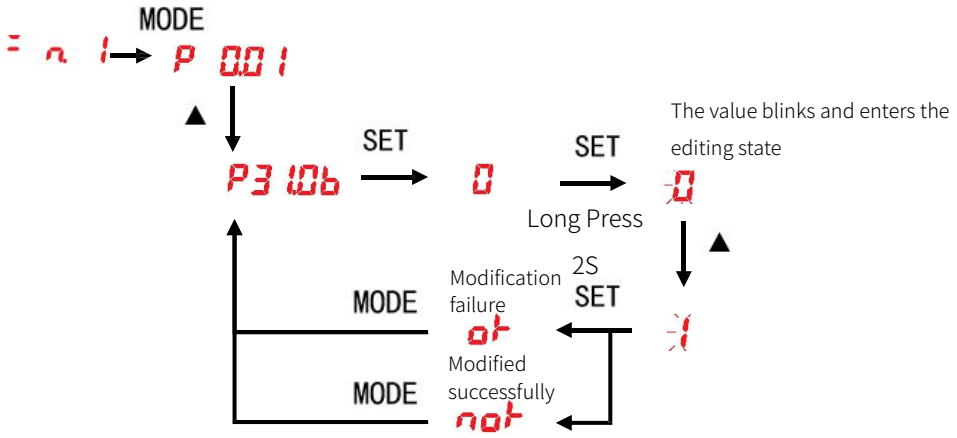


Figure 5.3.1.2: Change the motor rotation direction

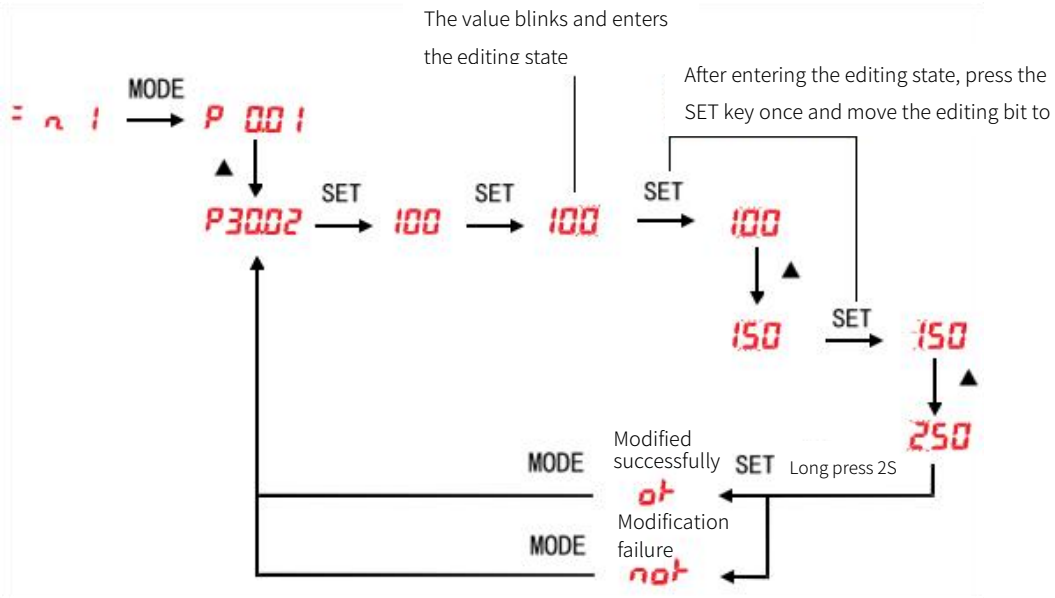


Figure 5.3.1.3 - Change "contracting brake Opening Time"

5.3.2 User login

By default, users can only browse parameters, but cannot edit or modify them. If you want to change the parameters, you need to log in to the system using the password. After 6 minutes of login, the password will automatically become invalid. If you want to continue editing, you need to log in again. The default login password is 1111. The login procedure is as follows:

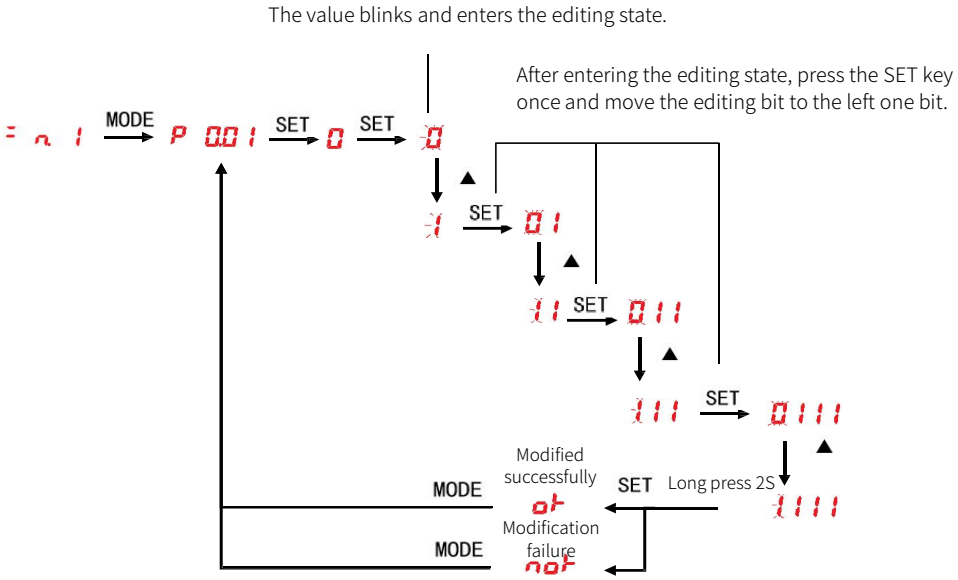


Figure 5.3.2 - Panel User login

Note:After the 0.11.6 firmware version, parameters can be modified without the login page

5.3.3 Fault reset

When the driver control channel is selected as "Debug Software Control" or "Panel Control", the panel provides a fault reset function to clear the current alarm status.

Note:

If the control channel is set to Controller Control, this function does not take effect.

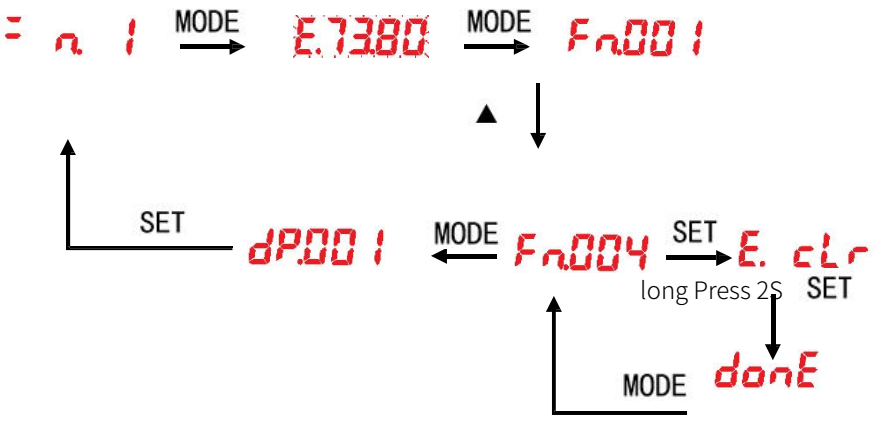


Figure 5.3.3 - Panel fault reset operation

5.3.4 Point JOG Function

When the driver control channel is selected as "Panel Control", the panel provides the JOG point function to facilitate shaft testing without debugging software and upper controller.

Note:

- JOG function must be in effect with "Panel Control" (parameter P0.02 is set to 0).
- Before running, ensure that the operating environment is safe and that wiring and grounding measures are correctly implemented.
- After the trial run is completed, please change back to the original control channel selection.

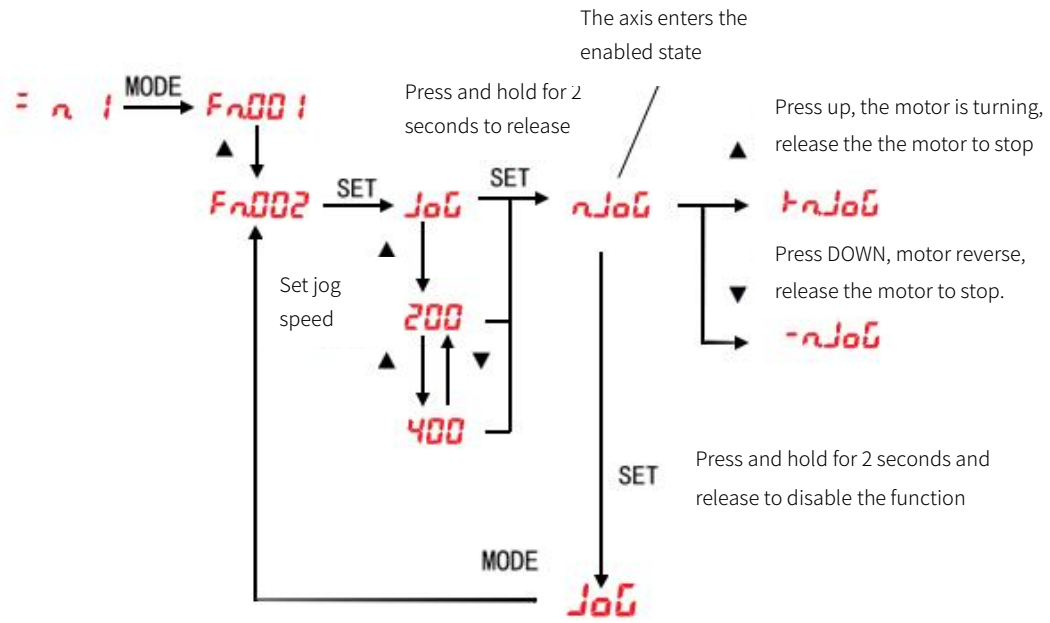


Figure 5.3.4 - Panel JOG operation

About the point speed: The unit of the point speed is 0.1RPM. So the panel says 200, which is actually 20 RPM. The click speed defaults to 200, and the incremental value of a single increase or decrease is 200. For safe operation, the maximum JOG is one-tenth of the maximum speed of the motor, for example, the rated speed of the motor is 3600RPM, the actual maximum speed is 360 RPM, and the panel maximum speed is displayed as 360.

Chapter 6 Introduction to EtherCAT communication

This chapter introduces the basic knowledge 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 Overview of EtherCAT

EtherCAT is a high performance, low cost, simple application, flexible topology, easy to implement industrial Ethernet technology, can be used in industrial field level high-speed networks, using the standard Ethernet physical layer, transmission medium twisted pair (100Base-TX).

EtherCAT system consists of a master station and a slave station. The master station only needs a common network card, and the slave station needs a dedicated slave control chip.

Figure 6.1.1 - EtherCAT networking diagram

EtherCAT features:

1) Fully comply with Ethernet standards, can coexist with other Ethernet devices and protocols and the same bus;

2) There is no need for subnets, complex nodes or IO nodes with only 2 bits can be used as EtherCAT slave stations;

3) High transmission rate, 100 Mbit Ethernet, full duplex mode;

4) Good synchronization performance, clock synchronization accuracy of each slave node device is less than 1us;

5) The refresh period is short, which can reach the data refresh period of less than 100us.

To support a wider range of devices and application layers, EtherCAT has established the following application protocols:

- CoE (CAN application protocol based on EtherCAT);
- SoE (in accordance with IEC61800-7-204 standard servo drive equipment specifications);
- EoE□Ethernet over EtherCAT□□
- FoE□File access over EtherCAT□□

The slave device does not need to support all communication protocols; instead, it simply selects the communication protocol that best suits its application.

6.1.2 System Parameter Settings

In order to enable the N3 series servo drive to connect to EtherCAT fieldbus network correctly, the relevant parameters of the N3 series servo drive need to be set.

Servo parameter serial number	Name	Set range	Default value	Target set value
P00.02	Control channel selection	0: Control panel 1: Controller control 2: Software control 3: Analog 1 control 4: Analog 2 control 5: Reservations	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 the P00.02 command channel as the controller control; Set P01.01 bus type to "EtherCAT", download and save parameters, power off and restart.

6.1.3 EtherCAT Communication Specifications and communication structure

1) EtherCAT communication specification

item		specification
Communication protocol		IEC 61158 Type 12, IEC 61800-7CiA 402 Drive Profile
Application layer	SDO	Fast transfer service Conventional transport service Segmented transmission service
	PDO	Variable PDO mapping Supports four TPDO channels, each of which supports a maximum of 16 objects Four RPDO channels are supported, with each channel supporting up to 16 objects
	CiA 402	Profile Position Mode (PP) Profile speed Mode (PV) Contour torque mode (PT) Origin reversion mode (HM) Synchronous cycle position Mode (CSP) Synchronous Cycle Speed Mode (CSV) Synchronous cycle Torque Mode (CST)
physical layer	Transport protocol	100BASE-TX (IEEE802.3)
	Maximum distance	100m
	port	RJ45*2(IN OUT)

2) EtherCAT communication structure

EtherCAT communication can have a variety of application layer protocols, in the N3 series servo drive, using IEC61800-7(CiA402)-CANOpen motion control subprotocol.

The following diagram shows the EtherCAT communication architecture based on the CANOpen application layer.

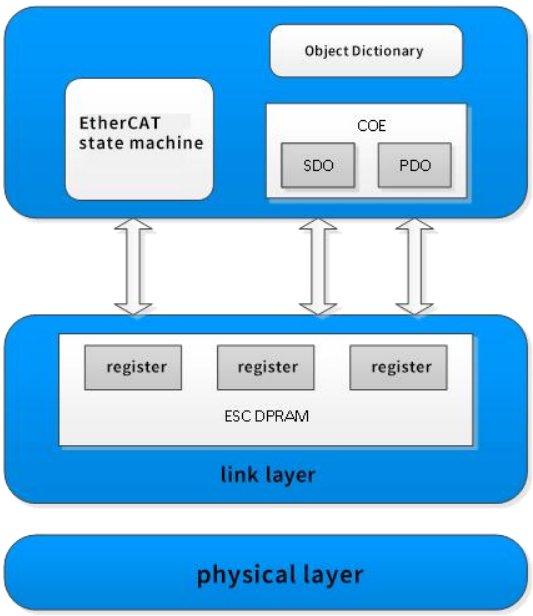


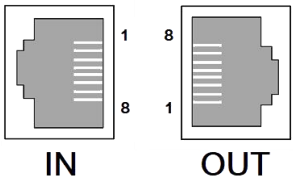
Figure 6.1.3 - EtherCAT communication architecture based on the CANOpen application layer

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

6.1.4 Basic Features

1) Interface information

The EtherCAT grid cable is connected to a metal-shielded network port terminal with input (IN) and output (OUT) interfaces. Electrical characteristics in line with IEEE802.3, ISO8877 standards

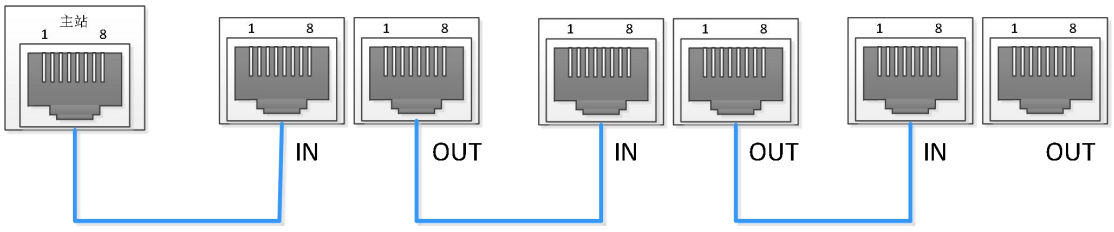


Pin	definition	Description
1	TD+	Data sending +
2	TD-	Data sending -
3	RD+	Data reception +
4	/	Bare foo
5	/	Bare foot
6	RD-	Data reception -
7	/	Bare foot
8	/	Bare foot
shell	shield	shield

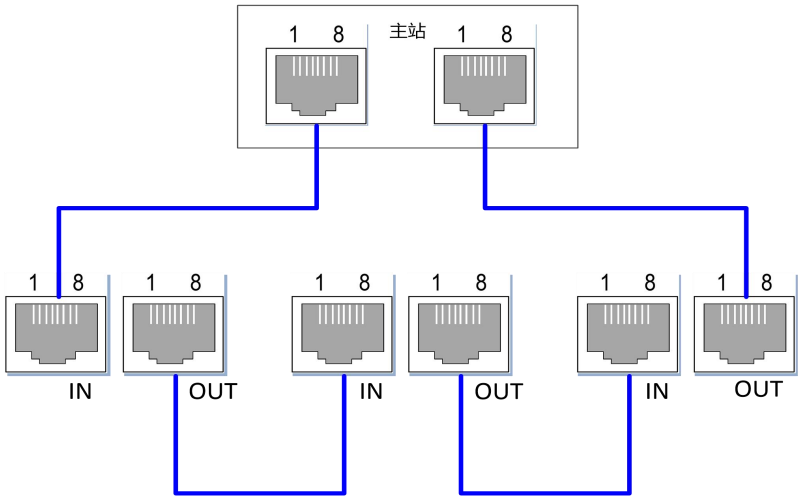
2) Topology connection

EtherCAT communication topology is flexible. This servo has IN and OUT interfaces, and the topological connection is as follows.

◆ Linear connection:



◆ Redundant ring connections:



6.2 EtherCAT Communication Basics

6.2.1 State Machine

The following is the EtherCAT state transition diagram:

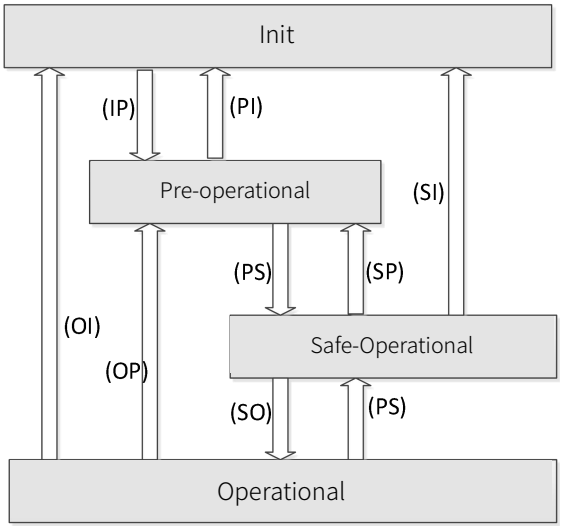


Figure 6.2.1 - ETherCAT state machine

EtherCAT devices must support four states and are responsible for coordinating the state of the master and slave applications during initialization and runtime.

Init☒	Init: Initialize,I for short;
Pre-Operational☒	Pre-Operational: Pre-run,P for short;
Safe-Operational☒	Safe operation:Safe operation,S for short;s
Operational☒	Operational:Run,O for short

When converting from the initialization state to the running state, you must follow the "initialization -->Pre-run -->Safe operation -->Run "sequence conversion, can not leapfrog.

Transitions can be made when returning from a running state. The state conversion operation and initialization process are as follows:

State and state transitions	Operation
initialize Init (I)	The application layer has no communication, and the master station can only read and write ESC registers
Initializes the conversion to prerun Init to Pre-Op (IP)	The primary station configures the secondary station address register Configuring Mailbox Channels Configure the DC distribution clock Request "Pre-run" status
prerun Pre-Op (P)	Application Layer Mailbox Data Communication (SDO)
Transition from pre-operation to safe operation Pre-Op to Safe-Op (PS)	The master uses mailbox initialization process data mapping The master station configures the SM channel used for process data communication The master station is configured with FMMU Request "Security status"
Safe operation Safe-Op (S)	There is process data communication, but only input data is allowed to be read and no output signal is generated (TPDO)
Safe operation to operation transformation Safe-Op to Op (SO)	The master station sends valid output data Request "Running status"
Running state Op(O)	All inputs and outputs are valid Can use mailbox communication (SDO, TPDO, RPDO)

6.2.2 Process Data PDO

The transmission of PDO real-time process data follows the producer-consumer model. PDO can be divided into RPDO(Receive PDO), through which the slave station receives commands from the master station. And TPDO(Trasmit PDO), the slave station feeds back its own state through TPDO.

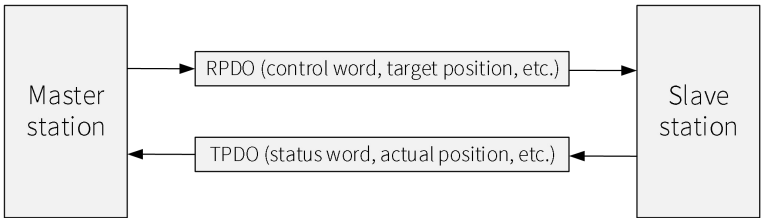


Figure 6-2-2 PDO transmission model

1) PDO mapping parameters

PDO mapping is used to establish the mapping relationship between object dictionary and PDO. 1600h~17FFh for RPDO, 1A00h~1BFFh for TPDO, N3 series servo drive, with 4 RPDO and 4 TPDO available. The drive defaults to two fixed PDO mappings, one RPDO and one TPDO, using communication objects 0x1600 and 0x1A00.

Object 0x1600: RPDO1 mapping			
subindex	Value	Data bytes	implication
0	7	1	Number of mapping objects
1	0x6040	2	Control Word(control word)
2	0x607A	4	Target Position(target location)
3	0x60FF	4	Target speed(Target speed)
4	0x6071	2	Target Torque(target torque)
5	0x6081	4	Profile speed(torque limiting speed)
6	0x60B8	2	Touch Probe Function(Latch function)
7	0x6060	1	Modes Of Operation(Operation mode)
Object 0x1A00: TPDO1 mapping			
subindex	Value	Data bytes	implication
0	8	1	Number of mapping objects
1	0x6041	2	Status Word(control word)
2	0x6064	4	Position Actual Value(Actual location)
3	0x606C	4	speed Actual Value(Actual speed)
4	0x6077	2	Torque Actual Value(Actual torque)
5	0x60B9	2	Touch Probe Status(Latched state)
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

PDO mapping parameters contain Pointers to PDO-related process data that PDO needs to send or receive, including indexes, subindexes, and mapping object lengths. Subindex 0 records the number of objects mapped by the PDO. Each PDO data length can be up to 4 x N bytes, and one or more objects can be mapped simultaneously. Subindexes 1 to N are mapping contents. The mapping parameters are defined as follows.

Digits		.....			.....			.....	
	31		16	15		8	7		0
implication	Index			Sub-index			Object Length		

The index and the sub-index jointly determine the position of the object in the object dictionary, and the object length indicates the specific bit length of the object, expressed in hexadecimal, that is:

Object length	Bit length
08h	8-bit
10h	16-bit
20h	32-bit

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

6.2.3 Mailbox data SDO

EtherCAT Mailbox data SDO is used to transmit non-weekly data, such as the configuration of communication parameters, the configuration of servo drive operating parameters, etc. EtherCAT CoE service types include:

1) Emergency information;

SDO request; SDO response; TxPDO; RxPDO; Remote TxPDO sends requests; Remote RxPDO sends requests; SDO information.

6.2.4 Distributing Clocks

The distributed clock allows all EtherCAT devices to use the same system time, thereby controlling the synchronized execution of tasks across devices. The slave device can generate a synchronization signal based on the synchronized system time. In the N3 series drives, only DC synchronization mode is supported. The synchronization period is controlled by SYNC0. The cycle range varies according to different modes of motion.

Note:

Distributed Clocks (DC) are synchronized clocks. EtherCAT supports three synchronization modes, namely DC synchronization, SM2(Sync manager) synchronization and FreeRun(free running), DC synchronization based on the first axis clock, high precision, SM2 synchronization based on RxPDO information time, FreeRun no synchronization.

6.2.5 CiA402 Control Introduction

When using the N3 series drive, the servo drive must be guided according to the process specified by the standard CiA402 protocol in order for the servo drive to operate in the specified state.

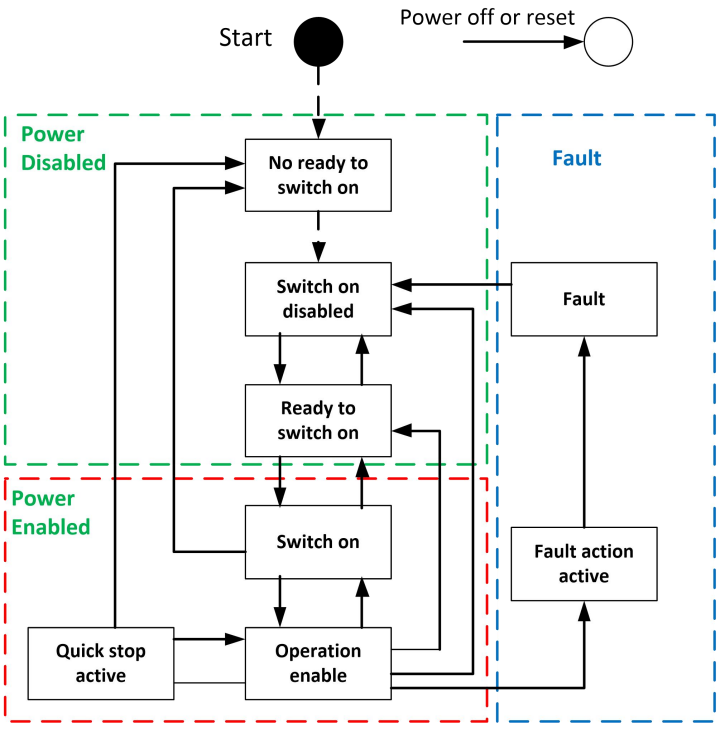


Figure 6.2.5 - CiA402 state switching diagram

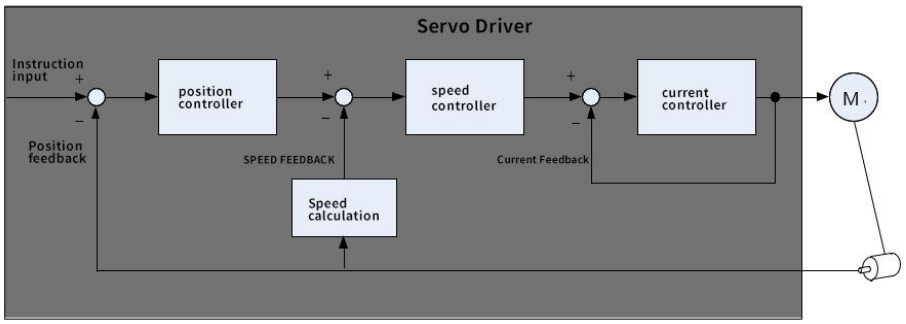
The status is described in the following table

Not ready to switch on	The status is described in the following table
Switch on disable	Servo initialization complete, no fault or error on servo drive has been eliminated. Drive parameters can be set.
Ready to switch on	Servo drive is ready. Drive parameters can be set
Switch on	Servo drive waiting to turn on the servo enable. Drive parameters can be set.
Operation Enable	The drive is running normally, a servo operation mode has been enabled, the motor has been powered on, and the motor rotates when the instruction is not 0. If the drive parameter attribute 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 attribute 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 failure shutdown. If the drive parameter attribute is "Run Change", you can set it. Otherwise, you cannot set it.
Fault	The fault shutdown is complete, all drive functions are disabled, and drive parameters are allowed to be changed in order to troubleshoot.

Chapter 7 Basic control mode

This section lists the control modes supported by N3 series servo drivers and their usage methods. Select and use the appropriate control mode according to the application.

The servo system consists of three main parts: servo drive, servo motor and encoder.



Servo drive is the control core of servo system, through the input signal and feedback signal processing, servo drive can work in position control mode, speed control mode and torque control mode, the above three modes can achieve the precise control of the motor position, speed or torque. Among them, position control is the most important and most commonly used control mode of servo system.

The control modes are described as follows:

1) Position control

Position control is to control the position of the motor through the position command. The total number of position instructions determines the target position of the motor, and the rate of change of the target position determines the rotational speed of the motor. By reading the encoder feedback value, the servo drive can achieve fast and accurate control of the motor rotor position and the motor speed. Therefore, the position control mode is mainly used in situations where precise positioning control is required, such as manipulators, chip placement machines, engraving machines, CNC machine tools, etc.

2) Speed control

Speed control is to control the speed of the motor through the speed command. By analyzing the given external speed instructions, the servo drive can achieve fast and accurate control of the motor speed. Therefore, the speed control mode is mainly used for occasions where the motor speed is relatively high, such as the spindle of the CNC milling machine.

3) Torque control

The input current of the servo motor has a linear relationship with the output torque, so the control of the current can realize the control of the output torque of the motor. Torque control is to control the output torque of the motor by inputting torque instructions to the servo controller. Torque instructions can be given by means of communication. The torque control mode is mainly used in devices that have strict requirements on the force of the material, such as winding devices and other tension control occasions.

7.1 Basic Settings

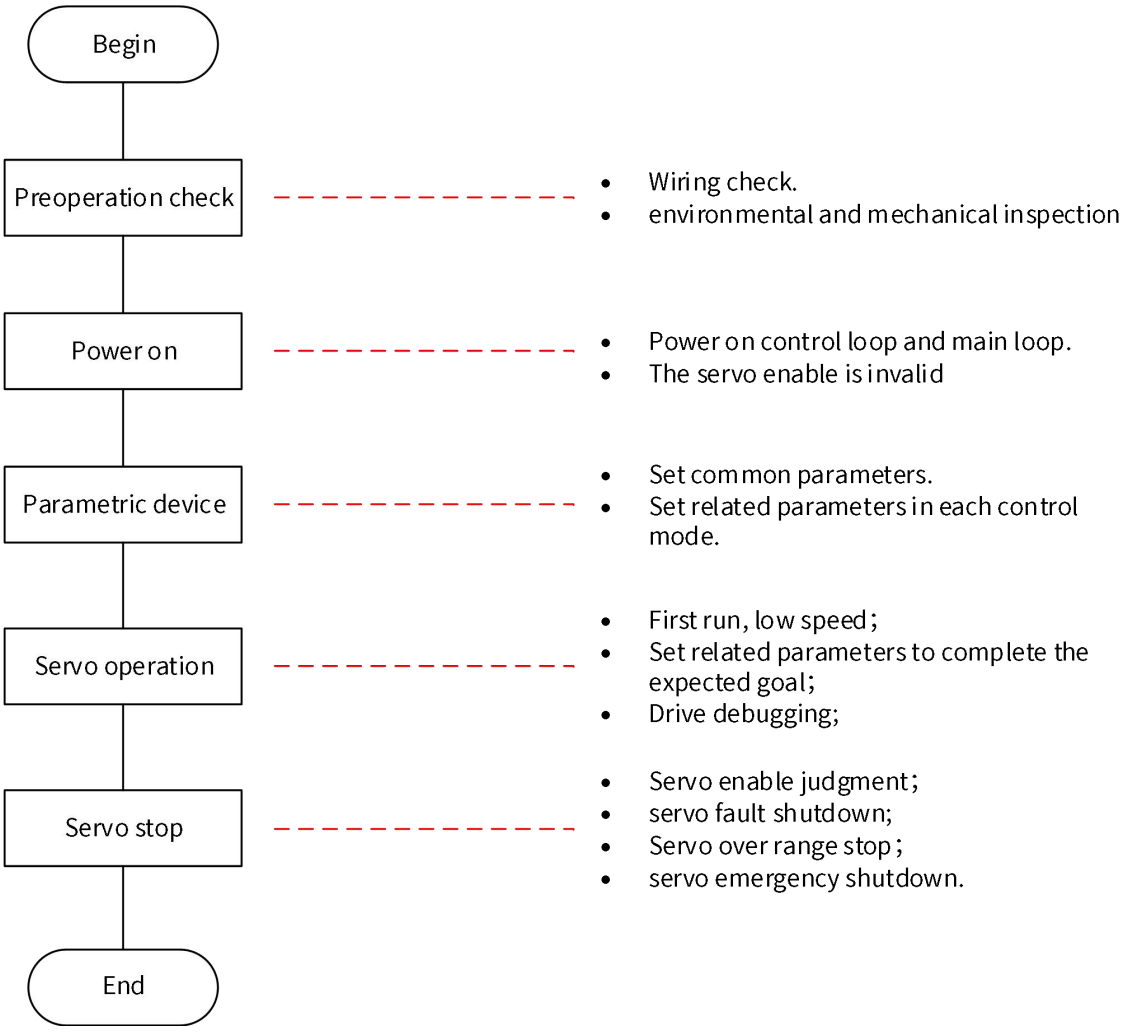


Figure 7.1 - Servo setup process

7.1.1 Check before running

The following checks should be carried out before the servo drive and servo motor are run:

Records	Serial number	content
wiring		
☐	1	The AC220V control power supply of the servo driver and the main loop power input terminals (L1, L2) must be correctly connected.
☐	2	The servo driver main loop output terminal (U, V, W) and the servo motor main circuit cable (U, V, W) must be phase consistent and securely connected.
☐	3	The main circuit power input terminals (L1, L2) and main circuit output terminals (U, V, W) of the servo driver must not be short-circuited.
☐	4	The control signal cables of the servo driver are correctly connected: the external signal cables such as the lock are correctly connected.
☐	5	The servo drive and servo motor must be reliably grounded.
☐	6	When an external brake resistor is used, the two poles of the external brake resistor must be connected between P3 and C on the CN6 terminal.
☐	7	The force on all cables is within the specified range.
☐	8	The distribution terminals have been insulated.
Environment and machinery		
☐	1	There are no foreign objects such as wire heads and metal shavings inside and outside the servo drive that will cause short circuit of signal lines and power lines.
☐	2	The servo drive and external brake resistors are not placed on combustible objects.
☐	3	The installation, shaft and mechanical connection of the servo motor must be reliable.
☐	4	The servo motor and the connected machinery must be in operational condition.

7.1.2 Powering on the Power Supply

1) Switch on the control power supply and the main loop power supply

Switch on the AC220V of the control loop and the power supply of the main loop:

For single-phase 220V main loop power supply terminals, the terminals are L1 and L2.

After the control loop power supply and the main loop power supply are connected, the panel display displays the node number set, and when the top and middle two horizontal lights of the first LED from the left are on, it indicates that the servo drive is in the running state, waiting for the host computer to give the servo enable signal.

If no.SS is displayed on the driver panel, the SCRAM signal is valid. Configure SCRAM signal parameters correctly or connect the SCRAM signal correctly.

If the driver panel display displays a fault, refer to Chapter 11 Troubleshooting to analyze and rectify the fault.

2) Disable the servo function

For details about the procedure, see 6.2.5 CiA402 Control Introduction.

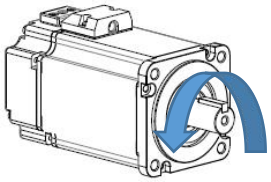
7.1.3 Rotation direction selection

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

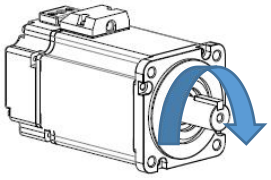
◆ Associated parameters:

Serial number P31.0 B	Name	Rotation direction selection			Set effective	Disable enable	Data range	0~1
	Access attribute	RW	Unit	-	Correlation model	ALL	Factory setting	0

0: counterclockwise is positive, facing the motor shaft, and it is positive when the rotation direction is counterclockwise.



1: clockwise is positive, facing the motor shaft, and it is positive when the rotation direction is clockwise.



7.1.4 Contracting brake Settings

The locking brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-running state and keeps the motor locked in position so that the moving part of the machine will not move because of its own weight or external force. If the servo motor does not have a holding brake, you can skip this section.

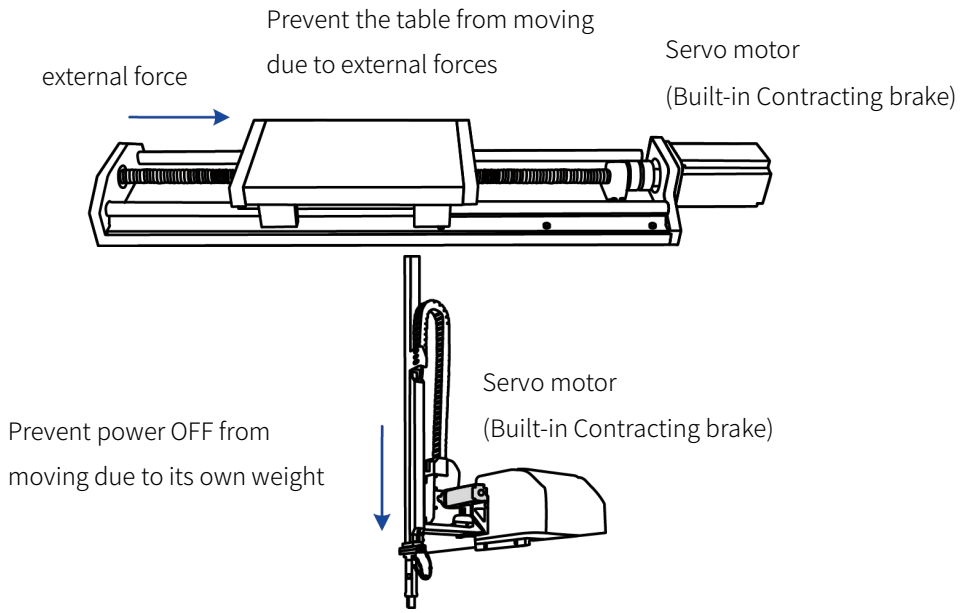


Figure 7.1.4-1 Schematic diagram of lock application

Note:

- The brake holding mechanism built-in in the servo motor is a non-electrified action type fixed special mechanism, which can not be used for braking purposes, only when the servo motor is kept in a stopped state;
- brake coil may have polarity need to carefully check the instructions of the servo motor;
- When the motor with built-in lock brake is running, the lock brake may make a snapping sound, which has no effect on the function;
- When the lock coil is energized (the lock is open), magnetic flux leakage may occur at the shaft end and other parts. Be careful when using instruments such as magnetic sensors near the motor.

1) Contracting brake wiring

The N3 series servo driver can be configured with a lock control DO output signal in the CN1 interface which drives the external intermediate relay circuit to control the motor lock coil.

Note:

The maximum output current of the DO loop is DC 50mA, so the control of the lock coil cannot be directly connected to the DO.

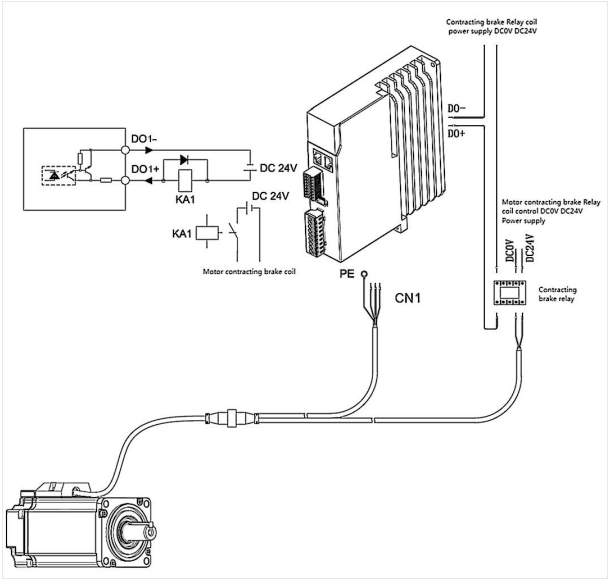


Figure 7.1.4-2 Schematic diagram of the lock cable

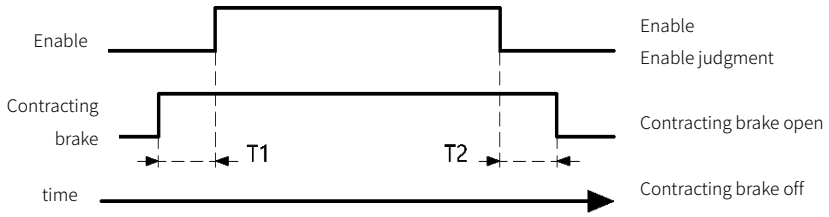
Contracting brake Wiring precautions:

The voltage drop caused by cable resistance should be fully considered in the length of the motor holding cable, and the input voltage should be at least 24V in the holding operation.

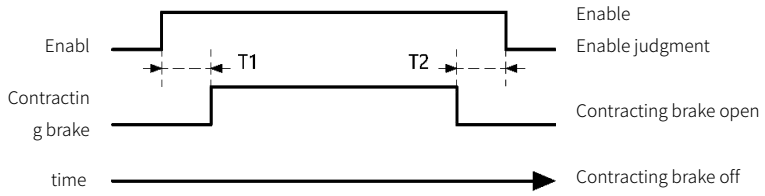
- Do not share the power supply with other electrical equipment when holding the gate, to prevent the voltage or current reduction caused by the work of other electrical equipment and eventually lead to the wrong operation of holding the gate, and the impact caused by holding the gate on other electrical equipment;
- Copper cables above GB/T12706.1-20020.5mm2 are recommended. operator
- If the brake coil with the servo motor has a polarity direction, please pay attention to the positive and negative terminals of the connection.
- Use an external loop with a continuation diode to prevent the reverse voltage from puncturing the internal components
- Check whether the DO parameter of the driver is set to lock output and whether it corresponds to the actual cable port

2) Contracting brake Software setup

Before using the lock function, ensure that the following parameters are set correctly

<table>
<tr><td rowspan="3">Serial number P30.02</td><td>Name</td><td colspan="3">Contracting brake Open delay</td><td>Set effective</td><td>immediate effect</td><td>Data range</td><td>1~1000</td></tr>
<tr><td>Access attribute</td><td>RW</td><td>Unit</td><td>ms</td><td>Correlation model</td><td>ALL</td><td>Factory setting</td><td>100</td></tr>
<tr><td colspan="8">Since the lock has a mechanical response time, this parameter is used to set the delay time for the lock to open.</td></tr>
<tr><td rowspan="3">Serial number P30.03</td><td>Name</td><td colspan="3">Contracting brake Lock delay</td><td>Set effective</td><td>immediate effect</td><td>Data range</td><td>1~1000</td></tr>
<tr><td>Access attribute</td><td>RW</td><td>Unit</td><td>ms</td><td>Correlation model</td><td>ALL</td><td>Factory setting</td><td>100</td></tr>
<tr><td colspan="8">Since the lock has a mechanical response time, this parameter is used to set the delay time between the lock coil of the motor and the output torque of the servo stop when the lock timing is controlled negatively. The longer the time, the more obvious the effect of preventing falls, but generally not more than 500ms.</td></tr>
<tr><td rowspan="3">Serial number P30.04</td><td>Name</td><td colspan="3">Contracting brake Time sequence</td><td>Set effective</td><td>immediate effect</td><td>Data range</td><td>0~1</td></tr>
<tr><td>Access attribute</td><td>RW</td><td>Unit</td><td>ms</td><td>Correlation model</td><td>ALL</td><td>Factory setting</td><td>100</td></tr>
<tr><td colspan="8">The modified parameter is used to set the sequence of servo output and lock action.
0:Contracting brake Positive sequence
Contracting brake Open Enable servo output Run Turn off servo output Contracting brake lock
 

1:Contracting brake Negative sequence
Servo output enable Contracting brake Open Run Contracting brake Open lock servo output off</td></tr>
</table>



T1: P30.02 lock opening delay; T2: P30.03 Lock delay

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

3) Servo drive normal state lock timing (lock negative timing)

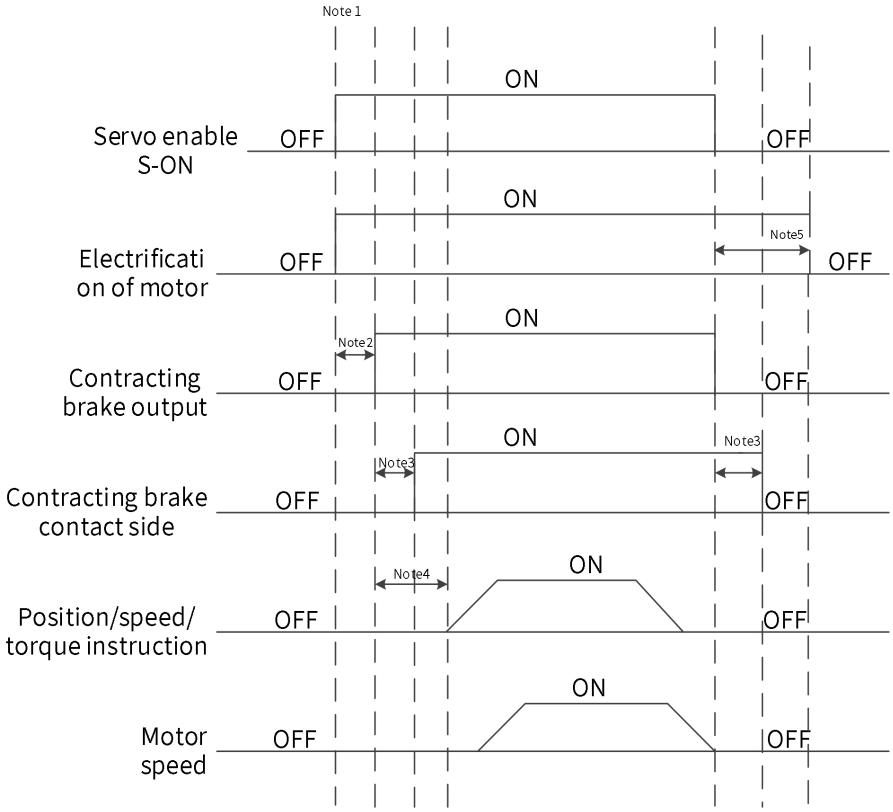


Figure 7.1.4-3 Timing of locking the brake when the motor is stationary

Note:

- When the servo is enabled ON, the lock output is set to ON and the motor enters the power-on state.
- after a delay of 10ms, hold the gate output signal output;
- The delay time of the lock contact part, please refer to the relevant specifications of the motor;
- From the lock output set to ON to the input position/speed/torque instruction, please interval more than P30.02 time;
- When the servo is enabled OFF, the lock output is set to OFF at the same time. The delay for the motor to enter the non-powered state after the lock output is OFF can be set by P30.03.
- After the lock output is set to ON from OFF, do not input position/speed/torque instruction within P30.02 hours, otherwise the instruction will be lost or the operation error will be caused;

- When used in a vertical shaft, the mechanical motion part of the weight or external force may cause the mechanical slight movement. When the servo motor is stationary, the servo is enabled OFF, and the lock output immediately becomes OFF, but within P30.03 time, the motor is still in the power state to prevent the mechanical moving part from moving due to its own weight or external force.

4) Servo drive fault state lock timing

According to the different shutdown mode, servo faults are divided into class 0 controllable faults and class 1 uncontrollable faults. Servo drive fault state lock timing can be divided into the following two cases:

Type 0 fault occurs: Lock DO output condition is the same as "lock timing under normal state of servo drive".

Class 1 fault occurs: When Class 1 fault occurs and the lock is enabled, the lock output immediately becomes OFF, and the motor is in a state of power failure.

7.1.5 Brake Settings

When the torque and speed of the motor are opposite, the energy is returned from the motor end to the driver, so that the bus voltage value increases, when the voltage rises to a certain height, the energy can only be consumed by the brake resistance. At this time, excessive energy must be consumed according to the braking requirements, otherwise it will damage the servo drive. Some models of the N3 series servo drive do not have an internal brake resistance, and when the brake resistance is required to perform the braking function, an additional brake resistance must be added.

1) Torque measurement

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

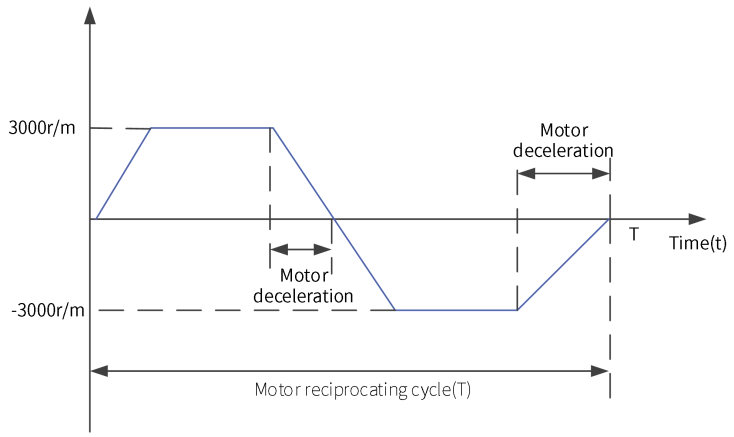
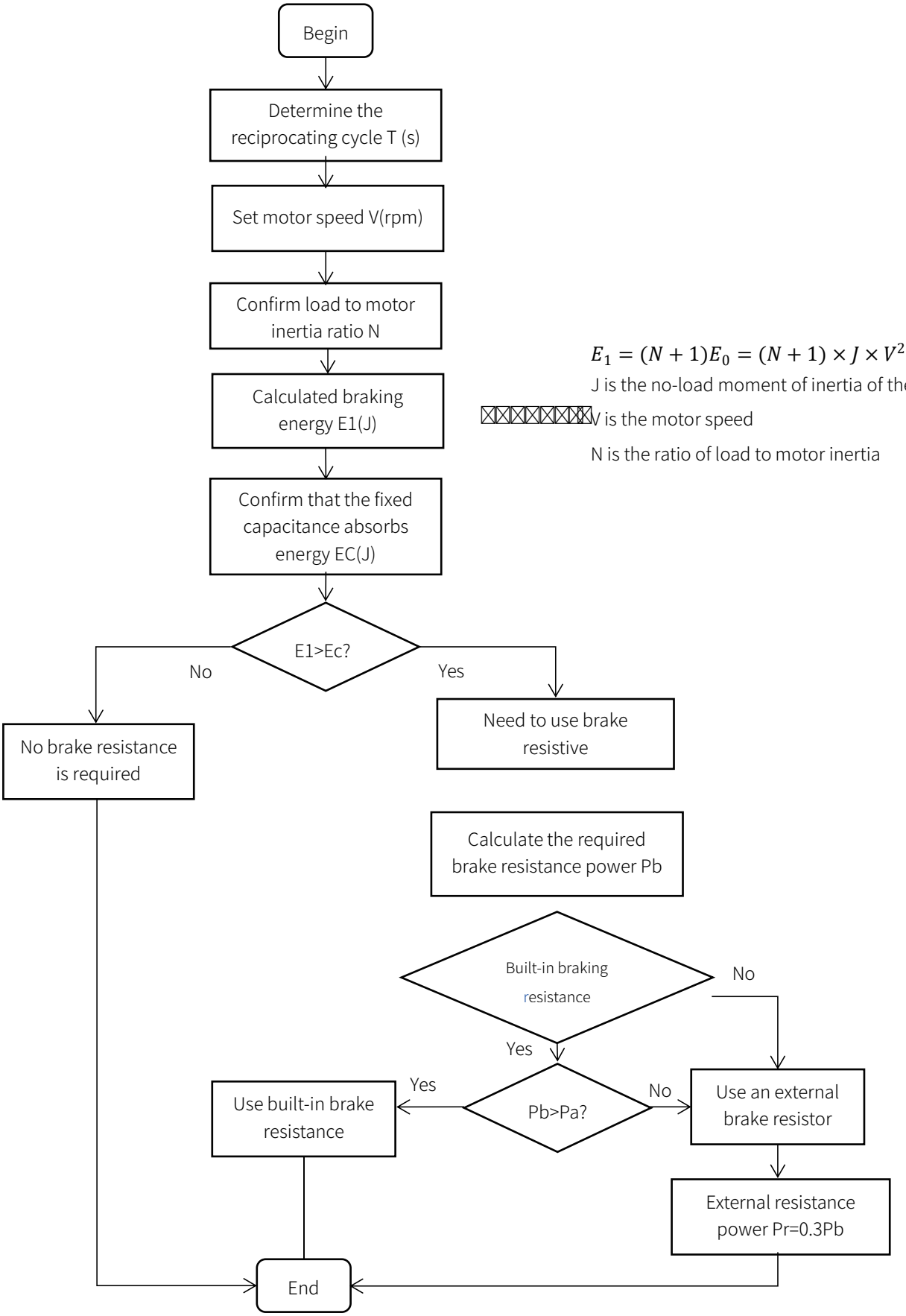


Figure 7.1.5-1 Example of motor speed curve in the absence of external load torque

1) Brake resistance selection



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

J is the no-load moment of inertia of the motor shaft

V is the motor speed

N is the ratio of load to motor inertia

For the specific selection of brake resistance, refer to the brake resistance selection in the product specification section

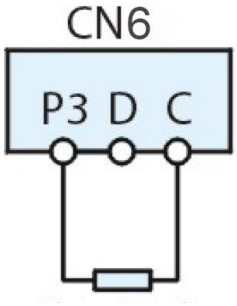
The simple calculation here is:

Assuming that the load inertia is N times that of the motor, when decelerating from 3000rpm to 0, the total braking energy is, minus the energy Ec absorbed by the capacitor,The energy consumed by the braking resistance required is $(n + 1) \times Eo - Ec$ joules.Assuming that the reciprocating movement period is T, the braking resistance power is required $2 \times \frac{(n + 1) \times Eo - Ec}{T}$ .According to Figure 7.1.5-2, you can determine whether the brake resistor is currently in use and the power selection of the brake resistor.

2) Connection and setting of brake resistance

Use external brake resistance:

IF Pb×T>=EC, connect an external brake resistor. At this time, according to the brake resistance cooling method is different. The external brake resistance should be used when the derating is 70%, that is, Pr=Pb/(1-70%), and ensure that it is greater than the minimum resistance value allowed by the driver. Both ends of the external brake resistor are connected to P3 and C of the servo CN6 terminal respectively



Pb×T<Pa; No brake resistance required for Pa:

If Pb×T<EC, no brake resistance is required, and only the bus capacitor can absorb the braking energy.

Note:

- Please correctly set the resistance value (P31.10) and power (P31.11) of the external brake resistor. Otherwise, this function will be affected.
- If using an external brake resistor, ensure that the resistance meets the minimum allowable resistance limit. If the brake resistance value is too small,
- will cause damage to the drive brake tube.
- Under natural conditions, when the brake resistance can handle power (average) is used at rated capacity, the temperature of the resistance will rise to more than 120 ° C (under continuous braking). For safety reasons, please use forced cooling to reduce the brake resistance temperature; Or use a brake resistor with a thermal switch. Consult the manufacturer for load characteristics of brake resistors.

3) There is external load torque, and the motor is in a power generation state

The motor rotates in the same direction as the torque, and the motor outputs energy to the outside. However, in some special cases, the motor torque output is opposite to the rotation direction

When the motor does negative work, the external energy generates electrical energy through the motor to feed back to the driver. When the load is continuous power generation, the common DC bus scheme is recommended.

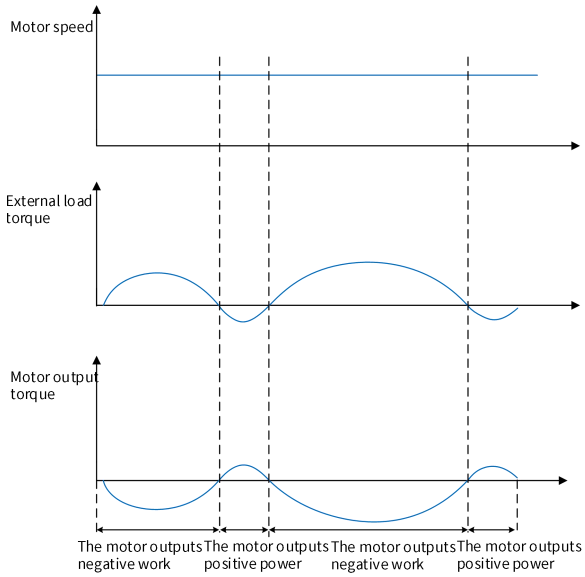


Figure 7.1.5.4 - Example of a curve in the presence of external load torque

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

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

- Associated parameters:

Serial number P31.10	Name	Brake resistance resistance value			Set effective	Disable enable	Data range	1~1000
	Access attribute	RW	unit	ohm	Correlation model	ALL	Factory setting	Type decision
This parameter is used to set the actual brake resistance value, which defaults to the built-in brake resistance value corresponding to each drive model (see the Product Specifications section for details). When an external brake resistor is connected, set the value based on the actual value of the external brake resistor. If this value is set to 0, there is no protection against overloading of the brake resistance, so it is not recommended to set this value to 0.								

Serial number P31.11	Name	Brake resistance resistance value			Set effective	Disable enable	Data range	1~1000
	Access attribute	RW	unit	ohm	Correlation model	ALL	Factory setting	Type decision
This parameter is used to set the actual brake resistance power used, which defaults to the built-in brake resistance value corresponding to each drive model (see the Product Specifications section for details). When an external brake resistance is connected, set this parameter based on the actual value of the external brake resistance power. If this value is set to 0, there is no protection against overloading of the brake resistance, so it is not recommended to set this value to 0.								

7.1.6 Servo operation

1) Select an appropriate control mode through parameter modification

Serial number P00.02	Name	Control channel selection			Set effective	Restart power	Data range	0~4
	Access attribute	RW	Unit	-	Correlation model	ALL	Factory setting	1
This parameter is used to set the given mode of the control instruction. 0: Control panel Use LED panels for related operations with limited functionality. 1: Controller control Through EtherCAT/CAN Open and other bus communication methods, the servo drive is enabled, run, stop, reset and other operations, and the bus sends relevant control instructions, such as position instructions, speed instructions, torque instructions, etc. 2: Software control Operate the Servo drive using Servo Tool debugging software. 3: Analog 1 control reserve 4: Analog 2 control reserve								

Note:

N3 series servo has five control modes, we must pay attention to choose the right control mode according to the current working condition

2) After input instructions, the servo motor rotates

Servo operation instructions		
record	Serial number	Content
☐	1	When running for the first time, a relatively low given instruction should be set to make the motor rotate at a low speed and confirm whether the motor rotation is correct.
☐	2	Observe whether the motor rotation direction is correct. If you find that the motor steering is contrary to the expected, please check the input command signal and the command direction setting signal.
☐	3	If the motor rotation direction is correct, use the driver panel or debugging software to observe the actual speed, time current and other data of the motor.
☐	4	After the above motor running condition check is completed, the relevant parameters can be adjusted to make the motor work in the expected condition.
☐	5	Refer to "Chapter 9 Adjustment" to debug the servo drive.

3) Power on sequence diagram

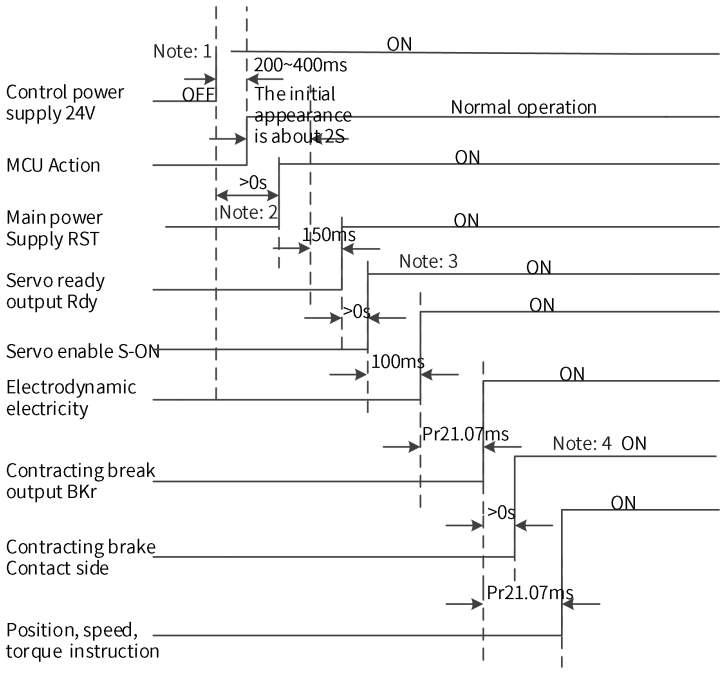


Figure 7.1.6-1 Power sequence

Note:

- You are advised to power on the main power supply after the control power supply.
- The servo power-on time depends on the command.
- The delay time of the lock contact part depends on the action time of the lock mechanism of the motor, and the setting time of P30.02 should be greater than the delay time.

Associated parameters:

Serial number P30.02	Name	Contracting brake Open delay			Set effective	immediate effect	Data range	1~1000
	Access attribute	RW	Unit	ms	Correlation model	ALL	Factory setting	100
Since the lock has a mechanical response time, this parameter is used to set the delay time for the lock to open.								

4) Shutdown sequence diagram in case of failure or overshoot

Fault: zero speed stop

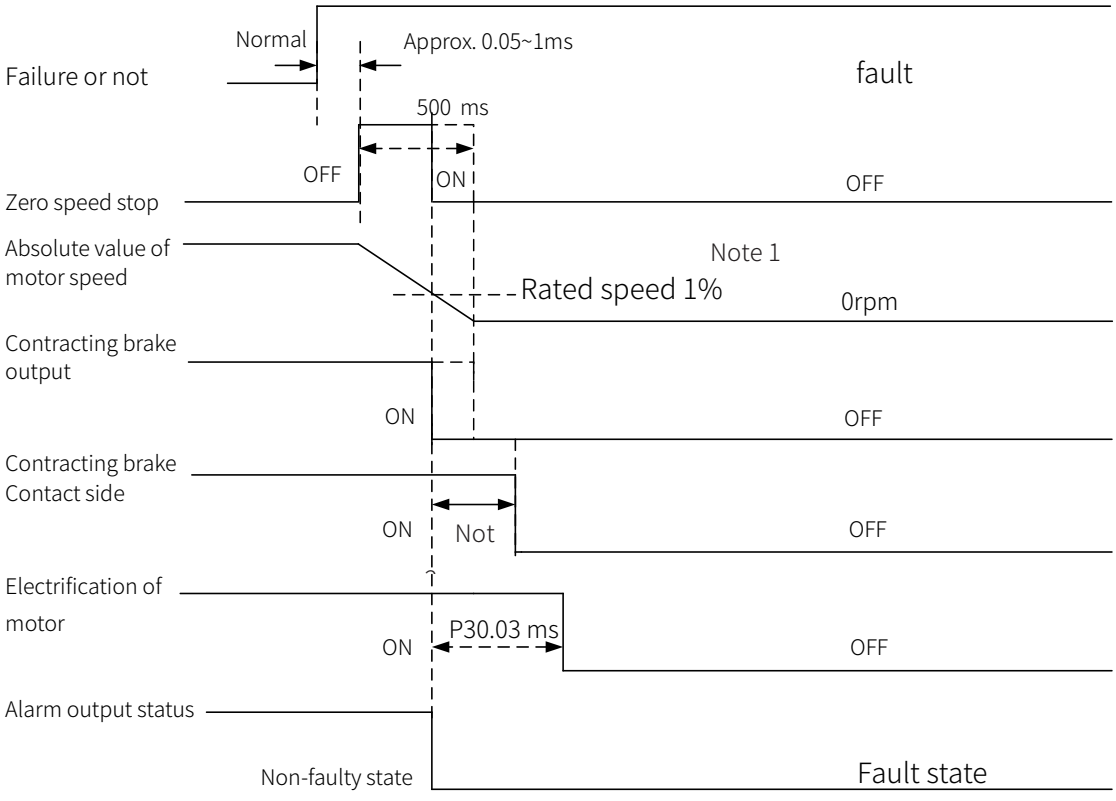


Figure 7.1.6-2 Sequence diagram of zero-speed shutdown state when fault occurs

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

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

Fault: lock forced stop

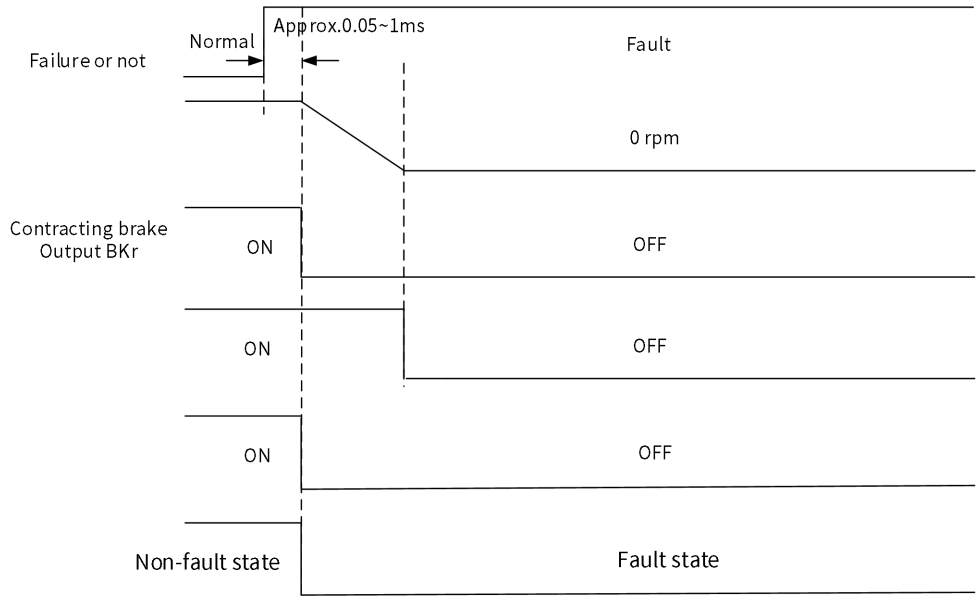


Figure 7.1.3-6 Timing diagram of forced lock state when a fault occurs

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

Overrange: zero speed stop, keep the position latch state

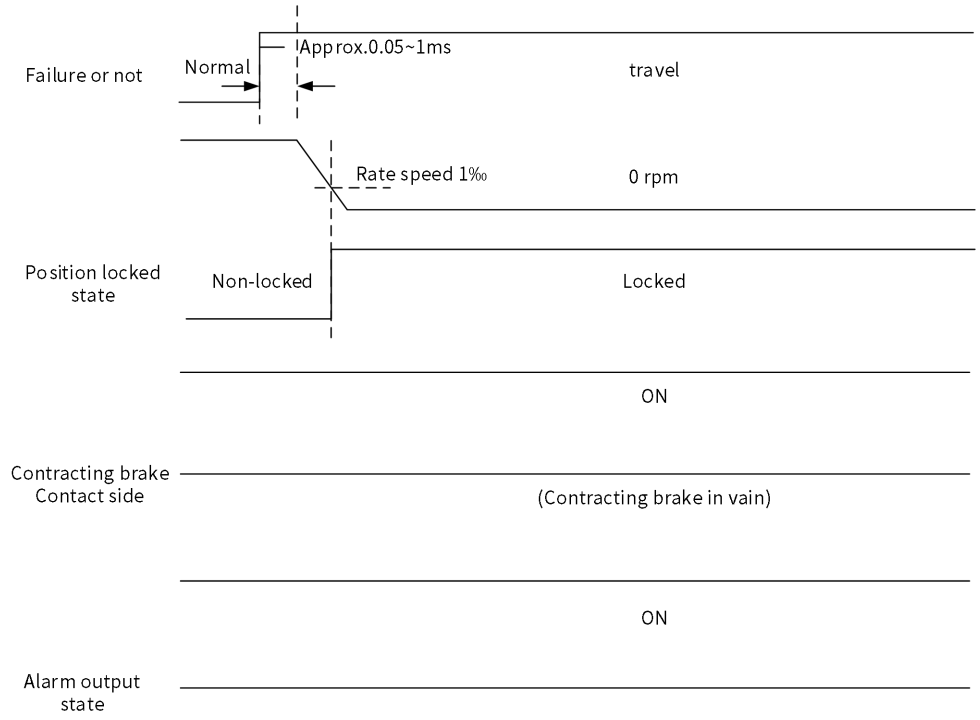


Figure 7.1.7-4 Sequence diagram of zero-speed shutdown state during overdrive

Fault reset:

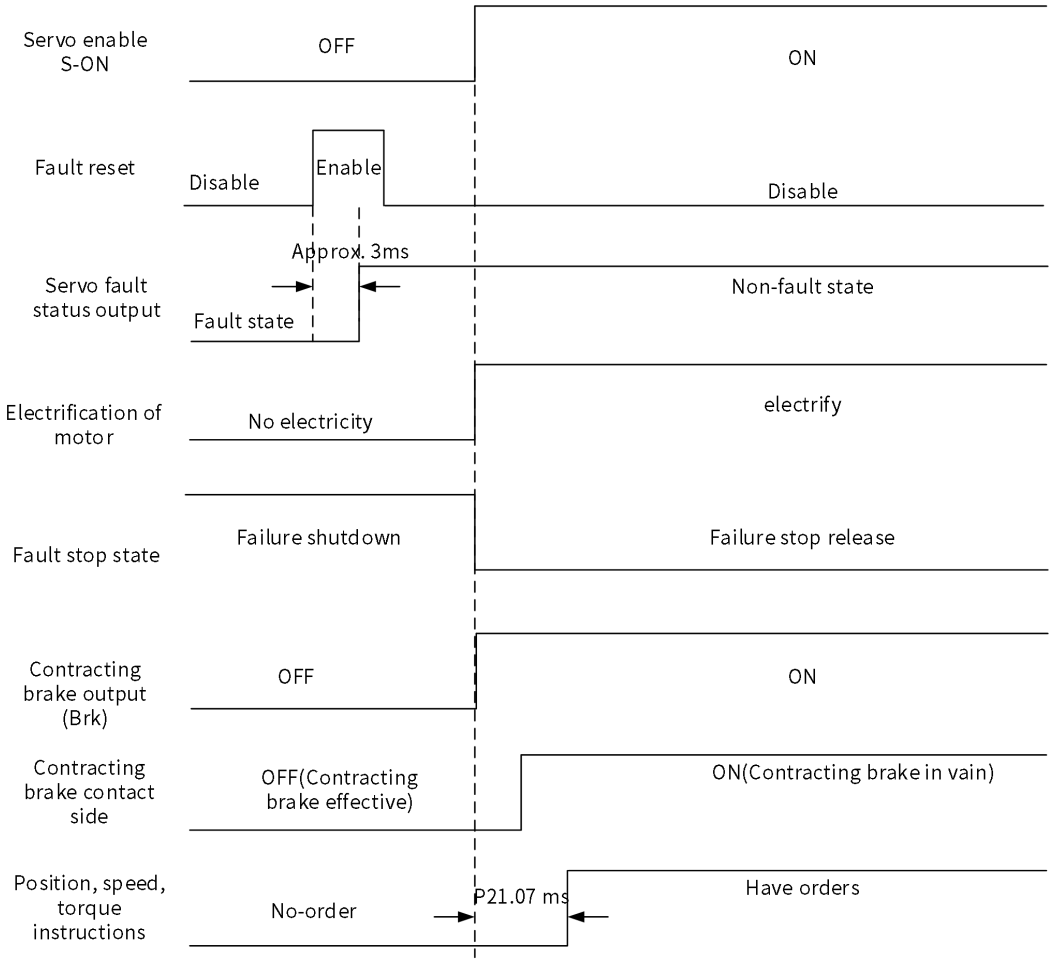


Figure 7.1.6-5 Reset sequence diagram

7.1.7 Servo stop

According to the different stopping mode, it can be divided into holding brake stop and zero speed stop. According to the shutdown state, it can be divided into the motor drive off state and the position to keep locked state. The details are as follows:

Shutdown mode	Contracting brake Shut down	Zero speed stop
shutdown description	The servo motor is not powered on, forced to stop by holding the brake, and the deceleration time is determined by the specifications of the holding brake. If there is no lock, free stop.	The servo drive outputs reverse braking torque, and the motor rapidly decelerates to 0.
Shutdown characteristic	If there is a lock, the mechanical impact is large, and the deceleration process is very fast; If there is no lock, the deceleration is smooth, the mechanical impact is small, but the deceleration process is slow.	Rapid deceleration, there is mechanical impact, but the deceleration process is fast.

	Drive off condition	Position remains latched
Shutdown state	After the motor stops rotating, the motor is not energized, if there is a lock, the motor shaft is locked; If there is no lock motor shaft can rotate freely.	After the motor stops rotating, the motor shaft is locked and cannot rotate freely.

Server stop bus object dictionary Settings

1⊠ Servo enable invalid stop

The communication control servo is disabled, and the servo stops in the Disable operation mode.

Associated object:

index	name	Disable operation option code			Settings Come into force	Run setting Shutdown effect	data structure	VAR	data type	Uint 16
605Ch	Access attribute	RW	Can map	NO	Correlation model	ALL	Data width	0~1	Factory setting	1
The meanings of set values are as follows: 0: Turn off the output of the servo unit and stop the motor freely. 1: After the motor stops at the deceleration slope, turn off the output of the servo unit. Note: When the state machine is switched from Operation Enable to Switch On, use 605Ch to select the stop mode.										

Note:

Only in bus control mode can the servo be set to enable stop or lock stop

2⊠ Failure stop

According to the fault type, the servo shutdown mode is different. For details about the fault classification, see Chapter 11 Troubleshooting.

Associated objects:

Index	name	Fault reaction option code			Settings Come into force	Run setting Shutdown effect	data structure	VAR	data type	Uint16
605Eh	Access attribute	RW	Can map	NO	Correlation model	ALL	Data width	0~3	Factory setting	1
The meanings of set values are as follows: 0: Turn off the output of the servo unit and stop the motor freely. 1: The motor stops at the deceleration slope. 2: The motor is stopped by the fast stop slope. 3: The motor is stopped by the maximum current (speed control, speed given instruction is 0). Note: After an alarm occurs, that is, before the system jumps into the Fault state machine, use 605Eh to select the shutdown mode.										

3☒ Overdrive stop

Noun explanation:

"Overrange" : refers to the mechanical movement beyond the designed safe movement range.

"Over-range stop" : refers to the safety function that when the moving part of the machine exceeds the safe moving range, the output level of the limit switch changes, and the servo driver makes the servo motor forcibly stop.

When the servo motor drives the vertical shaft, if it is in the overdrive state, the workpiece may fall. In order to prevent workpiece drop, the server has fixed the overdrive stop mode "zero speed stop, position lock state". In the case of linear movement of the workpiece, be sure to connect the limit switch to prevent mechanical damage. In the overrange state, the motor (workpiece) can be reversed by inputting reverse instructions.

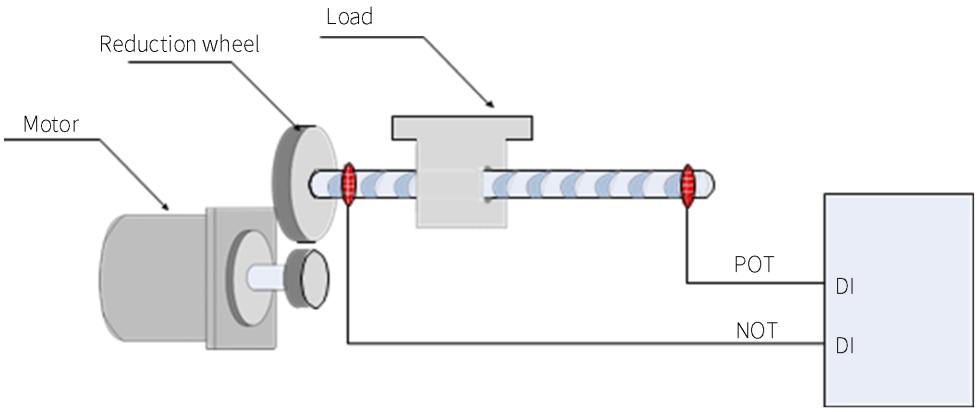


Figure 7.1.1-1 Installation diagram of the limit switch

When the overdrive stop function is used, any two of the four digital input ports 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), and the corresponding configuration parameter numbers are P70.01 to P70.04. To receive the limit switch input level signal. If the DI terminal valid logic is normally open, set it to 2 and 3. If the DI terminal valid logic is normally closed, set it to 102 and 103. Depending on whether the DI terminal level is valid, the driver will enable or disable the overdrive stop state.

4☒ Quick shutdown

Servo has 2 quick stop modes:

Use the SS port of the CN4 port to input the SCram signal, and configure the correct parameters according to the level logic of the external input

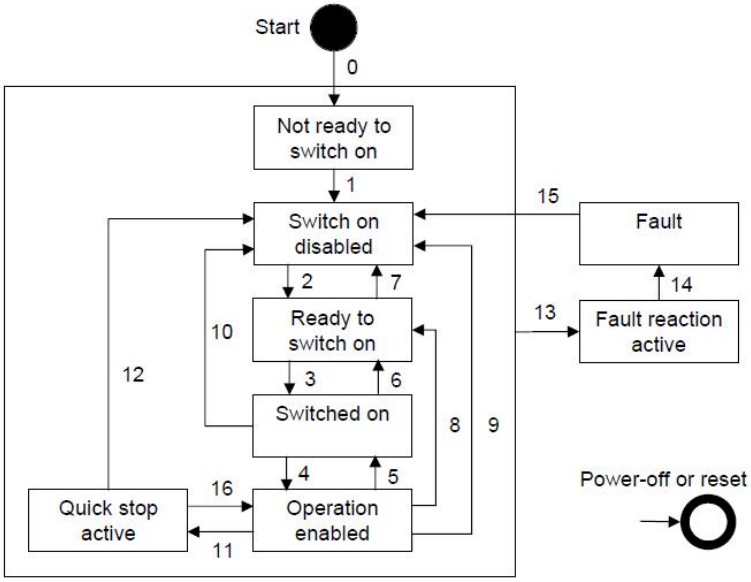
Serial number P70.06	name	Scram input logic			Set effective	With immediate effect	Data range	6 106
	Access attribute	RW	unit	-	Correlation model	ALL	Factory setting	6
This parameter is used to select the logical setting for the SCram input 6: Normally open logic, representing the emergency stop state of the corresponding servo when the effective state. 106: Normally closed logic, representing the emergency stop state of the corresponding servo when the invalid state.								

If bit2(Quick stop) of control word 6040h is 0, the system performs quick stop. Select the stop mode using object dictionary 605Ah.

index	name	Quick stop option code			Settings Come in to force	Run setting Shutdown effect	Data structure	VAR	Data type	Uint 16
605Ah	Access attribute	RW	Can map	NO	Correlation model	ALL	Data width	0~7	Factory setting	2
The meanings of set values are as follows: 0: Turn off the output of the servo unit and stop the motor freely. 1: After the motor is stopped by the deceleration slope, it jumps to the Switch on disabled state. 2: After the motor is stopped by the fast stop slope, jump to the Switch on disabled state. 3: After the motor stops at the maximum current, jump to the Switch on disabled state (speed control, speed given instruction is 0). 4: not defined 5: After the motor is stopped by the deceleration slope, it still stops in the QuickStop state. 6: After the motor is stopped by the fast stop slope, it still stops in the QuickStop state. 7: After the motor is stopped by the maximum current, it is still stopped in the QuickStop state (speed control, speed given instruction is 0). Note: When the state machine jumps from Operation Enable to the Quick reaction active state, use 605Ah (Quick stop option code) to select the stop mode.										

7.2 Servo state setting

When using the N3 series drive, the servo drive must be guided according to the process specified in the standard 402 protocol in order for the servo drive to operate in the specified state.



Each state is described in the following table:

Start	It automatically enters this state after being powered on or reset.
Not ready to switch on	Control power On, driver initialization, internal self-test, initialization is not completed until the state.
Switch on disable	Servo initialization complete, no fault or error on servo drive has been eliminated. Drive parameters can be set.
Ready to switch on	Servo drive is ready. Drive parameters can be set.
Switch on	Servo drive waiting to turn on the servo enable. Drive parameters can be set.
Operation Enable	The drive is running normally, a servo operation mode has been enabled, the motor has been powered on, and the motor rotates when the instruction is not 0. If the drive parameter attribute 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 attribute 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 failure shutdown. If the drive parameter attribute is "Run Change", you can set it. Otherwise, you cannot set it.
Fault	The fault shutdown is complete, all drive functions are disabled, and drive parameters are allowed to be changed in order to troubleshoot.

◆ Control command and status switch:

CiA402 status switch		Control word 6040h	Status word 6041h bit0~bit9*1
0	Power on -->initialize	Natural transition without control commands	0x0000
1	Initialization -->Servo fault free	Natural transition, no control instructions, if an error occurs during initialization, go directly to 13	0x0250
2	Servo fault free -->Servo ready	0x0006	0x0231
3	Servo ready -->Wait for the servo enable to turn on	0x0007	0x0233
4	Waiting to turn on the servo enable -->Servo operation	0x000F	0x0237
5	Servo operation -->Wait for the servo enable to turn on	0x0007	0x0233
6	Waiting to turn on the servo enable -->Servo ready	0x0006	0x0231
7	Servo ready -->Servo fault free	0x0000	0x0250
8	Servo operation -->Servo ready	0x0006	0x0231
9	Servo operation -->Servo fault free	0x0000	0x0250
10	Waiting to turn on the servo enable -->Servo fault free	0x0000	0x0250
11	Servo operation -->Quick stop	0x0002	0x0217
12	Quick shutdown -->Servo fault free	Quick stop mode 605A selection is 0~3, after the shutdown is completed, the natural transition, no control instructions	0x0250
13	Failure shutdown	In any state except "fault", once the servo drive fails, it automatically switches to the fault stop state without control instruction	0x021F
14	Failure shutdown -->breakdown	After the shutdown is complete, a natural transition occurs without the need for control instructions	0x0218

CiA402 status switch		Control word 6040h	Status word 6041h bit0~bit9*1
15	Failure -->Servo fault free	0x80; bit7 rising edge is effective; bit7 remains at 1 and all other control instructions are invalid.	0x0250
16	Quick shutdown -->Servo operation	Quick stop mode 605A is set to 5 to 7. After the stop is complete, 0x0F is sent	0x0237

Note:

*1. bit10~bit15(bit14 meaningless) of the status word 6041h is related to the operating status of each servo mode, which is represented by "0" in the table above. Please check the specific status of each servo operating mode.

7.2.1 Control word 6040h

Index	Name	control word			Set effective	Run setting shutdown takes effect	Data structure	VAR	Data type	Uint 16
6040h	Accessibility	RW	Can map	RPDO	Correlation model	ALL	Data range	0~65535	Factory setting	00

Set control instructions:

Bit	Name	description
0	Servo ready	1- valid, 0- invalid
1	Switch on the main circuit	1- valid, 0- invalid
2	Quick stop	1- invalid, 0- valid
3	Servo operation	1- valid, 0- invalid
4~6		Related to the servo operation mode
7	Fault reset	For resettable faults and warnings, perform the fault reset function; bit7 rising edge is effective; bit7 remains at 1 and all other control instructions are invalid.
8	Pause	605Dh
9~10	NA	Reserve.
11~15	Manufacturer's custom	Reserved, undefined

Note:

- Each bit of the control word has no meaning and must be combined with other bits to form a control instruction.
- bit0~bit3 and bit7 have the same meaning in each servo mode. Commands must be sent sequentially to guide the servo drive to the expected state according to the CiA402 state machine switching process. Each command corresponds to a certain state.
- bit4 to bit6 is related to each servo mode (see the control instructions for the different modes).

7.2.2 Status Word 6041h

Index	Name	status word			Set effective	-	Data structure	VAR	Data type	Uint 16
6041h	accessibility	RO	Can map	TPDO	Correlation model	ALL	Data range	0~FFFF	Factory setting	00

Reflect 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

Note:☒

- Each bit of the status word is meaningless to read separately, and must be composed with other bits to feedback the current status of the servo;
- bit0~bit9 have the same meaning in each servo mode. After the command is sent by the control word 6040h in sequence, the servo will feedback a definite state;
- bit12~bit13 is related to each servo mode (please see the control instructions in different modes);
- bit10 bit11 bit15 has the same meaning in each servo mode, and feedback the status of the servo after executing a certain servo mode.

7.3 Setting the Servo Mode

7.3.1 Servo Mode

The servo prerun mode can be set using object dictionary 6060h. You can view the current running mode of the server using object dictionary 6061h.

◆ Mode Setting 6060h:

Index	Name	Modes of operation			Set effective	-	Data structure	VAR	Data type	Int8
6060h	accessibility	RW	Can Map	RPDO	Correlation model	ALL	Data range	0~FFFF	Factory setting	00

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

Set value	name	description
0	Modelless setting	reserve
1	Profile Position Mode (pp)	Reference contour position Model (pp)
2	None-model setting	reserve
3	Profile speed Mode (pv)	Reference Profile speed Mode (pv)
4	Contour torque mode (pt)	Reference profile Torque mode (pt) * Note
5	None-model setting	reserve
6	Return-to-zero mode (hm)	Reference origin back to zero mode (hm)
7	Interpolation mode (ip)	Reference position Interpolation mode (ip) * Note
8	Periodic synchronous position Mode (csp)	Reference cycle synchronous position Mode (csp)
9	Periodic Synchronization Speed Mode (csv)	Reference Cycle Synchronization Speed Mode (csv)
10	Periodic synchronous Torque Mode (cst)	Reference period synchronous torque Mode (cst)

* Note: The N3 series does not support this control mode.

◆ 6061h displayed in mode:

Index	Name	Modes of operation			Set effective	-	Data structure	VAR	Data type	Int16
6061h	accessibility	RO	Can Map	TPDO	Correlation model	ALL	Data range	0~10	Factory setting	00

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

Set value	name	description
0	Modelless setting	reserve
1	Profile Position Mode (pp)	Reference contour position Model (pp)
2	None-model setting	reserve
3	Profile speed Mode (pv)	Reference Profile speed Mode (pv)
4	Contour torque mode (pt)	Reference profile Torque mode (pt) * Note
5	None-model setting	reserve
6	Return-to-zero mode (hm)	Reference origin back to zero mode (hm)
7	Interpolation mode (ip)	Reference position Interpolation mode (ip) * Note
8	Periodic synchronous position Mode (csp)	Reference cycle synchronous position Mode (csp)
9	Periodic Synchronization Speed Mode (csv)	Reference Cycle Synchronization Speed Mode (csv)
10	Periodic synchronous Torque Mode (cst)	Reference period synchronous torque Mode (cst)

* Note: The N3 series does not support this control mode.

7.3.2 Switching Modes

Note on mode switching:

- When the servo drive is in any state, the unexecuted position command will be abandoned after it enters into other modes from contour position mode or periodic synchronous position mode;
- Under any state, when the servo drive enters other modes from contour speed mode, contour torque mode, periodic synchronous speed mode, and periodic synchronous torque mode, ramp stop shall be executed first, and other modes can be entered after shutdown is completed.
- The servo is in the zero return mode, and is running, do not enter other modes; When the return to zero is complete or interrupted (failure or invalid enable), you can switch to other modes;
- When switching from other modes to periodic synchronous mode, send the command at least 1ms interval; otherwise, command loss or error will occur

7.3.3 Each mode supports the communication period

Cycle time	Profile Position Mode (PP)	Return-to-zero mode (HM)	Periodic synchronization position mode (CSP)	Periodic synchronization speed mode (CSV)	Profile speed Mode (PV)	Contour torque mode (PT)	Periodic synchronous torque mode (CST)
100us	×	×	×	×	×	×	×
200us						×	
400us						×	
1ms						×	

The synchronization cycles supported by 1ms and the following modes are shown in the table above. Otherwise, running errors may occur.

Above 1ms, the value is the position loop control cycle (N3 series servo position loop control cycle is 200us) the synchronization cycle of an integer multiple can also be supported, but the maximum should not exceed 8ms, otherwise the servo control effect cannot be guaranteed.

7.4 Periodic Synchronization Position Mode (csp)

In the periodic synchronous position mode, the upper controller completes the position instruction planning, and then sends the planned target position (607Ah) to the servo drive in a periodic synchronous way, and the position, speed and torque control are completed by the servo drive.

7.4.1 Control block diagram

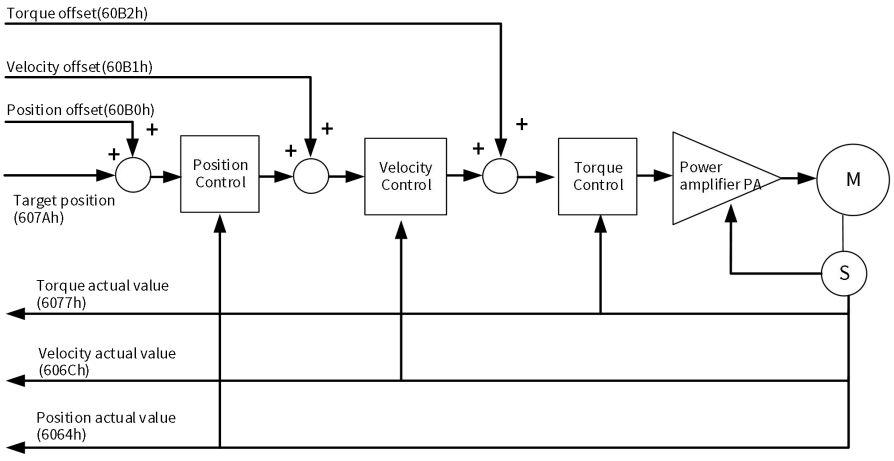


Figure 7.4.1-1 Periodic synchronization position control block diagram

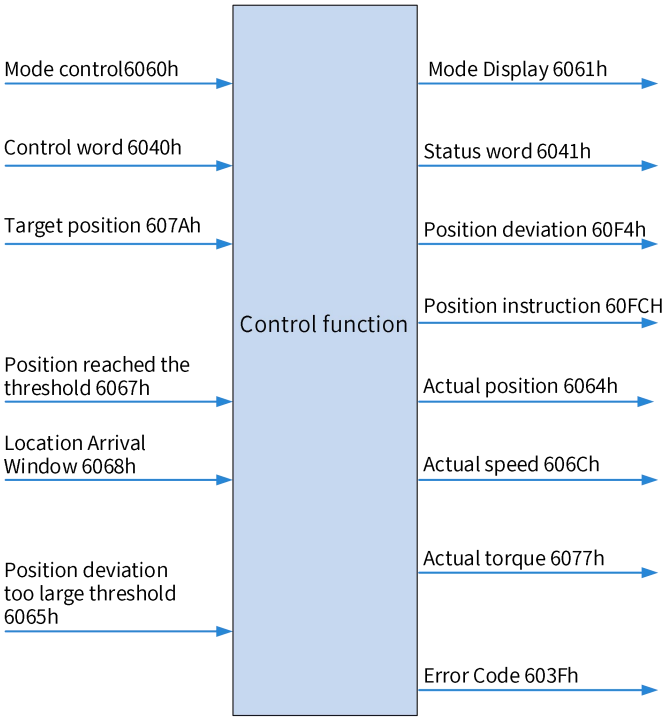


Figure 7.4.1-2 Periodic synchronization position Input and output objects

7.4.2 Related Objects

Control word 6040h		
position	name	description
0	Switch on	The value of bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
8	Halt	0: The servo is set to Bit0~bit3 1: The servo presses 605Dh to pause.

Status word 6041h		
position	name	description
10	Target Reach	0: The target position is not reached 1: The target position is reached
11	internal limit actice	0: Position instruction and position feedback are not exceeded 1: Position instruction or position feedback exceeds the limit

12	drive follow the command Value	0: The slave station did not follow the command 1: Follow instructions from the slave station: The slave station is in the running state and starts to execute the position instruction, the position is 1; Otherwise zero
13	Following error	0: There is no fault with large position deviation 1: The position deviation is too large
15	Home Find	0: The origin return to zero is incomplete 1: The origin is returned to zero

index (hex)	subindex (hex)	name	interview	data type	unit	Set 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	Position instruction	RO	Int32	Instruction unit	-	-
6063	0	Position feedback	RO	Int32	Encoder unit	-	-
6064	0	Position feedback	RO	Int32	Instruction unit	-	-
6065	0	Position deviation too large threshold	RW	Uint32	Instruction unit	0~(2^{32}-1)	3145728
6067	0	The location reached the threshold.	RW	Uint32	Encoder unit	0~65535	734

index (hex)	subindex (hex)	name	interview	data type	unit	Set range	Default value
		Procedure					
6068	0	Location arrival window	RW	Uint16	ms	0~65535	x10
606C	0	Actual speed	RO	Int32	Instruction 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 position	RW	Int32	Instruction unit	-2^{31}~$(2^{31}-1)$	0
6091	1	Motor resolution	RW	Uint32	-	0~$(2^{32}-1)$	1
	2	Axial resolution	RW	Uint32	-	1~$(2^{32}-1)$	1
60E0	0	Forward torque limitation	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limit	RW	Uint16	0.10%	0~5000	5000
60F4	0	Position deviation	RO	Int32	Instruction unit	-	-
60FC	0	Position instruction	RO	Int32	Encoder unit	-	-
Note: For details on how to use related objects, see Chapter 8 Parameter and Object Dictionary Details.							

7.4.3 Related Function Settings

1) Positioning is complete

index	Sub index	Name	description
6067	0	The location reached the threshold. Procedure	When the position deviation is within the range of ± 6067h and the time reaches 6068, the positioned DO signal is effective, and the bit10 of 6041 is 1. If either condition is not met, the location arrival is invalid.
6068	0	Location arrival window	

2) Position deviation is too large threshold

Index	sub index	Name	description
6065	0	Position deviation too large threshold	When the position deviation is greater than this value, the position deviation is too large fault, the panel displays an alarm, and the bit13 of the status word is set. When 6065h=0xFFFFFFFF, the drive does not perform large position deviation detection.

7.4.4 Recommended Configuration

The periodic synchronous position mode (csp) is configured as follows:

RxPDO	TxPDO	noted
6040☒control word	6041☒status word	must
607A☒target position	6064☒position actual value	must
6060☒modes of operation	6061☒modes of operation display	select able

7.5 Cycle Synchronization Speed Mode (csv)

In the periodic synchronous speed mode, the upper controller sends the calculated target speed 60FF periodically and synchronously to the servo drive, and the speed and torque adjustment is performed internally by the servo

7.5.1 Control block diagram

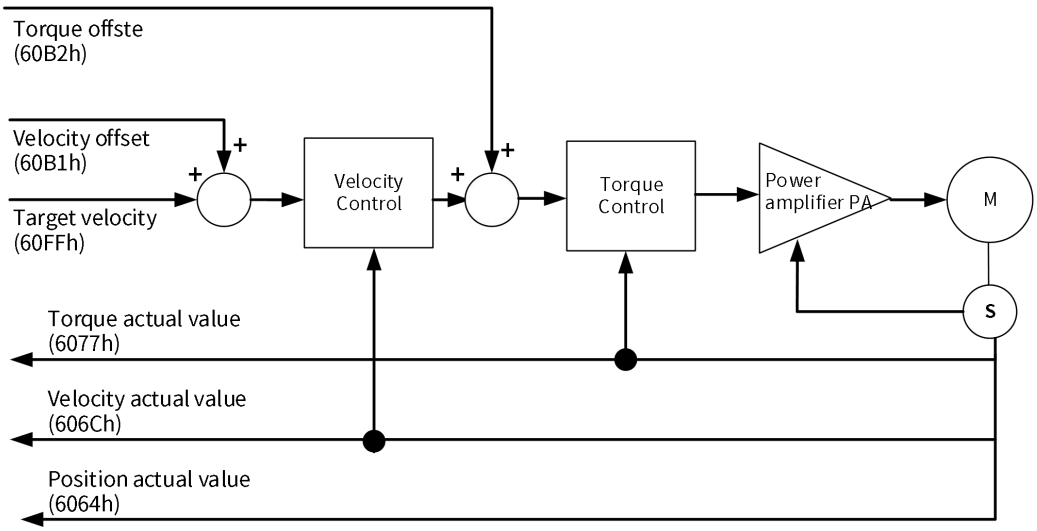


Figure 7.5.1-1 Periodic synchronization speed control block diagram

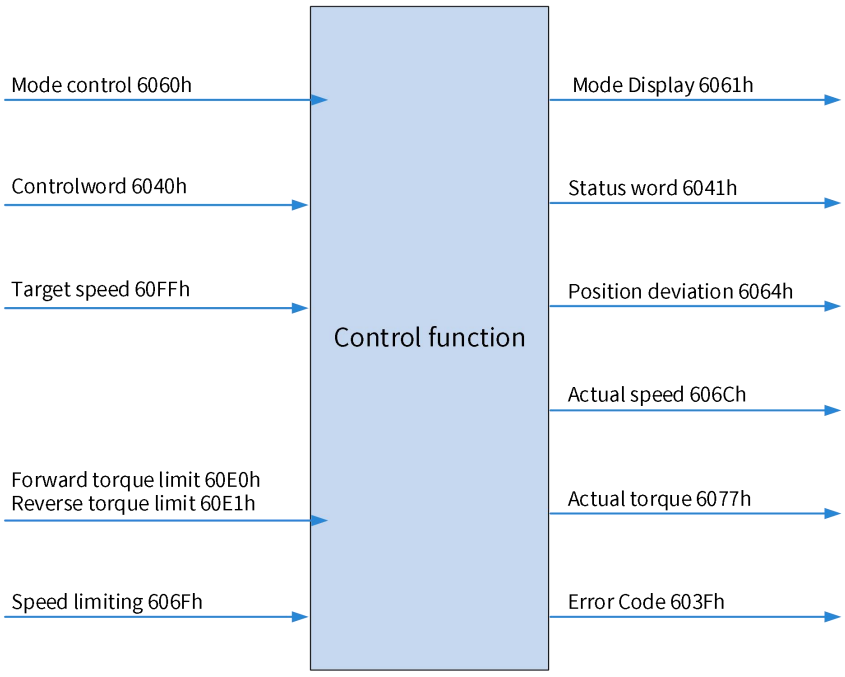


Figure 7.5.1-2 Input and output objects

◆ Related objects

Control word 6040h		
position	name	description
0	Switch on	The value of bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
8	Halt	0: The servo is set to bit0~bit3 1: The servo presses 605Dh to pause.

Status word 6041h		
position	Name	description
10	Target Reach	0: Target speed not reached 1: Target speed reached
12	drive follow the command Value	0: The slave station did not follow the command 1: Follow the command from the slave station
13		To be defined
15	Home Find	0: The origin return to zero is incomplete 1: The origin is returned to zero

Index (hex)	Sub index (hex)	Name	nterview	Data type	Unit	Set 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
6063	0	Position feedback	RO	Int32	Encoder unit	-	-
6064	0	Position	RO	Int32	Instruction	-	-

Index (hex)	Sub index (hex)	Name	nterview	Data type	Unit	Set range	Default value
		feedback			unit		
606C	0	Actual speed	RO	Int32	Instruction unit /s	-	-
606D	0	The speed reaches the threshold	RW	Uint32	Encoder unit	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	Instruction unit /s	$0\sim(2^{32}-1)$	230
6083	0	acceleration	RW	Uint32	Instruction unit /S^2	$0\sim(2^{32}-1)$	100
6084	0	deceleration	RW	Uint32	Instruction unit /S^2	$0\sim(2^{32}-1)$	100
60B1	0	speed bias	RW	Int32	Instruction unit /s	$-2^{31}\sim(2^{31}-1)$	0
60B2	0	Torque bias	RW	Int32	0.10%	-5000~5000	0
60E0	0	Forward torque limitation	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limit	RW	Uint16	0.10%	0~5000	5000
60FF	0	Target speed	RW	Int32	Instruction unit /s	$-2^{31}\sim(2^{31}-1)$	0

Note:

For detailed instructions on how to use related objects, see Chapter 8 Detailed Instructions on Parameter and Object Dictionaries.

7.5.2 Related Function Settings

◆ Speed arrival function

index	sub index	Name	description
606Dh	0	Speed reaches the threshold	The difference between the target speed of 60FF(converted into motor speed /rpm) and the actual speed of the motor is within ±606D, and when the time reaches 606E, it is considered that the speed reaches, the bit10 of the status word 6041 =1, and the speed reaches the DO function. When the servo function is effective in contour speed mode and periodic synchronous speed mode, the flag bit is meaningful. Otherwise there's no point.
606Eh	0	Speed arrival window	

7.5.3 Recommended Configuration

Periodic synchronization speed mode (csv), the basic configuration is as follows:

RxPDO	TxPDO	emark
6040☒control word	6041 ☒status word	Must
60FF☒target speed	6064☒position actual value	must
	606C☒speed actual value	must
6060☒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 drive periodically and synchronously, and the torque adjustment is performed internally by the servo. When the speed reaches the limiting value, it will enter the speed regulation stage.

7.6.1 Control block diagram

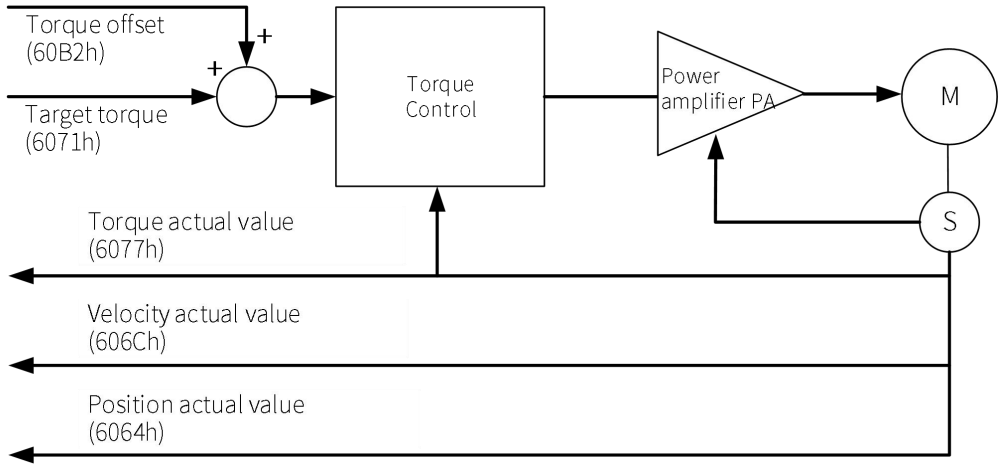


Figure 7.6.1-1 Block diagram of periodic synchronous torque mode

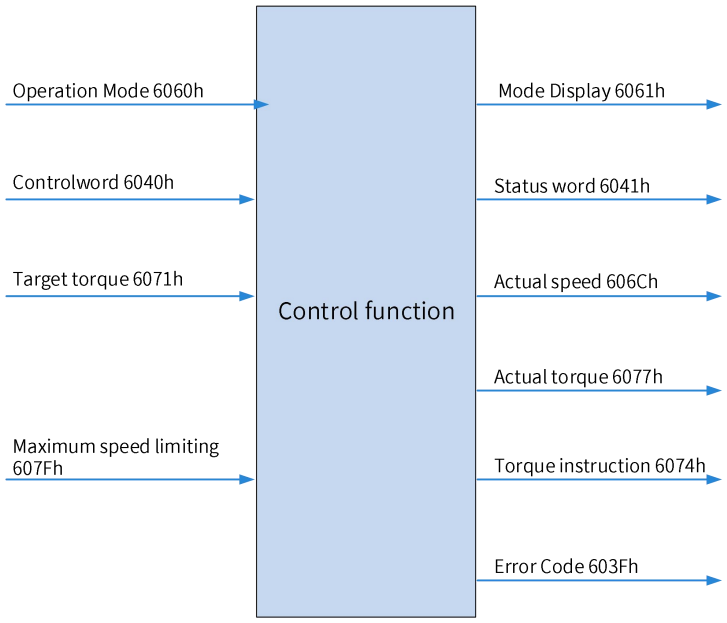


Figure 7.6.1-2 Input and output objects in periodic synchronous torque mode

◆ Related objects

Control word 6040h		
position	Name	description
0	Switch on	The value of bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
8	Halt	0: The servo is set to bit0~bit3 1: The servo presses 605Dh to pause

Status word 6041h		
position	name	description
10	Target Reach	0: The target torque is not reached 1: Target torque is reached
12	drive follow the command Value	0: The slave station did not follow the command 1: Follow the command from the slave station
13		To be defined
15	Home Find	0: The origin return to zero is incomplete 1: The origin is returned to zero

index (hex)	Sub index (hex)	Name	interview	Data type	unit	Set 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	Instruction unit /s	-	-
6071	0	Target torque	RW	Int16	0.10%	-5000~5000	0

index (hex)	Sub index (hex)	Name	interview	Data type	unit	Set range	Default value
6074	0	Torque instruction	RO	Int16	0.10%	-5000~5000	0
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
607F	0	Maximum speed	RW	Uint32	nstruction unit /s	0~(2^{32}- 1)	230
60B2	0	Torque bias	RW	Int32	0.10%	-5000~5000	0
60E0	0	Forward torque limitation	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limit	RW	Uint16	0.10%	0~5000	5000

Note: For details on how to use related objects, see Chapter 8 Parameter and Object Dictionary Details.

7.6.2 Recommended Configuration

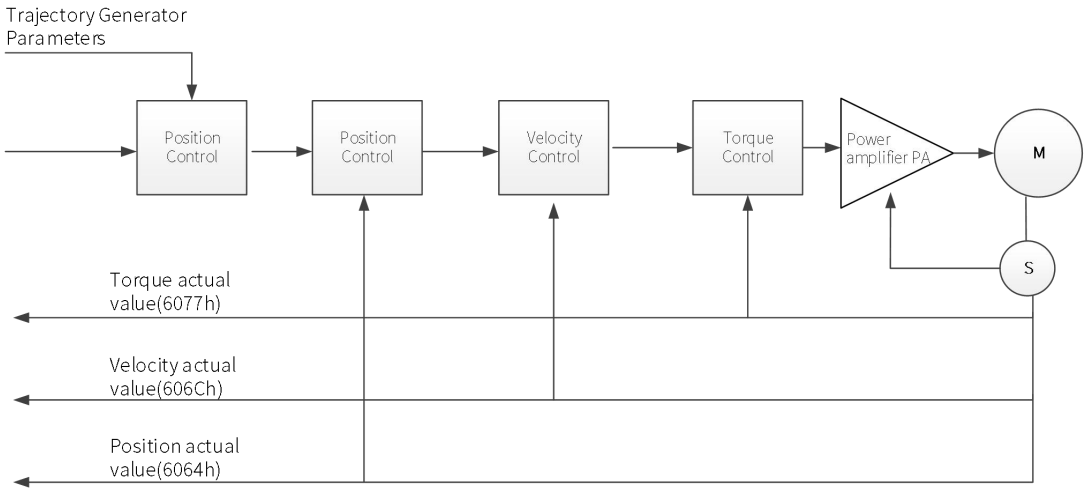
Periodic synchronous torque mode (cst), the basic configuration is as follows:

RxPDO	TxPDO	remark
6040☒control word	6041☒status word	must
6071☒target Torque	6064☒position actual value	must
607F☒most Profile Velocity	606C☒speed actual value	must
6060☒modes of operation	6077☒Torque ActualValue	must
	6061☒modes of operation display	must

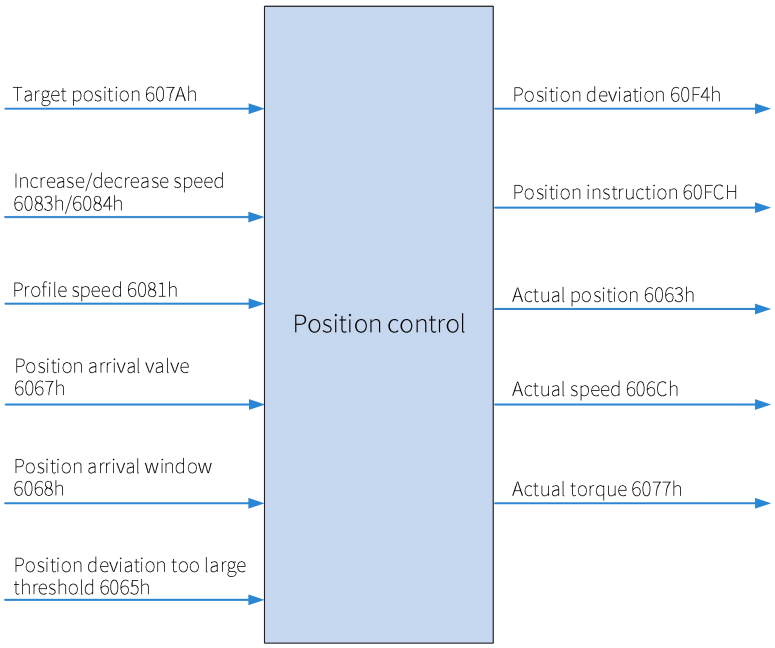
7.7 Profile Position Mode (pp)

This mode is mainly used for point-to-point positioning applications. In this mode, the host computer gives the target position (absolute or relative), the speed, acceleration and deceleration of the position curve, and the track generator inside the servo will generate the target position curve instruction according to the setting, and the position control, speed control and torque control will be completed inside the driver.

7.7.1 Control block diagram



7.7.1-1 Outline position mode control block diagram



7.7.1-2 Outline Position Mode (pp) Input and output block diagram

◆ Related objects

Control word 6040h		
position	name	description
0	Switch on	The value of bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
4	New set-point	The rising edge of this bit from 0 to 1 indicates that the new target position 607Ah, profile speed 6081h, acceleration 6083h, and deceleration 6084h are given before triggering
5	Change set immediately	0: not updated immediately 1: Update immediately
6	Absolute position instruction/relative position instruction abs/rel	0: The target position is an absolute position instruction 1: The target position is a relative position instruction

Status word 6041h		
position	name	description
10	Target Reach	0: The target position is not reached 1: The target position is reached
12	Set-point acknowledge	0: The slave station did not follow the command 1: The slave station does not follow the command, the slave station is in the running state and starts to execute the position command, the position 1; Otherwise zero
13	Following error	0: There is no fault with large position deviation 1: The position deviation is too large
15	Home Find	0: The origin return to zero is incomplete 1: The origin is returned to zero

index (hex)	Sub index (hex)	name	interview	Data type	unit	Set rang	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~xFFFF	0
6060	0	Operation mode	RW	Int8	-	0~10	0
6061	0	Mode display	RO	Int8	-	0~10	0
6062	0	Position instruction	RO	Int32	Position instruction	-	-
6063	0	Position feedback	RO	Int32	Encoder unit	-	-
6064	0	Position feedback	RO	Int32	Position instruction	-	-
6065	0	Position deviation too large threshold	RW	Uint32	Position instruction	0~(2^{32}-1)	1048576
6067	0	The location reached the threshold. Procedure	RW	Uint32	Encoder unit	0~65535	734
6068	0	Location arrival window	RW	Uint16	ms	0~65535	x10
606C	0	Actual speed	RO	Int32	Instruction unit /s	-	-
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0
607A	0	Target position	RW	Int32	Instruction unit	-2^{31}~(2^{31}-1)	0

index (hex)	Sub index (hex)	name	interview	Data type	unit	Set rang	Default value
6083	0	acceleration	RW	Uint32	Instruction unit /s^2	0~(2^{32}-1)	100
6084	0	deceleration	RW	Uint32	Instruction unit /s^2	0~(2^{32}-1)	100
6091	1	Motor resolution	RW	Uint32	-	0~(2^{32}-1)	1
	2	Axial resolution	RW	Uint32	-	1~(2^{32}-1)	1
60E0	0	Forward torque limitation	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limit	RW	Uint16	0.10%	0~5000	5000
60F4	0	Position deviation	RO	Int32	Instruction unit		
60FC	0	Position instruction	RO	Int32	Encoder unit		

Note: For details on how to use related objects, see Chapter 8 Parameter and Object Dictionary Details.

7.7.2 Related Function Settings

1) Positioning is complete

index	Sub index	name	description
6067	0	The location reached the threshold. Procedure	When the position deviation is within the range of ±6067h and the time reaches 6068, the positioned DO signal is effective, and the bit10 of 6041 is 1. If either condition is not met, the location arrival is invalid.
6068	0	Location arrival window	

2) Excessive position deviation threshold

Index	Sub index	Name	description
6065	0	Position deviation overthreshold	When the position deviation is greater than this value, the position deviation is too large fault, the panel displays an alarm, and the bit13 of the status word is set. When 6065h=0xFFFFFFFF, the drive does not perform large position deviation detection.

7.7.3 Position curve generator

The curve generator contains two modes, which are single point mode and multi-point mode. When 6040h.bit5=1, it is a single point of operation mode, that is, immediate update mode.

When 6040.bit5=0, it is in multipoint mode. After setting a new point for the 607Ah object dictionary, the newly set point can be enabled by controlling a rising edge for 6040h.bit4 to make the driver control motor run to the newly set coordinates. At the same time, the status word 6041h.bit12 will give 1 status, and the new set point will only be accepted if 6041h.bit12=0.

1) Single point operation mode

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

2) Multi-point motion mode

If 6040h.bit5=0, the system runs in multipoint mode. The mode runs in two ways, as follows:

The first is 6040h.bit9=0 is the sequential planning mode. As shown in the figure below, a point is being processed. After the planning of this point is completed, the second set point will run immediately after the planning.

The second is 6040h.bit9=1. Maintain the speed of 6040h.bit4 trigger time to complete the current position planning, and use this speed as the starting speed for the next position planning.

The solid line in the figure shows the plan, and the dashed line is the plan when bit9=0. When the first point of planning is completed, the next point will be activated for planning.

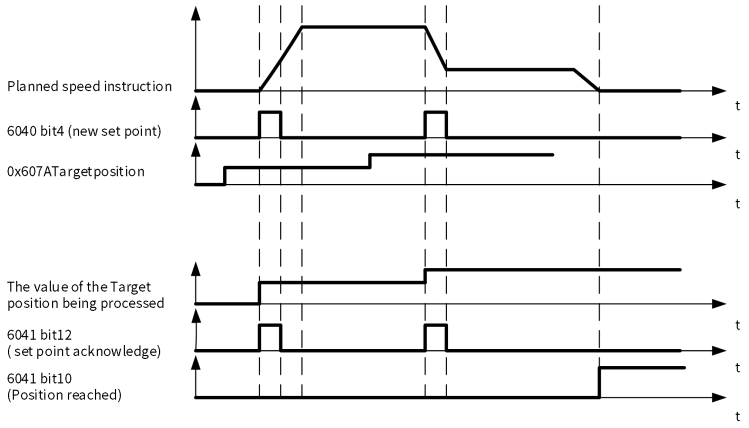


Figure 7.7.4-1 Single point Run mode update TargetPosition diagram

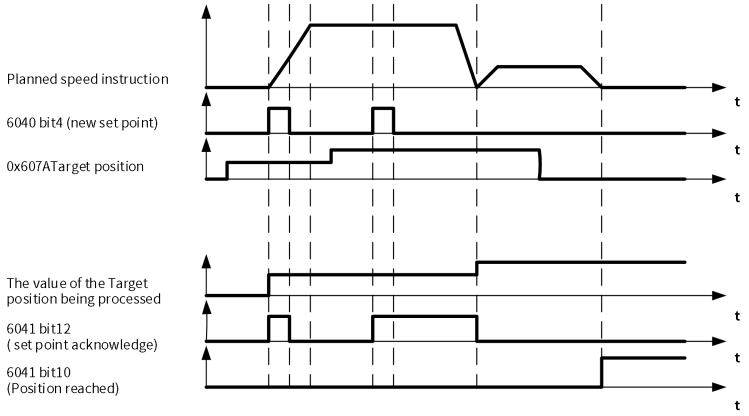


Figure 7.7.4-2 Multi-point running mode 6040.bit9=0 Running diagram

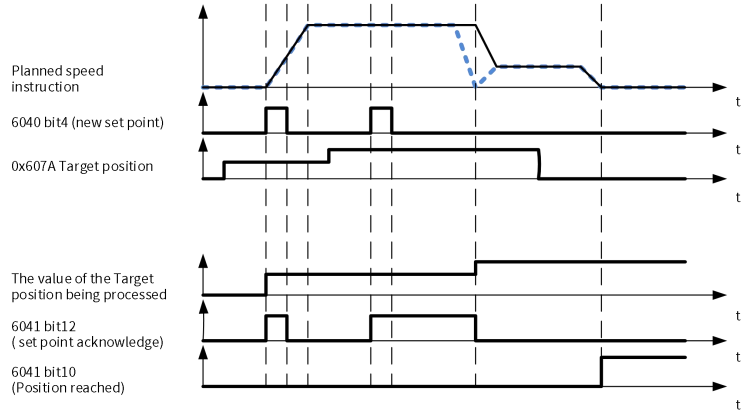


Figure 7.7.4-3 Multi-point running mode 6040.bit9=1 Running diagram\

7.7.4 Recommended Configuration

Profile position mode (pp), the basic configuration is as follows:

RxPDO	TxPDO	remark
6040☒control word	6041☒status word	must
607A☒target speed	6064☒position actual value	must
6081☒pro☒e speed		must
6083☒pro☒eacceleration		select able
6084☒pro☒e deceleration		select able
6060☒modes of operation	6061☒modes of operation display	select able

7.8 Profile Speed Mode (pv)

In this mode, the upper controller sends the target speed, acceleration and deceleration to the servo drive, and the speed and torque adjustment is performed internally by the servo.

7.8.1 Control block diagram

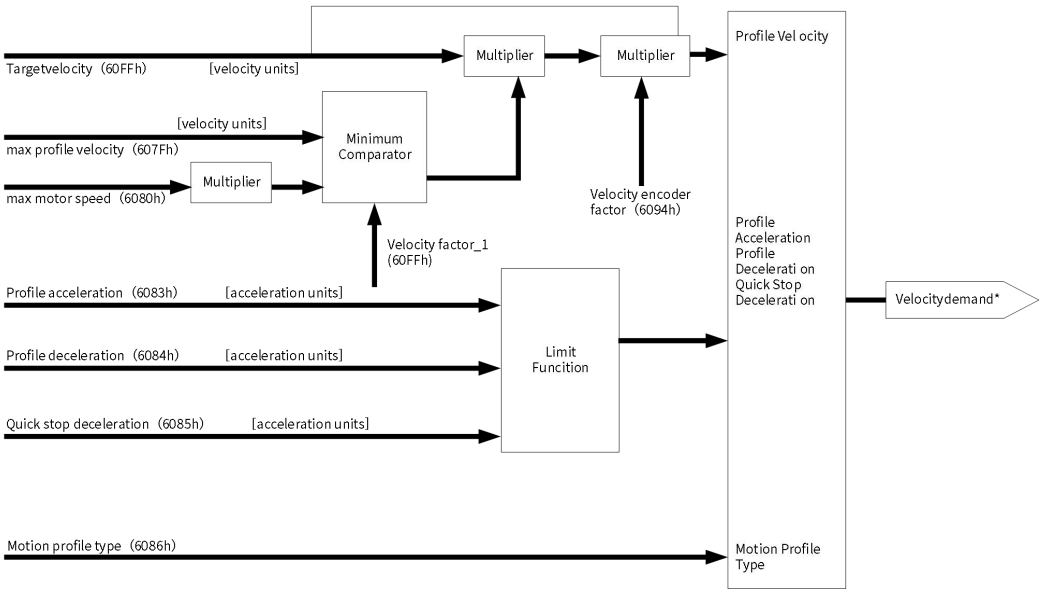


Figure 7.8.1-1 Outline speed mode control block diagram

7.8.2 Related object

Control word 6040h		
position	name	description
0	Switch on	The value of Bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
8	Halt	0: The servo is set to Bit0~bit3 1: The servo presses 605Dh to pause

Control word 6041h		
position	name	description
10	Target Reach	0: The target position is not reached 1: The target position is reached
11	internal limit actice	0: Position instruction and position feedback are not exceeded 1: Position instruction or position feedback exceeds the limit
15	Home Find	0: The origin return to zero is incomplete 1: The origin is returned to zero

index (hex)	Sub index (hex)	Name	Inter view	Data type	Unit	Set 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 profile speed	RW	Uint32	Instruction unit /s	0~$(2^{32}-1)$	230

index (hex)	Sub index (hex)	Name	Inter view	Data type	Unit	Set range	Default value
6063	0	Position feedback	RO	Int32	Encoder unit	-	-
6064	0	Position feedback	RO	Int32	Instruction unit	-	-
60FF	0	Target speed	RW	Int32	Instruction unit /s	-2^{31}~(2^{31}-1)	0
60E0	0	Forward torque limitation	RW	Uint16	0.10%	0~5000	5000
60E1	0	Reverse torque limit	RW	Uint16	0.10%	0~5000	5000
606C	0	Actual speed	RO	Int32	Instruction unit /s	-	-
6077	0	Actual torque	RO	Int16	0.10%	-5000~5000	0

Note: For detailed instructions on how to use related objects, see "Chapter 8 Detailed Instructions on Object Dictionaries".

7.8.3 Related Function Settings

Speed arrival function

Index	Sub index	Name	description
606Dh	0	Speed reaches the threshold	The difference between the target speed of 60FF(converted into motor speed /rpm) and the actual speed of the motor is within ±606D, and when the time reaches 606E, it is considered that the speed reaches, the bit10 of the status word 6041 =1, and the speed reaches the DO function. When the servo function is effective in contour speed mode and periodic synchronous speed mode, the flag bit is meaningful. Otherwise there's no point.
606Eh	0	Speed arrival window	

7.8.4 Recommended Configuration

Profile Speed mode (pv), the basic configuration is as follows:

RxPDO	TxPDO	remark
6040□control word	6041□status word	must
60FF□target speed		must
	6064□position actual value	select able
	606C□speed actual value	select able
6083□profile acceleration		select able
6084□pro□e deceleration		select able
6060□modes of operation	6061□modes of operation display	select able

7.9 Contour torque mode (pt)

Bus servo drives do not support this feature.

7.10 Return to Zero Mode (hm)

The origin return to zero mode is used to find the mechanical origin and locate the position relationship between the mechanical origin and the mechanical zero. Mechanical origin: A fixed position on the machine can be switched to a certain origin point, which can correspond to the Z signal of the motor. Mechanical zero: absolute zero position on the machine. After the origin is returned to zero, the motor stop position is the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero can be set: mechanical origin = mechanical zero +607Ch(origin offset). When 607Ch=0, the mechanical origin coincides with the mechanical zero.

7.10.1 Control block diagram

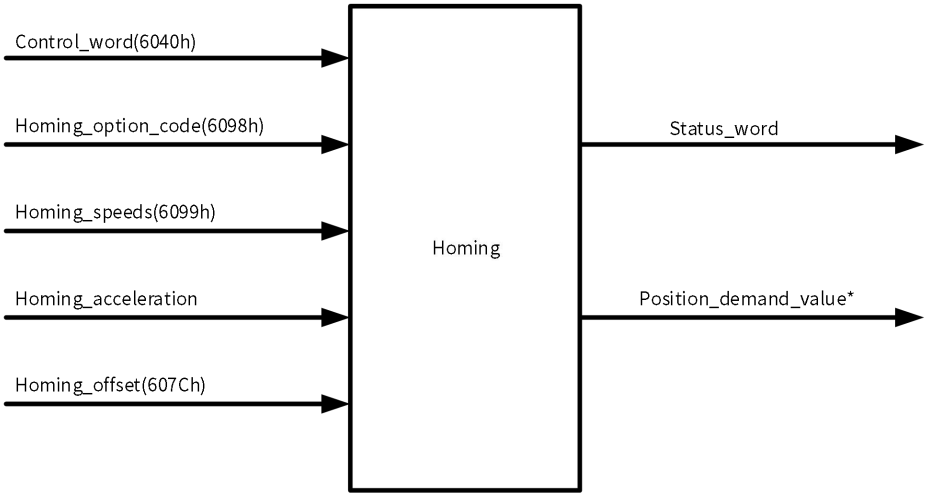


Figure 7.10.1-1 zero return control block diagram

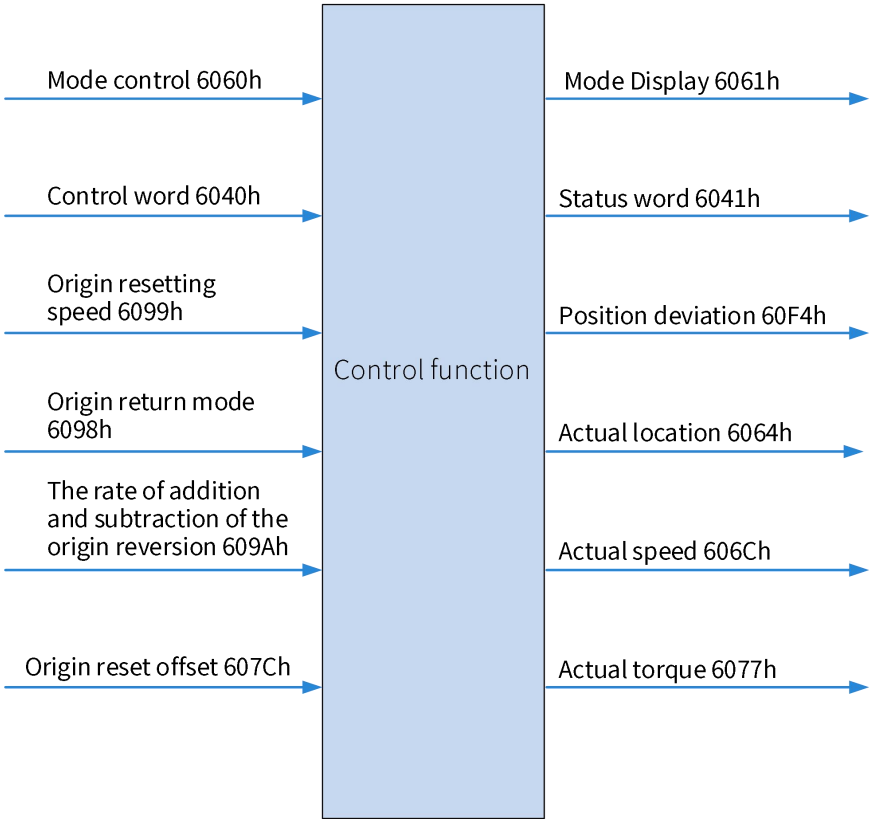


Figure 7.10.1-2 Input and output objects returned to zero

7.10.2 Related Objects

Control word 6040h		
position	name	description
0	Switch on	The value of bit0 to bit3 is 1, indicating that the system is started
1	Enable voltage	
2	Quick stop	
3	Enable operation	
4	0-Homing start	0->1: The startup returns to zero 1: The return to zero is in progress 1-1->0: The end returns to zero
8	Halt	0: The servo is set to Bit0~bit3 1: The servo presses 605Dh to pause

Status word 6041h		
Position	Name	description
10	Target Reach	0: The target torque is not reached 1: Target torque is reached
12	Homing attained	0: failed to return to zero 1: The return to zero is successful. This flag bit is effective after the target reach signal is set when the servo is running in the return to zero mode
13	Homing error	0: No error occurred in the return to zero 1: A return to zero timeout or deviation error occurs
15	Home Find	0: The origin return to zero is incomplete 1: The origin return to zero is complete, and this flag bit is set when it encounters the origin signal

Index (hex)	Sub index (hex)	Name	Inter view	Data type	Unit	Set range	Default value
603F	0	Error	RO	Uint16	-	0~65535	0
6040	0	Control word	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 position	RO	Int32	Instruction unit	-	-
6064	0	Position feedback	RO	Int32	Instruction unit	-	-
6067	0	The location reached the threshold. Procedure	RW	Uint32	Encode unit	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	Instruction unit /s	-	-
6098	0	Origin reversion method	RW	Int8	-	1~35	1
6099	1	High speed search for deceleration points	RW	Uint32	Instruction unit /s	$0\sim(2^{32}-1)$	100
	2	Search origin low speed	RW	Uint32	Instruction unit /s	$10\sim(2^{32}-1)$	100
609A	0	acceleration	RW	Udint32	Instruction unit $/s^2$	$0\sim(2^{32}-1)$	100
60F4	0	Position deviation	RO	Dint32	Instruction unit	-	-

Note: For details on how to use related objects, see Chapter 8 Parameter and Object Dictionary Details.

7.10.3 Related Function Settings

Current location calculation mode

index	Sub index	Name	description
60E6	0	Current location calculation mode	The 60E6 determines whether the user uses absolute or relative return to zero in an incremental system 60E6=0(absolute return to zero) : After the return to zero is complete, the position feedback 6064 is set to the origin offset 607C 60E6=1(relative return to zero) : After returning to zero, position feedback 6064 superimposes position bias 607C on the original basis

7.10.4 Return to zero operation

Return-to-zero mode

1) Return to zero mode 1(6098h=1) uses a negative limit and motor encoder index pulse (Z-phase pulse) signal

The driver drives the motor to move rapidly in the negative direction at the speed of 6099h.01h until the negative limit signal is detected to slow down and stop, and the object is moving forward at the low speed of 6099h.02h to find the zero position, the zero point is the location of the first encoder index pulse (Z-phase pulse signal) after the negative limit signal is detected. As shown in the following picture. (Note: Index Pulse: encoder index pulse Negative Limit Switch: negative Limit Positive Limit Switch: positive limit Home Switch origin, the same below)

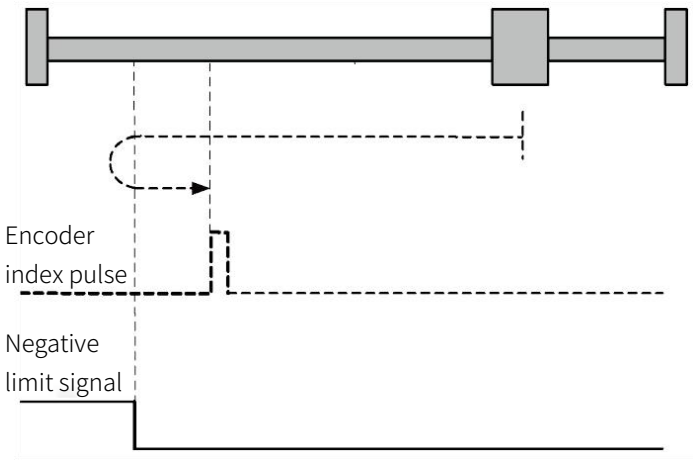


Figure 7.10.3-1 Returning to zero Method 1

2) Return to zero mode 2(6098h=2) uses a forward limit and motor encoder index pulse (Z-phase pulse) signal

The servo motor moves rapidly in the positive direction at the speed of the 6099h.01h object until the positive limit signal is detected to slow down and stop, and moves negatively at the low speed of the 6099h.02h object to find the zero point position, where the first encoder index pulse (Z-phase pulse) signal is detected after the falling edge of the positive limit signal. As shown in the picture below:

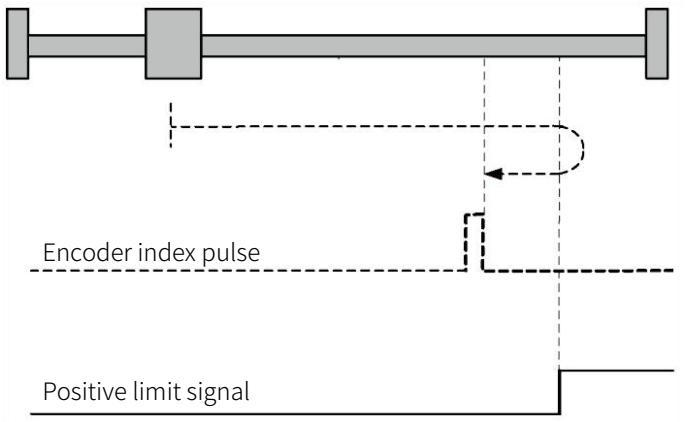


Figure 7.10.3-2 Return to zero Method 2

3) Return to zero mode 3 Use the origin and motor encoder to index pulses (Z-phase pulses)

- The deceleration point signal is invalid when starting back to zero:

When the origin limit signal is 0 at the beginning of return to zero, the driver drives the motor to start back to zero at a forward high speed until the origin limit signal is detected rising edge, deceleration, reverse and low speed operation, looking for the zero position, the zero point is the position of the first encoder index pulse (Z-phase pulse) signal after the origin limit signal is detected rising edge.

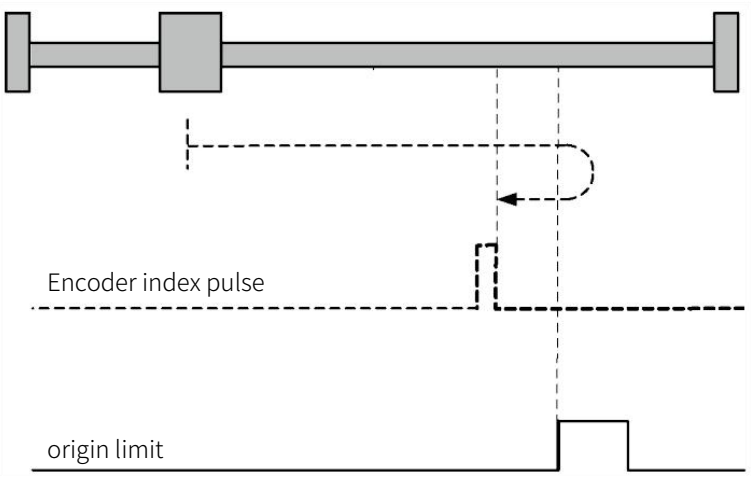


Figure 7.10.3-3-1 Method 3 of returning to zero

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin limit signal is 1, and the driver directly drives the motor to start to return to zero at a reverse low speed, looking for the zero position, and the zero is the test

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

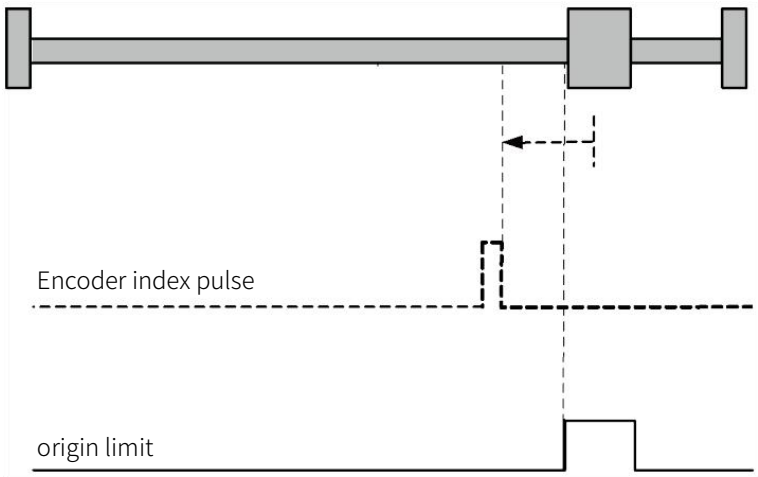


Figure 7.10.3-3-2 Return to zero Method 3

4) Return to zero mode 4 Use the origin and motor encoder to index pulses (Z-phase pulses)

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the origin limit signal is 0, and the driver drives the motor to start to return to zero at a forward low speed. The zero point is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the rising edge of the origin limit signal.

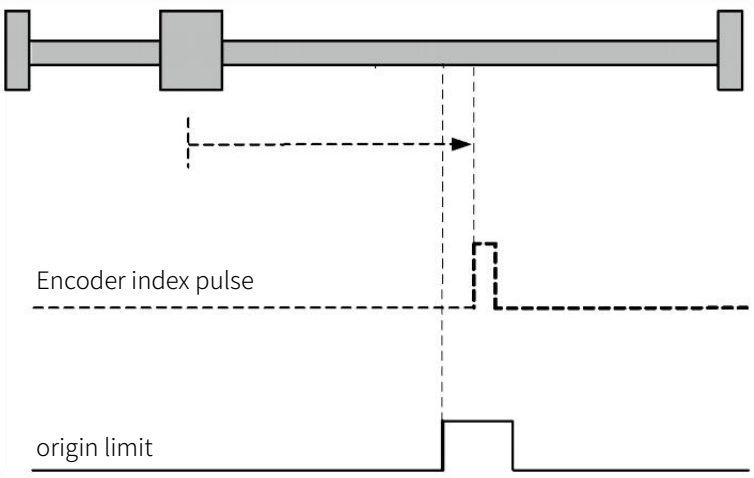


Figure 7.10.3-4-1 Returning to zero Method 4

- The deceleration point signal is valid when starting back to zero:

When the origin limit signal is 0, the driver drives the motor to start to return to zero at a reverse high speed until the origin limit signal is detected, decelerate, reverse and run at a low speed, looking for the zero position, the zero point is the position of the first encoder index pulse (Z-phase pulse) signal after the origin limit signal is detected.

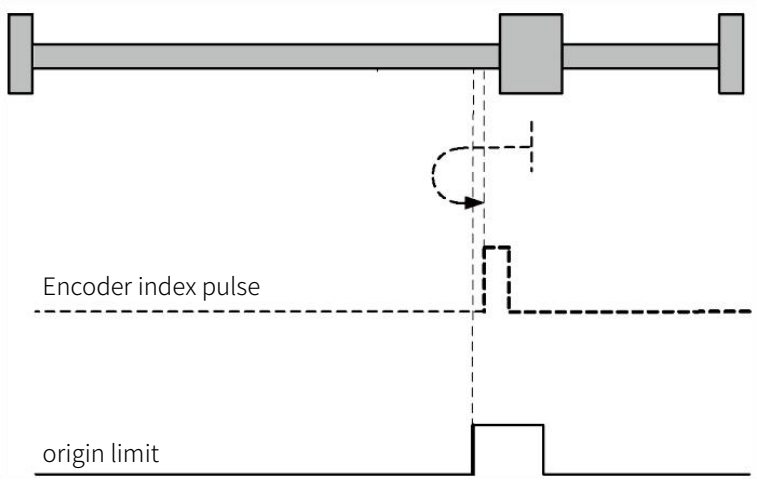


Figure 7.10.3-4-2 Return to zero mode 4

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

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

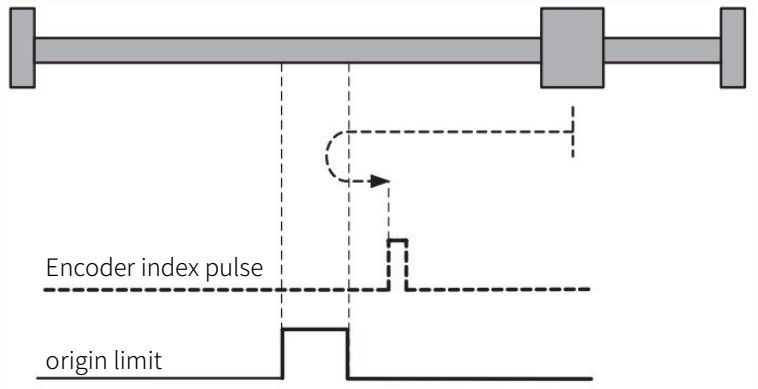


Figure 7.10.3-5 Return to zero mode 5

- The deceleration point signal is effective when starting to return to zero, that is, the limit signal is 1 when starting to return to zero, and the servo motor directly starts to return to zero at a low speed until the position of the first encoder index pulse (Z-phase pulse) after the falling edge of the limit signal is detected.

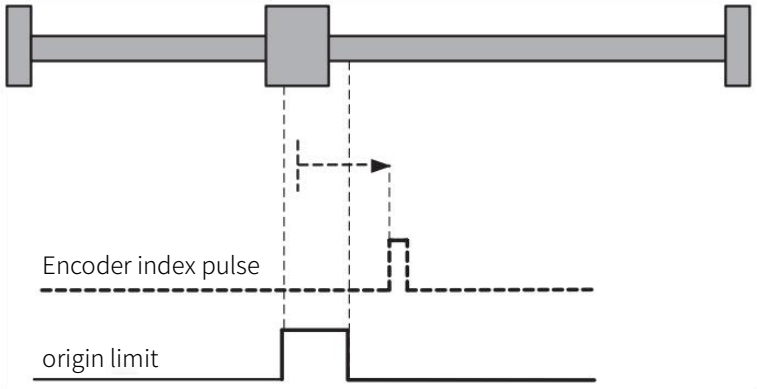


Figure 7.10.3-5 Return to zero mode 5

6) Return to zero mode 6 (6098=6) Encoder index pulse (Z-phase pulse) using origin and motor

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the origin limit signal is 0, and the driver drives the motor directly to reverse the low speed to start the movement, looking for the zero point position, which is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the limit signal rising along the signal.

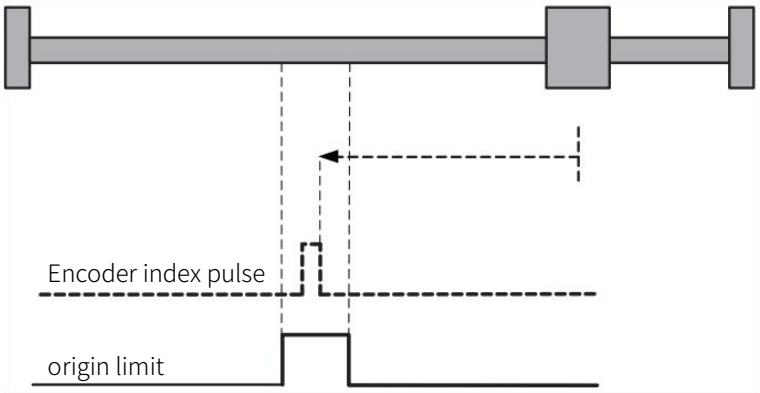


Figure 7.10.3-6-1 Return to zero mode 6

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin limit signal is 1, and the driver drives the motor to start moving at a forward high speed, looking for the zero point position, which is when the falling edge of the limit signal is detected, it begins to slow down and run at a reverse low speed, and encounters the position of the first encoder index pulse (Z-phase pulse) signal.

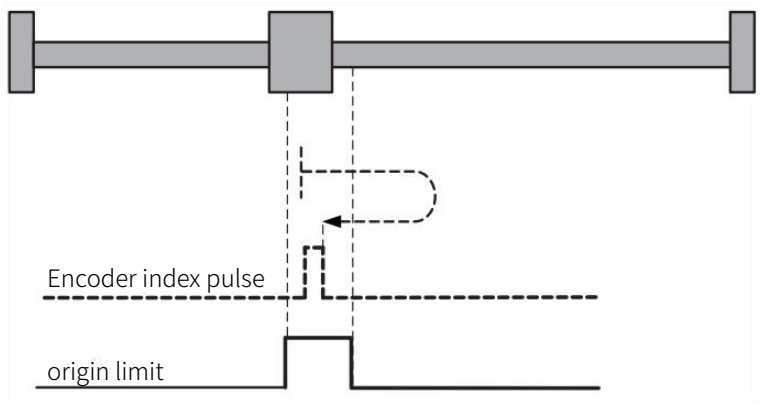


Figure 7.10.3-6-2 Return to zero mode 6

7) Return to zero mode 7 (6098=7) Using the index pulse (Z-phase pulse) of the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the positive limit pulse signal is 0, the driver drives the motor to start to return to zero at high speed, if there is no positive limit switch, after encountering the origin limit signal rising edge, the motor decelerates and runs at a reverse low speed, and the zero point is the position of the first encoder index pulse after detecting the origin signal falling edge.

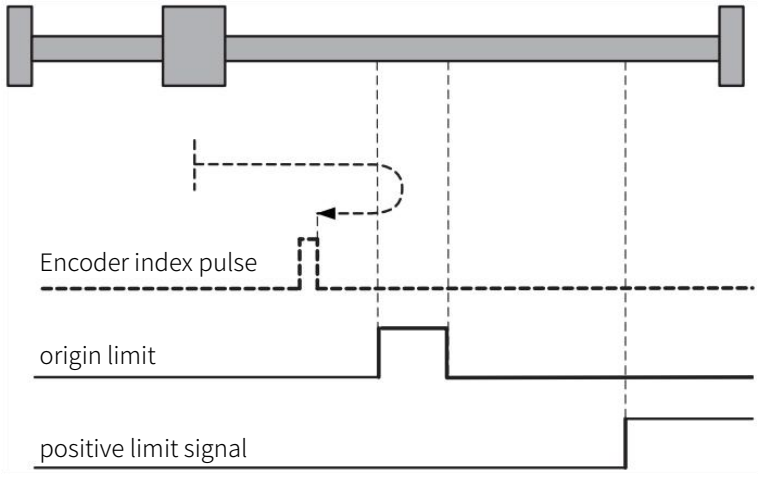


Figure 7.10.3-7-1 Return to zero mode 7

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

At the beginning of return to zero, the origin limit signal is 0, and the driver with the motor starts to return to zero at a forward high speed. If the forward limit switch is encountered, the motor automatically reverses and runs at a high speed, until it encounters the rising edge of the origin limit signal, the motor decelerates and continues to run at a reverse low speed, and the zero point is the position where the first encoder index pulse (Z-phase pulse) is detected.

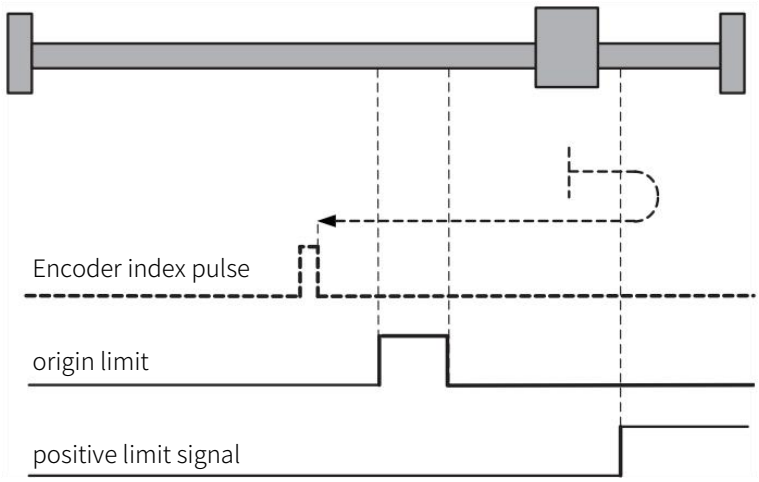


Figure 7.10.3-7-2 Return to zero mode 7

- The deceleration point signal is valid when starting back to zero:

When starting back to zero, the origin limit signal is 1, and the driver drives the motor directly to reverse the low speed to start back to zero, and the zero point is the position of the first motor encoder index pulse after detecting the origin limit signal falling along.

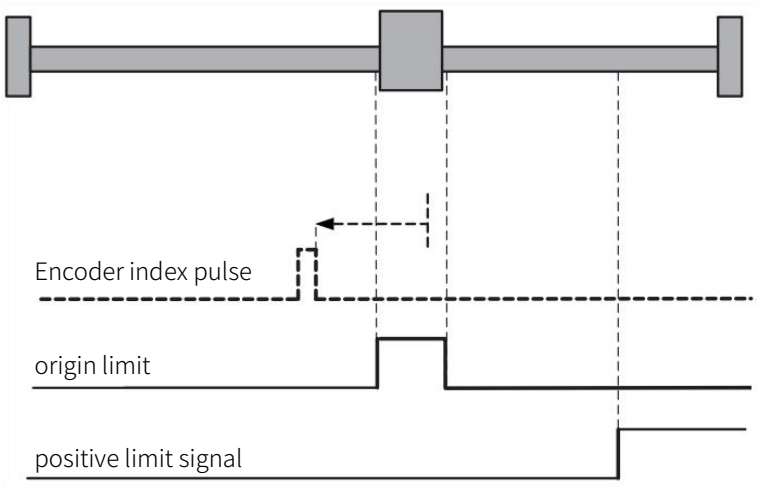


Figure 7.10.3-7-3 Return to zero mode 7

8) Return to zero mode 8 (6098=8) Index pulse (Z-phase pulse) using the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the origin limit signal is 0, the driver drives the motor to start to return to zero at a positive high speed. If the limit switch is not encountered, it will decelerate and run at a reverse low speed after encountering the origin limit signal rising edge, until it encounters the origin signal falling edge, it begins to reverse and the motor is running at a positive low speed. Zero is the position of the first motor encoder index pulse after the origin signal rise is detected.

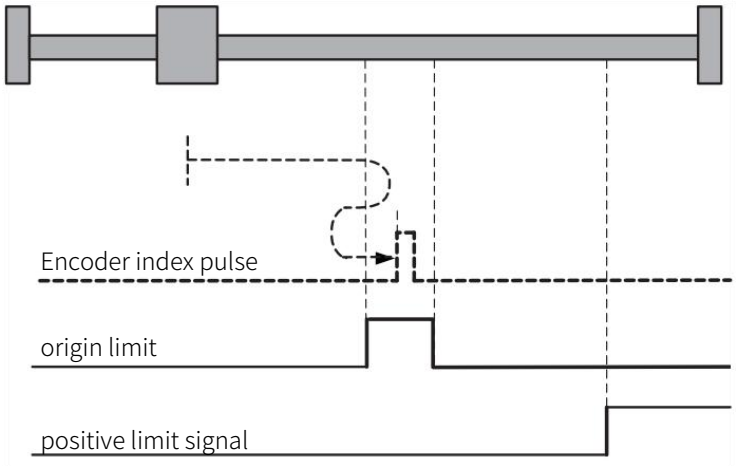


Figure 7.10.3-8-1 Return to zero mode 8

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin limit signal is 0, the driver drives the motor to start to return to zero at a forward speed, if the limit switch is encountered, the automatic reverse and high-speed operation; Until the rise edge of the origin limit signal is encountered, the motor slows down and runs at a reverse low speed, and the zero point is the position of the first motor encoder index pulse after detecting the rise edge of the origin limit signal.

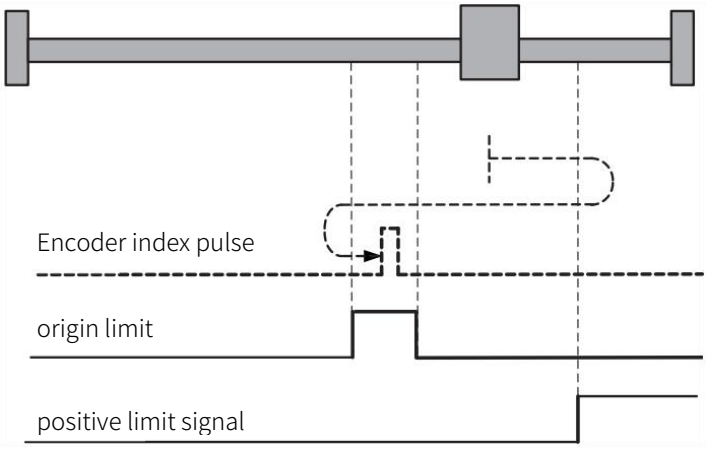


Figure 7.10.3-8-2 Return to zero mode 8

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin limit signal is 1, the driver drives the motor to directly reverse low-speed movement, until it encounters the origin limit signal falling along the motor reverse and forward low-speed operation, the zero point is the location of the first motor encoder index pulse after detecting the origin limit signal.

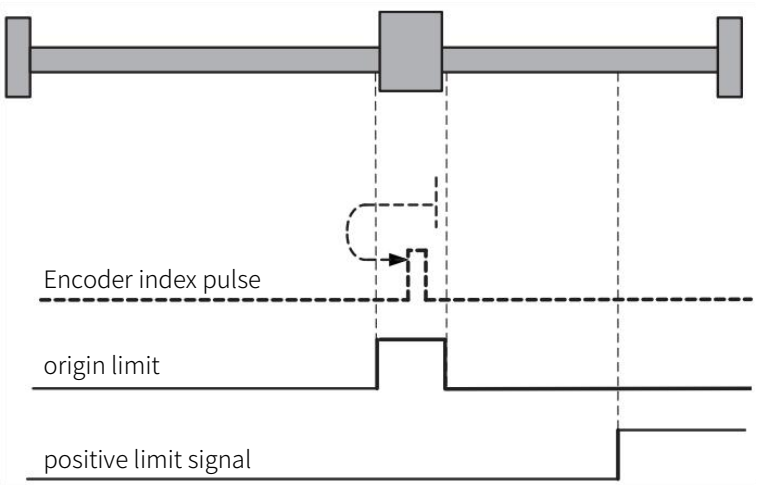


Figure 7.10.3-8-3 Return to zero mode 8

9) Return to zero mode 9 (6098=9) Using the index pulse (Z-phase pulse) of the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start back to zero at a positive high speed, if the limit switch is not encountered, after encountering the origin switch signal, slow down and run at a positive low speed, until the origin signal is detected after the falling edge, the motor runs at a reverse low speed, and the zero point is the position of the first motor encoder index pulse after the origin signal is detected.

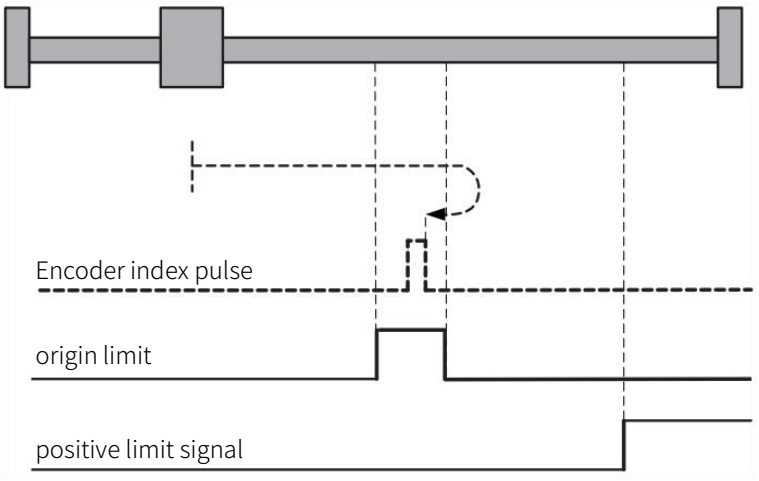


Figure 7.10.3-9-1 Return to zero mode 9

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to return to zero at a forward high speed. If the limit switch is encountered, the motor will automatically reverse and run at a high speed. Until the origin signal is detected, the motor will decelerate and reverse to resume forward operation. Zero is the position of the first motor encoder index pulse after detecting the rising edge of the origin signal.

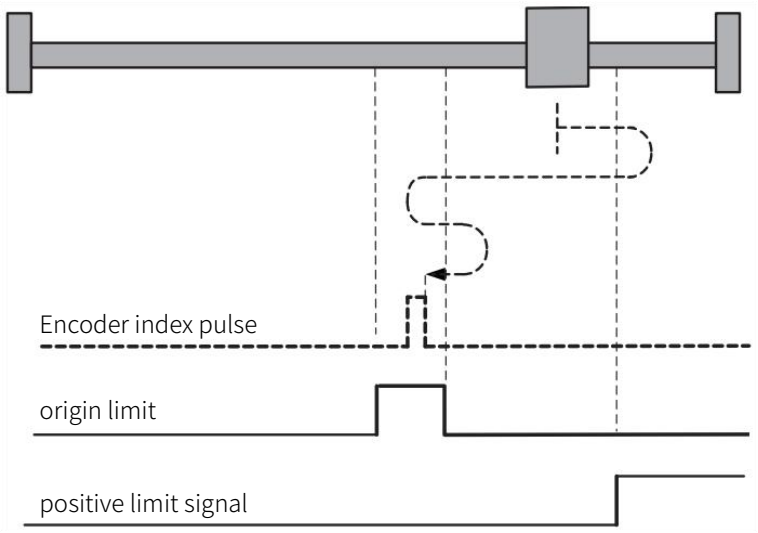


Figure 7.10.3-9-2 Return to zero mode 9

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver drives the motor directly to start to return to zero at a low speed, until it encounters the falling edge of the origin switch signal, the motor runs at a low speed in reverse, and the zero point is the position of the first motor encoder index pulse after detecting the rising edge of the origin switch signal.

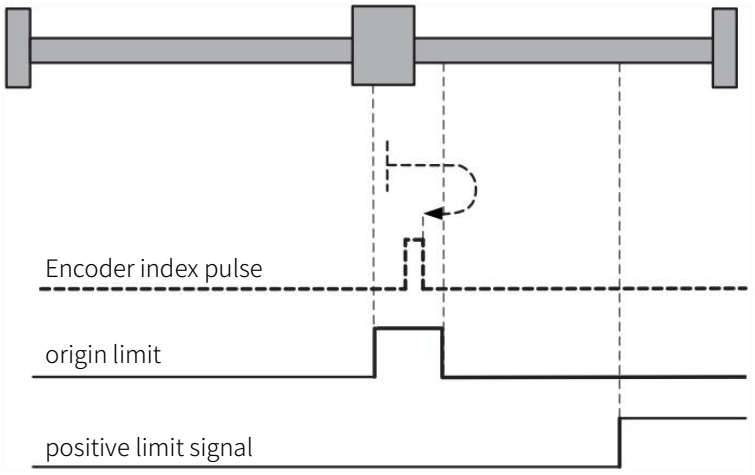


Figure 7.10.3-9-3 Return to zero mode 9

10) Return to zero mode 10 (6098=10) Index pulse (Z-phase pulse) using the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start back to zero at a positive high speed. If the limit switch is not encountered, after encountering the origin signal rising edge, the motor decelerates and continues to run forward, until it encounters the origin signal falling edge, continue to run forward at a low speed, and the zero point is the position where the first motor index pulse is detected.

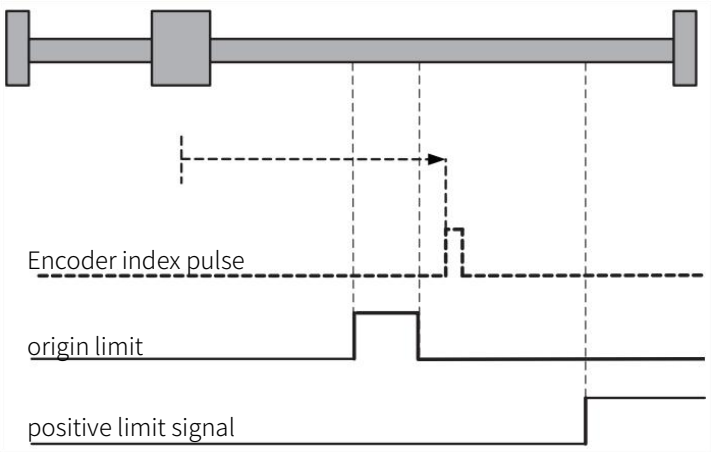


Figure 7.10.3-10-1 Return to zero mode 10

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start to return to zero at a forward speed, if the limit switch is encountered, the automatic reverse and reverse high-speed operation; Until the origin switch signal rising edge is encountered, the reverse deceleration is resumed forward operation, and the zero point is the position of the first motor encoder index pulse after the forward low speed detection of the origin switch signal falling edge.

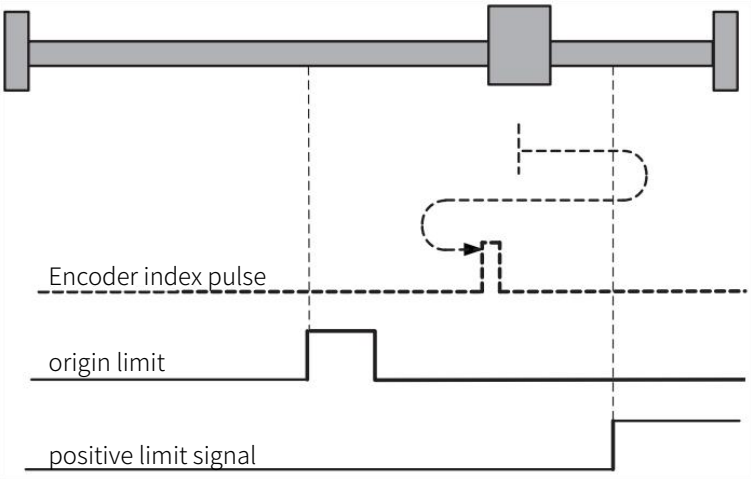


Figure 7.10.3-10-2 Return to zero mode 10

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, and the driver drives the motor directly to start running at a low speed, looking for the zero point, which is the position of the first motor encoder index pulse after detecting the origin switch signal's falling edge.

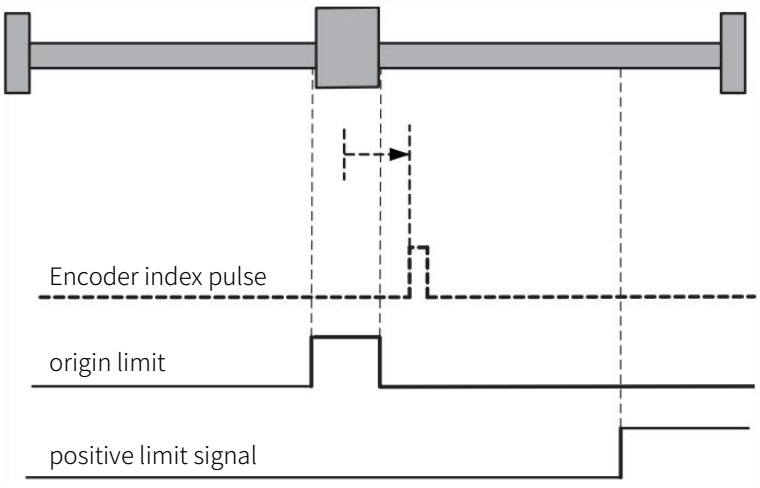


Figure 7.10.3-10-3 Return to zero mode 10

11) Return to zero mode 11 (6098=11) Using the index pulse of the origin and motor encoder (z-phase pulse)

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start running at reverse high speed, looking for the zero point position, if there is no limit switch, after encountering the origin signal rising edge, the motor decelerates and reverses, that is, the forward low speed operation, the zero point is the position of the first motor encoder index pulse after detecting the origin limit signal falling edge.

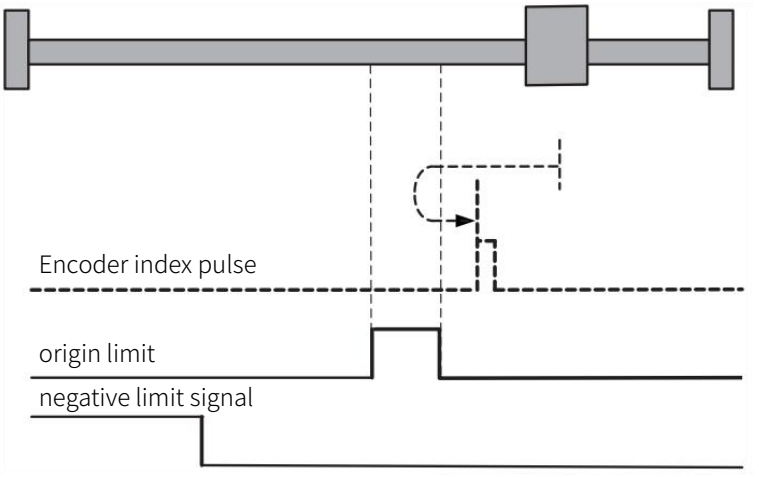


Figure 7.10.3-11-1 Return to zero mode 11

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

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start running at reverse high speed, looking for the zero position, if the limit switch is encountered, the motor automatically reverses, that is, the forward high speed operation, until the rise edge of the origin switch signal is detected, the motor decelerates and continues to run at a forward low speed. Zero is the bit of the first motor encoder index pulse after detecting the falling edge of the origin switching signal.

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start running at reverse high speed, looking for the zero position, if the limit switch is encountered, the motor automatically reverses, that is, the forward high speed operation, until the rise edge of the origin switch signal is detected, the motor decelerates and continues to run at a forward low speed. Zero is the bit of the first motor encoder index pulse after detecting the falling edge of the origin switching signal.

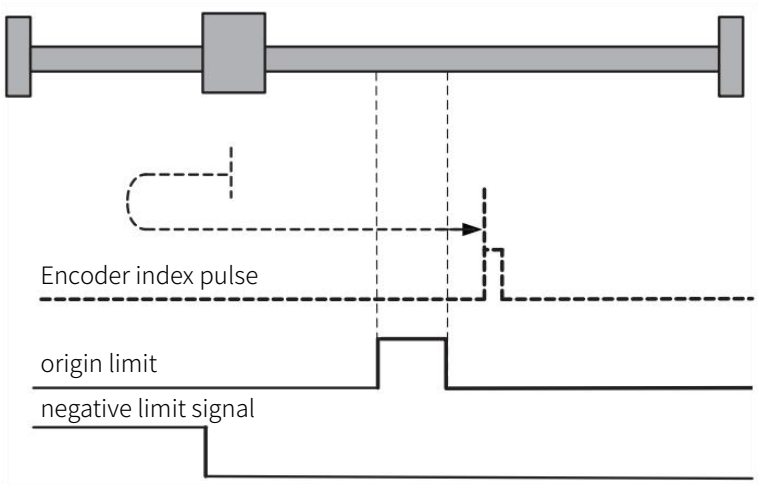


Figure 7.10.3-11-2 Return to zero mode 11

- The deceleration point signal is valid when starting back to zero:

At the beginning of zero return, the origin switch signal is 1, the driver drives the motor to run directly in the forward low speed, and the zero point is the position of the first motor encoder index pulse after detecting the origin signal falling edge.

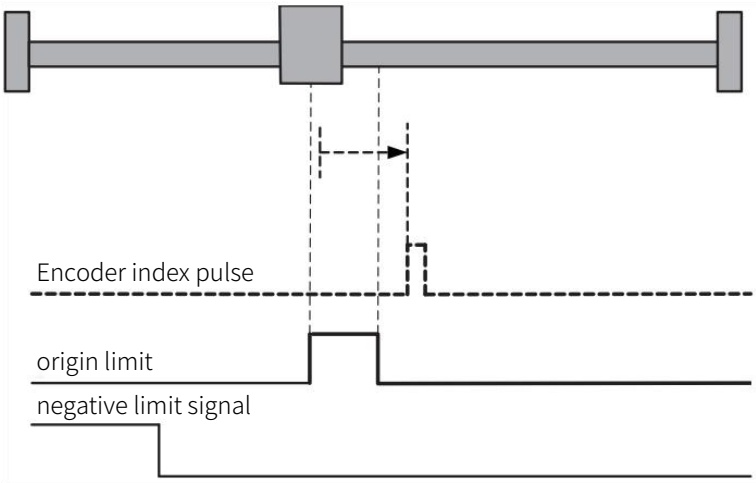


Figure 7.10.3-11-3 Return to zero mode 11

12) Return to zero mode 12 (6098=12) Using the index pulse (Z phase pulse) of the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to run at reverse high speed, looking for the zero point position, in the absence of the limit switch, after detecting the origin switch signal rising edge, the motor decelerates and reverses, and the forward low speed operation, the zero point is the position of the first motor encoder index pulse after detecting the origin switch signal rising edge.

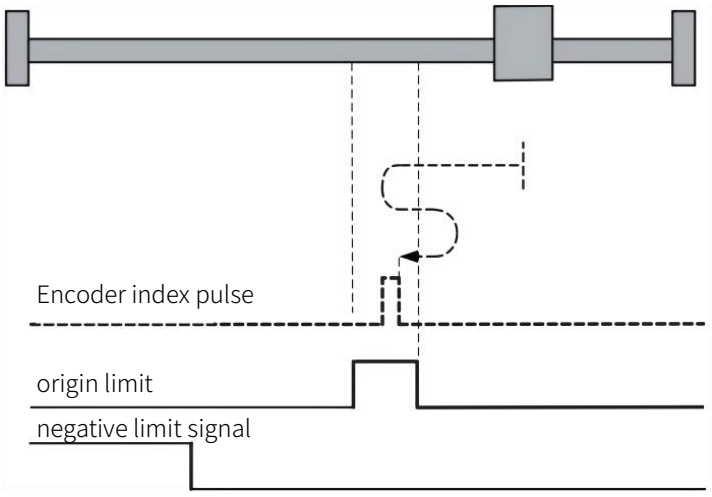


Figure 7.10.3-12-1 Return to zero mode 12

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

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

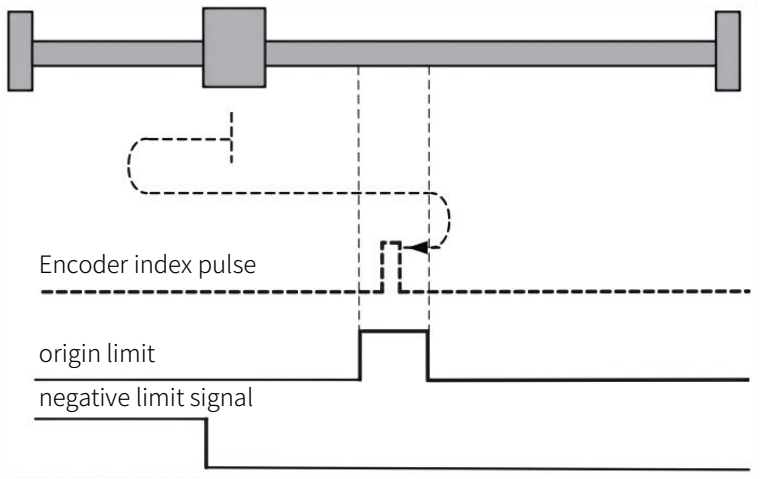


Figure 7.10.3-12-2 Return to zero mode 12

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver motor is running directly at a low speed, looking for the zero position, when the origin switch signal falls along, the motor begins to run at a low speed in reverse, and the zero point is the position of the first motor encoder index pulse after detecting the origin switch signal.

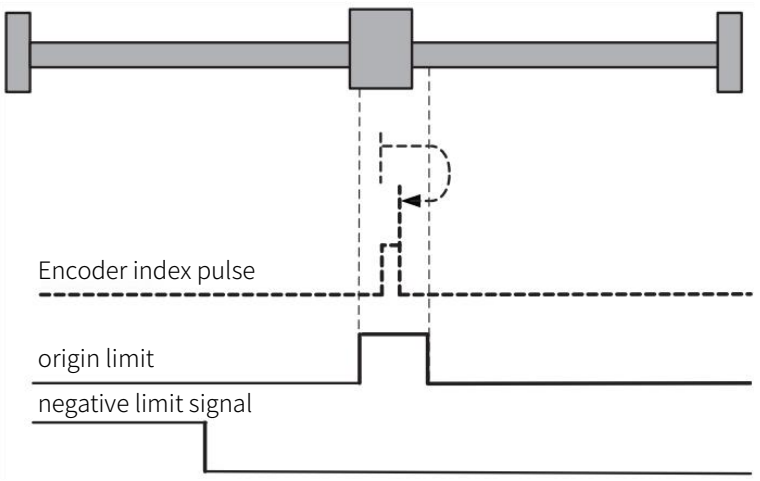


Figure 7.10.3-12-3 Return to zero mode 12

13) Return to zero mode 13 (6098=13) Using the index pulse (Z-phase pulse) of the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to run at reverse high speed, looking for the zero position, if the limit switch is not encountered, after detecting the origin switch signal rising edge, the motor decelerates and runs at reverse low speed, the zero point is the position of the first motor encoder index pulse after detecting the origin switch signal rising edge.

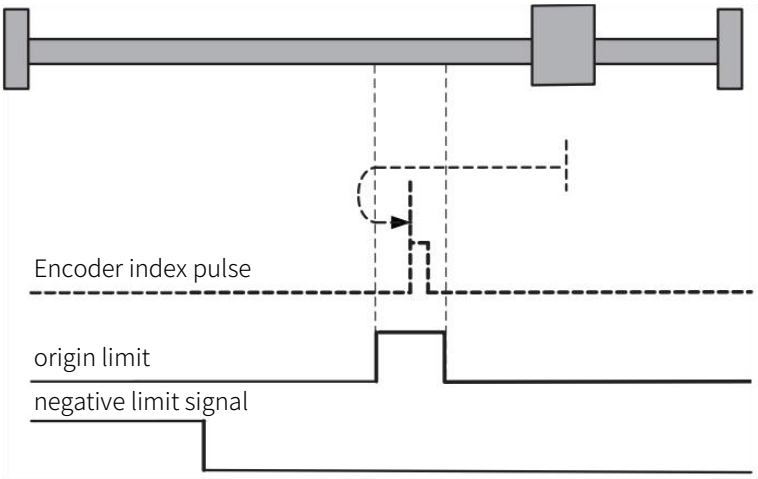


Figure 7.10.3-13-1 Return to zero mode 13

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

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to run at reverse high speed, looking for the zero point, if the limit switch signal rises, the motor decelerates and runs at reverse low speed, the zero point is the first motor encoder index pulse position after the motor detects the origin switch signal rises when the motor is running forward.

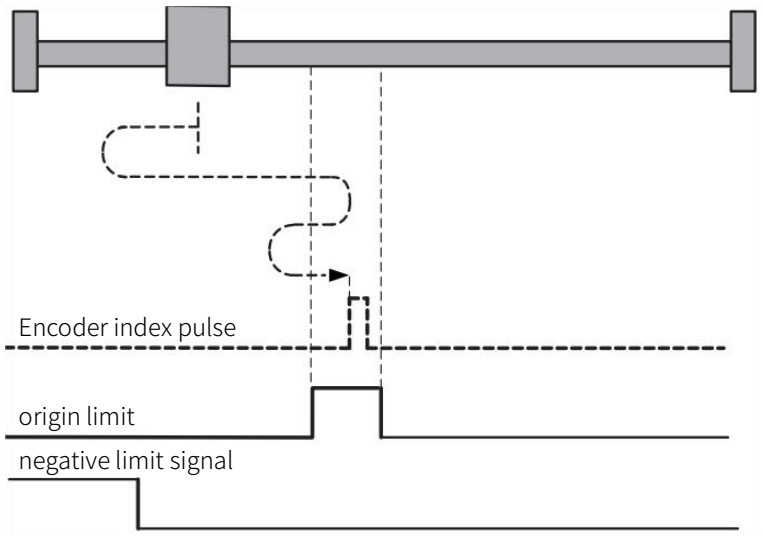


Figure 7.10.3-13-2 Return to zero mode 13

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver drives the motor to directly reverse low-speed operation, looking for the zero point position, if the origin switch signal is detected after the falling edge, the motor begins to reverse that is, forward low-speed operation, zero point is the position of the first motor encoder index pulse after detecting the original electric switch signal rising edge.

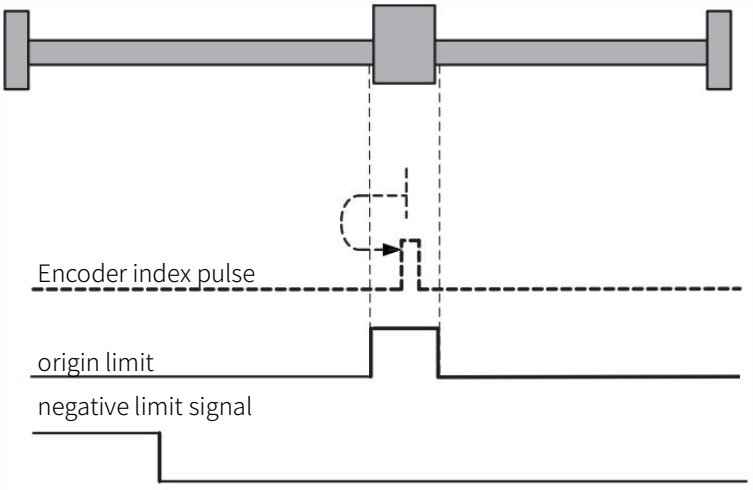


Figure 7.10.3-13-3 Return to zero mode 13

14) Return to zero mode 14 (6098=14) Using the index pulse (Z-phase pulse) of the origin and motor encoder

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start running at reverse high speed, looking for the zero point position, in the absence of the limit switch, after detecting the origin switch signal rising edge, the motor begins to slow down and reverse low speed operation, zero point is the detection of the origin switch signal falling edge, detected the first motor encoder index pulse position.

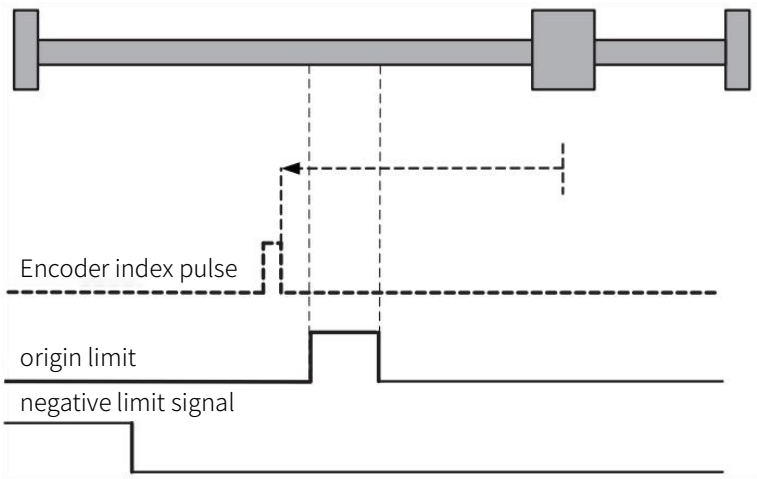


Figure 7.10.3-14-1 Return to zero mode 14

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

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

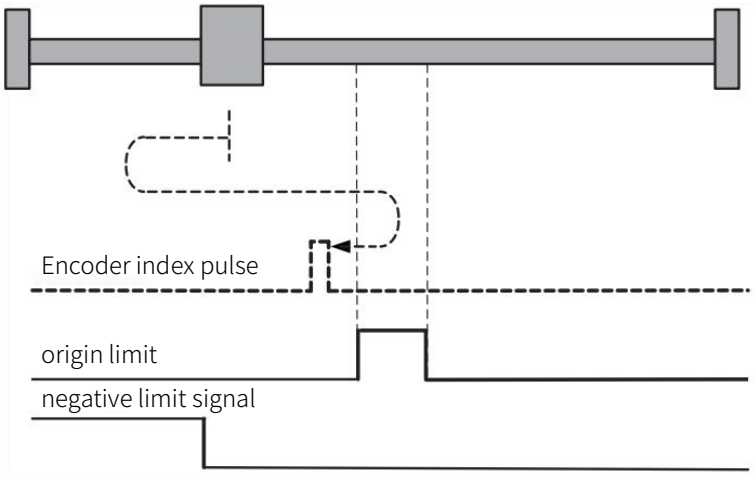


Figure 7.10.3-14-2 Return to zero mode 14

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver drives the motor to run directly in reverse at a low speed, and the zero point is the position of the first motor encoder index pulse after detecting the origin switch signal falling along.

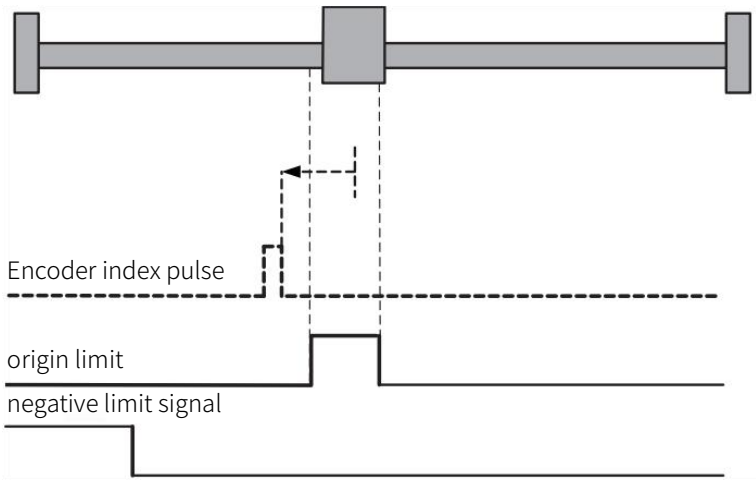


Figure 7.10.3-14-3 Return to zero mode 14

15) Return to zero mode 17 (6098=17) uses mechanical origin and reverse overdrive switches

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the reverse overrange switch signal is 0, the driver drives the motor to run at reverse high speed, looking for the zero point position, after detecting the reverse overrange switch signal rising edge, the motor begins to slow down and reverse, that is, forward low speed operation, zero point is the position where the reverse overrange switch signal falling edge is detected.

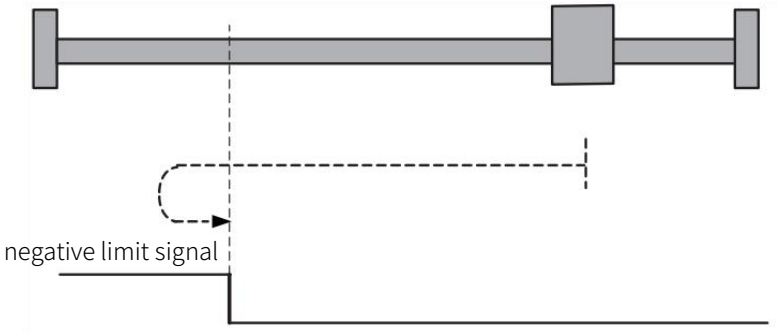


Figure 7.10.3-17-1 Mode of returning to zero 17

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the reverse overrange switch signal is 1, the driver drives the motor to run directly at a low speed, and the zero point is the position where the falling edge of the overrange switch signal is detected.

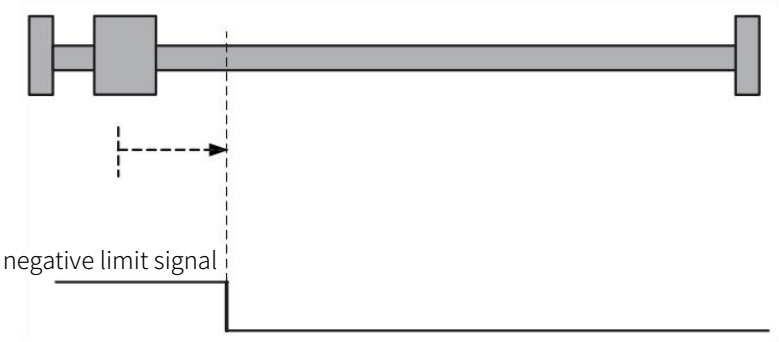


Figure 7.10.3-17-2 Mode of returning to zero 17

16) Return to zero mode 18 (6098=18) uses mechanical origin and forward overpass switches

- The deceleration point signal is invalid when starting back to zero:

At the beginning of the return to zero, the forward overrange switch signal is 0, the driver drives the motor to run at a forward high speed, looking for the zero position, after detecting the upward edge of the forward overrange switch signal, the motor decelerates and runs at a reverse low speed, and the zero point is the position where the downward edge of the forward overrange switch is detected.

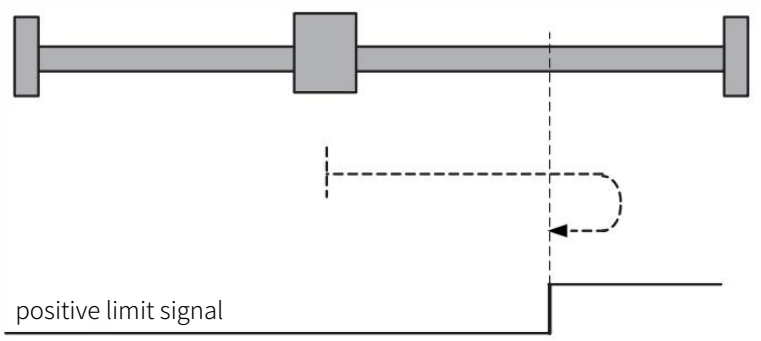


Figure 7.10.3-18-1 Mode of returning to zero 18

- The deceleration point signal is valid when starting back to zero:

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

Figure 7.10.3-18-2 Mode of returning to zero 18

17) Return to zero mode 19 (6098=19) Use the origin switch

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to run at a forward high speed, looking for the zero point position, until the origin switch signal is detected after the rising edge, the motor decelerates and runs at a reverse low speed, the zero point is the position where the origin switch signal is detected.

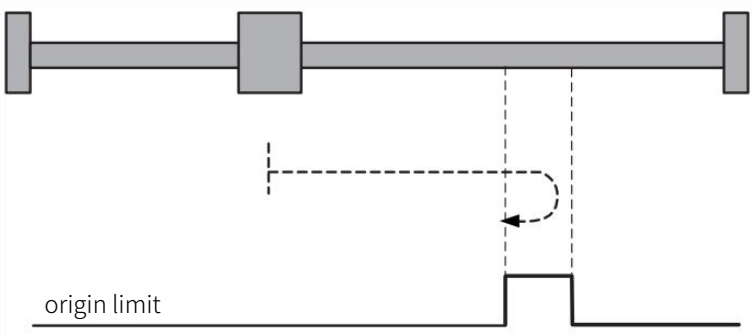


Figure 7.10.3-19-1 Return to zero mode 19

- The deceleration point signal is valid when starting back to zero:

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

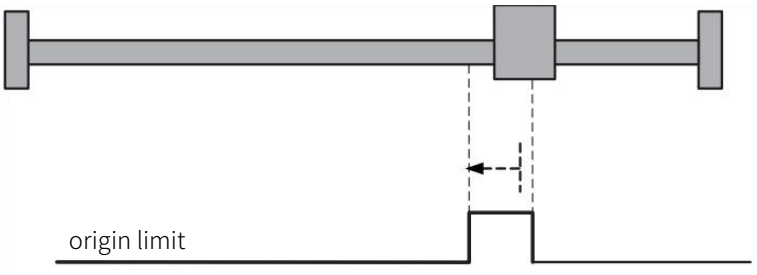


Figure 7.10.3-19-2 Mode of returning to zero 19

18) Return to zero mode 20 (6098=20) Use the origin switch

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor directly to start to return to zero at a low speed, and the zero point is the position where the origin switch signal is detected

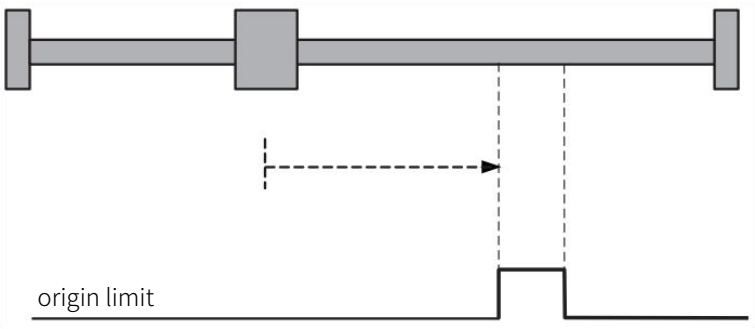


Figure 7.10.3-20-1 Return to zero mode 20

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver drives the motor to start running at reverse high speed, looking for the zero point position, until the origin switch signal is detected after the falling edge, the motor decelerates, reverse, that is, the forward low speed operation, the zero point is the position where the origin switch signal is detected.

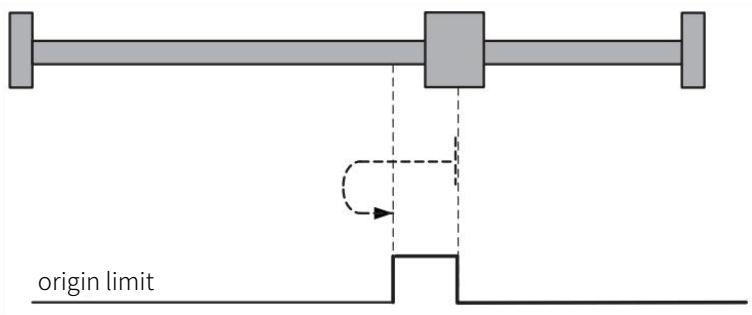


Figure 7.10.3-20-2 Return to zero mode 20 Return to zero mode 21 (6098=21) Use the origin switch

- The deceleration point signal is invalid when starting back to zero:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to run at reverse high speed, looking for the zero point position, until the origin switch signal is detected after the rising edge, the motor decelerates and reverses, that is, the forward low speed operation, the zero point is the position of the falling edge after the origin switch signal is detected.

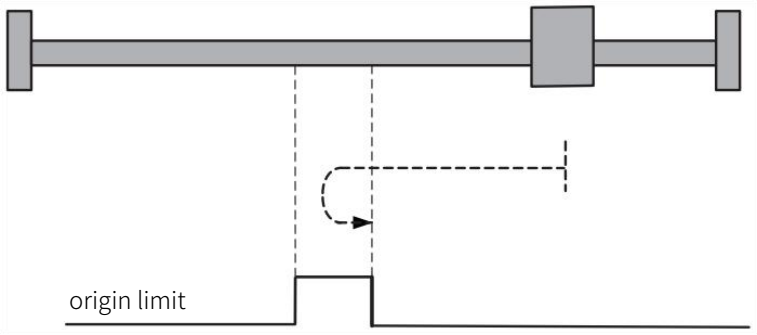


Figure 7.10.3-21-1 Return to zero mode 21

- The deceleration point signal is valid when starting back to zero:

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

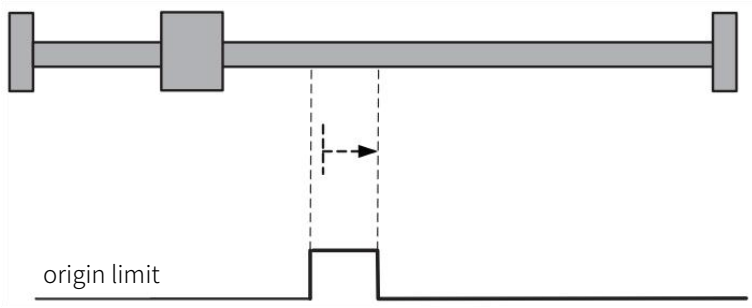


Figure 7.10.3-21-2 Return to zero mode 21 Return to zero mode 22 (6098=22) Use the origin switch

- The deceleration point signal is invalid when starting back to zero:

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

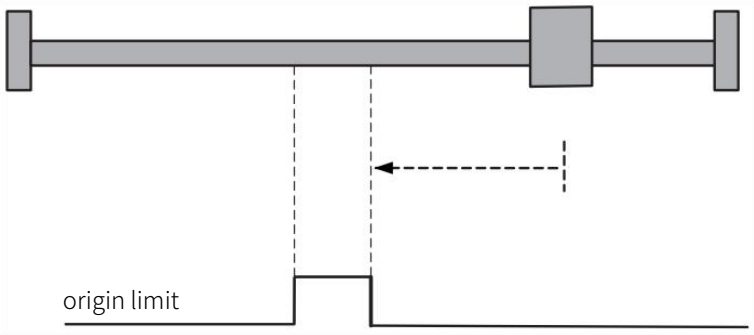


Figure 7.10.3-22-1 Return to zero mode 22

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, and the driver drives the motor to run at a forward high speed to find the zero position. Until the origin switch signal falling edge is encountered, the motor decelerates and runs at a reverse low speed, and the zero point is the position where the origin switch signal rising edge is detected.

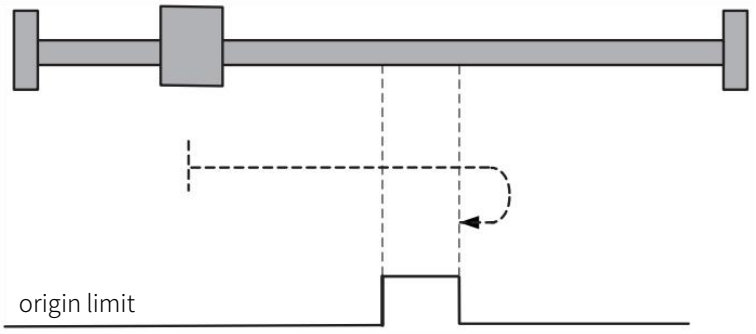


Figure 7.10.3-22-2 Return to zero mode 22

19) Return to zero mode 23 (6098=23) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

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

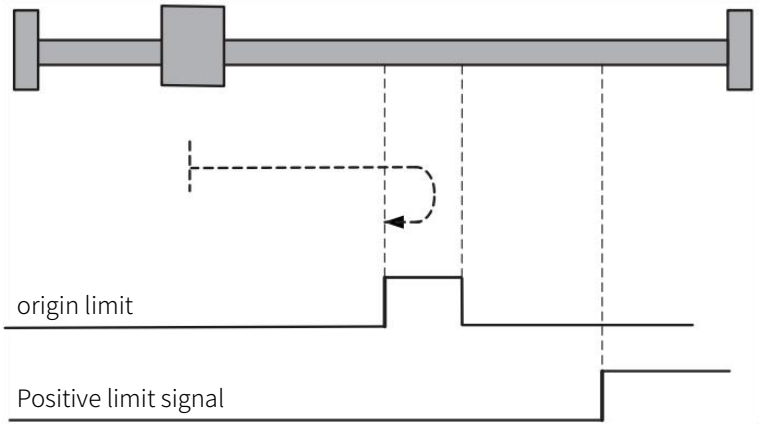


Figure 7.10.3-23-1 Return to zero mode 23

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start back to zero at a forward high speed. If the limit switch is encountered, the motor automatically runs at a reverse high speed until the origin switch signal is detected at the rising edge, the motor decelerates and continues to run at a reverse low speed. The zero point is the position where the origin switch signal is detected at the falling edge.

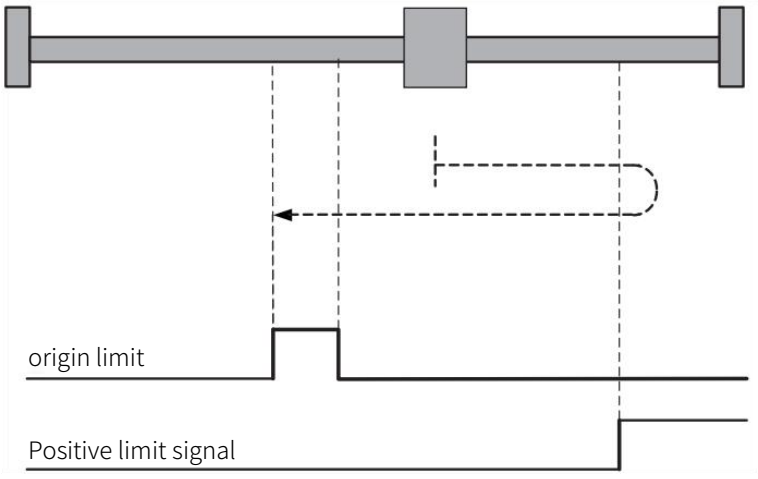


Figure 7.10.3-23-2 Return to zero mode 23

- The deceleration point signal is valid when starting back to zero:

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

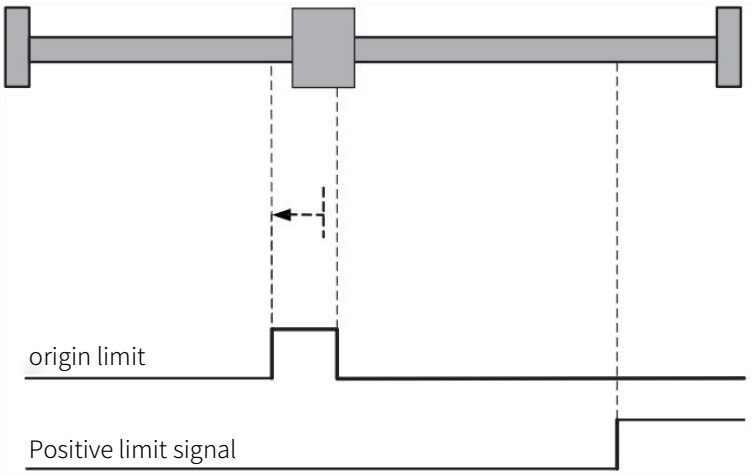


Figure 7.10.3-23-3 Return to zero mode 23

20) Back to zero mode 24 (6098=24) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start to return to zero at a forward high speed, and the limit switch is not encountered until the rise edge of the origin switch signal is detected, the motor decelerates and runs at a reverse low speed, and the zero point is the position where the limit edge of the origin switch is detected.

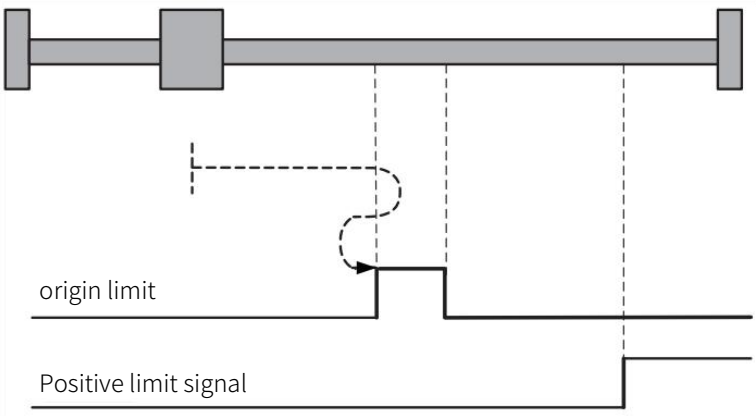


Figure 7.10.3-24-1 Return to zero mode 24

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start back to zero at a forward high speed. When the limit switch is encountered, the motor automatically reverses and runs at a high speed. After detecting the origin switch signal rising edge, the motor begins to slow down and reverse to run at a low speed.

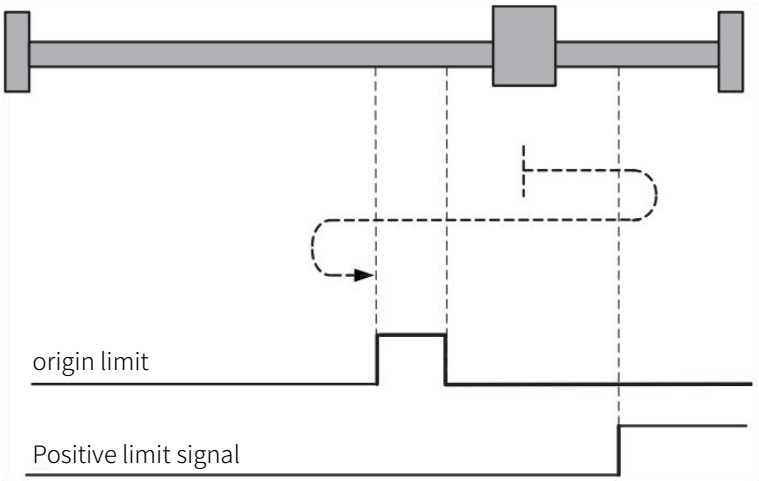


Figure 7.10.3-24-2 Return to zero mode 24

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, and the driver drives the motor directly to reverse and start to return to zero at a low speed, until the origin switch signal is detected after the falling edge, the motor reverses and runs forward at a low speed, and the zero point is the position where the original switch signal is detected.

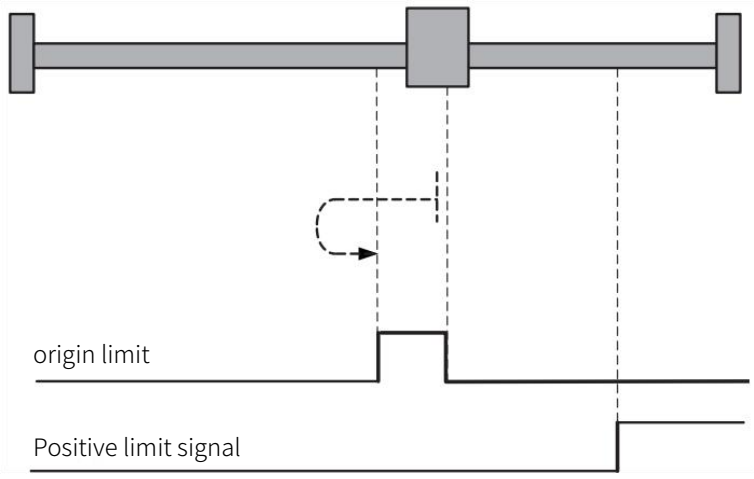


Figure 7.10.3-24-3 Return to zero mode 24

21) Back to zero mode 25 (6098=25) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

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

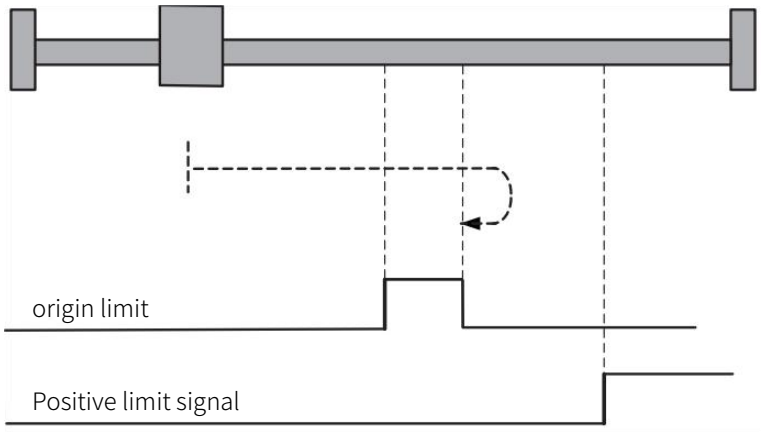


Figure 7.10.3-25-1 Return to zero mode 25

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, when the driver drives the motor to start to return to zero at a forward high speed, the limit switch is encountered, the motor automatically reverses and runs at a high speed, until the origin switch signal is detected at the rising edge, the motor decelerates in reverse, that is, the forward operation is resumed. After the origin switch signal is detected at the falling edge in the forward low speed operation, the motor reverses the low speed operation. Zero is the position after detecting the rising edge of the origin switch signal.

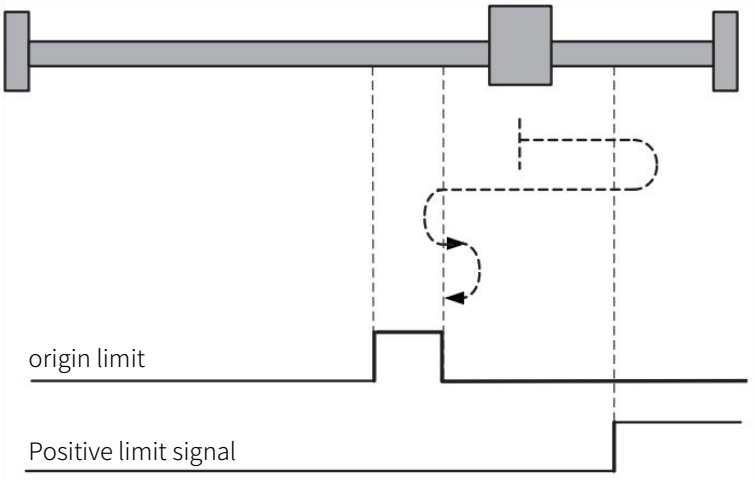


Figure 7.10.3-25-2 Return to zero mode 25

- The deceleration point signal is valid when starting back to zero:

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

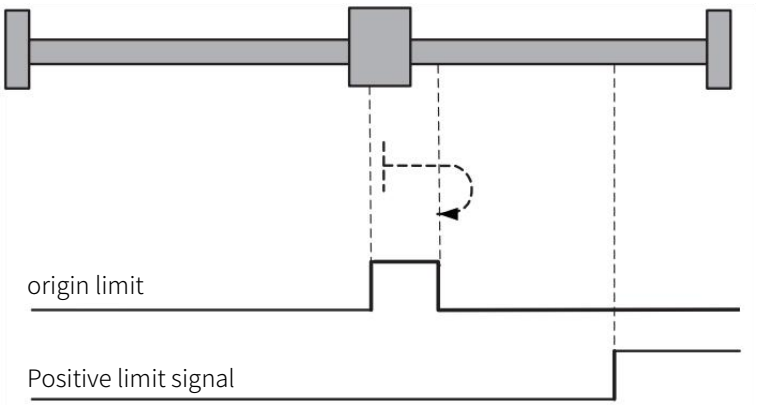


Figure 7.10.3-25-3 Return to zero mode 25

22) Return to zero mode 26 (6098=26) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is not encountered:

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start to return to zero at a positive high speed, and the limit switch is not encountered, until the origin switch signal is detected after the rising edge, the motor decelerates and runs at a positive low speed, and the zero point is the position where the origin switch signal is detected.

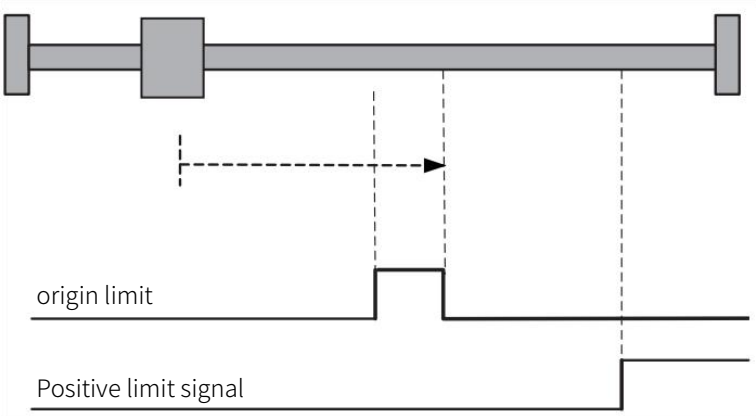


Figure 7.10.3-26-1 Return to zero mode 26

- The deceleration point signal is invalid when starting back to zero, and the forward limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to run at a forward high speed to find the zero position. If the limit switch is encountered, the motor automatically reverses and runs at high speed, until the origin switch signal is detected at the rising edge, the motor decelerates the reverse, that is, the forward operation is resumed, and the zero point is the position where the origin switch signal is detected at the falling edge.

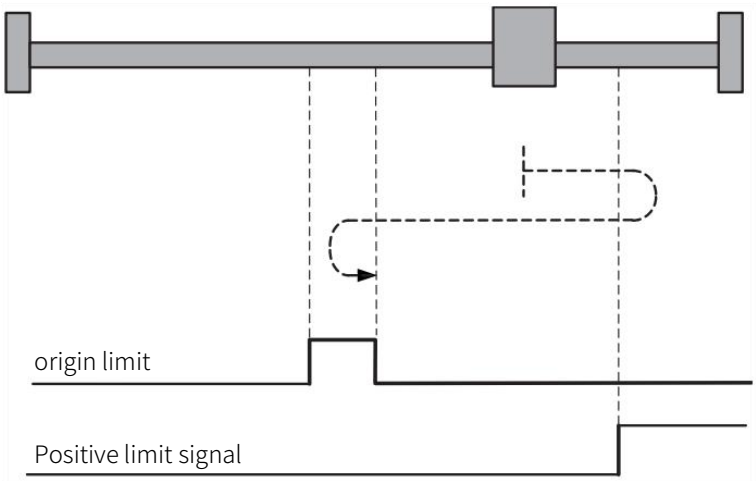


Figure 7.10.3-26-2 Mode of returning to zero 26

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, and the driver drives the motor directly to start to return to zero at a low speed, and the zero point is the position where the origin signal is detected.

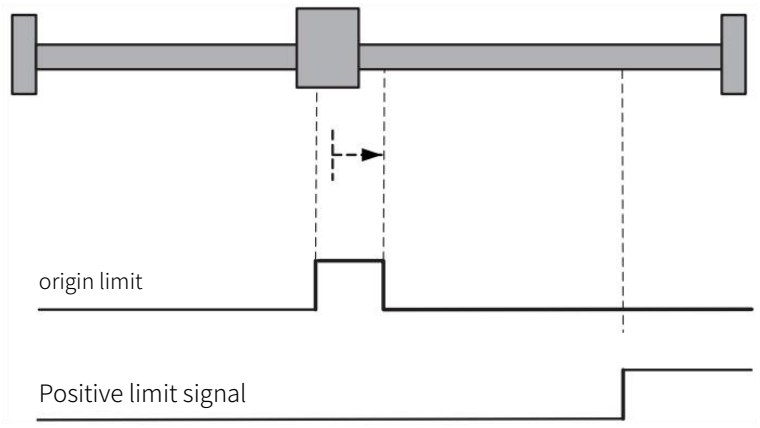


Figure 7.10.3-26-3 Mode of returning to zero 26

23) Back to zero mode 27 (6098=27) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to return to zero at a reverse high speed. When the limit switch is not encountered, the motor slows down after detecting the origin switch signal rising edge, that is, the motor is running at a forward low speed, and the zero point is the position where the origin switch signal falling edge is detected.

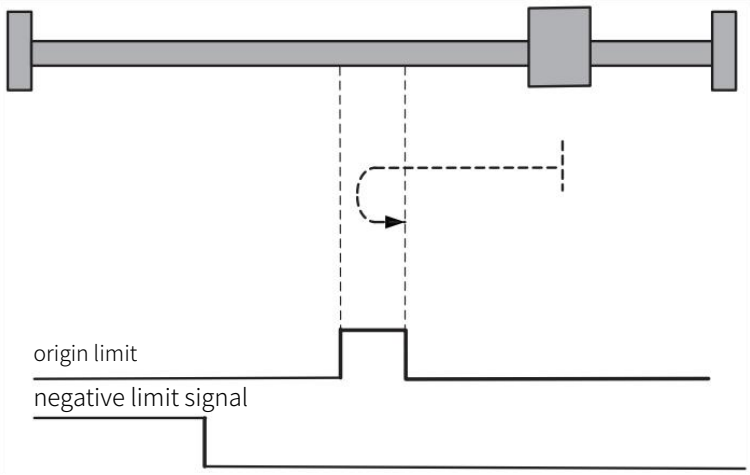


Figure 7.10.3-27-1 Return to zero mode 27

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

When starting to return to zero, the origin switch signal starts to return to zero at a reverse high speed, if the limit switch is encountered, the motor automatically reverses and runs at a positive high speed, until the origin switch signal is detected at the rising edge, the motor begins to slow down and continues to run at a positive low speed, and the zero point is the position where the origin switch signal is detected at the falling edge.

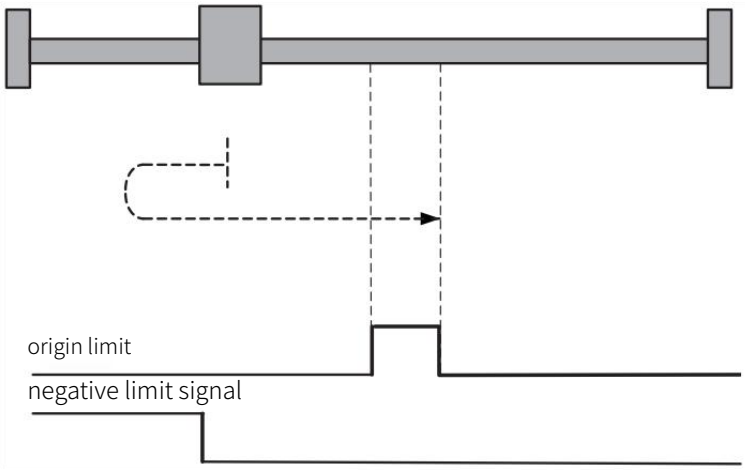


Figure 7.10.3-27-2 Return to zero mode 27

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, and the driver drives the motor directly to start to return to zero at a low speed. The zero point is the position where the origin switch signal is detected.

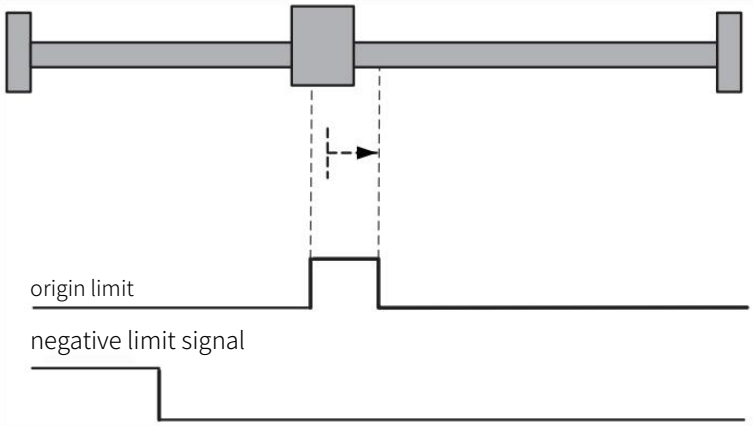


Figure 7.10.3-27-3 Return to zero mode 27

24) Back to zero mode 28 (6098=28) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to run at reverse high speed to find the zero position. When the limit switch is not encountered, after detecting the origin switch signal rising edge, the motor decelerates and reverses, and the motor is running at a low speed forward, until the origin switch signal falling edge is detected, the motor reverses and runs at a low speed, and the zero point is the position where the origin switch signal rising edge is detected.

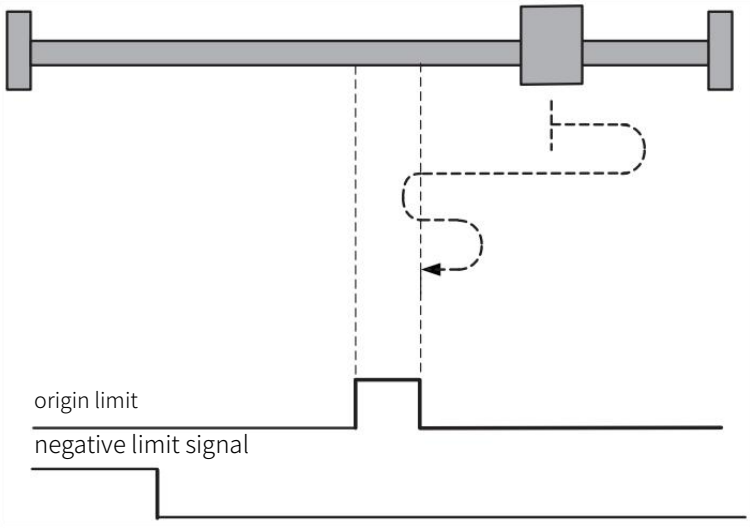


Figure 7.10.3-28-1 Return to zero mode 28

- The deceleration point signal is invalid when starting back to zero. Reverse limit switch is encountered

When HW starts to return to zero, it starts to return to zero at reverse high speed. When the limit switch is encountered, it automatically reverses and runs at forward high speed. When it encounters the rising edge of HW, it slows down and runs at forward low speed. When it encounters the falling edge of HW, it reverses and runs at reverse low speed.

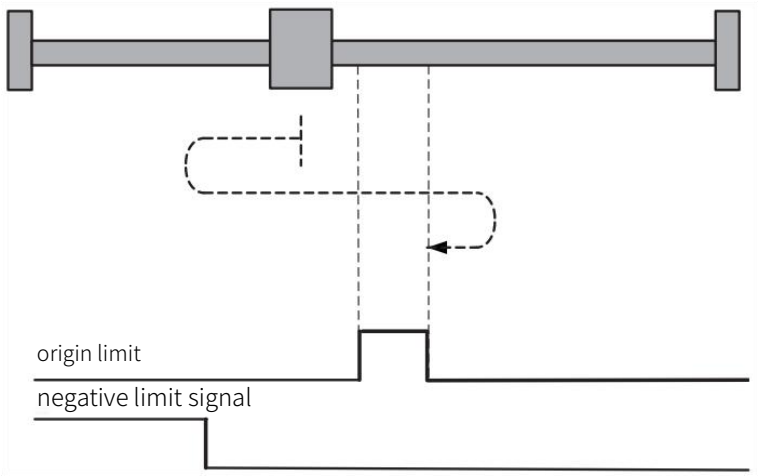


Figure 7.10.3-28-2 Return to zero mode 28

- The deceleration point signal is valid when starting back to zero

When HW=1 when starting back to zero, it starts to return to zero directly at low speed. After encountering HW falling edge, reverse, reverse low speed, stop when encountering HW rising edge;

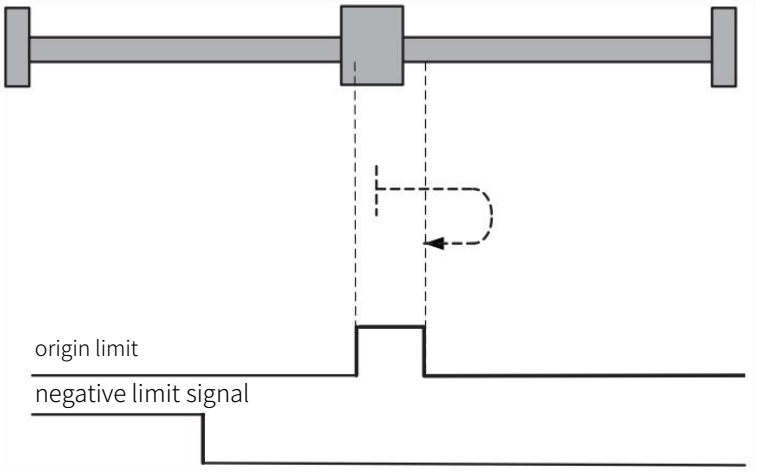


Figure 7.10.3-28-3 Return to zero mode 28

25) Back to zero mode 29 (6098=29) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin 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, the motor slows down and runs at a reverse low speed after detecting the rising edge of the origin switch signal, and the zero point is the position where the origin switch signal is detected.

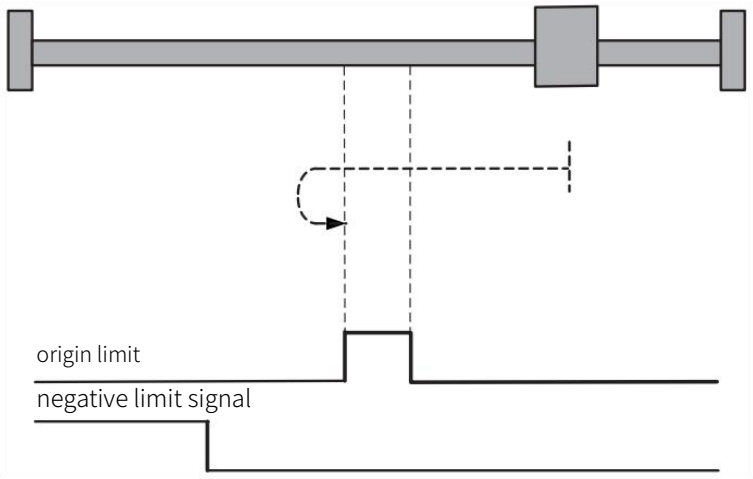


Figure 7.10.3-29-1 Return to zero mode 28

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

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to return to zero at reverse high speed. If the limit switch is encountered, the motor automatically reverses and the motor begins to run forward at high speed. Until the origin switch signal is detected along the rising edge, the motor begins to slow down and run backward. Zero is the position where the rising edge of the original electrical switch signal is detected.

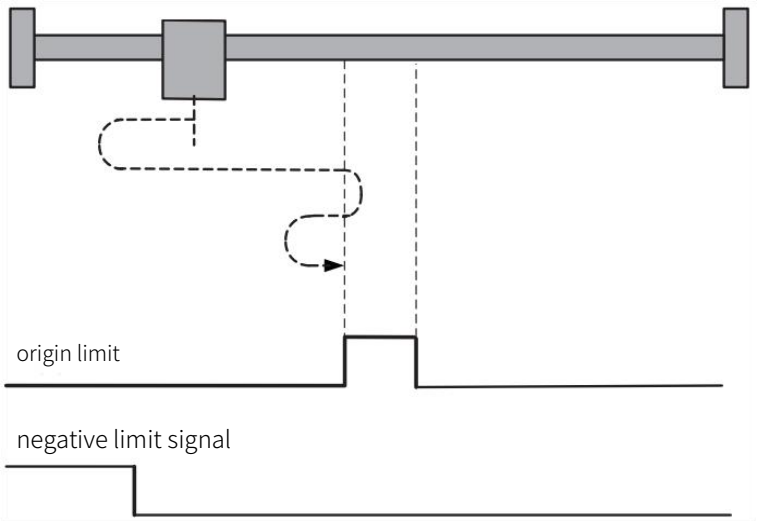


Figure 7.10.3-29-2 Mode of returning to zero 28

- The deceleration point signal is valid when starting back to zero:

When starting to return to zero, the origin switch signal is 1, the driver drives the motor directly to reverse the low speed to start to zero, until the origin switch signal is detected after the falling edge, the motor reverse that is, forward low speed operation, the zero point is the position where the origin switch signal is detected.

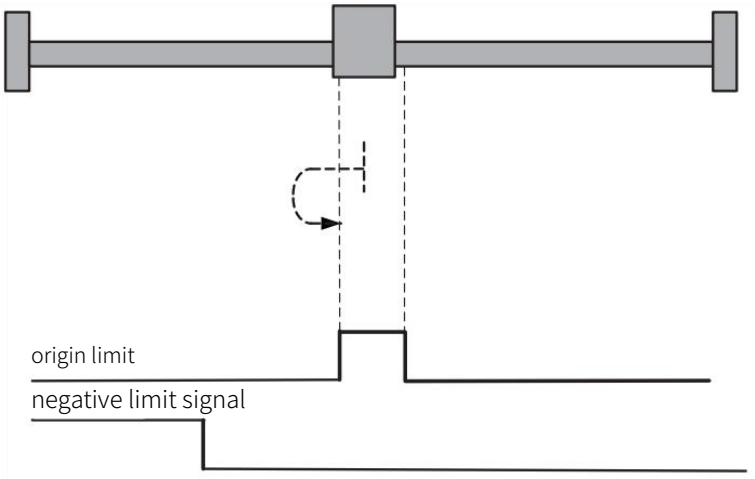


Figure 7.10.3-29-3 Mode of returning to zero 28

26) Back to zero mode 30 (6098=30) Use the origin switch

- The deceleration point signal is invalid when starting back to zero, no reverse limit switch is encountered:

When starting to return to zero, the origin switch signal is 0, and the driver drives the motor to return to zero at a reverse high speed. If the limit switch is not encountered, the motor slows down and runs at a reverse low speed after detecting the origin switch signal rising edge, and the zero point is the position where the origin switch signal falling edge is detected.

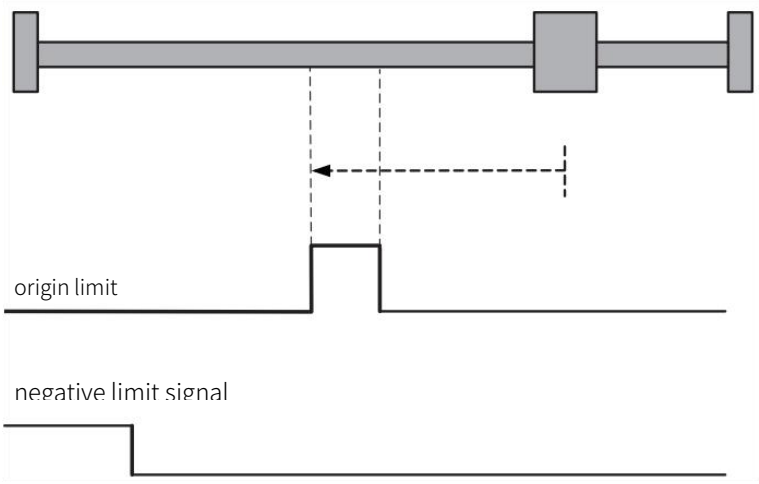


Figure 7.10.3-30-1 Return to zero mode 30

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

When starting to return to zero, the origin switch signal is 0, the driver drives the motor to start back to zero at reverse speed, if the limit switch is encountered, the motor automatically reverses and runs at a forward high speed, until the origin switch signal is detected after the rise of the motor deceleration reverse operation, the zero point is the position where the origin switch signal is detected.

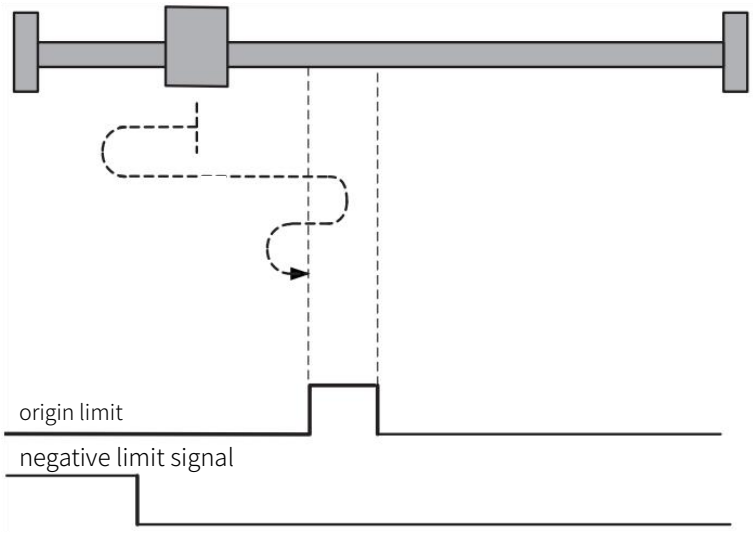


Figure 7.10.3-30-2 Return to zero mode 30

- The deceleration point signal is valid when starting back to zero:

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

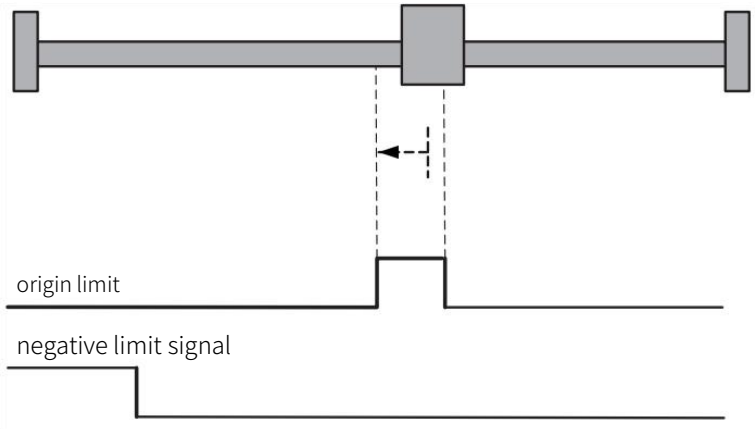


Figure 7.10.3-30-3 Return to zero mode 30

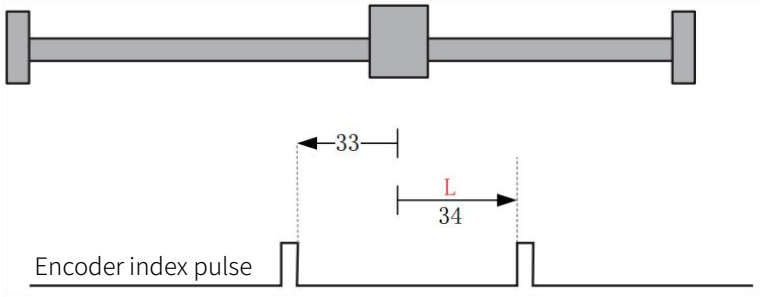
27) Return to zero mode 31/32 (6098=31/32)

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

28) Return to zero mode 33/34 (6098=33/34) Index pulse using motor encoder (Z trust sign)

Return to zero mode 33: Reverse low speed operation, the first Z signal encountered stops

Return to zero mode 34: Forward low speed operation, encountered the first Z signal stop



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

Return to zero mode 35, taking the current position as the mechanical origin, triggering the origin to zero (6040 control word: 0x0F 0x1F) :

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

After the return to zero is complete, the position feedback 6064 is set to the origin offset 607C.

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

After returning to zero, position feedback 6064 superimposes position bias 607C on the original basis.

- When the origin signal is OFF:

Return to zero mode 3:

the servo motor moves forward with 6099h.01h object at high speed, detects the rising edge of the origin signal, slows down and stops, and moves negative with 6099h.02h at low speed to find the zero point. The zero point position is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the falling edge of the origin signal.

Return to zero mode 4:

the servo motor runs at a forward low speed with the 6099h.02h object to find the zero point, which is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the rising edge of the origin signal.

- When the origin signal is ON:

Return to zero mode 3:

the servo motor runs at a low speed in the negative direction of 6099h.02h object, looking for zero point, which is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the falling edge of the origin signal.

Return to zero mode 4:

the servo motor moves in the negative direction of the 6099h.01h object at high speed, detects the falling edge of the origin signal, slows down and stops, and moves forward in the low speed of 6099h.02h, looking for the zero point. The zero point position is the position of the first encoder index pulse (Z-phase pulse) signal after detecting the rising edge of the origin signal.

7.10.5 Recommended Configuration

In zero return mode, the basic configurations are as follows:

RxPDO	TxPDO	remark
6040□control word	6041□status word	must
6098□Homing method		Select Able
6099-01□speed during search for switch		Select Able
6099-02□speed during search for zero		Select Able
609A□Homing acceleration		Select Able
	6064□position actual value	Select Able
6060□modes of operation	6061□modes of operation display	Select Able

7.11 Auxiliary Functions

The drive provides the following accessibility features:

□1□Input phase missing detection function;

□2□motor protection function;

□3□Probe function.

7.11.1 Input the Phase Missing Detection function

N3 series bus servo with main RST input phase detection function. After the function is enabled on the servo, check whether the main power input is out of phase according to parameter P31.08.

Serial number P31.08	name	Enter the phase missing detection configuration			Set effective	With immediate effect	Data range	0~2
	Accessibility	RW	unit	-	Correlation model	ALL	Factory setting	1
This parameter is used to enable the input phase missing detection function of the servo. 0: detection disable: Disable the input phase missing detection function of the servo. 1: Input single-phase detection: When single-phase AC220V power supply is used, enable the servo input phase detection function. This function will alarm and stop when the single-phase power input is detected to degrade the current operating performance of the servo. 2: Input three-phase test: When three-phase AC220V or AC380V power supply is used, enable the servo input phase detection function. This function will alarm and stop when the three-phase power input is detected to have a deteriorating effect on the current operating performance of the servo.								

7.11.2 Motor protection function

- Motor overload protection:

After the servo motor is energized, due to the thermal effect of the current, it continuously generates heat and releases heat to the surrounding environment. When the heat generated exceeds the heat released, the motor temperature rises, and the temperature is too high, which will cause the motor to burn. Therefore, the driver provides the motor overload protection function to prevent the motor from burning out due to excessive temperature.

By setting the time of the corresponding overload multiple (related parameters: P31.01, P31.02, P31.03, P31.04), the time reported by the motor overload fault (E71.80) can be adjusted. P31.01, P31.02, P31.03, P31.04 are generally kept as the default values, but can be changed according to the actual heat of the motor when the following situations occur:

Servo motor working environment temperature is high occasions;

The servo motor is in cyclic motion, and the single movement period is short, frequent acceleration and deceleration of the occasion.

Associated parameters:

Serial number P31.01	name	1.5x overload time			Set effective	Disable enable	Data range	1~1000000
	Accessibility	RW	unit	-	Correlation model	ALL	Factory setting	100000
This parameter is used to set the duration of the overload alarm when the servo current exceeds 1.5 times the rated current. In order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the overload running curve of the motor.								

Serial number P31.02	name	2.5x overload time			Set effective	Disable enable	Data range	1~1000000
	Accessibility	RW	unit	-	Correlation model	ALL	Factory setting	20000
This parameter is used to set the duration of the overload alarm when the servo current exceeds 2.5 times the rated current. In order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the overload running curve of the motor.								

Serial number P31.03	name	Maximum overload multiple of motor			Set effective	Disable enable	Data range	300~400
	accessibility	RW	unit	%	Correlation model	ALL	Factory setting	400
The maximum allowable current of the motor is a multiple of the rated current of the motor. In order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the overload running curve of the motor.								

Serial number P31.04	name	Maximum overload current time			Set effective	Disable enable	Data range	1~50000
	Accessibility	RW	unit	ms	Correlation model	ALL	Factory setting	1000
The maximum allowable duration of the motor's maximum current, in order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the motor's overload running curve.								

Serial number P31.05	name	Overload gain			Set effective	Disable enable	Data range	1~50000
	accessibility	RW	unit	ms	Correlation model	ALL	Factory setting	1000
The maximum allowable duration of the motor's maximum current, in order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the motor's overload running curve.								

- Motor speed protection:

Servo motor speed is too large will cause motor damage or mechanical damage. Therefore, the servo drive provides motor over maximum speed protection and motor stall protection.

Exceed the maximum speed protection

If the motor speed exceeds the maximum motor speed of P11.05 for 300ms continuously, the fault of exceeding the maximum speed is reported (E84.82).

◆ Associated parameters:

Serial number P11.05	name	Maximum motor speed			Set effective	Shutdown effect	Data range	1~30000
	Accessibility	RW	unit	rpm	Correlation model	ALL	Factory setting	3000
This parameter is used for the maximum speed of the input motor; Or it can be automatically entered after P10.02 selects the model.								

Motor stall protection

If the difference between the motor speed feedback and the speed instruction exceeds the P50.16 stall threshold and continues for the P50.17 stall filtering time, the motor stall fault will be reported (E84.85).

◆ Associated parameters:

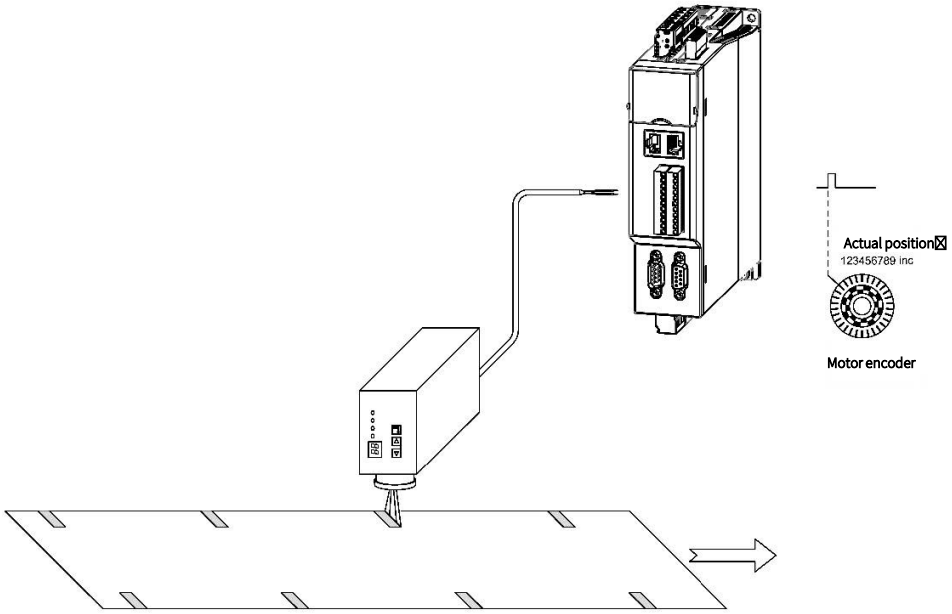
Serial number P50.16	name	Stall threshold			Set effective	With immediate effect	Data range	0~200
	Accessibility	RW	unit	%	Correlation model	ALL	Factory setting	100
This parameter is used to set the stall protection threshold. The base value is the current speed given. When the difference between the speed set and the speed feedback reaches or exceeds the threshold set by P50.16 and the duration exceeds the filtering time set by P50.17 (for example, a flying car), the servo drive will stop and report a fault.								

Serial number P50.17	name	Stall filtering time			Set effective	With immediate effect	Data range	0~2000
	accessibility	RW	unit	ms	Correlation model	ALL	Factory setting	100
This parameter is used to set the filtering time of stall protection. Generally, the filtering time is not adjusted and the default value is used.								

7.11.3 Probe Function

The probe function is the position latch function. It can latch the position information (command unit) when the external DI signal or the motor Z signal (real Z signal or analog Z signal) changes.

The N3 servo driver supports two probes to be enabled at the same time. The position information corresponding to the rising edge and falling edge of each probe signal can be recorded at the same time, and four position information can be locked at the same time. The probe 1/2 can select either the DI or the motor Z signal as the probe signal.



1) Related objects

index	Sub index	Name	Interview	Data type	Unit	Set rang	Default Value
60B8h	00	Probe function	RW	Uint16	-	0~65535	0
60B9h	00	Probe state	RO	Uint16	-	-	0
60BAh	00	Probe 1 rising edge latch position	RO	Int32	inc	-	0
60BBh	00	Probe 1 falls along latch position	RO	Int32	inc	-	0
60BCh	00	Probe 2 rising edge latch position	RO	Int32	inc	-	0
60BDh	00	Probe 2 falls along latch position	RO	Int32	inc	-	0

Note: For detailed instructions on how to use related objects, see "Chapter 8 Detailed Instructions on Object Dictionaries".

2) Set the steps

Set DI

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

Set the probe function

Probe function (0x60B8) The meanings are as follows:

Bit	description	description
0	Probe 1 enables: 0-- Probe 1 is disabled 1-- Indicates that probe 1 is enabled	bit0 to bit5: Settings related to probe 1. During the operation of probe 1, 60B8h bit0 must remain active For absolute encoders, the Z signal refers to the zero of the motor position feedback on a single turn
1	Probe 1 triggers mode 0 - Single trigger, only triggered when the trigger signal is active for the first time 1 - Triggered continuously	
2	Probe 1 trigger signal selection 0 - DI Input signal 1-Z signal	

Bit	description	description
3	NA	
4	The rising edge of probe 1 was enabled 0-- The rising edge does not latch 1-- Rising edge latch	
5	The falling edge of probe 1 was enabled 0-- The falling edge does not latch 1-- Falling edge latch	
6~7	NA	NA
8	Probe 2 enables: 0-- Probe 2 is disabled 1--Indicates that probe 2 is enabled	bit8 to bit13: Settings related to probe 2. During the operation of probe 2, 60B8h bit8 must remain active For absolute encoders, the Z signal refers to the zero of the motor position feedback on a single turn
9	Probe 2 triggers mode 0 - Single trigger, only triggered when the trigger signal is active for the first time 1 - Triggered continuously	
10	Probe 2 trigger signal selection 0 - DI Input signal 1-Z signal	
11	NA	
12	The rising edge of probe 2 was enabled 0-- The rising edge does not latch 1-- Rising edge latch	
13	The falling edge of probe 2 was enabled 0-- The falling edge does not latch 1-- Falling edge latch	
14~15	NA	NA

3) Read the probe status 0x60B9

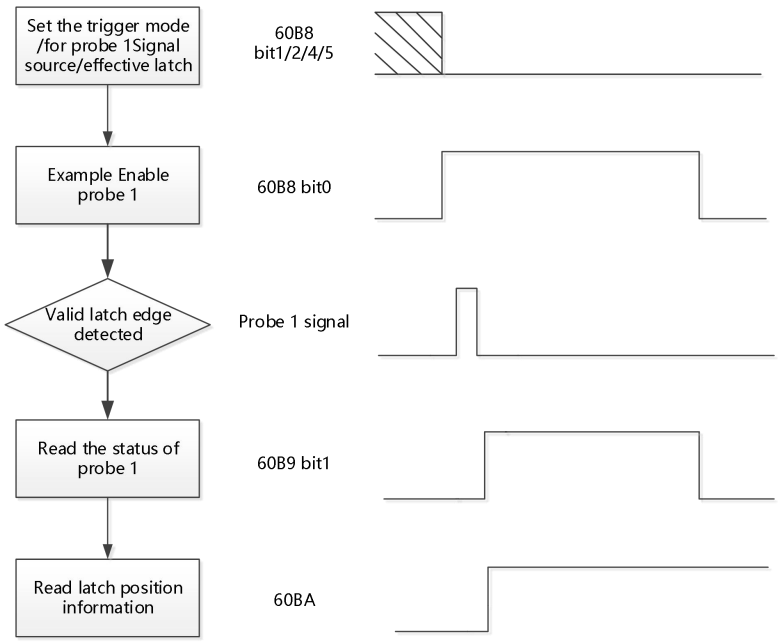
Bit	description	remark
0	Probe 1 enables: 0-- Probe 1 is disabled 1-- Indicates that probe 1 is enabled	bit0~bit2: indicates the state of probe 1
1	Probe 1 is executed with rising edge latch 0-- The rising edge latch is not executed 1-- The rising edge latch has been executed	

Bit	description	remark
2	Probe 1 is executed by falling edge latch 0-- Falling edge latch not executed 1-- Falling edge latch executed	
3~7	NA	NA
8	Probe 2 enables: 0-- Probe 2 is disabled 1: Indicates that probe 2 is enabled	bit8~bit10: reflects the state of probe 2
9	Probe 2 is executed with rising edge latch 0-- The rising edge latch is not executed 1-- The rising edge latch has been executed	
10	Probe 2 is executed by falling edge latch 0-- Falling edge latch not executed 1-- Falling edge latch executed	
11~15	NA	NA

4) Read the latch position of the probe

The four positions of the probe are recorded in objects 0x60BA to 0x60BD.

For example, if 0x60B8=0x0013 is set, the DI signal is used as the trigger signal of probe 1, and the rising edge is triggered once. By reading bit1 at 0x60B9, you can determine whether the servo drive has performed the probe 1 rising edge position latch function. If it is determined that the ascending edge position latch function of probe 1 has been performed, the position information can be read by reading 0x60BA(the ascending edge position feedback latch value of probe 1, command unit).



Chapter 8 Object dictionary

◆ Noun interpretation

name	Explain	
Protection class	0	General browsing rights;
	1	Operator authority;
	2	Engineer rights.
Access attribute	RW	can read and write;
	RO	read-only;
	WO	only write.
Setting mode	0	stop setting;
	1	Run Settings.
Effective mode	0	Takes effect immediately.
	1	Shutdown takes effect;
	2	Power on again.
Can map	NO	cannot be mapped to PDO.
	RPDO	can be mapped to RPDO.
Map	TPDO	can be mapped to TPDO;
	RTPDO	can map to RPDO or TPDO

Note:

The units in the parameter object table in this chapter refer to the units when the upper controller is used to read and write parameters. The unit is not consistent with the debugging software interface, so it is used

When debugging software Settings, distinguish between units and factory values.

8.1 P00 General Configuration Parameter Group

Sub index 3000h (P00)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	General configuration	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
Sub index 01h (P00.01)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Permission password	DINT32	-	WO	Run setting	With immediate effect	0
		Data range	-	0~65535	Can map	Correlation model	Protection class
		unit	-	-	NO	ALL	0
	This parameter is used to enter the login password. When setting parameters on the operation panel, you can modify the corresponding parameters of the server only after the login is successful Count; When setting parameters using the debugging software, enter the corresponding password on the login page. This parameter is not limited						
Sub index 02h (P00.02)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	
	Control channel selection	DINT32	RW	Stop setting	re-energize	1	
		Data range	0~4	Can map	Correlation model	Protection class	
		unit	-	NO	ALL	1	
	This parameter is used to set the given mode of the control instruction under different control modes: 0: panel control 1: controller control 2: software control 3: Analog 1 control 4: analog 2 control 5: reserved						
Sub index 03h (P00.03)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	
	Motor configuration selection	DINT32	RW	Stop setting	re-energize	0	
		Data range	0~2	Can map	Correlation model	Protection class	
		unit	-	NO	ALL	2	
	This parameter is used to set the motor parameters in a given way. The modification of this parameter should be performed under protection level 2 (Engineer level) 0: motor read By reading the internal data of the motor encoder, match the motor model parameters 0x3010, the motor nameplate parameters 0x3011, 0x3002:02, 0x3002:03 encoder multi-turn resolution parameters, 0x3002:07 encoder position Angle parameters; When using this mode, it should be noted that the matched motor is our KMT, KMZ series motor, and should be confirmed 0x3002:01						

	Encoder type parameters match the current matching motor type. 1: User Settings When the motor used is another series of motors, the parameters 0x3010, 0x3011, 0x3020, 0x3021 and so on need to be manually configured Group. 2: Bus configuration Temporarily invalid.

8.2 P01 bus control parameter group

Sub index 3001h (P01)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Communication parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
Sub index 01h (P01.01)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Bus type selection	DINT32	RW		Run setting	re-energize	1
		Data range	0~2		Can map	Correlation model	Protection class
		unit	-		NO	ALL	1
	This parameter is used to select the communication mode selected by the servo, the default is EtherCAT communication: 0: No bus interface 2: CANopen (reserved)						
Sub index 02h (P01.02)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Local node number	DINT32	RW		Stop setting	re-energize	1
		Data range	0~240		Can map	Correlation model	Protection class
		unit	-		NO	ALL	0
	This parameter is used to set the node number of the servo in the bus topology for bus communication. If the bus type is "EtherCAT", two configuration modes are supported for the node. For details, see parameter 0x3001:05 Node Number.						
Sub index 03h (P01.03)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Master station communication cycle	DINT32	RO		-	Shutdown effect	2000
		Data range	200~1000000		Can map	Correlation model	Protection class
		unit	us		NO	ALL	1
	This parameter displays the communication period during bus communication. EtherCAT automatically obtains the communication period of the master station without user setting						

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 04h (P01.04)	Synchronization detection was enabled. Procedure	DINT32	RW	Run setting	re-energize	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	This parameter is used to set synchronous data detection when bus communication is enabled: 0: No 1: Yes					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 05h (P01.05)	The node number is selected	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	This parameter is used to set the station number setting mode: 0: Bus Settings The station number address can be written by the upper controller through the bus 1: P01.02 Parameter Settings The drive local parameter P01.02 determines the station ID address, but note that some upper controllers, such as Beckford, are not allowed to be used by the slave station The station number is written in this mode. Therefore, when setting the address of the slave station in this mode, please pay attention to whether the upper controller supports it.					

8.3 P10~P11 Motor parameter group

	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
Sub index 3010h (P10)	Motor type parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

	name	Data type	Data structure	Access attribute	Setting mode	Effective mode
Sub index 01h (P10.01)	Motor series	DINT32	RW	Stop setting	Shutdown effect	0
		Data range	0~6	Can map	Correlation model	Protection class
		unit	-	NO	ALL	0
	This parameter is used to select the motor series☒ 0: Other series of motors 1: KMT 200V motor					

	2: KMT 400V motor 3: KMZ 200V motor 4: KMZ 400V motor					
Sub inedx 02h (P10.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor type	DINT32	RW	Stop setting	Shutdown effect	0
		Data range	0~40	Can map	Correlation model	Protection class
		unit	-	NO	ALL	0
	This parameter is used to select the motor model based on the 3010h:01h motor series parameters:					
	0: Other series of motors	0: Custom motor				
	1☒KMT 200V motor	For example: 0☒KMTM40-00230 1☒KMTM40-00330				
	2☒KMT 400V motor	For example: 1☒KMTM130H-05415 2☒KMTM130H-08315				
	3☒KMZ 200V motor	For example: 0☒KMZ40-00230 1☒KMZ40-00330				
	4☒KMZ 400V motor	For example: 0☒KMZ80H-01330 1☒KMZ80H-02430				
	5☒KMR 200V motor	For example: 1☒KMR40-00330 2☒KMR60-00630				
Sub index 03h (P10.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor type	DINT32	RW	Stop setting	Shutdown effect	0
		Data range	0~2	Can map	Correlation model	Protection class
		unit	-	-	NO	ALL
	This parameter is used to set the type of motor: 0: synchronous motor 1: asynchronous motor 2: linear motor					
Sub index 3011h (P11)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Motor nameplate parameters	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
Sub index 01h (P11.01)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Rated power of motor	DINT32	RW		Run setting	Shutdown effect	68
		Data range	1~20000		Can map	Correlation model	Protection class
		unit	0.01kW		NO	ALL	1

	This parameter is used to input the rated power of the motor; or it can be filled in automatically after selecting the motor model through P10.01 and P10.02.					
Sub index 02h (P11.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Rated current of motor	DINT32	RW	Run setting	Shutdown effect	20
		Data range	-1~4000	Can map	Correlation model	Protection class
		unit	0.1A	NO	ALL	1
	This parameter is used for the effective value of the rated current of the input motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 03h (P11.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Static current of motor	DINT32	RW	Run setting	Shutdown effect	25
		Data range	1~4000	Can map	Correlation model	Protection class
		unit	0.1A	NO	ALL	1
	This parameter is used for the static current of the input motor; Or enter it automatically by selecting the model in 10.02.					
Sub index 04h (P11.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Rated motor speed	DINT32	RW	Run setting	Shutdown effect	3000
		Data range	1~30000	Can map	Correlation model	Protection class
		unit	rpm	NO	ALL	1
	This parameter is used for the rated speed of the input motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 05h (P11.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Electric machine Maximum speed	UDINT32	RW	Run setting	Shutdown effect	4000
		Data range	1~30000	Can map	Correlation model	Protection class
		unit	rpm	NO	ALL	1
	This parameter is used for the maximum speed of the input motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 06h (P11.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Number of motor poles	UDINT32	RW	Run setting	Shutdown effect	5
		Data range	1~80	Can map	Correlation model	Protection class
		unit	Pn	NO	ALL	1
	This parameter is used for the number of poles of the input motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model. When using a custom motor, it can be obtained by the pole number self-tuning method or filled in by finding the motor technical information.					

Sub index 07h (P11.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Rated torque of the motor	DINT32	RW	Run setting	Shutdown effect	2150
		Data range	1~1000000	Can map	Correlation model	Protection class
		unit	0.001N.m	NO	ALL	1
	This parameter is used for the rated torque of the input motor; Or enter it automatically by selecting the model in 10.02.					
Sub index 08h (P11.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor stator phase resistance	DINT32	RW	Run setting	Shutdown effect	505
		Data range	1~100000	Can map	Correlation model	Protection class
		unit	0.01ohm	NO	ALL	1
	This parameter is used to input the stator phase resistance of the motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model. Note: Pay attention to the calculation method of different brands of motors.					
Sub index 09h (P11.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor D axis inductance	DINT32	RW	Run setting	Shutdown effect	1620
		Data range	1~100000	Can map	Correlation model	Protection class
		unit	0.01mH	NO	ALL	1
	This parameter is used to input the D-axis inductance of the motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 0Ah (P11.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Q-axis inductance of motor	DINT32	RW	Run setting	Shutdown effect	1620
		Data range	1~100000	Can map	Correlation model	Protection class
		unit	0.01mH	NO	ALL	1
	This parameter is used to input the Q-axis inductance of the motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 0Bh (P11.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor rotor moment of inertia	DINT32	RW	Run setting	Shutdown effect	223
		Data range	1~100000	Can map	Correlation model	Protection class
		unit	0.01Kc2	NO	ALL	1
	This parameter is used to input the rotor inertia of the motor; Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 0Ch	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Back potential	DINT32	RW	Run setting	Shutdown effect	73

(P11.0C)	constant of the motor	Data range	1~2000	Can map	Correlation model	Protection class
		unit	Vkr	NO	ALL	1
	The parameter is used for the back potential constant of the input motor. Or it is automatically filled by P10.01 and P10.02 after selecting the motor model.					
Sub index 0Dh (P11.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Self-tuning motor pole number	DINT32	RW	Run setting	With immediate effect	5
		Data range	1~80	Can map	Correlation model	Protection class
		unit	Pn		ALL	2
	This parameter represents the number of motor poles automatically obtained by the servo drive after the self-tuning operation of the servo motor. This parameter is automatically saved in the servo drive after the motor pole self-tuning process is completed until the motor pole self-tuning is performed again.					

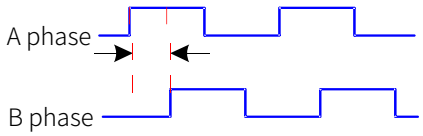
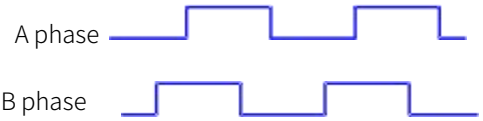
8.4 P20~P21 Encoder Parameter group

Sub index 3020h (P20)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode
	Encoder basic parameter	-	ARR	-	-	-
		Data range	-	Can map	Correlation model	Protection class
		unit	-	-	-	-
Sub index 01h (P20.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Encoder type	DINT32	RW	Run setting	re-energize	0
		Data range	0~6	Can map	Correlation model	Protection class
		unit	-	NO	ALL	0
	This parameter sets the communication protocol type of the encoder. When setting the motor parameters through the motor reading mode, set this parameter first and then power on again to obtain; 0: Tonomagawa encoder 1: ENDAT encoder 2: NIKON encoder 3: SICK encoder 4: Rotary encoder 5: ABZ encoder 6: Panasonic encoder					
Sub index 02h (P20.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Encoder single-turn resolution	DINT32	RW	Run setting	re-energize	17
		Data range	10~24	Can map	Correlation model	Protection class

		unit	-		ALL	0
Sub index 03h (P20.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Encoder multi-turn resolution	DINT32	RW	Run setting	re-energize	16
		Data range	0~99	Can map	Correlation model	Protection class
		unit	-		ALL	0
Sub index 04h (P20.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Number of ABZ encoder pulses	DINT32	RW	Run setting	re-energize	2500
		Data range	0~2097152	Can map	Correlation model	Protection class
		unit	ppr		ALL	1
	When the encoder is ABZ					
Sub index 05h (P20.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Frequency division pulse output number	DINT32	RW	Blackout setting	re-energize	2500
		Data range	0-32767	Can map	Correlation model	Protection class
		unit	ppr	-	-	1
	Set the number of output pulses of the pulse output terminal PAO or PBO after 1 turn of the motor rotation. After 4 frequency doubling, the pulse output resolution is: the pulse output resolution of the motor rotates 1 turn = (2005-12h) X4.					
Sub index 06h (P20.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Output pulse phase	DINT32	RW	Blackout setting	re-energize	0
		Data range	0-1	Can map	Correlation model	Protection class
		unit	-	-	ALL	1

Set the pulse output function when the motor rotation direction is unchanged, output A phase pulse and B phase pulse between

Phase relationship of:

Set value	Output pulse phase	Remark
0	A ahead of B	In the output pulse of the encoder, the A phase pulse is 90° ahead of the B phase pulse 
1	A lags B	In the output pulse of the encoder, the A phase pulse lags behind the B phase pulse by 90° 

Sub index 0X07 (P20.07)

name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Encoder position Angle	DINT32	RO	-	With immediate effect	24567
	Data range	0~33554432	Can map	Correlation model	Protection class
	unit	inc	NO	ALL	1

This parameter displays the encoder zero self-tuning obtained by five methods: "encoder micromotion zero correction", "encoder offset zero correction", "encoder write zero correction", "encoder offset zero correction 2" and "encoder write zero correction 2"

The position Angle of the motor encoder is not allowed to be modified by the user when the servo is used normally.

Sub index 0X08 (P20.08)

name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Number of Resolver poles	DINT32	RW	Run setting	Shutdown effect power on again	1
	Data range	1~10	Can map	Correlation model	Protection class
	unit	-		ALL	2

This parameter is used to set the number of poles of Resolver

Sub index 0X09 (P20.09)

name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Pulse output source selection	DINT32	RW	Stop setting	re-energize	0
	Data range	0-3	Can map	Correlation model	Protection class
	unit	-	-	-	1

Set pulse output port output source:

Set value	Output source	remark
0	Encoder frequency division output	When the motor rotates, the encoder feedback signal is according to the 2005-12h Set value after frequency division output. When the upper computer is used as closed-loop feedback, it is recommended to use the encoder frequency division output mode.
1	Pulse command synchronous output	When the position instruction is derived from the pulse instruction, the input pulse instruction is synchronized Output. When multi-axis servo pulse synchronous tracking, it is recommended to use pulse command synchronous output mode.
2	Fixed frequency output	Output at internal fixed frequency for testing frequency division function
3	Virtual encoder output	When the virtual axis of the upper computer is running, the frequency division output is divided according to the position of the virtual axis and the set value of 2005-12h.

Pulse output hardware terminals:

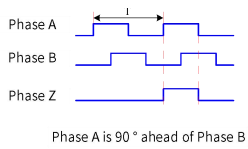
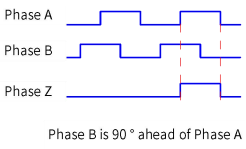
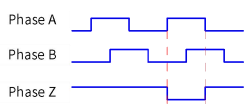
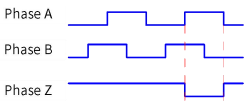
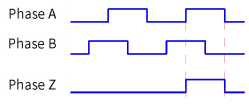
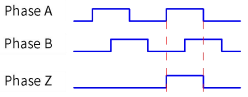
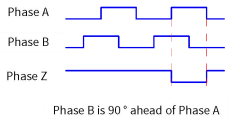
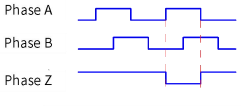
Signal name	Output type	Output port	Maximum pulse frequency
A-phase signal	Differential output	PAO+ PAO-	1Mpps
B-phase signal	Differential output	PBO+ PBO-	1Mpps
Z-phase signal	Differential output	PZO+ PZO-	1Mpps
	Open collector output	PZ-OUT GND	100kpps

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 the width of the A/B phase pulse signal.

The Z-phase signal output polarity is set by 2005-2Ah(Z-pulse output Polarity Selection).

Sub index 0X0A (P20.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Z-pulse output polarity selection	DINT32	RW	Stop setting	re-energize	1
		Data range	0-1	Can map	Correlation model	Protection class
		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)	Forward and pulse output diagram	Inversion and pulse output diagram
0	0		
	1		
1	0		
	1		

For applications where the Z signal frequency division output accuracy is required to be higher, it is recommended to use the effective change edge of the Z signal output:

Set value	Z-pulse output polarity selection	
0	Positive polarity (high level when Z-pulse is active)	The effective changing edge is the falling edge
1	Negative polarity (low level when Z-pulse is active)	The effective changing edge is the rising edge

Sub index 10h (P20.10)

name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Auxiliary encoder Settings	DINT32	RW	Stop setting	With immediate effect	0
	Data range	0-3	Can map	Correlation model	Protection class
	unit	-	-	ALL	1

Set the role of the pulse auxiliary encoder:

setting	Output source	remark
0	Turn off auxiliary encoder	The second encoder function is not used
1	Internal encoder feedback	Turn on the second encoder function to read the position feedback of the second encoder;
2	Auxiliary encoder feedback	Turn on the position full closed loop function

<table>
<tr><td rowspan="5">Sub index 0X11 (P20.11)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Auxiliary encoder type</td><td>DINT32</td><td>RW</td><td>Stop setting</td><td>With immediate effect</td><td>0</td></tr>
<tr><td>Data range</td><td>0-1</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>-</td><td>-</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Set the type of pulse auxiliary encoder:
<table><tr><th>setting</th><th>Output source</th><th>remark</th></tr><tr><td>0</td><td>ABZ encoder</td><td>5V differential pulse signal</td></tr><tr><td>1</td><td>SSI encoder</td><td>The auxiliary encoder type is SSI communication, and the protocol format is 24binE or 24bin. The 24binE format is recommended</td></tr></table></td></tr>
<tr><td rowspan="5">Sub index 0X12 (P20.12)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Auxiliary encoder Pulse number</td><td>DINT32</td><td>RW</td><td>Stop setting</td><td>With immediate effect</td><td>2500</td></tr>
<tr><td>Data range</td><td>0-2097152</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>ppr</td><td>-</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">The number of pulses generated by the auxiliary encoder after one turn of the motor.
Note: This pulse number is the number of pulses before the frequency doubling.</td></tr>
<tr><td rowspan="5">Sub index 0X13 (P20.13)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Auxiliary encoder direction</td><td colspan="2">DINT32</td><td>Stop setting</td><td>With immediate effect</td><td>0</td></tr>
<tr><td colspan="2">Data range</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td colspan="2">unit</td><td>-</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">Auxiliary encoder direction:
0: indicates the positive direction
1: Reverse direction</td></tr>
<tr><td rowspan="4">Sub index 3021h (P21)</td><td>name</td><td>Data type</td><td>Data structure</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Encoder parameter</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 map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Sub index 01h (P21.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The encoder is faulty. Procedure	DINT32	RW	Run setting	re-energize	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Set whether to enable the encoder's own alarm except "encoder connection error", do not need to save the motor after the servo power off Rotor absolute position					
	In the application of information, the encoder power supply battery can not be installed, and the encoder battery under voltage and encoder battery disconnection fault can be shielded by this parameter. 0: No 1: Yes					
Sub index 02h (P21.02)	Data type		Access attribute	Setting mode	Effective mode	Factory default
	Encoder maximum acceleration		RW	Run setting	Shutdown effect	200
			50~5000	Can map	Correlation model	Protection class
			inc	NO	ALL	2
	Set the maximum encoder acceleration deviation allowed between two encoder read cycles. In the case of poor grounding of the encoder or serious interference, static electricity, can avoid the speed or over current failure. This parameter is automatically set according to the resolution of the connected encoder and generally does not need to be set.					
Sub index 03h (P21.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Acceleration over differential enable	DINT32	RW	Run setting	With immediate effect	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	-	1
	This parameter is used to set whether the acceleration error alarm is enabled. 0: No 1: Yes					
Sub index 04h (P21.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Self-tuning current threshold	DINT32	RW	Run setting	With immediate effect	100
		Data range	10~300	Can map	Correlation model	Protection class

		unit	1%	NO	ALL	1
	This parameter is used to set the given current size in the case of self-tuning, which is the percentage of the rated current of the motor.					

8.5 P30~P31 Motor control parameter group

Sub index 3030h (P30)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Hold brake and motor Control parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 02h (P30.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Contracting brake Open delay	DINT32	RW	Run setting	With immediate effect	100
		Data range	1~1000	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	When the negative timing of the lock is used, it indicates the delay time from the output torque after the servo is enabled to the issuance of the motor lock coil opening instruction, the longer the time, the more obvious the effect of preventing falls, but generally not more than 500ms. This parameter should be adjusted according to the lock characteristics and load of the motor. If the lock timing is used, it indicates the delay time from the opening of the motor lock coil to the beginning of the motor output torque.					

Sub index 03h (P30.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Contracting brake Lock delay	DINT32	RW	Run setting	With immediate effect	100
		Data range	1~1000	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	When using the negative timing, it means the delay time from the motor issuing the locking coil locking command to the servo stopping output torque, the longer the time, the more obvious the effect of preventing falls, but generally not more than 500ms. If the lock timing is used, it means that the motor servo stops the output torque to the motor lock coil holding command delay time.					

Sub index 04h (P30.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Contracting brake Time sequence	DINT32	RW	Run setting	With immediate effect	1

		Data range	0~1	Can map	Correlation model	Protection class
		unit	-		ALL	1
	This parameter is used to set the sequence of servo output and lock action. 0: lock the brake Positive sequence 1Contracting brake Negative sequence					
Sub index 05h (P30.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Contracting brake Starting speed	UDINT32	RW	Run setting	With immediate effect	30
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rmp			1
	When the servo operation error occurs or receives the emergency stop command to enter the braking state, if the motor rotation speed is less than the setting Value, the servo drive will issue a lock lock command.					

Sub index 3031h (P31)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Motor control parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P31.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	1.5x overload time	DINT32	RW	Run setting	Shutdown effect	20000
		Data range	1~1000000	Can map	Correlation model	Protection class
		unit	ms		ALL	1
	This parameter is used to set the allowable running time of the motor under overload of 1.5 times the rated current. In order to better protect the motor from being damaged under overload conditions, this parameter needs to be set correctly according to the overload running curve of the motor.					

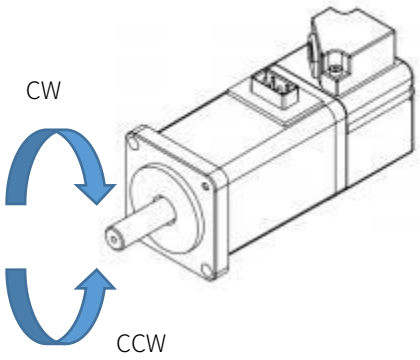
Sub index 02h (P31.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	2.5 times overload time	DINT32	RW	Run setting	Shutdown effect	5000
		Data range	1~50000	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	This parameter is used to set the allowable running time of the motor under overload of 2.5 times the rated current, for better protection of the motor in overload Condition is not damaged, the parameter needs to be set correctly according to the overload running curve of the motor.					

Sub index 03h (P31.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Maximum overload multiple of motor	DINT32	RW	Run setting	Shutdown effect	500
		Data range	300~500	Can map	Correlation model	rotection class
		unit	%	NO	ALL	1
	The maximum allowable current of the motor is a multiple of the rated current of the motor. In order to better protect the motor from being damaged under overload conditions, this parameter needs to be correctly set according to the overload running curve of the motor.					
Sub index 04h (P31.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Maximum overload current time	DINT32	RW	Run setting	Shutdown effect	10
		Data range	1~10000	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	The maximum motor current (parameter 0x3031:03) allows the maximum duration. In order to better protect the motor from being damaged under overload condition, this parameter needs to be set correctly according to the overload running curve of the motor.					
Sub index 08h (P31.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the phase missing detection configuration	DINT32	RW	Run setting	With immediate effect	1
		Data range	0~2	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	This parameter is used to enable the input phase missing detection function of the servo. This function will alarm and stop when it detects that the single-phase power input has degraded the current operating performance of the servo. 0: The detection is disabled. 1: Input single-phase detection; 2: Input three-phase test;					
Sub index 09h (P31.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The output phase missing detection was enabled	DINT32	RW	Run setting	With immediate effect	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	This parameter is used to enable the output phase missing detection function of the servo (reserved parameter).					

	0: No Disable the output phase out detection function of the servo, when the servo output breaks or misses, the servo will not report the output phase out fault, but may report other faults and stop. When the servo drive power is seriously mismatched with the servo motor power, the output phase missing false alarm may occur. In this case, the output phase missing detection function can be shielded by this parameter, but it is necessary to confirm that the servo system does not have the output phase missing problem, otherwise the servo performance may be affected. 1: Yes Enable the output phase missing detection function of the servo, which will alarm and stop when 1-3 phases are detected between the servo output and the motor are not reliably connected.

Sub index 0Ah (P31.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Phase loss protection current threshold	DINT32	RW	Run setting	With immediate effect	10
		Data range	5~100	Can map	Correlation model	Protection class
		unit	%		-	1
	This parameter is used to set the value of the phase-out protection current threshold, which is the percentage of the rated current of the motor.					

Sub index 0Bh (P31.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Motor rotation positive direction	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	2
	This parameter is used to set the positive direction of motor rotation: 0 means that from the axis side, the CCW direction is positive: when the forward command is positive, from the motor axis side, the motor rotation direction is CCW direction, that is, the motor rotates counterclockwise. 1 represents that from the axis side, the CW direction is positive: When the forward command is positive, from the motor axis side, the motor rotation direction is CW direction, that is, the motor rotates clockwise.					



Sub index 0Ch (P31.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Filter enable	DINT32	RW	Run setting	Shutdown effect	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-		ALL	1
	This parameter is used to enable the filter to enable servo: 0: All filters are disabled 1: All filters are enabled					

Sub index 0Dh (P31.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Carrier frequency	DINT32	RO	-	-	10000
		Data range	1000~20000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2
	This parameter displays the PWM carrier frequency and cannot be modified. The larger the carrier frequency, the faster the current transient response, but the larger the heating of the power module, the higher the heat loss. The smaller the carrier frequency, the smaller the power module heating, heat loss, but the current transient response slowed down.					

Sub index 0Eh (P31.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Modulation mode	DINT32	RW	Run setting	re-energize	0
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	2
	This parameter sets the PWM modulation mode: 0: bilateral modulation 1: unilateral modulation Bilateral modulation mode can expand the bandwidth of the current loop, mainly used to adjust the control performance of the current loop, generally do not adjust, according to Default value Settings.					

<table>
<tr><td rowspan="5">Sub index 10h (P31.10)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Brake resistance resistance value</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>Shutdown effect</td><td>80</td></tr>
<tr><td>Data range</td><td>0~10000</td><td>Can map</td><td>Correlation model</td><td>Protection class</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 resistance value connected to the servo. The servo will perform braking resistance overload protection according to the set value. If the braking resistance is not set (the value is 0), the braking resistance overload protection is not implemented.
N3 driver built-in resistance is as follows:
<table><tr><td>V1 specification driver</td><td>None</td></tr><tr><td>V2 specification driver</td><td>40W 80Ω</td></tr></table>
If you need to use an external brake resistor, disconnect the short-circuit terminals D and P3 of CN6 and connect the two ends of the brake resistor to each other C, P3.
When the built-in brake resistance is used for the selected model, the brake resistance parameters are automatically matched. For example, the external brake resistance must be configured according to the actual value.</td></tr>
<tr><td rowspan="5">Sub index 11h (P31.11)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Brake resistance power</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>Shutdown effect</td><td>40</td></tr>
<tr><td>Data range</td><td>0~10000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>W</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the brake resistance power connected to the servo. The servo will implement brake resistance overload protection according to the set value. If the braking resistance is not set (the value is 0), no brake resistance overload protection will be implemented.</td></tr>
</table>

8.6 P40 Current ring Parameter Group

Sub index 3040h (P40)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Current loop parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P40.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Electric current Kp	DINT32	RW	Run setting	Shutdown effect	54
		Data range	0~9999	Can map	Correlation model	Protection class
		unit	0.01		ALL	2
	P40.01, P40.02, P40.03 three parameters are mainly used to adjust the PID of the current ring, generally do not adjust, according to the default setting. The larger the Kp, the faster the response, but too large is easy to produce oscillation, Kp can not completely eliminate the deviation, eliminate the residual deviation can use Ti; The smaller Ti is, the faster the servo responds to the deviation change, but too small is easy to produce oscillation; If the system has frequent feedback with a jump, then Kd is needed, and Kd can quickly respond to the system feedback with a given deviation change. The larger the Kd, the faster the response, but too large is easy to cause oscillation.					

Sub index 02h (P40.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Electric current Ti	DINT32	RW	Run setting	Shutdown effect	1000
		Data range	1~99999	Can map	Correlation model	Protection class
		unit	0.1ms	NO	ALL	2
	Set the value of the current loop integration time.					

Sub index 03h (P40.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Electric current Kd	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~9999	Can map	Correlation model	Protection class
		unit	0.1	NO	ALL	2
	Sets the value of the differential constant of the current loop.					

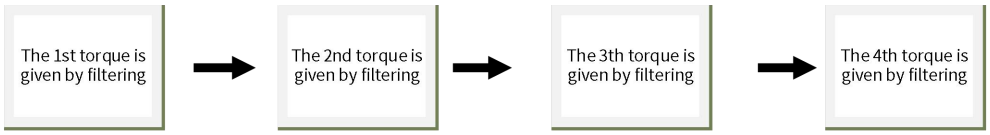
Sub index 04h (P40.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Dead space time	DINT32	RW	Run setting	Re-energize	4000
		Data range	2000~20000	Can map	Correlation	Protection

					model	class
		unit	ns	NO	ALL	2
	This parameter is used to set the dead zone time. The value is the default value.					
Sub index 05h (P40.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Dead space Compensation coefficient	UDINT32	RW	Run setting	Shutdown effect	500
		Data range	0~200	Can map	Correlation model	Protection class
		unit	%		ALL	2
	The two parameters 3040h:05h and 3040h:06h mainly affect the compensation effect of dead zone compensation in current control. Increasing the dead-time compensation coefficient is helpful to reduce the torque ripple in the high-speed section of the motor. The dead-time compensation threshold mainly affects the sinusoidal degree when the current crossing the zero point. These two parameters are mainly used for the current loop control performance adjustment, generally not adjusted, and set according to the default value.					
Sub index 06h (P40.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Dead space Compensation threshold	UDINT32	RW	Run setting	Shutdown effect	100
		Data range	0~100	Can map	Correlation model	Protection class
		unit	%		ALL	2
	The two parameters 3040h:05h and 3040h:06h mainly affect the compensation effect of dead zone compensation in current control. Increasing the dead-time compensation coefficient is helpful to reduce the torque ripple in the high-speed section of the motor. The dead-time compensation threshold mainly affects the sinusoidal degree when the current crossing the zero point. These two parameters are mainly used for the current loop control performance adjustment, generally not adjusted, and set according to the default value.					
Sub index 07h (P40.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Weak magnetic field Controls Kp	DINT32	RW	Run setting	Shutdown effect	100
		Data range	1~9999	Can map	Correlation model	Protection class
		unit	0.01AS	NO	P/T	2
	This parameter is used to set the control parameters of the weak magnetic control and the proportional coefficient of the current loop. Generally, it is not modified.					
Sub index 08h (P40.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Weak magnetic field Controls Ti	DINT32	RW	Run setting	Shutdown effect	150
		Data range	1~99999	Can map	Correlation model	Protection class

		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 attribute	Setting mode	Effective mode	Factory default
	Torque is set to an upper limit	DINT32	RW	Run setting	Shutdown effect	300
		Data range	0~1000	Can map	Correlation model	Protection class
		unit	1% rated torque	NO	P/S	1
	This parameter refers to the maximum forward torque allowed by the servo drive motor as a percentage of the amount of torque used for the current given limiting of the output of the speed loop. If this parameter exceeds the drive capability of the inverter module of the current driver model, it is automatically set to the maximum value.					
Sub index 0Ah (P40.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque set lower limit	DINT32	RW	Run setting	Shutdown effect	-300
		Data range	-1000~0	Can map	Correlation model	Protection class
		unit	1% rated torque	NO	P/S	1
	This parameter refers to the percentage of the maximum reverse torque allowed by the servo drive motor to the quota torque used for the current given limiting of the output of the speed loop. If this parameter exceeds the drive capability of the inverter module of the current driver model, it is automatically set to the maximum value.					
Sub index 0Dh (P40.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque acceleration limit	DINT32	RW	Run setting	With immediate effect	50
		Data range	5~1000	Can map	Correlation model	Protection class
		unit	1% rated torque	NO	ALL	2
	The torque acceleration limit refers to the incremental limiting value of two adjacent torque given instructions, set as a percentage of the motor's allowable torque. This parameter affects the response speed and anti-jamming ability of the servo. Increasing the setpoint will speed up the servo response and reduce the servo anti-jamming ability. Reducing the setpoint will slow down the servo response and improve the servo anti-jamming ability. This parameter is not adjusted. The default value is used.					
Sub index 0Eh (P40.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque control speed limiting	DINT32	RW	Run setting	With immediate effect	1200
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rpm	NO	T	2

	This parameter is used in torque control mode for speed limiting when the external load is less than the given torque and the motor continues to accelerate Be worth. This parameter takes effect when the controller is not in control mode. When the controller is in control mode, the speed limit is set by 0x6081

8.7 P41~P42 Current loop filter parameter set

<table>
<tr><td rowspan="5">Sub index 3041h (P41)</td><td>name</td><td>Data type</td><td>Data structure</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Torque given 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 map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="7">To enable a filter function of the current loop, first set the filter enable (3031-0Ch) to 1;
If 3031-0Ch is 0, even if 3041h to 3042h is configured, the filter is not effective in the current loop control.
The N3 series servo drivers are equipped with filter functions in torque setting and torque feedback parts respectively. Each filtering link is formed by 4 separate filter modules in series, taking the torque as an example, the torque given large link is formed by the current given filter 1, 2, 3, 4, etc., 4 separate filter modules in series, as shown in the figure.
Each link is composed of four filter modules in series
 
Each filter module has 4 control parameters, described in terms of current set filter 1 (current set filter 2, 3, 4 will not be described again)</td></tr>
<tr><td rowspan="5">Sub index 01h (P41.01)</td><td>name</td><td>Data type</td><td colspan="2">Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">The first torque is given to the filter type</td><td>DINT32</td><td colspan="2">RW</td><td>Run setting</td><td>Shutdown effect</td><td>0</td></tr>
<tr><td>Data range</td><td colspan="2">0~4</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">-</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="7">The first torque set filter represents the torque set filter module 1, this parameter is used to select the type of the first torque set 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="2">Sub index 02h (P41.02)</td><td>name</td><td>Data type</td><td colspan="2">Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td>Torque set cutoff frequency 1</td><td>DINT32</td><td colspan="2">RW</td><td>Run setting</td><td>Shutdown effect</td><td>3500</td></tr>
</table>

		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
	The torque given cutoff frequency 1 represents the low-pass cutoff frequency of the first torque given filter (this parameter is meaningful only when the first torque given filter type is selected as 1 or 2 or 3; When the filter type of the first torque is selected as 0 or 4, the value of this parameter is meaningless.) The low-pass filter is used to filter out high-frequency clutter. When the frequency of the input signal is higher than the low-pass cutoff frequency, the amplitude of the output signal of the filter will be greatly attenuated; For a fixed frequency input signal, the lower the cut-off frequency of the filter, the greater the phase delay to the signal. The default current loop filter low-pass cutoff frequency is 3500Hz. When the three-loop performance is adjusted through rigidity, the system will calculate the default torque given cutoff frequency 1, but the filter type 3041h:01h is still not used. If the torque given clutter frequency is significantly higher than the given value observed by an oscilloscope, it can be configured as a first-order low-pass filter.					
Sub index 03h (P41.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque set notch frequency 1	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
	When the torque given filter type 1 is configured as a notch filter (4), this parameter is used to set the notch center frequency of the first torque given filter. The parameter 3041h:04h torque given notch filter Notch depth is used to set the notch depth of the current given filter module 1 (when the current given filter type is 0, 1, 2, 3, the values of these two parameters are meaningless). Notch filter, also known as band-stop filter, is a filter that can pass most frequency components, but attenuates some frequency components to very low levels. The notch filter has a very strong attenuation effect on the signal near the center frequency, and has little effect on the signal far away from the center frequency. The greater the depth of the notch, the stronger the attenuation effect on the central frequency point. In general, the notch filter is enabled only after the motor vibrates and the vibration frequency is detected, and the detailed configuration method is detailed in "Filter Use".					
Sub index 04h (P41.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque given notch depth 1	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	1
	Set the value of the first torque for the given filter notch depth.					
Sub index 05h (P41.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The second torque is given to the filter	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation	Protection

					model	class
		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 attribute	Setting mode	Effective mode	Factory default
	Torque set cutoff frequency 2	UDINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
Sub index 07h (P41.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque set notch frequency 2	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
Sub index 08h (P41.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque given notch depth 2	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	1
Sub index 09h (P41.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The third torque is given for the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-	NO	ALL	2
	0: No filter is used 1: first-order low-pass filter 4: notch filter					

Sub index 0Ah (P41.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque given cutoff frequency 3	DINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2

Sub index 0Bh (P41.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque set notch frequency 3	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2

Sub index 0Ch (P41.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque given notch depth 3	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	2

Sub index 0Dh (P41.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The fourth torque is given for the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Torque set cutoff frequency 4	DINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2

Sub index 0Fh (P41.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque set notch frequency 4	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2

Sub index 10h (P41.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque given notch depth 4	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	2

Sub index 3042h (P42)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default	name
	Torque feedback filter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P42.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 1st torque feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Torque feedback cutoff frequency 1	DINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1

Sub index 03h (P42.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch frequency 1	DINT32	RW	Run setting	Shutdown effect	100

		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
Sub index 04h (P42.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch depth 1	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	1
Sub index 05h (P42.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Type 2 torque feedback filter	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Torque feedback cutoff frequency 2	UDINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	1
Sub index 07h (P42.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch frequency 2	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz		ALL	1
Sub index 08h (P42.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch depth 2	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation	Protection

					model	class
		unit	db		ALL	1

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 09h (P42.09)	The third torque feedback Filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-	NO	ALL	2
	0: No filter is used 1: first-order low-pass filter 4: notch filter					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 0Ah (P42.0A)	Torque feedback Cutoff frequency 3	DINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 0Bh (P42.0B)	Torque feedback notch frequency 3	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz		ALL	2

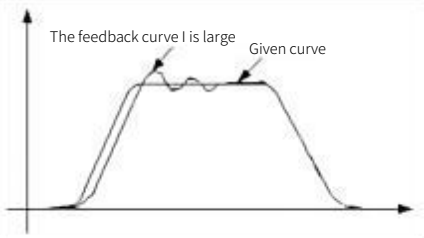
	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 0Ch (P42.0C)	Torque feedback notch depth 3	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db		ALL	2

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 0Dh (P42.0D)	The 4th torque feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Torque feedback cutoff frequency 4	DINT32	RW	Run setting	Shutdown effect	3500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2
Sub index 0Fh (P42.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch frequency 4	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	ALL	2
Sub index 10h (P42.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feedback notch depth 4	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	ALL	2

8.8 P50 Speed loop parameter group

Sub index 3050h (P50)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	speed loop parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
Sub index 01h (P50.01)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Speed loop gain 1	DINT32	RW		Run setting	Shutdown effect	270
		Data range	1~5000		Can map	Correlation model	Protection class
		unit	0.1Hz		NO	P/S	1

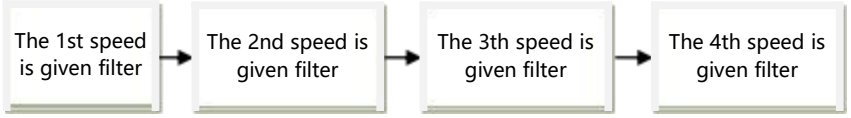
	Set the proportional gain of the speed ring. This parameter determines the response of the speed ring. The larger the response of the speed ring, the faster the response of the speed ring. In position mode, to increase the gain of position loop, it is necessary to increase the gain of speed loop at the same time.					
Sub index 02h (P50.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed loop integration time 1	DINT32	RW	Run setting	Shutdown effect	400
		Data range	1~3700	Can map	orrelation model	Protection class
		unit	0.1ms	NO	P/S/HM	1
	Set the integral time constant of the speed loop. The smaller the value set, the stronger the integration effect, and the faster the deviation value at stop approaches 0. When the Ti setting value is small, the system response is fast, but the oscillation phenomenon may occur if it is too small. When the Ti setting value is large, the system response is slow. If set to 9999.9, the integral is invalid (Kp alone control). The influence of the integral time constant Ti on speed tracking is shown in the figure:  					
Sub index 03h (P50.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed loop Kd1	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0-120	Can map	Correlation model	Protection class
		unit	-	NO	P/S/HM	1
	Differential time Kd: Generally not adjusted, according to the default Settings, this parameter can quickly respond to system feedback with a given deviation change. The larger the Kd value, the faster the response, but too large is easy to cause oscillation. When set to 0, differentiation is invalid.					
Sub index 04h (P50.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed loop gain 2	DINT32	RW	Run setting	Shutdown effect	270
		Data range	1~5000	Can map	Correlation model	Protection class
		unit	0.1Hz	NO	P/S	1
	Second speed loop gain.					
Sub index 05h (P50.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed loop	UDINT32	RW	Run setting	Shutdown	210

	integration time 2				effect	
		Data range	1~3700	Can map	Correlation model	Protection class
		unit	ms	NO	P/S	1
	The second speed loop integral time constant.					
Sub index 06h (P50.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed loop Kd2	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~120	Can map	Correlation model	Protection class
		unit	-		P/S	1
	The second speed loop differential time coefficient.					
Sub index 10h (P50.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque feed forward control selection	DINT32	RW	Run setting	Shutdown effect	2
		Data range	0~2	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	0: no torque feedforward 1: Internal torque feedforward 2:60B2h torque feedforward Currently, only two options are supported.					
Sub index 11h (P50.11)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Speed control period	DINT32	RW	Run setting	Shutdown effect	4
		Data range	2~40	Can map	Correlation model	Protection class
		unit	-	NO	P/S	2
	Set the ratio of the speed control period to the current control period. This parameter is mainly used to adjust the control period of the speed ring. speed loop period =(P50.11*1000000)/(P31.0D*(2 - P31.0E)) microseconds. When using bus control, the communication period of the master station 3001h:03h needs to be an integer multiple of the speed loop period.					
Sub index 12h (P50.12)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Set speed limit	DINT32	RW	Run setting	With immediate effect	200
		Data range	0~1000	Can map	Correlation model	Protection class
		unit	1% rated speed	NO	P/S	2

	This parameter is used to set the maximum limit of the given speed value to the percentage of the rated motor speed, 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 attribute	Setting mode	Effective mode	Factory default
	Speed setting lower limit	DINT32	RW	Run setting	With immediate effect	-200
		Data range	-1000~0	Can map	Correlation model	Protection class
		unit	1% rated speed	NO	P/S	2
	This parameter is used to set the lower limit of the speed given value to the percentage of the rated speed of the motor, in the position control 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 attribute	Setting mode	Effective mode	Factory default
	Speed tracking error threshold	DINT32	RW	Run setting	With immediate effect	500
		Data range	0~1000	Can map	Correlation model	Protection class
		unit	0.1% rated speed	NO	ALL	1
	This parameter is used to set the threshold for the speed tracking error, with the base value being the current speed given. When the difference between speed set and speed feedback reaches or exceeds the set threshold of this parameter and the duration exceeds 0x3050:15 set filtering time (such as flying car), the servo drive will stop and report fault.					
Sub index 15h (P50.15)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Tracking error filtering time	DINT32	RW	Run setting	With immediate effect	500
		Data range	0~2000	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	This parameter is used to set the filtering time for speed tracking error protection. Generally, the filtering time is not adjusted.					
Sub index 16h (P50.16)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Stall threshold	DINT32	RW	Run setting	With immediate effect	1000
		Data range	0~2000	Can map	Correlation model	Protection class
		unit	0.1% rated speed	NO	ALL	1

<table>
<tr><td></td><td colspan="6">This parameter is used to set the stall protection threshold. The base value is the current speed given. When the difference between speed set and speed feedback reaches or exceeds the threshold set by this parameter and the duration exceeds 0X3050:17 set filtering time (such as flying car), the servo drive will stop and report fault.</td></tr>
<tr><td rowspan="5">Sub index 17h (P50.17)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Stall filtering time</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>With immediate effect</td><td>100</td></tr>
<tr><td>Data range</td><td>0~2000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the filtering time of stall protection. Generally, the filtering time is not adjusted and the default value is used.</td></tr>
<tr><td rowspan="5">Sub index 18h (P50.18)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Stall protection is enabled</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>With immediate effect</td><td>1</td></tr>
<tr><td>Data range</td><td>0~1</td><td>Can map</td><td>Correlation model</td><td>Protection class</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 detect the stall protection fault.
0: No
1: Yes</td></tr>
<tr><td rowspan="5">Sub index 19h (P50.19)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Overspeed filtering time</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>With immediate effect</td><td>100</td></tr>
<tr><td>Data range</td><td>0~2000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">This parameter is used to set the filtering time for overspeed protection. Generally, the value is the default value.</td></tr>
</table>

8.9 P51~P52 speed loop filter parameter group

<table>
<tr><td rowspan="5">Sub index 3051h (P51)</td><td>name</td><td>Data type</td><td>Data structure</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">speed setting filter</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 map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="7">To enable a filter function of the speed ring, first set the filter enable (3031-0Ch) to 1; If (3031-0Ch) is 0, it will not have the actual filtering effect even if the related filters of 0x3051 and 0x3052 speed rings are configured.
The speed loop of the servo system has a total of two major links configured with filter functions, which are speed setting filter and speed feedback filter, and the functions of the filters are consistent, and they are put together to explain. Each of the major links is formed by 4 separate filter modules in series, with the speed given as an example, the speed given the major link is formed by the speed given filter 1, 2, 3, 4 and other 4 separate filter modules in series, as shown in the figure:
(Each major link is composed of four filter modules in series)
 
Each filter module has four control parameters, described in terms of the first speed given filter (the second, third, and fourth speed given filters are not described separately).</td></tr>
<tr><td rowspan="5">Sub index 01h (P51.01)</td><td>name</td><td>Data type</td><td colspan="2">Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">The first speed is given by the filter type</td><td>DINT32</td><td colspan="2">RW</td><td>Run setting</td><td>Shutdown effect</td><td>0</td></tr>
<tr><td>Data range</td><td colspan="2">0~4</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">-</td><td>NO</td><td>P/HM</td><td>1</td></tr>
<tr><td colspan="7">By default the speed given filter is not turned on:
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 02h (P51.02)</td><td>name</td><td>Data type</td><td colspan="2">Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Speed given cutoff frequency 1</td><td>DINT32</td><td colspan="2">RW</td><td>Run setting</td><td>Shutdown effect</td><td>2500</td></tr>
<tr><td>Data range</td><td colspan="2">200~5000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td colspan="2">Hz</td><td>NO</td><td>P/HM</td><td>1</td></tr>
<tr><td colspan="7">This parameter is used to set the low-pass cutoff frequency of the speed given filter module 1 (this parameter is meaningful only when the 3051h:01h parameter is set to 1 or 2 or 3; When the 3051h:01h</td></tr>
</table>

<table>
<tr><td></td><td>parameter is set to 0 or 4, the value of this parameter is meaningless).
Low-pass filter is used to filter out high-frequency clutter. When the frequency of the input signal is higher than the low-pass cutoff frequency, the amplitude of the output signal will be greatly attenuated. For a fixed frequency input signal, the lower the cut-off frequency of the filter, the greater the phase delay to the signal. The default low-pass cutoff frequency for speed loop filters is 2500Hz.</td></tr>
<tr><td rowspan="5">Sub index 03h (P51.03)</td><td>
<table>
<tr><th>name</th><th>Data type</th><th>Access attribute</th><th>Setting mode</th><th>Effective mode</th><th>Factory default</th></tr>
<tr><td rowspan="3">speed given notch frequency 1</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>Shutdown effect</td><td>100</td></tr>
<tr><td>Data range</td><td>3~5000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>Hz</td><td>NO</td><td>P/HM</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>The speed given notch frequency 1 is used to set the notch center frequency of the first speed given filter, and the speed given notch depth 1 is used to set the notch depth of the first speed given filter (when 3051h:01h is selected as 4, these two parameters are meaningful; When 3051h:01h is selected as 0, 1, 2, or 3, the values of these two parameters are meaningless.
Notch filter, also known as band-stop filter, is a filter that can pass most frequency components, but attenuates some frequency components to very low levels. The notch filter has a very strong attenuation effect on the signal near the center frequency, and has little effect on the signal far away from the center frequency. The greater the depth of the notch, the stronger the attenuation effect on the central frequency point.
In general, the notch filter is enabled only after the motor vibrates and the vibration frequency is detected.</td></tr>
<tr><td rowspan="3">Sub index 04h (P51.04)</td><td>
<table>
<tr><th>name</th><th>Data type</th><th>Access attribute</th><th>Setting mode</th><th>Effective mode</th><th>Factory default</th></tr>
<tr><td rowspan="3">speed given notch depth 1</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>Shutdown effect</td><td>5</td></tr>
<tr><td>ata range</td><td>3~50</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>db</td><td>NO</td><td>P/HM</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>As described in 3051h:04h, it is used to set the notch depth of the first speed given notch filter, the greater the notch depth, the stronger the attenuation effect on the central frequency point.</td></tr>
<tr><td rowspan="3">Sub index 05h (P51.05)</td><td>
<table>
<tr><th>name</th><th>Data type</th><th>Access attribute</th><th>Setting mode</th><th>Effective mode</th><th>Factory default</th></tr>
<tr><td rowspan="3">The second speed is given by the filter type</td><td>UDINT32</td><td>RW</td><td>Run setting</td><td>Shutdown effect</td><td>0</td></tr>
<tr><td>Data range</td><td>0~4</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>-</td><td>NO</td><td>P/HM</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>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>
</table>

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 06h (P51.06)	Speed given cutoff frequency 2	UDINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 07h (P51.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch frequency 2	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 08h (P51.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch depth 2	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	1
Sub index 09h (P51.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The third speed is given by the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 low pass 4: notch filter					
Sub index 0Ah (P51.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Speed given cutoff frequency 3	DINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2

Sub index 0Bh (P51.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch frequency 3	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2

Sub index 0Ch (P51.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch depth 3	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	2

Sub index 0Dh (P51.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The fourth speed is given by the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 low pass 4: notch filter					

Sub index 0Eh (P51.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Speed given cutoff frequency 4	DINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2

Sub index 0Fh (P51.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch frequency 4	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2

Sub index 10h (P51.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed given notch depth 4	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	2

index 3052h (P52)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback filter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
	This set of parameters is used to set the speed feedback filter, which is mainly used to eliminate the clutter caused by high frequency harmonics and mechanical vibration in the speed feedback, and ensure the operation of the system						

Sub index 01h (P52.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback filter class 1	DINT32	RW	Run setting	Shutdown effect	1
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-	NO	P/S/HM	1
	By default, the first speed 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					

Sub index 02h (P52.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 1 Cut-off frequency	DINT32	RW	Run setting	Shutdown effect	1000
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	1
	By default, the first speed feedback filter is a first-order low-pass filter, and the cutoff frequency is 1000hz; The smaller the setting, the smaller the speed feedback fluctuation, but the larger the feedback delay. The cut-off frequency is 5000Hz without filtering effect.					

Sub index 03h (P52.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 1 notch	DINT32	RW	Run setting	Shutdown	100

	frequency				effect	
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S/HM	1
Sub index 04h (P52.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 1 Notch depth	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/S	1
Sub index 05h (P52.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Type 2 speed feedback filter	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 pas 4: notch filter					
Sub index 06h (P52.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 2 Cut-off frequency	UDINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	1
sub index 07h (P52.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 2 notch frequency	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	1
Sub index 08h (P52.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 2 notch	DINT32	RW	Run setting	Shutdown	5

	depth				effect	
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/S	1
Sub index 09h (P52.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 3rd speed feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Speed feedback 3 Cut-off frequency	DINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	2
Sub index 0Bh (P52.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 3 notch frequency	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	-	P/S	2
Sub index 0Ch (P52.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 3 notch depth	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/S	2
Sub index 0Dh (P52.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 4th speed feedback	DINT32	RW	Run setting	Shutdown	0

	filter type				effect	
		Data range	0~4	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Speed feedback 4 Cut-off frequency	DINT32	RW	Run setting	Shutdown effect	2500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	2
Sub index 0Eh (P52.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 4 notch frequency	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/S	2
Sub index 10h (P52.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback 4 trap depth	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/S	2
Sub index 11h (P52.11)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feedback average filtering option	DINT32	RW	Stop setting	With immediate effect	0
		Data range	0-4	Can map	Correlation model	clasee
		unit	-	-	ALL	1

Set value	Output source	remark
0	Disable average filtering	
1	2 times average filtering	
2	4 times average filtering	
3	8 times average filtering	
4	16 times average filtering	

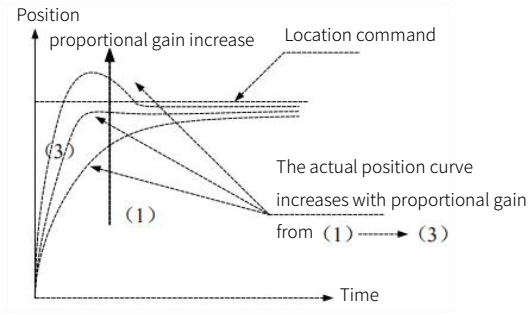
8.10 P60 Position ring parameter group

Sub index 3060h (P60)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Position control parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

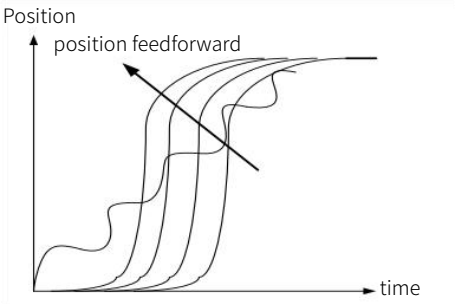
Sub index 01h (P60.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position loop gain	DINT32	RW	Run setting	Shutdown effect	1500
		Data range	0~10000	Can map	Correlation model	Protection class
		unit	0.1Hz	NO	P/HM	1

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

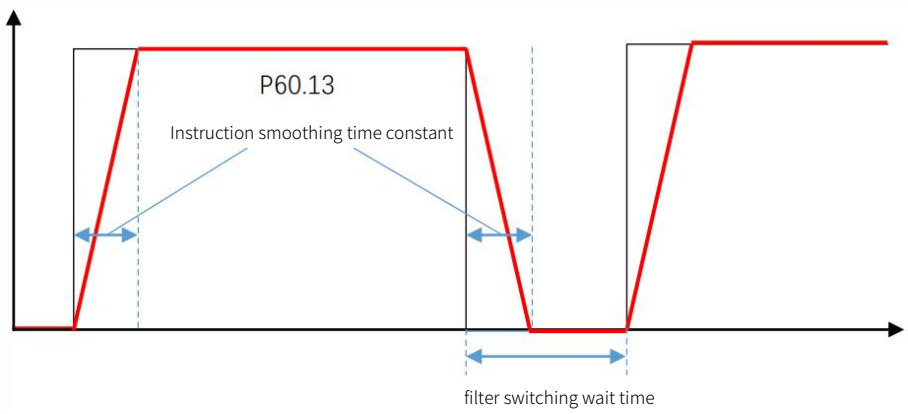
When the position control gain value increases, the position response can be improved and the position control error amount can be reduced. However, if the setting is too large, it is easy to produce vibration and noise. The effect of proportional gain is shown in the figure:



Sub index 02h (P60.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feed forward coefficient	DINT32	RW	Run setting	Shutdown effect	500
		Data range	0~10000	Can map	Correlation model	Protection class

		unit	0.1% position ring given value	NO	P/HM	1
	Set the value of the position feed forward factor, the percentage of speed, usually set not to exceed 100%. In position control mode, increasing the feedforward value can improve the position following error. The reduction of feedforward value can reduce the running vibration of the mechanism. When the proportional gain is too large, the motor rotor will oscillate, and reduce the proportional gain until the motor rotor no longer oscillates. When the external torque increases, too low proportional gain can not meet the reasonable position tracking error requirements. In this case, the feed forward gain can effectively reduce the dynamic position tracking error. The effect of feed forward gain is shown in the figure:  					
Sub index 03h (P60.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	speed feed forward filtering time	DINT32	RW	Run setting	Run setting	50
		Data range	0-64	Can map	Correlation model	Protection class
		unit	ms	-	PP/HM/CSP	
	Sets the filtering time constant for speed feed forward					
Sub index 04h (P60.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position loop gain 2	DINT32	RW	Run setting	Run setting	640
		Data range	0-1000	Can map	Correlation model	Protection class
		unit	Hz	-	PP/HM/CSP	
	Set the position loop, the second gain of the speed loop. 2008-04h, 2008-05h, 2008-06h, and 2008-07h (the second torque instruction filtering time constant) are called the second gain.					
Sub index 0Bh (P60.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position tracking error detection enabled	DINT32	RW	Run setting	Run setting	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	P/HM	1
	This parameter is used to set whether to perform position tracking error fault detection: 0: disables fault detection of position tracking error 1: Enables fault detection of position tracking error					

Sub index 0Ch (P60.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position tracking error threshold	DINT32	RW	Run setting	Run setting	393216
		Data range	0~16777216	Can map	Correlation model	Protection class
		unit	inc		P/HM	1
	This parameter sets the threshold for the position tracking error in the position control loop, and the base value is the encoder single-turn resolution. When the difference between the position setting and the position feedback reaches or exceeds the threshold (for example, the car, motor shaft stuck), the servo drive will stop and report a fault.					
Sub index 0Dh (P60.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Set the soft limit function	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	0: The soft limit function is disabled.					
Sub index 0Eh (P60.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The soft limit indicates the maximum value	UDINT32	RW	Run setting	Run setting	2147483647
		Data range	0~2147483647	Can map	Correlation model	Protection class
		unit	inc	NO	ALL	1
	Maximum software absolute location limit.					
Sub index 0Fh (P60.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Minimum soft limit	DINT32	RW	Run setting	Run setting	-2147483647
		Data range	-2147483647~0	Can map	Correlation model	Protection class
		unit	inc	NO	ALL	1
	Minimum software absolute location limit.					
Sub index 10h (P60.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Command exception detection was enabled	UDINT32	RW	Run setting	Run setting	1
		Data range	0~1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Used to detect whether the given control command data is abnormal. When the acceleration speed corresponding to the two adjacent given control commands is greater than the acceleration indicated by the 0x3060:11 (P60.11) parameter, the given command is judged to be abnormal and the servo					

<table>
<tr><td></td><td colspan="6">alarm is given. Excessive command acceleration or abnormal command may cause motor overload or speed. In order to prevent equipment damage, it is recommended to turn on this function.</td></tr>
<tr><td rowspan="5">Sub index 11h (P60.11)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Instruction detects acceleration time</td><td>UDINT32</td><td>RW</td><td>Run setting</td><td>Run setting</td><td>2000</td></tr>
<tr><td>Data range</td><td>200~100000</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>μ s</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">During the command anomaly detection process, the maximum acceleration required for the motor speed to accelerate from zero speed to the rated speed in this time according to the ladder plan is calculated. When the acceleration speed corresponding to two adjacent given control instructions is greater than the acceleration indicated by this parameter, the given instruction is judged to be abnormal and the servo alarm is given.</td></tr>
<tr><td rowspan="5">Sub index 13h (P60.13)</td><td>name</td><td>Data type</td><td>Access attribute</td><td>Setting mode</td><td>Effective mode</td><td>Factory default</td></tr>
<tr><td rowspan="3">Instruction smoothing time constant</td><td>UDINT32</td><td>RW</td><td>Run setting</td><td>Run setting</td><td>80</td></tr>
<tr><td>Data range</td><td>0~500</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>0.1ms</td><td>NO</td><td>ALL</td><td>1</td></tr>
<tr><td colspan="6">The speed feed forward jitter caused by the position instruction fluctuation can be effectively suppressed and the torque fluctuation given by the position instruction can be avoided.
 
</td></tr>
</table>

8.11 P61~P62 Position loop filter parameter set

Sub index 3061h (P61)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Position loop set filtering (not supported yet)	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P61.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position 1 gives the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-	NO	P/HM	1
	0: No filter is used 1: indicates 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 attribute	Setting mode	Effective mode	Factory default
	Position given cutoff frequency 1	DINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1

Sub index 03h (P61.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch frequency 1	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~500	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1

Sub index 04h (P61.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch depth 1	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	1

Sub index 05h (P61.05)	name	Data type	Access attribute	Setting mode	ffective mode	Factory default
	Position 2 gives the filter type	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-	NO	P/HM	1
	0: No filter is used 1: indicates first-order low-pass filtering 2: second-order low-pass filtering 3: Second order with zero low pass 4: notch filter					
Sub index 06h (P61.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position given cutoff frequency 2	UDINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 07h (P61.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch frequency 2	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz		P/HM	1
Sub index 08h (P61.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch depth 2	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db		P/HM	1
Sub index 09h (P61.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position 3 gives the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-		P/HM	2

	0: No filter is used 1: indicates first-order low-pass filtering 2: second-order low-pass filtering 3: Second order with zero low pass 4: notch filter

Sub index 0Ah (P61.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position given cutoff frequency 3	DINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	orrelation model	Protection class
		unit	Hz		P/HM	2

Sub index 0Bh (P61.0B)	name	Data type	Acces s attribute	Setting mode	Effective mode	Factory default
	Position set notch frequency 3	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz		P/HM	2

Sub index 0Ch (P61.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch depth 3	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db		P/HM	2

Sub index 0Dh (P61.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position 3 gives the filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		unit	-		P/HM	2
	0: No filter is used 1: indicates 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 attribute	Setting mode	Effective mode	Factory default
	Position given cutoff	DINT32	RW	Run setting	Shutdown	1500

	frequency 4				effect	
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz		P/HM	2
Sub index 0Fh (P61.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch frequency 4	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz		P/HM	2
Sub index 10h (P61.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position set notch depth 4	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	2

Index 3062h P62)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback filtering (not supported yet)	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P62.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	1st position feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 02h (P62.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback cutoff frequency 1	DINT32	RW	Run setting	Shutdown effect	1500

		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 03h (P62.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch frequency 1	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 04h (P62.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch depth 1	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	1
Sub index 05h (P62.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Type 2 position feedback filter	UDINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 (P62.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback cutoff frequency 2	UDINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 07h (P62.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch frequency 2	DINT32	RW	Run setting	Shutdown effect	100

		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	1
Sub index 08h (P62.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch depth 2	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	1
Sub index 09h (P62.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 3rd position feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 low pass 4: notch filter					
Sub index 0Ah (P62.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback cutoff frequency 3	DINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2
Sub index 0Bh (P62.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch frequency 3	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2
Sub index 0Ch (P62.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch depth 3	DINT32	RW	Run setting	Shutdown effect	5

		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	2
Sub index 0Dh (P62.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 4th position feedback filter type	DINT32	RW	Run setting	Shutdown effect	0
		Data range	0~4	Can map	Correlation model	Protection class
		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 low pass 4: notch filter					
Sub index 0Eh (P62.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback cutoff frequency 4	DINT32	RW	Run setting	Shutdown effect	1500
		Data range	200~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2
Sub index 0Fh (P62.0F)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch frequency 4	DINT32	RW	Run setting	Shutdown effect	100
		Data range	3~5000	Can map	Correlation model	Protection class
		unit	Hz	NO	P/HM	2
Sub index 10h (P62.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position feedback notch depth 4	DINT32	RW	Run setting	Shutdown effect	5
		Data range	3~50	Can map	Correlation model	Protection class
		unit	db	NO	P/HM	2

8.12 P63 Set parameters of inertia and rigidity

Sub index 3063h (P63)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Inertia and rigidity setting	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P63.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Ratio of inertia	DINT32	RW	Run setting	Shutdown effect	250
		Data range	0~5000	Can map	Correlation model	Protection class
		unit	1%	NO	ALL	1
	Load inertia ratio: When the external mechanical load is converted to the mechanical inertia on the motor shaft, divided by the moment of inertia of the motor itself, the inertia ratio is obtained. For example, if the ratio of inertia is doubled, the value is 100. This value can be entered manually or automatically by inertia self-tuning. Note: When used for position rough precision control, the drive supports up to 20 times load inertia ratio. Please consider carefully in the mechanical design selection stage.					

Sub index 02h (P63.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Mechanical rigidity setting	DINT32	RW	Run setting	Shutdown effect	13
		Data range	0~31	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1

The mechanical rigidity level is set from 0 to 31, with 0 representing the weakest gain and 31 representing the strongest gain. Each rigidity class corresponds to a set of three-loop gain data.

class	Position loop gain	speed loop gain	speed loop integration time	The current is given the 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 attribute	Setting mode	Effective mode	Factory default
	Inertia identification frequency	DINT32	RW	Run setting	Shutdown effect	
		Data range	1~2000	Can map	Correlation model	Protection class

		unit		NO	ALL	1

Sub index 10h (P63.10)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The 2nd gain mode is set	DINT32	RW	Run setting	With immediate effect	1
		Data range	0-1	Can map	Correlation model	Protection class
		unit	-	-	PP/PV/HM/ CSP/CSV	-

Set the switching mode for the second gain

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

Sub index 11h (P63.11)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The gain switching condition is set	DINT32	RW	Run setting	With immediate effect	0
		Data range	0-12	Can map	Correlation model	Protection class
		unit	-	-	PP/PV/HM/ CSP/CSV	-

0: First gain fixed (PS)
1:60FE bit28 switch
2: Torque instruction large (PS)
3: Speed command large (PS)
4: Speed command change rate (PS)
5: Speed instruction high low speed threshold (PS)
6: Large position deviation (P)
7: Position instruction (P)
8: Positioning incomplete (P)
9: Actual speed (P)
10: Position command + actual speed (P)

Sub index 12h (P63.12)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Gain switching delay time	DINT32	RW	Run setting	With immediate effect	50
		Data range	0-1000	Can map	Correlation	Protection

					model	class
		unit	ms	-	PP/PV/HM/ CSP/CSV	-
	Set the required duration when the switchover condition is met when the first gain is returned from the second gain.					
Sub index 13h (P63.13)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Gain switching level	DINT32	RW	Run setting	With immediate effect	50
		Data range	0-20000	Can map	Correlation model	Protection class
		unit	-	-	PP/PV/HM/ CSP/CSV	-
	Set the level that meets the gain switching condition. The actual switching action is affected by both the level and the delay. See the description of 2008-0Ah for the specific influence mode. According to the different gain switching conditions, the unit of the switching level will change.					
Sub index 14h (P63.14)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Gain switching delay	DINT32	RW	Run setting	With immediate effect	30
		Data range	0-20000	Can map	Correlation model	-
		unit	-	-	PP/PV/HM/ CSP/CSV	-
	Set the delay to meet the gain switching condition. The two conditions of the generation level and time delay of the actual switching action are jointly affected, and the specific influence mode is described in 2008-0Ah. According to the different gain switching conditions, the unit of switching delay will change. Note: Please set 2008-0Ch≥2008-0Dh. If 2008-0Ch < 2008-0Dh, the internal value is set to 2008-0Ch=2008-0Dh.					
Sub index 15h (P63.15)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position gain switching time	DINT32	RW	Run setting	With immediate effect	30
		Data range	0-1000	Can map	Correlation model	-
		unit	ms	-	PP/PV/HM/ CSP/CSV	-
	In position control mode, if 2008-06h (second position loop gain) is much larger than 2008-03h (position loop gain), set the time for switching from 2008-03h to 2008-06h after the switching action occurs. Using this parameter can reduce the impact caused by increasing the gain of the position ring. If 2008-06h≥2008-03h, this parameter is invalid and the second gain is switched immediately.					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 16h (P63.16)	Position 3rd gain effective time	DINT32	-	Run setting	With immediate effect	-
		Data range	0-1000	Can map	Correlation model	Protection class
		unit	-	-	-	-
Sub index 17h (P63.17)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Position 3rd gain multiplier	DINT32	-	Run setting	With immediate effect	-
		Data range	50-1000	Can map	Correlation model	Protection class
		unit	%	-	-	-
Sub index 20h (P63.20)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque disturbance compensation gain	DINT32	RW	Run setting	With immediate effect	0
		Data range	-100-100	Can map	Correlation model	-
		unit	%	-	PP/PV/HM/ CSP/CSV	-
	In non-torque control mode, the disturbance torque compensation gain is set. Disturbance torque compensation can suppress the influence of external disturbance torque on speed. The larger the parameter setting, the stronger the compensation effect and the stronger the disturbance immunity. However, if the setting is too large, the vibration and noise will be caused, it needs to be used together with 2009-20h.					
Sub index 21h (P63.21)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Torque perturbation filter constant	DINT32	RW	Run setting	With immediate effect	50
		Data range	0-25	Can map	Correlation model	-
		unit	ms	-	PP/PV/HM/ CSP/CSV	-
	In non-torque control mode, the filtering time constant of the disturbance torque compensation filter is set. This parameter has a smoothing effect on 2009-1Fh disturbed torque compensation. The larger the					

	filtering time is set, the slower the disturbed torque compensation takes effect, but the noise decreases. When adjusting, first set 2009-20h as the larger value; Then the set value of 2009-1Fh is gradually increased from 0 until a certain set value, the disturbance observer gets the effect. Finally, on the premise that the disturbance observer is always effective, the set value of 2009-20h is gradually reduced.

8.13 P70~P73 IO parameter set

Sub index 3070h (P70)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	I/O parameters	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the DI2 function	DINT32	RW	Run setting	With immediate effect	2
		Data range	0~112	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
Sub index 0X01 (P70.01)	NO indicates normally open logic An option without NO indicates normally closed logic 0: The DI function is not defined 1: servo operation NO 2: The forward motion is prohibited NO 3: Reverse movement is prohibited NO 6: Reservations 9: return to zero proximity switch NO 10: Bus I/O input NO 11: indicates probe 1NO 12: indicates probe 2NO 13: Probe 1ANO (Second encoder probe) 14: Probe 2ANO (Second encoder probe) 101: Servo run 102: Forward motion prohibited 103: Reverse motion prohibited 106: Reserved 109: return to zero approach switch 110: Bus IO input 111: probe 1 112: probe 2						

	113: Probe 1A (second encoder probe) 114: Probe 2A (Second encoder probe)

Sub index 02h (P70.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the DI2 function	DINT32	RW	Run setting	With immediate effect	3
		Data range	0~ 112	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Enter the function configuration description as DI1					

Sub index 03h (P70.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the DI3 function	DINT32	RW	Run setting	With immediate effect	10
		Data range	0~ 112	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	NO indicates normally open logic, and the option without NO indicates normally closed logic. 0: The DI function is not defined 1: servo operation NO 2: The forward motion is prohibited NO 3: Reverse movement is prohibited NO 6: Reservations 9: return to zero proximity switch NO 10: Bus I/O input NO 101: Servo run 102: Forward motion prohibited 103: Reverse motion prohibited 106: Reserved 109: return to zero approach switch 110: Bus IO input					

Sub index 04h (P70.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the DI4 function	DINT32	RW	Run setting	With immediate effect	10
		Data range	0~ 112	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Enter the function configuration description as DI3.					

Sub index 05h (P70.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Enter the DI5 function	DINT32	RW	Run setting	With immediate effect	10
		Data range	0~ 112	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Enter the function configuration description as DI3.					
Sub index 06h (P70.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Scram logic	UDINT32	RW	Run setting	With immediate effect	6
		Data range	6~ 106	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	This parameter is used to select the logical setting of the SCram: 6: Normally open logic: the emergency stop is set to normally open logic, for the effective input state, the servo is in the emergency stop state; 106: Normally closed logic: The SCram is set to normally closed logic, and the servo is in scram state for high resistance state and effective input state					
Sub index 07h (P70.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Digital input filtering time	DINT32	RW	Run setting	With immediate effect	5
		Data range	0~500	Can map	Correlation model	Protection class
		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 attribute	Setting mode	Effective mode	Factory default
	Input state	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~31	Can map	Correlation model	Protection class
		unit	-			1
	The logical state of DI is displayed. bit4 to bit0 of this parameter corresponds to the logical state of DI5 to DI1.					

Sub index 09h (P70.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Analog input is enabled	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~ 1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	0: no, 1: yes. By setting this parameter, you can determine whether the input simulation function of DI to DI5 is enabled. When this function is enabled, you can set the DI logic using parameter P70.0A. When this function is disabled, the DI logic is set through the corresponding DI physical interface.					
Sub index 10h (P70.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Analog input	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~31	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	When P70.09 is 1, the DI analog input function is enabled. The binary bit4 to bit0 of this parameter correspond to the logical Settings of DI5 to DI1 respectively, which determines whether the function logic set by DI is triggered.					

Sub index 3071h (P71)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default	name
	DO parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P71.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Output DO1 function	DINT32	RW	Run setting	With immediate effect	2
		Data range	0~108	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	0: DO function not defined: 1: The servo returns to zero to complete NO 2: Enable NO for servo operation 3: Servo alarm NO 4: Position tracking exceeds the limit NO 5: The target position reaches NO 6: Lock output NO					

<table>
<tr><td></td><td>7: Bus I/O output NO
101: Servo return to zero to complete NC
102: Enable NC for servo operation
103: Servo alarm NC
104: Position tracking overrun NC
105: Target position reaches NC
106: Contracting brake output NC
107: Bus I/O output NC</td></tr>
<tr><td rowspan="5">Sub index 02h (P71.02)</td><td><table>
<tr><th>name</th><th>Data type</th><th>Access attribute</th><th>Setting mode</th><th>Effective mode</th><th>Factory default</th></tr>
<tr><td rowspan="3">Output DO2 function</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>With immediate effect</td><td>3</td></tr>
<tr><td>Data range</td><td>0~ 108</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
</table></td></tr>
<tr><td>Same as 3070h: 01h Parameter description:
0: DO function not defined:
1: The servo returns to zero to complete NO
2: Enable NO for servo operation
3: Servo alarm NO
4: Position tracking exceeds the limit NO
5: The target position reaches NO
6: Lock output NO
7: Bus I/O output NO
101: Servo return to zero to complete NC
102: Enable NC for servo operation
103: Servo alarm NC
104: Position tracking overrun NC
105: Target position reaches NC
106: Contracting brake output NC
107: Bus I/O output NC</td></tr>
<tr><td rowspan="2">Sub index 03h (P71.03)</td><td><table>
<tr><th>name</th><th>Data type</th><th>Access attribute</th><th>Setting mode</th><th>Effective mode</th><th>Factory default</th></tr>
<tr><td rowspan="3">Output DO3 function</td><td>DINT32</td><td>RW</td><td>Run setting</td><td>With immediate effect</td><td>5</td></tr>
<tr><td>Data range</td><td>0~ 108</td><td>Can map</td><td>Correlation model</td><td>Protection class</td></tr>
<tr><td>unit</td><td>-</td><td>NO</td><td>ALL</td><td>1</td></tr>
</table></td></tr>
<tr><td>Same as the 3070h:01h parameter description.
0: DO function not defined:
1: The servo returns to zero to complete NO
2: Enable NO for servo operation</td></tr>
</table>

	3: Servo alarm NO 4: Position tracking exceeds the limit NO 5: The target position reaches NO 6: Lock output NO 7: Bus I/O output NO 101: Servo return to zero to complete NC 102: Enable NC for servo operation 103: Servo alarm NC 104: Position tracking overrun NC 105: Target position reaches NC 106: Contracting brake output NC 107: Bus I/O output NC

Sub index 04h (P71.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Output DO4 function	DINT32	RW	Run setting	With immediate effect	6
		Data range	0~ 108	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	As described in the 3070h:01h parameter, DO4 is configured to hold the gate normally open output by default: 0: DO function not defined: 1: The servo returns to zero to complete NO 2: Enable NO for servo operation 3: Servo alarm NO 4: Position tracking exceeds the limit NO 5: The target position reaches NO 6: Lock output NO 7: Bus I/O output NO 101: Servo return to zero to complete NC 102: Enable NC for servo operation 103: Servo alarm NC 104: Position tracking overrun NC 105: Target position reaches NC 106: Contracting brake output NC 107: Bus I/O output NC					

Sub index 05h (P71.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO1 Enable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class

		unit	ms	-	ALL	1
	DO1 output signal open filtering time setting.					
Sub index 06h (P71.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO2 Enable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms		ALL	1
	DO2 output signal opening filtering time setting.					
	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO3 Enable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	DO3 output signal opening filtering time setting.					
Sub index 08h (P71.08)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO4 Enable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	DO4 output signal opening filtering time setting.					
Sub index 09h (P71.09)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO1 Disable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	DO1 output signal off filtering time setting.					
Sub index 0Ah (P71.0A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO2 Disable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation	Protection

					model	class
		unit	ms	NO	ALL	1
	DO2 output signal off filtering time setting.					
Sub index 0Bh (P71.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO3 Disable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	DO3 output signal off filtering time setting.					
Sub index 0Ch (P71.0C)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	DO4 Disable filtering time	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~500	Can map	Correlation model	Protection class
		unit	ms	NO	ALL	1
	DO4 output signal off filtering time setting					
Sub index 0Dh (P71.0D)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Output state	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~ 15	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	The logical output status of the current DO1-DO4 is displayed. The Bit0-Bit3 values correspond to the actual output status of ports D01-DO4 in sequence. For example, terminals DO1 are low and terminals DO2-DO4 are high: the corresponding binary code is 1110.					
Sub index 14h (P71.0E)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Forcible output is enabled	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~ 1	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	By setting this parameter, you can select the DO output terminal logic as the DO configured function logic, or the user can directly control the DO output logic through 0x3071:0F. 0: no, control the DO output by the internal function logic set 0x30700:01 ~0x3070:04. 1: Yes, the user directly controls the DO output logic on 0x3070:0F.					

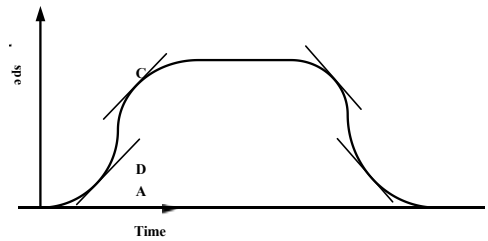
	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 0Fh (P71.0F)	Forced output	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~ 15	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	When the parameter 0x3071:0E is set to 1, the user directly controls the DO output logic through this parameter. The actual output of D01-DO4 ports is controlled by Bit0-Bit3 of the binary value. For example, terminals DO1 are low and terminals DO2-DO4 are high. The corresponding binary code is 1110.					

8.14 Setting a Parameter Group for P80 Internal Speed Curve

	name	Data type	Data structure	Access attribute	Setting mode	Effective mode
Sub index 3080h (P80)	speed planning parameter	-	ARR	-	-	-
		Data range	-		Can map	Correlation model
		unit	-	-	-	-
	This parameter set is used for speed planning for speed mode control in non-controller control channels or acceleration planning for torque mode.					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 01h (P80.01)	speed curve type	DINT32	RW	Run setting	With immediate effect	2
		Data range	0~3	Can map	Correlation model	Protection class
		unit	-	NO	S	1
	0: ladder curve 1 :siN3 curve (not supported yet) 2 :Jerk-free curve 3 :Jerk- limited curve					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 02h (P80.02)	acceleration	DINT32	RW	Run setting	With immediate effect	20
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO	S	1
	Parameter specifies the speed of addition and subtraction of the speed curve					

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 03h (P80.03⊠	deceleration	DINT32	RW	Run setting	With immediate effect	20
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO	S	1
	This parameter gives the speed of addition and subtraction of the speed curve					
Sub index 04h (P80.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Accelerated rounded corners Jerk0	DINT32	RW	Run setting	With immediate effect	1000
		Data range	1~1000	Can map	Correlation model	Protection class
		unit	nT	NO	S	1
	This parameter is used to set the value of accelerated corner Jerk0. The parameter 0x3080:04~0x3080:07 is used to set the outline of the curve planning. The unit is nT, that is, the speed loop period, which indicates the time of Jerk acceleration from 0 to acceleration and deceleration (in ms). As shown in the figure, Jerk0 represents segment A, Jerk1 represents segment B, Jerk2 represents segment C, and Jerk3 represents segment D.  					
Sub index 05h (P80.05)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Accelerated fillet Jerk1	UDINT32	RW	Run setting	With immediate effect	1000
		Data range	1~1000	Can map	Correlation model	Protection class
		unit	nT	NO	S	1
	This parameter is used to set the value of Jerk1 for accelerating corners.					
Sub index 06h (P80.06)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Slow down rounded Jerk2	UDINT32	RW	Run setting	With immediate effect	1000

		Data range	1~1000	Can map	Correlation model	Protection class
		unit	nT	NO	S	1
	This parameter is used to set the value of deceleration fillet Jerk2.					
Sub index 07h (P80.07)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Decelerating rounded corners Jerk3	DINT32	RW	Run setting	With immediate effect	1000
		Data range	1~1000	Can map	Correlation model	Protection class
		unit	nT	NO	S	1
	This parameter is used to set the value of decelerating fillet Jerk3.					

8.15 P81 Internal position curves set parameter groups

Sub index 3081h (P81)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Location planning parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
	This parameter set is used for position contour curve planning for position mode control in non-controller control channels.						
Sub index 01h (P81.01)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	Uniform speed	DINT32	RW		Run setting	With immediate effect	100
		Data range	0~5000		Can map	Correlation model	Protection class
		unit	rpm		NO	P	1
	This parameter is used for the uniform segment speed of a given position profile.						
Sub index 02h (P81.02)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	acceleration	DINT32	RW		Run setting	With immediate effect	10
		Data range	0~1000		Can map	Correlation model	Protection class
		unit	rpm/ms		NO	P	1
	This parameter set is used for speed planning of position mode control for non-controller control channels.						

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 03h (P81.03)	deceleration	DINT32	RW	Run setting	With immediate effect	10
		Data range	0~1000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO	P	1
	This parameter set is used for speed planning of position mode control for non-controller control channels.					

8.16 P82~P83 Zeroback/SCram parameter group

	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
Sub index 3082h (P82)	Return-to-zero parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
Sub index 01h (P82.01)	Return-to-zero mode	DINT32	RW	Run setting	-	53
		Data range	0~53	Can map	Correlation model	Protection class
		unit	-	NO	HM	1
	No function, please use CiA402 standard object Settings (to be associated).					
Sub index 02h (P82.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Back to zero bias	DINT32	RW	Run setting	-	0
		Data range	-2147483647 ~2147483647	Can map	Correlation model	Protection class
		unit	inc	NO	-	1
	No function, please use CiA402 standard object Settings.					
Sub index 03h (P82.03)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Return to zero speed 1	DINT32	RW	Run setting	-	600
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO	-	1
	No function, please use CiA402 standard object Settings (to be associated).					

Sub index 04h (P82.04)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Return to zero speed 2	DINT32	RW	Run setting	With immediate effect	300
		Data range	0~1000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO	-	1
	No function, please use CiA402 standard object Settings (to be associated).					

index 3083h (P83)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Scram parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 01h (P83.01)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Scram selection code	DINT32	RW	Run setting	With immediate effect	1
		Data range	-32~32	Can map	Correlation model	Protection class
		unit	-	NO		1
	Set this parameter by 0x605A					

Sub index 02h (P83.02)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Scram acceleration	DINT32	RW	Run setting		300
		Data range	0~3000	Can map	Correlation model	Protection class
		unit	rpm/ms	NO		1
	No function, please use CiA402 standard object Settings (to be associated).					

8.17 P90 Control debug parameter group

Sub index 3090h (P90)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Control debugging	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-
Sub index 01h (P90.01)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	M Control mode selection	DINT32	RW		Run setting	Shutdown effect	1
		Data range	0~2		Can map	Correlation model	Protection class
		unit	-		NO	ALL	1
	When the command channel of the servo drive is selected as panel control, debug software control, analog 1, analog 2, this parameter is used to set the control mode of the servo drive. This parameter is not valid under controller control. 0: torque control mode 1: Speed control mode 2: Position control mode						
Sub index 02h (P90.02)	name	Data type	Access attribute		Setting mode	Effective mode	Factory default
	The reciprocating motion is enabled	DINT32	RW		Run setting	With immediate effect	0
		Data range	0~1		Can map	Correlation model	Protection class
		unit	-		NO	P/S	1
	This parameter is used for the setting of reciprocating motion and is controlled in panel control and debug software. 0: No 1: Yes						

8.18 P91 Display parameter group

index 3091h (P91)	name	Data type	Data structure	Access attribute	Setting mode	Effective mode	Factory default
	Display parameter	-	ARR	-	-	-	-
		Data range	-		Can map	Correlation model	Protection class
		unit	-		-	-	-

Sub index 15h (P91.15)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Total power-on time	DINT32	RO	Run setting	-	0
		Data range	0~2147483647	Can map	Correlation model	Protection class
		unit	0.1s	NO	ALL	1
	Total system power-on time, cumulative display, this function code is used to record the total running time of the servo drive. If the drive is powered on and off repeatedly within a short period of time, the total power-on time may be different for several minutes.					

Sub index 16h (P91.16)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Maximum load rate	DINT32	RO	Run setting	-	0
		Data range	0~10	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Retain the parameter and have no function.					

Sub index 17h (P91.17)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Average load rate	DINT32	RO	Run setting	-	0
		Data range	0~10	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Retain the parameter and have no function.					

Sub index 18h (P91.18)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Fault record selection	DINT32	RW	Run setting	With immediate effect	0
		Data range	0~9	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	Select in order to display the failure of the servo drive and the system power-on time when the failure occurs, a total of 10 can be recorded Indicates the record of the most recent fault. 0 indicates the most recent fault.					

Sub index 19h (P91.19)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	The selected fault code	DINT32	RO	Run setting	-	0
		Data range	0~65535	Can map	Correlation model	Protection class
		unit	-	NO	ALL	1
	The fault code selected 0x3091:18 is displayed. Note that the value displayed in the error code table is hexadecimal.					
Sub index 1Ah (P91.1A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Time of failure	DINT32	RO	Run setting	-	1
		Data range	0~2147483647	Can map	Correlation model	Protection class
		unit	0.1s	NO	ALL	1
	The system power-on time of 0x3091:18 when the selected fault record occurred is displayed.					
Sub index 2Ah (P91.2A)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	EtherCAT communication status	DINT32	RO	Run setting	-	1
		Data range	0~8	Can map	Correlation model	Protection class
		unit	-	NO		1
	1: INT communication initialization 2: PreOP 3: SafeOP, the controller can normally read the communication object of the servo drive TPDO 4: OP, this state can operate the normal communication state					

8.19 P0A Drive information parameter group

Sub index 11h (PA0.0B)	name	Data type	Access attribute	Setting mode	Effective mode	Factory default
	Software version	DINT32	RO	Run setting	-	2313
		Data range	0~2147483647	Can map	Correlation model	Protection class
		unit	-	-	-	3
	The parameter mainly displays the fixed parameters of the servo, which are generally set directly by the manufacturer, and the user does not need to set.					

Chapter 9 Debugging software

- Software installation environment:

1) Support Windows 7 (32-bit / 64-bit), 10 (32-bit / 64-bit) operating system, recommended to use Windows10 (64-bit) operating system.

2) Microsoft.NET Framework 4.5 needs to be installed.

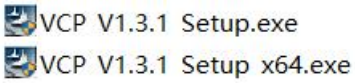
Note: In V0.9.4 earlier debugging software versions, if the computer display resolution is 1080P or higher, you need to set the "change text, size in application project" to 100% in the "Zoom and Layout" setting, otherwise the cursor will display error.

9.1 Software and driver installation

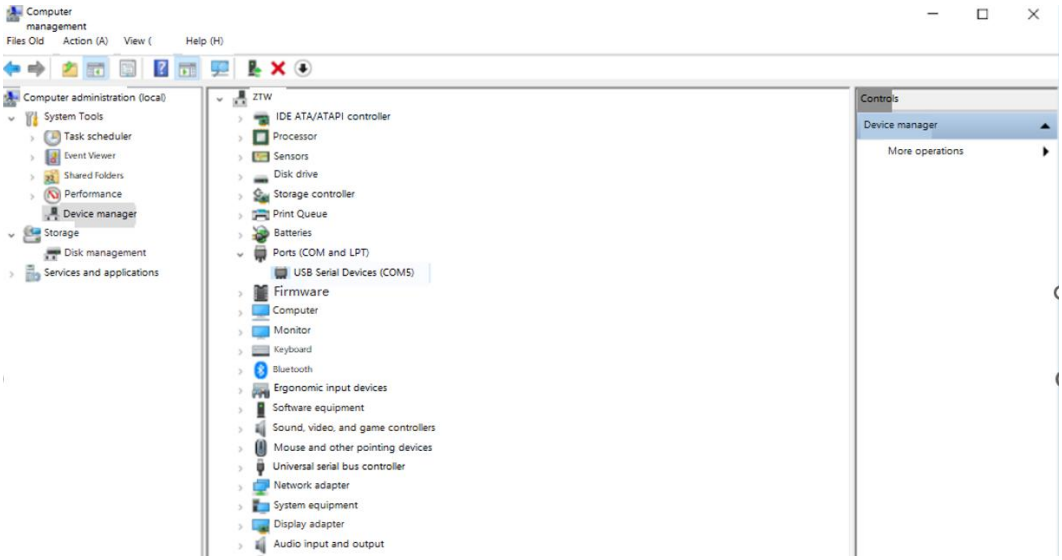
9.1.1 Installing Drivers

1) Locate 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 the 64-bit operating system.



3) After the driver is installed successfully, connect the servo drive to display the newly installed USB port in the computer device manager.



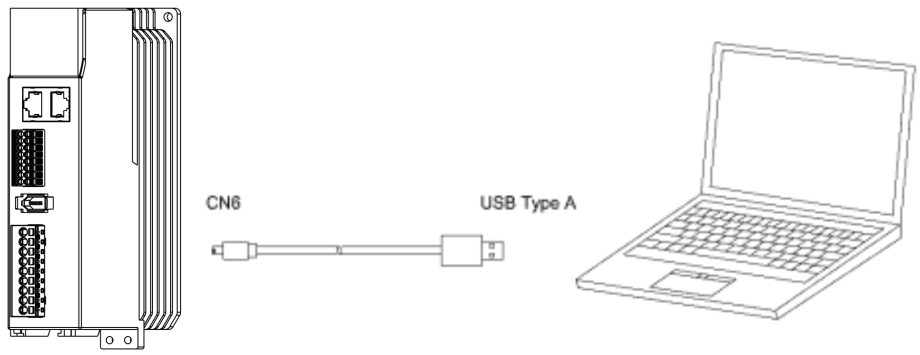
9.1.2 Commissioning Software Installation

Servo Tool belongs to the installed version. After decompressing the software, find the installation and running file, click and install it as prompted.

9.2 Connecting a Drive

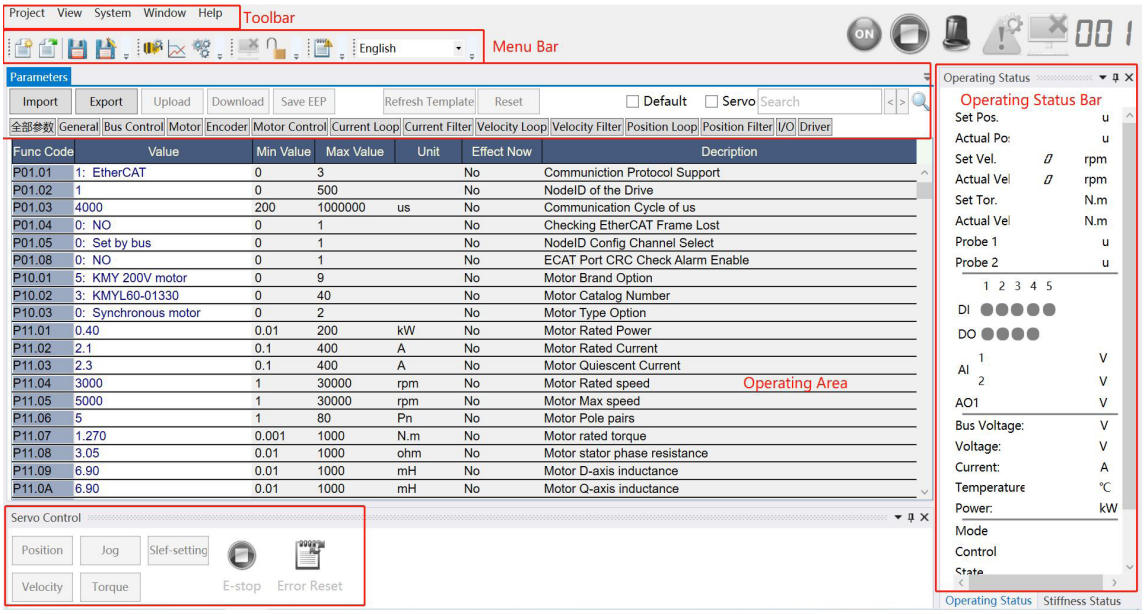
After powering on the drive, connect the CN6 port of the drive to the PC with Servo Tool software using the Mini USB debugging cable. Note: Please use the standard debugging cable provided by KRO. If you need to use a third-party cable, please ensure the shielding effect and install a magnetic ring.

The length of the debugging cable must not exceed 3 meters. Otherwise, the software connection may be unstable. In addition, install anti-interference measures such as magnetic rings to ensure communication quality.



9.3 Debugging Software

9.3.1 Introduction to the Software Interface



1. Introduction to the toolbar

icon	name	description
	New project	A new project
	Open project	Open an existing project
	Save project	Save current project
	Save as project	Save as current project
	Connection	After the drive is powered on and connected with the debugging wire, click the button to establish a communication connection with the drive and successfully establish a connection After the message, the button appears green.
	Log in	If you are not logged in, you can view only limited parameter information. Click the login button, you will log in with the default password (common permission), and you can see most of the parameters. You can also enter the advanced password (advanced permission 58Ks) to log in. You can edit advanced user parameters. If you do not log in to the server, the icon is

icon	name	description
		displayed as unlocked. In this case, parameter download and server debugging cannot be performed. After you log in, the icon is displayed as unlock. In this case, you can perform operations corresponding to your login permission.
	Enable	Enable button. If the current server command mode is controller control, this button is displayed only in the enabled state. If it is not enabled, it is OFF, and if it is enabled, it is ON. When the command mode of the drive is debug software control, this icon is the enable button function. Click to enable the operation, and click again to disable the operation.
2	node	Display/set the server node ID. After the server drive is successfully connected, if the server node ID saved in the project is inconsistent with the actual node ID, the server node ID is displayed in red and the server node ID is consistent with green. When the connection is successful, click the node to set the node number (this operation may cause the communication between the host computer and the servo drive to fail, please note. See the Parameter Setting section for details)
	Fault indication	When the fault, will display the current fault status and alarm information, no fault hidden.

2. Menu bar tabs and corresponding functional areas are introduced

Menu bar TAB	function	description
Parameter setting	Import a file	Import parameters from a file to the current project.
	Export file	Export the parameters in the current project to a separate file.
	Up	Upload the parameter information of the connected drive.
	download	Download parameters to the connected drive.
	Save EEP	Save the EEPROM. (Do not use!)
	Update parameter template	When the parameter list in the drive is inconsistent with the debugging software, click Update parameter template to synchronize the parameter list in the drive to the debugging software (for example, after the driver firmware version is updated, the parameter list has N parameters, while the parameter list in the debugging software only has X parameters). In this case, you need to upload information,

Menu bar TAB	function		description
			synchronize the debugging software parameter list to N, and obtain the latest parameters and content.
	Parametric search		Parameter content can be retrieved by keyword.
	Reset parameter		Perform a parameter reset (factory reset) operation on the connected drive.
Servo control	Fault reset		When the driver fault alarm is generated and the control mode is Debug Software, you can reset the fault after the fault is rectified.
	Forward motion		When the control mode is "debugging software" control, in the speed and torque control mode, this button is used to set the forward motion command; In position control mode, this button is used to set the direction of motion to positive.
	Reverse motion		When the control mode is "debugging software" control, in the speed and torque control mode, this button is used to give the reverse motion command; In position control mode, this button is used to set the direction of motion to reverse.
	Reciprocating motion		Works only in location mode. When the control mode is Debug Software and parameter P90.02 is set to 1: Yes, this button is used to enable the reciprocating operation. When switching to speed control or torque control, the P90.02 should be set to "0", otherwise the speed mode and torque mode cannot operate normally.
	Position mode	Run button	When the control mode is Debug Software and the running mode is Position mode, this button is used to set the relative position motion command.
		Given position	Debug software servo control, set the position control mode when the movement distance, unit circle.
		Uniform speed setting	When debugging software servo control, set the motion speed in position control mode, unit rpm.
		Acceleration setting	When debugging software servo control, set the motion acceleration in position control mode, in rpm/ms.
			When debugging software servo control, set the motion

Menu bar TAB	function		description
		Deceleration setting	deceleration in position control mode, in rpm/ms.
	speed mode	speed curve type	When debugging the software servo control, set the speed acceleration curve type.
		Acceleration setting	When debugging software servo control, set the motion acceleration in the speed control mode, the unit is rpm/ms.
		Deceleration setting	When debugging software servo control, set the motion deceleration in the speed control mode, in rpm/ms.
		Run button	When the control mode is Debug Software and the running mode is Position mode, this button is used to set the relative position motion command.
		Stop button	When the control mode is Debug Software and the running mode is Torque mode, this button is used to stop the motion command.
	Torque mode	Torque setting	When debugging software servo control, set the target torque when torque control mode, unit: percentage (100% equal to rated torque).
		Speed limit setting	When debugging software servo control, set the speed limit in torque control mode (when torque control, the motor accelerates until the set target torque, and the speed limit is used to limit the maximum speed at this time), in percentage (100% equal to the rated torque).
		Inching operation	Debug software servo control, used for point-and-click operation.
		self-tuning	When debugging software servo control, it is used for various self-tuning functions.
Signal sampling	Start sampling		The system starts to sample the configured data.
	Stop sampling		Stop the data being sampled.
	Save data		Saves the sampled data to a file.
	Number of channels		Configure the number of data channels to be collected.
	Sampling period		The sampling period is generally proportional to the number of channels, and the more channels, the larger the period. The recommended value is Number of channels +1.
	Sampling frequency		Automatically calculated according to the sampling period,

Menu bar TAB	function	description
		no setting is required.
	Event triggering	Trigger sampling according to the set conditions.
	Sampled data	To display the configured sampling channel, click the CH button on the left of the sampling channel to hide or display the sampling channel data in the current curve.
Waveform analysis	Loaded waveform	Load the waveform file.
	Frequency domain analysis	Convert waveform frequency domain and time domain.
	Reset bias	Restore all bias Settings to their initial values.
	Sampled data	To display the sampled data in the waveform file, click the CH button on the left of the sampling channel to hide or display the sampling channel data in the current curve.
	Data gain	The raw data channel can be scaled to the gain multiple.
	Data bias	The original data channel can be overlaid with the preset offset.
Fault information	Fault reset	When the driver has a fault alarm, this button can reset the fault after the fault is eliminated.
	Clear record	Clear current and historical fault alarms in the project.
	Current fault	Displays the current driver fault alarm.
	Historical fault	Displays historical faults in the project (after the project is shut down, historical faults cannot be saved).

3. Actual status area

name	description
Given position	Given the value of the position loop,Unit inc.
Actual position	The encoder feeds back the actual position value,Unit inc.
Given speed	Speed ring given value, unit rpm.
Actual speed	The encoder feeds back the actual speed value,Unit rpm.
Given torque	Torque given value,Unit N M.
Actual torque	The actual torque value measured by the drive,Unit N M.
Probe 1 position	When probe 1 is triggered, record the actual position value of the encoder, Unit inc.
Probe 2 position	When probe 2 is triggered, the actual encoder position value is recorded, Unit inc.
DI state	DI1 to DI5 Indicates the actual status feedback of the input channel.

D0 state	DO1~DO4 Indicates the actual control status of the digital output channel.
AI state	AI1~AI2 Analog The actual voltage feedback of the input channel, in V.
AO state	AO analog output channel, output actual voltage value, unit V.
Bus voltage	The actual voltage on the DC bus,unit V.
Output voltage	The actual voltage output of the servo driver,unit V.
Output current	The actual current output of the servo drive, unit A.
Servo temperature	Internal temperature of servo drive, unit ° C.
Active power	Active power of servo, unit kW.
Operation mode	The current operating mode of the servo drive (see Chapter 7, Introduction to the 6060 Servo Operating Mode for details).
Control word	The control word currently received by the servo drive (see Chapter 7, Introduction to the 6040 Control Word for details).
Status word	The actual current status word of the servo drive (see Chapter 7, Introduction to 6041 Status Word for details).
Drive current status	Displays the actual status of the connected servo, including "Ready", "main power on", "Running", "Fault error".
Drive firmware version number	Displays the firmware version number of the connected servo drive.

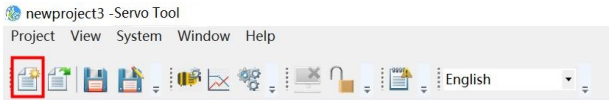
4. Operating area

Menu TAB	Operating area	description
Parameter setting	Parameter view edit	View and edit all or filter parameters.
Servo tuning	Signal sampling record	Displays the current signal sampling.
Waveform acquisition and analysis		
Fault handling	Fault recording, analysis and processing	Displays the current and historical fault records, cause analysis, and handling measures.

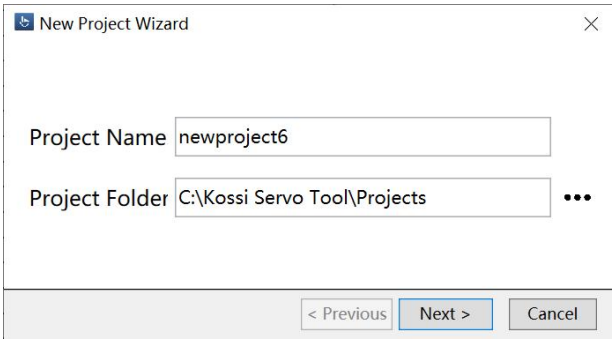
9.3.2 Creating a Project

Run the Servo Tool debugging software

Click the "New Project" button

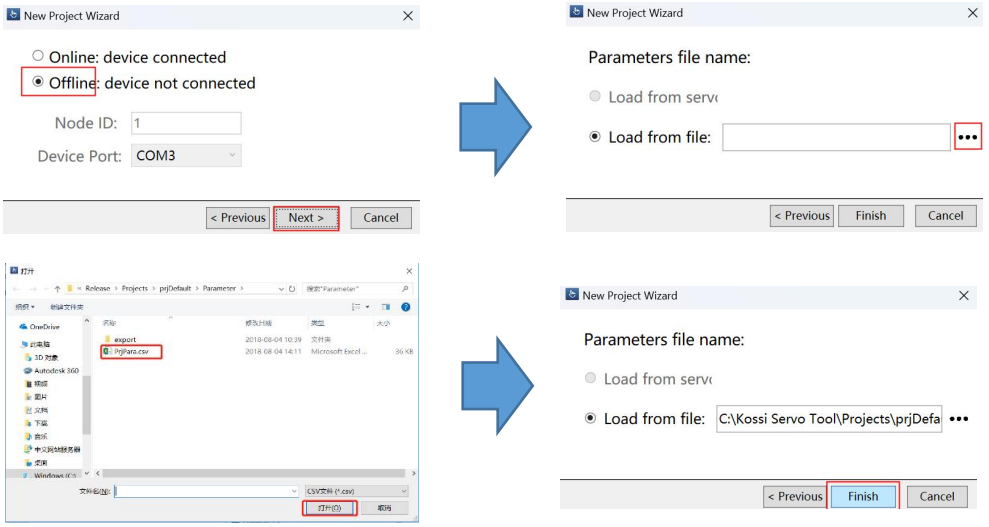


In the pop-up dialog box, enter the project name and save path, the default path is installation directory \Projects.



1) Create the project offline

Choose to create the project offline or online. A template file is required to create a project offline

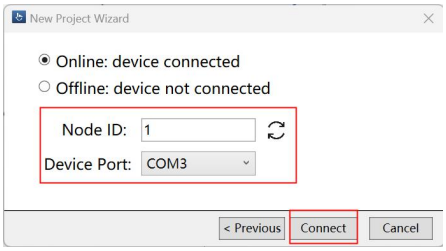


The default path is the installation directory Projects\prjDefault\Parameter\PrjPara.csv

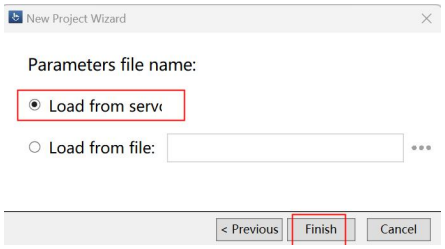
The offline creation project is complete.

2) Create projects online

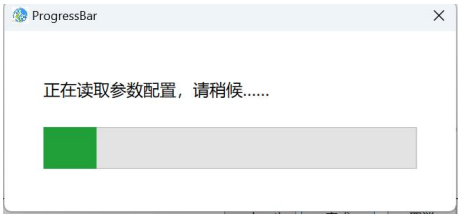
In the case that the drive is successfully connected, you can create the project in online mode, fill in the node number of the actual connected drive and select the port number of the USB driver.

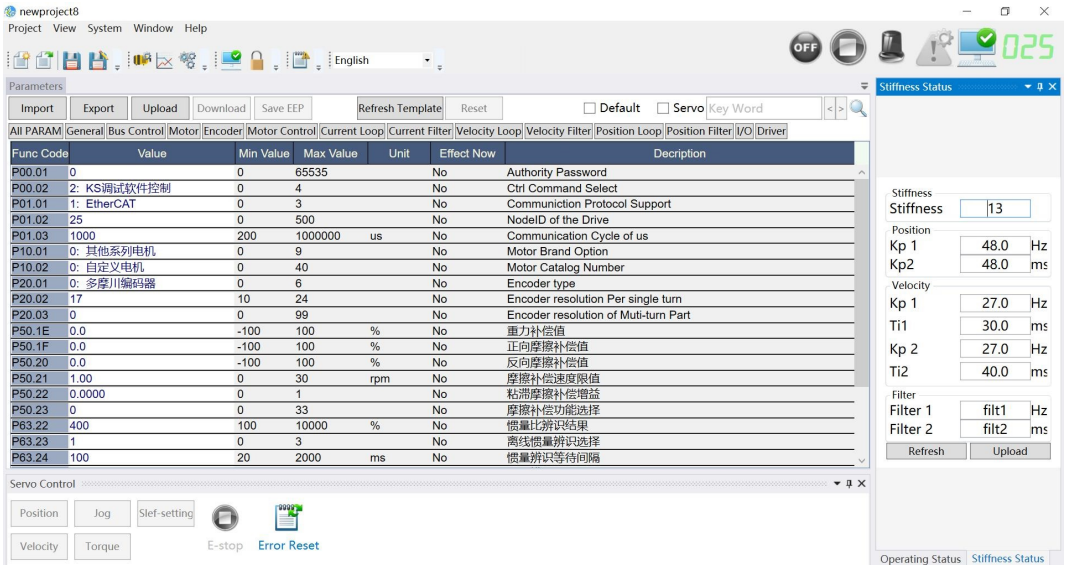


Choose to upload parameters from the drive, or use a template file (Upload parameters are usually selected online).



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

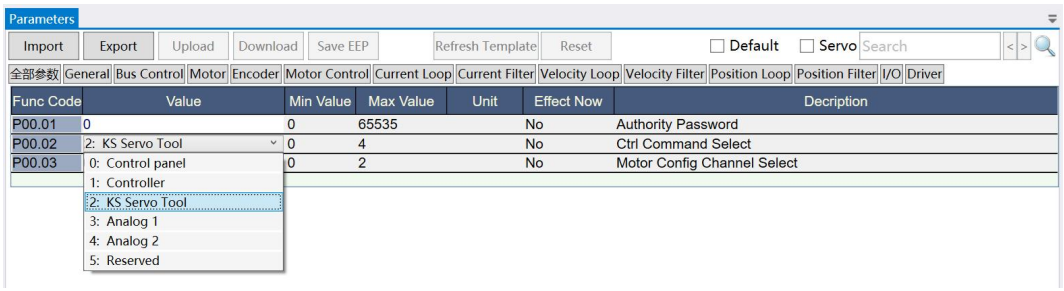




At this point, the new construction is completed.

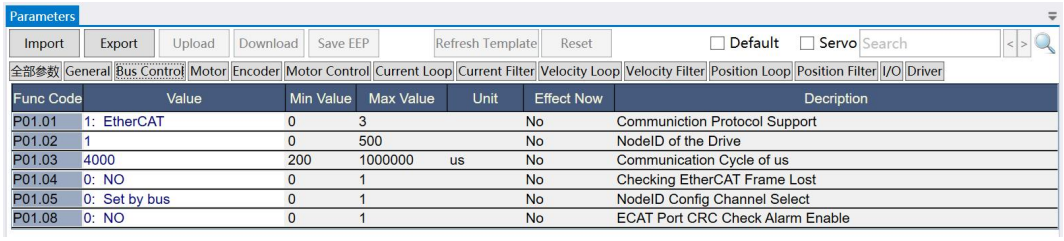
3) General configuration

In the general configuration options, you can select the current control channel, and set the current node number of the servo.



name	description	remark
Control channel selection	0: Control panel control 1: Controller control 2: software control 3: Analog 1 control 4: Analog 2 control 5: Reservations	0: Use LED operating panel for control. 1: Use the upper controller for control 2: Use debugging software for control 3: Speed or torque control using analog channel 1. 4: Speed or torque control using analog channel 2. 5: Reservations
Permission password	Permission password setting	

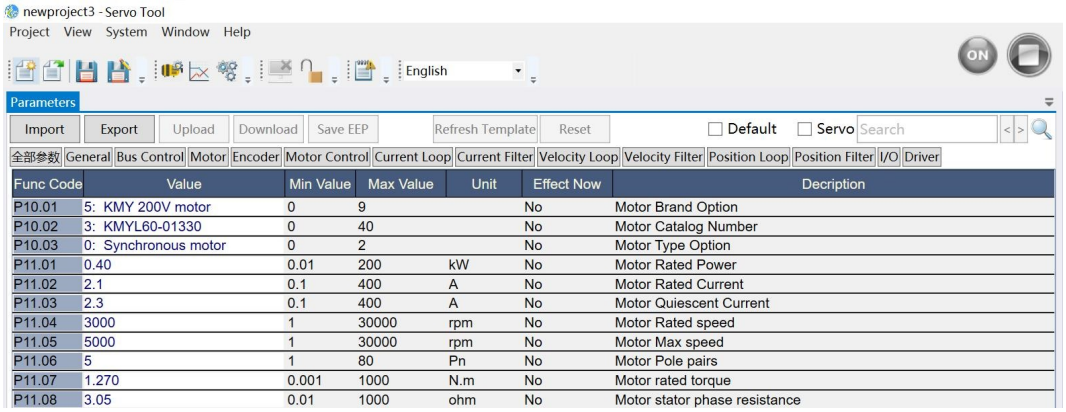
4) Bus control



name	description	remark
Bus type selection	0: No bus interface 1☒EtherCAT 2☒CANOpen	Select EtherCAT/CAN Open and other bus communication methods to enable, run, stop, reset and other operations of the servo drive, and send relevant control instructions from the bus, such as position instructions, speed instructions, torque instructions, etc.
Local node number	Local node number	The local node number is displayed
Master station communication cycle	Master station communication cycle	The communication cycle of the master station is set

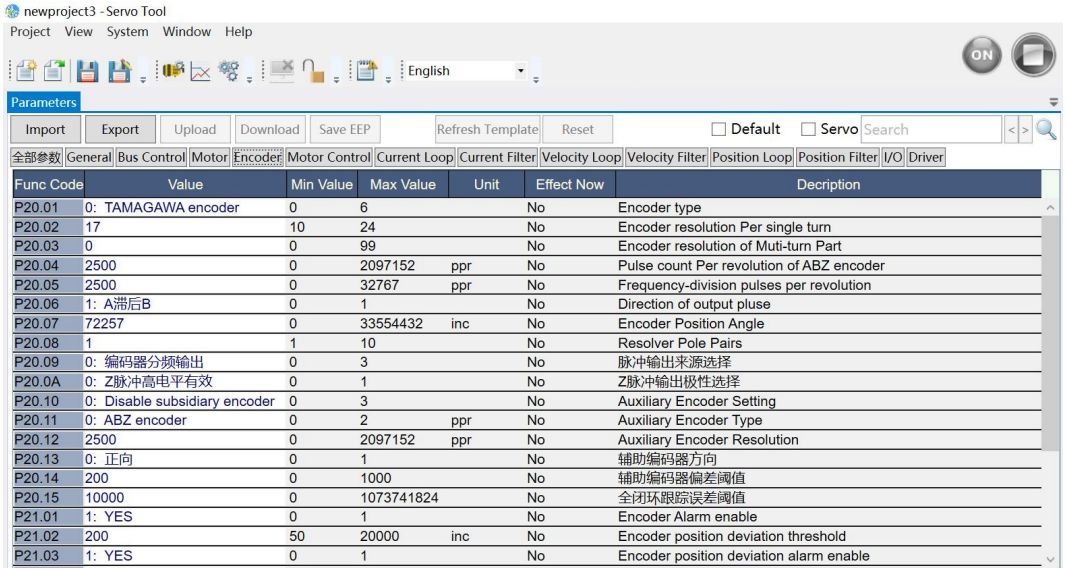
5) Motor parameters

In the motor parameters option, you can configure the motor series and model operations.



Func Code	Value	Min Value	Max Value	Unit	Effect Now	Decription
P10.01	5: KMY 200V motor	0	9		No	Motor Brand Option
P10.02	3: KMYL60-01330	0	40		No	Motor Catalog Number
P10.03	0: Synchronous motor	0	2		No	Motor Type Option
P11.01	0.40	0.01	200	kW	No	Motor Rated Power
P11.02	2.1	0.1	400	A	No	Motor Rated Current
P11.03	2.3	0.1	400	A	No	Motor Quiescent Current
P11.04	3000	1	30000	rpm	No	Motor Rated speed
P11.05	5000	1	30000	rpm	No	Motor Max speed
P11.06	5	1	80	Pn	No	Motor Pole pairs
P11.07	1.270	0.001	1000	N.m	No	Motor rated torque
P11.08	3.05	0.01	1000	ohm	No	Motor stator phase resistance

Motor rated speed, maximum speed, rated power and rated torque are automatically presented according to the selected motor, without manual filling. In firmware versions after V11.3, the electronic nameplate function is integrated. By default, there is no need to configure the parameters of the servo motor.



Func Code	Value	Min Value	Max Value	Unit	Effect Now	Decription
P20.01	0: TAMAGAWA encoder	0	6		No	Encoder type
P20.02	17	10	24		No	Encoder resolution Per single turn
P20.03	0	0	99		No	Encoder resolution of Muti-turn Part
P20.04	2500	0	2097152	ppr	No	Pulse count Per revolution of ABZ encoder
P20.05	2500	0	32767	ppr	No	Frequency-division pulses per revolution
P20.06	1: A滞后B	0	1		No	Direction of output pluse
P20.07	72257	0	33554432	inc	No	Encoder Position Angle
P20.08	1	1	10		No	Resolver Pole Pairs
P20.09	0: 编码器分频输出	0	3		No	脉冲输出来源选择
P20.0A	0: Z脉冲高电平有效	0	1		No	Z脉冲输出极性选择
P20.10	0: Disable subsidiary encoder	0	3		No	Auxiliary Encoder Setting
P20.11	0: ABZ encoder	0	2	ppr	No	Auxiliary Encoder Type
P20.12	2500	0	2097152	ppr	No	Auxiliary Encoder Resolution
P20.13	0: 正向	0	1		No	辅助编码器方向
P20.14	200	0	1000		No	辅助编码器偏差阈值
P20.15	10000	0	1073741824		No	全闭环跟踪误差阈值
P21.01	1: YES	0	1		No	Encoder Alarm enable
P21.02	200	50	20000	inc	No	Encoder position deviation threshold
P21.03	1: YES	0	1		No	Encoder position deviation alarm enable

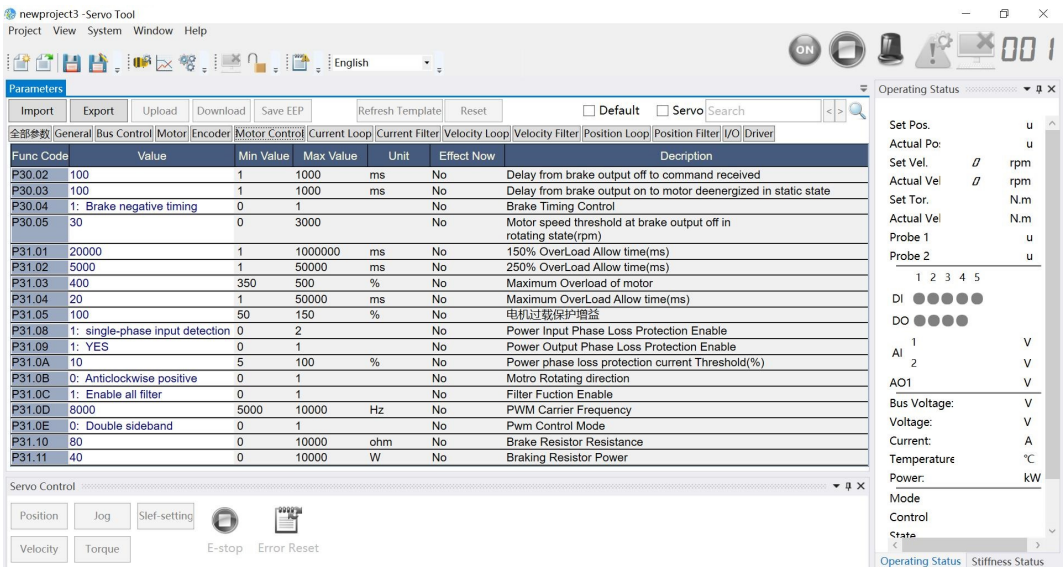
6) Encoder parameters

In the encoder Settings option, you can configure the encoder type and accuracy.

project	description
Encoder type	Tama Chuan, Nikon, Panasonic, etc., please determine the specific type according to the actual motor nameplate knot and selection data
Primary encoder Single-turn resolution	It is determined by the type and model of the encoder, and can be determined according to the actual motor nameplate combined with the selection data. For example, Tama River 23-bit multi-turn encoder refers to the single-turn resolution of 23 bits, that is, 223 pulse units
Primary encoder	It is determined by the type and model of the encoder, and can be determined

Multiturn resolution	according to the actual motor nameplate combined with the user manual, for example, Tama Chuan 23-bit multi-turn encoder, the multi-turn value is 16-bit 216 or 65536 turns
Number of main ABZ encoder pulses	Main ABZ encoder pulse number Settings
Encoder position Angle	Obtained by the encoder zero tuning
Secondary encoder setup	Secondary encoder setup
Auxiliary encoder type	Secondary encoder type Settings
Number of auxiliary encoder pulses	Auxiliary encoder pulse number setting
The encoder is faulty. Procedure	Used for shielding and displaying faults related to absolute encoders. After this enable is turned on, alarms related to the absolute value saving battery, such as encoder battery undervoltage, encoder battery break, etc. can only be displayed, otherwise these alarms will be blocked.
Acceleration overdifferential enable	

7) Motor control



In the motor control options, you can choose the motor lock control timing and motor rotation direction and other operations.

8) Three-ring parameter setting

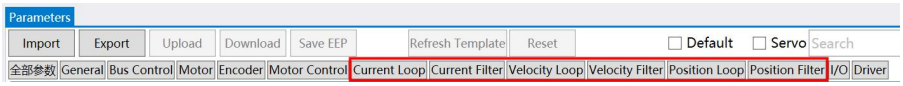
In order to make the driver better adapt to the mechanical load, achieve the purpose of fast and accurate drive motor and better follow the relevant instructions issued by the host computer, it is necessary to adjust the servo gain properly.

The servo gain is set by a combination of several parameters (rigid table, inertia ratio, position loop PID parameters, speed loop PID parameters, filter Settings, etc.), which affect each other, so the servo gain setting must take into account the balance between the various parameters.

In Servo Tool debugging software, three-ring parameters can be adjusted in two ways:

(1) Parameter list selection in "Servo tuning".

(2) Through the parameter Settings to find "current loop parameter", "position loop parameter", "speed loop parameter" and so on to set.



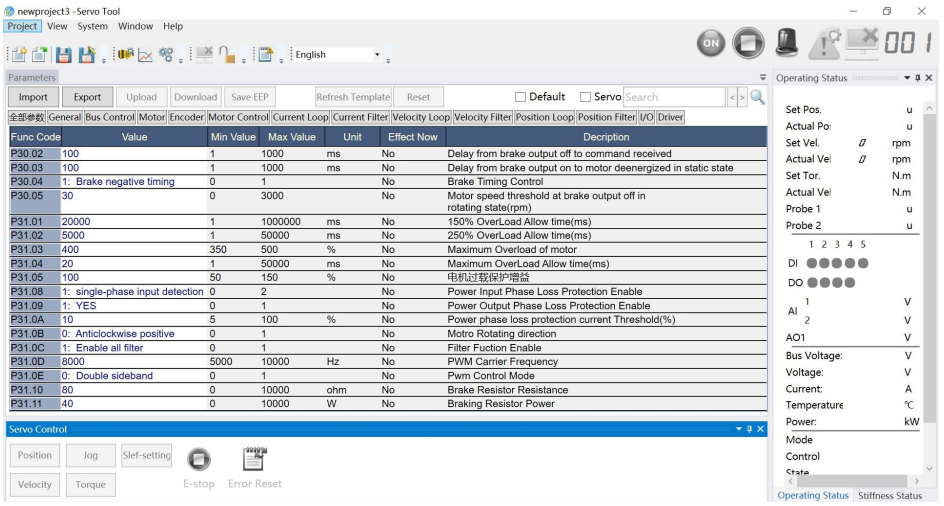
Note:

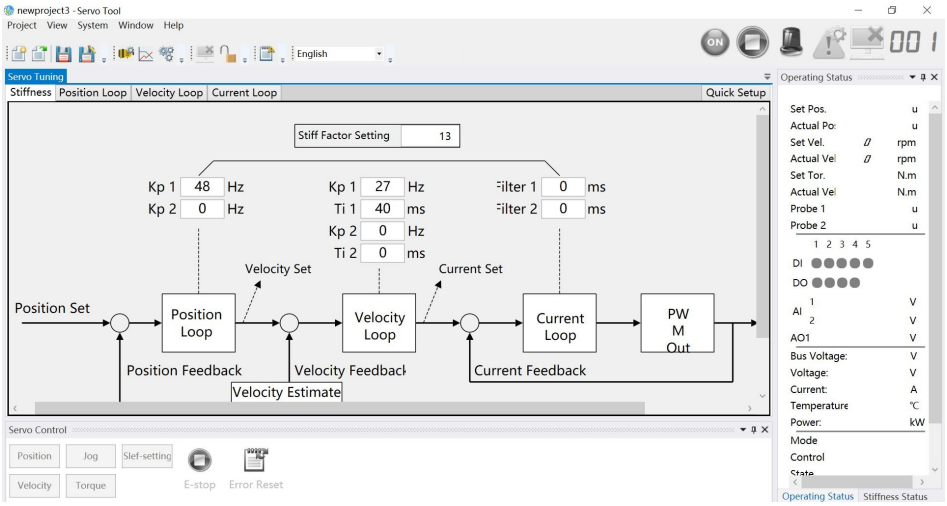
- During servo commissioning, measures such as scram protection and mechanical protection should be taken to ensure the personal safety of the equipment during servo enabling and running to the greatest extent. In order to avoid misaction such as field interference signal, all operation parameters should be reset after the servo test run to prevent accidental start and other situations.
- Before adjusting the parameters of the servo third ring, ensure that the parameters of the motor and encoder are correct, and that the safety protection facilities such as emergency stop operate normally and reliably. And before the operation point test run servo to ensure normal operation.

9.3.3 Setting Three-Ring Parameters

Open the software, in the "Parameter List" TAB, find "Servo tuning," click to enter.

In the pop-up page, there are stiffness coefficient, position ring parameter, speed ring parameter, torque ring parameter Settings. The gain adjustment of the servo three rings can be realized by corresponding setting.





1) Stiffness coefficient

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

2) Position ring parameters

name	unit	remark
Position loop gain	Hz	Used to adjust the position ring response
Position loop feedforward coefficient	%	Used to adjust the amount of feedforward given in position
Soft limit Settings	-	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	The default is the single-turn resolution of the encoder

3) Speed ring parameters

name	unit	remark
Speed loop gain 1	Hz	Used to adjust the speed loop response
speed loop integral 1	ms	Used to adjust the speed loop response time
Speed tracking error threshold	%	Used to set the error alarm threshold for speed tracking
Tracking error filtering time	ms	Used to set the protective filtering time for speed tracking errors
Stall threshold	%	This parameter is used to set the stall protection threshold
Stall filtering time	ms	Used to set the filtering time for stall protection
Stall protection is enabled	-	Used to turn on and off stall protection detection

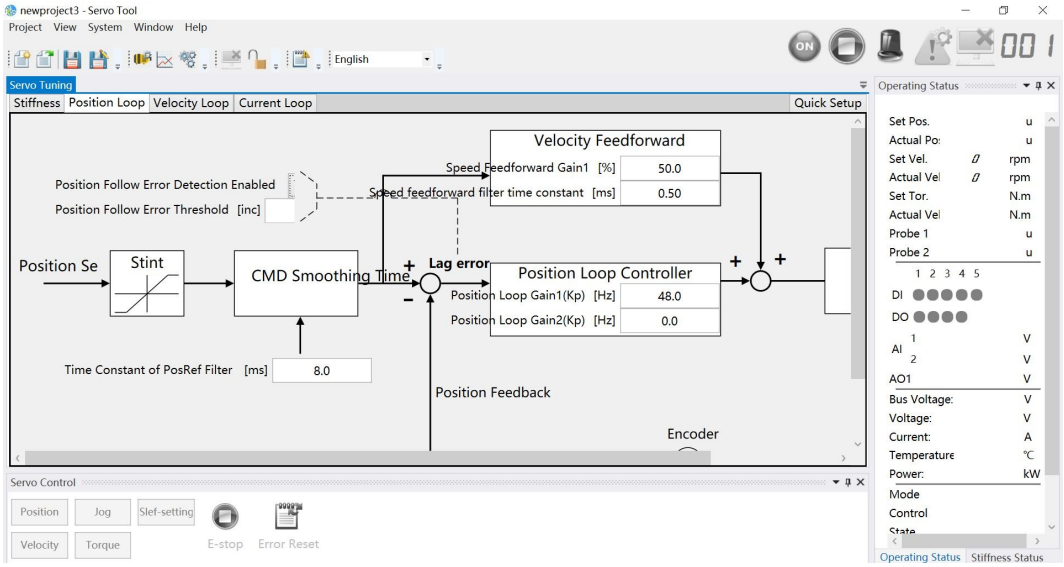
4) Current loop parameters

name	unit	remark
Torque feedforward selection	-	For turning on and off torque feedforward function (currently invalid)
Current loop gain (Kp)		Used to adjust current loop response
Current loop integral (Ti)	ms	Used to adjust the current loop response time
Torque is set to an upper limit	%	Used to set the maximum forward output limit of the torque ring.
Torque set lower limit	%	Used to set the reverse maximum output limit of the torque ring.

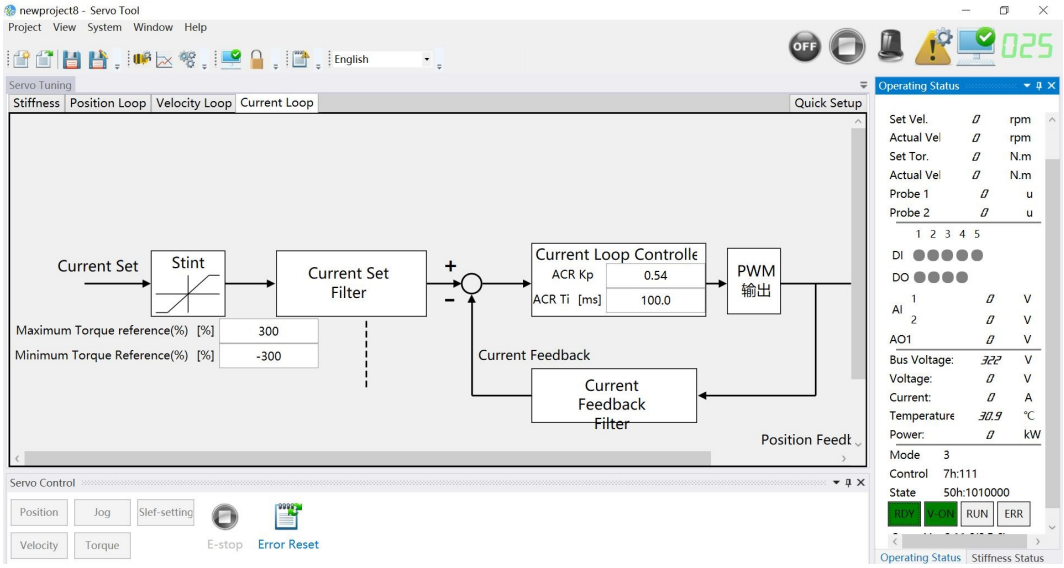
Note: The parameters set in "Three-ring Parameters" do not take effect immediately. You need to download the parameters and save them.

9.3.4 Searching Related Parameters from the Parameter List

1) You can select the parameter group to find the relevant parameters for setting.



2) Or enter the keyword search method, find the parameters and set.



9.3.5 Three-ring Parameters That Need to be Set

1) Position ring parameters

Parameter address	name	unit	remark
P60.01	Position loop gain	Hz	Used to adjust the position ring response
P60.02	Position loop feedforward coefficient	%	Used to adjust the amount of feedforward given in position
P60.0C	Position loop tracking error setting	pulse	The default is the single-turn resolution of the encoder

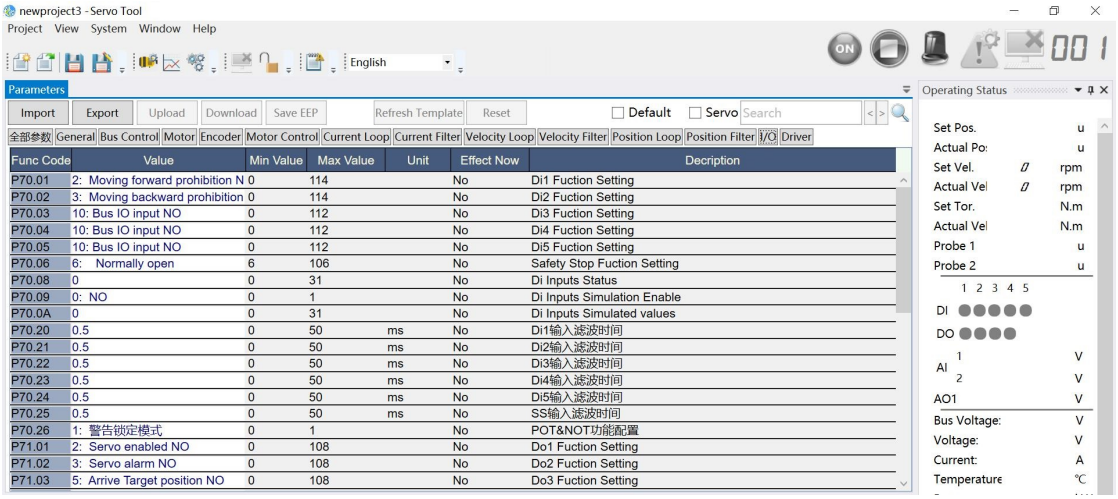
2) speed loop parameter

Parameter address	name	unit	remark
P50.01	speed loop gain 1	Hz	Used to adjust the speed loop response
P50.02	speed loop integral 1	ms	Used to adjust the speed loop response time

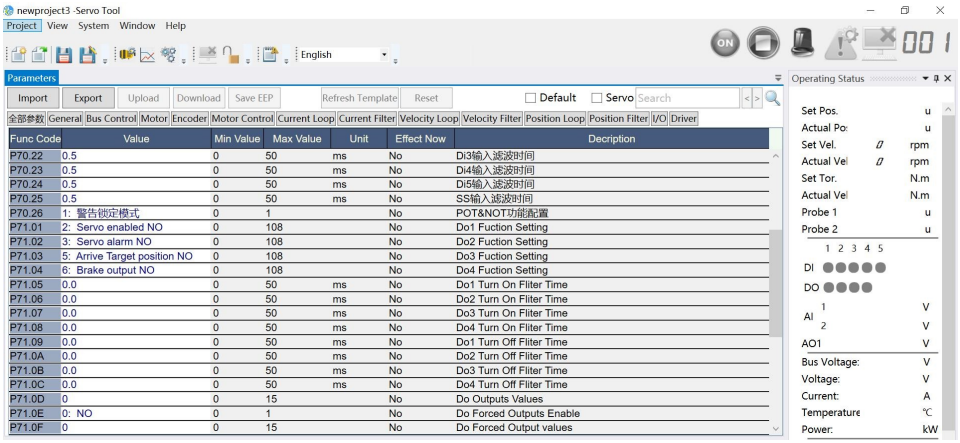
3) Current loop parameters

Parameter address	name	unit	remark
P40.09	Torque is set to an upper limit	%	Used to set the maximum forward output limit of the torque ring.
P40.0A	Torque set lower limit	%	Used to set the reverse maximum output limit of the torque ring.

4) In the IO parameter setting options, you can configure DI,DO function and emergency stop input logic

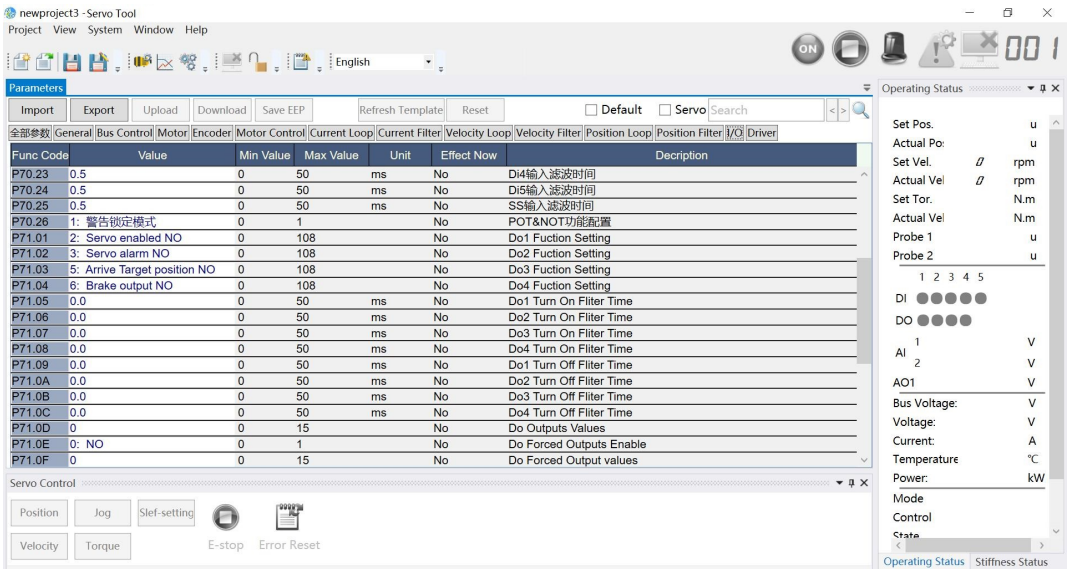


<table>
<tr><th colspan="3">DI input Settings</th></tr>
<tr><th>Serial number</th><th>name</th><th>remark</th></tr>
<tr><td>1</td><td>Servo START NO</td><td>Normally open signal, when the command channel uses analog control, used to enable the servo. Not valid under other control modes.</td></tr>
<tr><td>2</td><td>Forward motion prohibition NO</td><td>When the servo is in a forward motion, triggering the signal will cause the servo to stop immediately, and a fault alarm E86.13 will occur.</td></tr>
<tr><td>3</td><td>Reverse movement bans NO</td><td>Reverse motion disables the normally on signal. When the servo is in reverse motion, triggering the signal will cause the servo to stop immediately and a fault alarm E86.14.</td></tr>
<tr><td>9</td><td>Return to zero approach switch NO</td><td>Return to zero approach switch normally open signal, when using the servo internal return to zero function, the signal is used as the return to zero approach switch signal. (If the upper computer is used to return to zero, there is no need to configure this function, and the bus IO can be used).</td></tr>
<tr><td>10</td><td>Bus IO input NO</td><td>Bus IO input, normally open signal. The state of this digital input channel is transmitted to the upper controller through the bus. The mapping between DI channels and PDO object addresses is 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>Note that probe 1 can only be configured in the DI1 channel (probe is the high-speed position latch function), which can latch the external DI signal or the motor position information when the motor Z confidence number changes.</td></tr>
<tr><td>12</td><td>Probe 2NO</td><td>Normally open signal of probe 2, note that probe 2 can only be configured in DI2 channel (probe is high-speed position latch function), it can latch the external DI signal or the motor position information when the motor Z confidence number changes</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; The interpretation is the same as above, except that the signal logic is reversed and is normally closed.</td></tr>
</table>



D0 output function		
Serial number	name	remark
1	Servo return to zero completes NO	Servo return to zero complete signal, high active. When the servo internal zero return function is used, and the zero return is completed, the signal output is effective. If the reset action is restarted, the signal is cleared.
2	Enable NO for servo operation	Servo run enable signal, high level active. When the servo drive is enabled, the signal is output. After disabling, the signal is cleared to zero.
3	Servo alarm NO	Servo alarm output, high active. When the servo alarm occurs, the signal output. After the alarm is reset, the signal clears to zero.
4	Location tracking overrun NO	Position tracking overrun alarm, active at high level. When the servo position tracking error exceeds the limit value, the signal is output. After the reset alarm, the signal is cleared to zero.
5	Target position reached NO	Target position reached output, high active. When the positioning is completed and the target position is reached, the signal is output. When starting a new exercise, change the signal to clear zero.
6	Contracting brake Output NO	Contracting brake output signal, high level active. When enabled, the signal is output after delayed setting time according to the set locking time sequence. When the shutdown is enabled, this signal clears to zero according to the set locking timing
7	Bus IO output NO	Bus digital output, high level effective. When the DO channel is configured with this function, the digital output channel can be switched on and off by the upper controller. The mapping between the DO channel and the PDO object address is as follows: DO channel / Bus address DO1 / 60FE_01.16 DO2 / 60FE_01.17 DO3 / 60FE_01.18 DO4 / 60FE_01.19 Note: 60FE_01 is the sub index 01 of 60FE; When using the upper computer control, 60FE sub index 02 needs to be configured to 16#FFFFFFFF.
101~107	1,101; 2,102; 3,103; 4,104,; 5,105; 6, 106; 7, 107 The interpretation is the same as above, except that the logic is reversed and the output is valid at a low level.	

9.4 Debug software servo control



9.4.1 Function area introduction

Menu bar TAB	Function		description
Servo control	Fault reset		When the driver fault alarm is generated and the control mode is Debug Software, you can reset the fault after the fault is rectified.
	Forward motion		When the control mode is "debugging software" control, in the speed and torque control mode, this button is used to set the forward motion command; In position control mode, this button is used to set the direction of motion to positive.
	Reverse motion		When the control mode is "debugging software" control, in the speed and torque control mode, this button is used to give the reverse motion command; In position control mode, this button is used to set the direction of motion to reverse.
	Reciprocating motion		Works only in location mode. When the control mode is Debug Software and parameter P90.02 is set to 1: Yes, this button is used to enable the reciprocating operation. When switching to speed control or torque control, the P90.02 should be set to "0", otherwise the speed mode and torque mode cannot operate normally.
	Position mode	Run button	When the control mode is Debug Software and the running mode is Position mode, this button is used to set the relative position motion command.
		Given position	Debug software servo control, set the position control mode when the movement distance, unit circle.
		Uniform speed setting	When debugging the servo control of the software, set the motion speed of the position control mode.Unit rpm.
		Acceleration setting	When debugging the servo control of the software, set the motion acceleration in the position control mode.Unit rpm/ms.

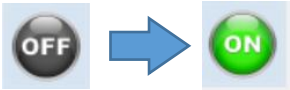
		Deceleration setting	When debugging software servo control, set the motion deceleration when position control mode,Unit rpm/ms.
	speed mode	Set speed	When debugging the software servo control, set the running speed of the speed mode,Unit percentage (100% equal to rated speed).
		speed curve type	When debugging the software servo control, set the speed acceleration curve type.
		Acceleration setting	When debugging the software servo control, set the motion acceleration in the speed control mode.Unit rpm/ms.
		Deceleration setting	When debugging software servo control, set the motion deceleration when speed control mode,Unit rpm/ms.
		Run button	When the control mode is Debug Software and the running mode is Position mode, this button is used to set the relative position motion command.
		Stop button	When the control mode is Debug Software and the running mode is Torque mode, this button is used to stop the motion command.
	Torque mode	Torque setting	When debugging software servo control, set the target torque when torque control mode,Unit percentage (100% equal to rated torque).
		Speed limit setting	When testing the software servo control, set the speed limiting value in the torque control mode (in the torque control, the motor will accelerate until the set target torque, and the speed limiting is used to limit the maximum speed at this time),Unit percentage (100% equal to rated torque).
		inching operation	Debug software servo control, used for point-and-click operation.
		self-tuning	When debugging software servo control, it is used for various self-tuning functions.

Note:

Servo control takes effect only when the command channel is Software Control

9.4.2 Location Mode Control

To control the position mode, first use the enable button on the interface toolbar to enable the servo.



Button	description
Fault reset	When the driver fault alarm is generated and the control mode is Debug Software, you can reset the fault after the fault is rectified.
Forward motion	When the control mode is Debug Software, this button is used to set the motion direction to forward in the position control mode.
Reverse motion	When the control mode is Debug Software, this button is used to set the motion direction to reverse in the position control mode.
Reciprocating motion	Works only in location mode. When the control mode is Debug Software and parameter P90.02 is set to 1: Yes, this button is used to enable the reciprocating operation. When switching to speed control or torque control, the P90.02 should be set to "0" otherwise the speed mode and torque mode will not work properly.
Run button	When the control mode is Debug Software and the running mode is Position mode, this button is used to set the relative position motion command.
Given position	Debug software servo control, set the position control mode when the movement distance, unit circle.
Uniform speed setting	When debugging software servo control, set the motion speed in position control mode, unit rpm.
Acceleration setting	When debugging software servo control, set the motion acceleration in position control mode, in rpm/ms.
Deceleration setting	When debugging software servo control, set the motion deceleration in position control mode, in rpm/ms.

General operation steps of position control:

1) Set the reciprocating motion mode. If necessary, set the parameter P90.02 Reciprocating motion mode.
2) Set the position movement distance, speed, acceleration and deceleration speed.
3) Set the direction of movement.

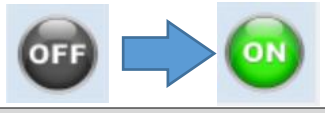
4) Click the "Run" button, and the servo will automatically stop after running the set movement distance.

Note:

0.9.3 and earlier versions of the software cannot terminate the positioning motion after the position mode positioning has begun, unless the disenable operation is performed, but the disenable is not suitable for some loads with particularly large inertia, and the servo will be in a free stop state, or be dragged by the load. Therefore, when using the positioning mode, be sure to exercise caution and ensure that the personal device can run safely.

9.4.3 Speed Mode Control

To control the speed mode, first use the enable button on the interface toolbar to enable the servo.



button	description
Fault reset	When the driver fault alarm is generated and the control mode is Debug Software, you can reset the fault after the fault is rectified.
Forward motion	When the control mode is "Debug Software" control, this button is used to give forward motion instructions in speed control mode.
Reverse motion	When the control mode is " Debug Software" control, in the speed control mode, this button is used to give the reverse motion command.
Set speed	When debugging the software servo control, set the running speed of the speed mode,Unit percentage (100% equal to rated speed).
speed curve type	When debugging the software servo control, set the running speed of the speed mode,Unit percentage (100% equal to rated speed).
Acceleration setting	When debugging the software servo control, set the motion acceleration in the speed control mode.Unit rpm/ms
Deceleration setting	When debugging software servo control, set the motion deceleration when speed control mode,Unit rpm/ms.
Run button	When the control mode is Debug Software and the running mode is Speed mode, this button is used to set the relative speed motion command.
Stop button	When the control mode is Debug Software and the running mode is Speed mode, this button is used to stop the motion command.

General operation steps of speed control:

1) Set the speed curve type.

2) Set the speed, acceleration and deceleration values.

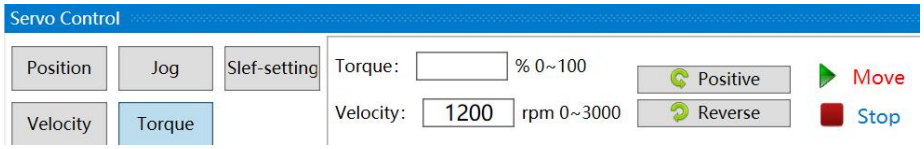
3) Select the motion direction button, and then click the "Run" button to make the motor start running at the set speed in the selected direction.

4) Click the movement direction button again to stop the motor movement; Or click the "Stop" button to terminate the motor movement.

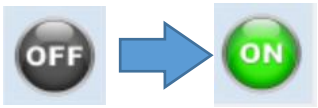
Note:

During servo commissioning, it is necessary to take measures such as emergency stop protection and mechanical protection to ensure the personal safety of the equipment during servo enablement and operation to the greatest extent. In order to avoid the field interference signal and other misactions, after the servo trial run, all operation parameters should be reset to prevent accidental start 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.



button	description
Fault reset	When a driver fault alarm is generated and the control mode is Debug Software, the driver can be reset after the fault is rectified
Forward motion	When the control mode is "Debug Software" control, this button is used to set forward motion command in torque control mode.
Reverse motion	When the control mode is " Debug Software" control, this button is used to give the reverse motion command in the torque control mode.
Set torque	When debugging the servo control of the software, set the target torque when the torque control mode, in percentage (100% equal to the rating Torque).
Speed limit setting	When debugging software servo control, set the target torque when torque control mode, unit percentage (100% equal to rated torque)
Run button	When the control mode is "Debug Software" control and the running mode is torque mode, this button is used to set the torque movement command.
Stop button	When the control mode is Debug Software and the running mode is Torque mode, this button is used to stop the motion command.

General operation steps of 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 debugging).

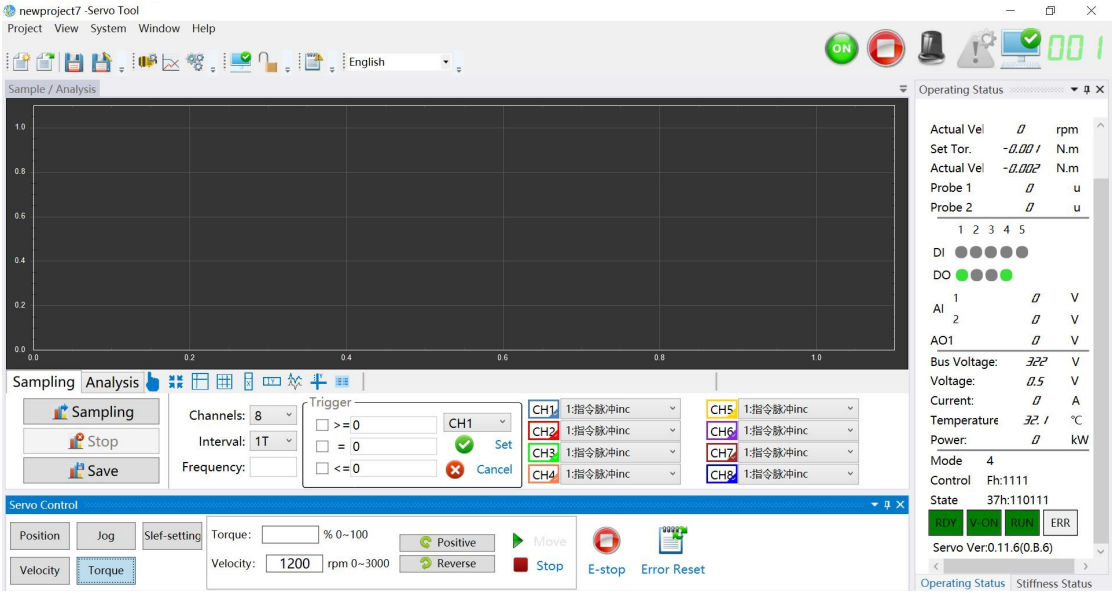
2) Select the motion direction button, and then click the "Run" button to make the motor start running in the selected direction according to the set torque and speed limiting.

3) Click the movement direction button again to stop the motor movement; Or click the "Stop" button to terminate the motor movement.

Note:

- During servo commissioning, measures such as scram protection and mechanical protection should be taken to ensure the personal safety of the equipment during servo enabling and running to the greatest extent. In order to avoid misaction such as field interference signal, all operation parameters should be reset after the servo test run to prevent accidental start and other situations.
- After the given direction of movement (forward or reverse), the motor starts to operate in accordance with the set torque and speed limit. When the actual torque of the motor is less than the set torque, the servo will speed up to the current set speed limit. When the actual torque is greater than or equal to the set torque, the servo will continue to output according to the given torque. If you want to stop movement, you can cancel the direction of movement, or you can stop movement by setting the given torque or speed limit to 0. Therefore, consider the torque target value and speed limit value in the context of the mechanical situation.

9.5 Waveform acquisition and analysis



Menu bar TAB	function	description
Signal sampling	Start sampling	The system starts to sample the configured data.
	Stop sampling	Stop the data being sampled.
	Save data	Saves the sampled data to a file.
	Number of channels	Configure the number of data channels to be collected.
	Sampling period	1T=50μs sampling period is proportional to the number of channels, the more channels, the greater the period. The recommended value is Number of channels +1.
	Sampling frequency	Automatically calculated according to the sampling period, no setting is required.
	Event triggering	Trigger sampling according to the set conditions.
	Sampled data	To display the configured sampling channel, click the CH button on the left of the sampling channel to hide or display the sampling channel data in the current curve.

9.5.1 Collecting the Channel List

Sample data summary table			
Serial number	Name	Unit	description
1	Command pulse	pulse	Single position loop given instruction increment value;
2	Instruction filter pulse	pulse	
3	Encoder position	pulse	
4	Encoder filter position	pulse	
5	Position tracking error	pulse	Previous position loop period 0x60FC bus required position (channel 9) Current position loop period 0x60FC encoder actual position value (channel 10) It can be used to represent the dynamic and steady-state errors following the system position.
6	Encoder number of turns	circle	The actual single-turn value of the multi-turn encoder feedback; The current loop is periodically updated
7	Encoder cycle value	pulse	One turn value of encoder feedback; The current loop is periodically updated
8	Bus target location	pulse	Absolute target location delivered by the controller, communication object 0x607A; Communication cycle update
9	Bus demand location	pulse	The interpolation of the absolute target position issued by the controller is resolved to the absolute position given value of the position ring, and the communication object is 0x60FC; The position loop is periodically updated
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 actual motor position of the controller, communication object 0x6064; The current loop is periodically updated
12	speed setting	RPM	The speed setting instruction is connected to the speed setting filter input;
13	speed filter setting	RPM	The speed loop is given the instruction, and the speed is given the filter output value;

Sample data summary table			
Serial number	Name	Unit	description
14	speed feedback	RPM	Speed feedback, each speed loop cycle calculated according to the actual value of the encoder speed feedback is connected to the input end of the speed feedback filter; Dynamic speed performance recommended observation channel;
15	speed filter feedback	RPM	Speed loop feedback instruction, speed feedback filter output value;
16	speed feedback	RPM	Speed feedback filter value, speed stability error recommended observation channel;
17	speed PID output	A	The output value of the speed loop PID calculation
18	ld setting	A	
19	ld filter is given	A	
20	ld PID feedback	A	
21	Id PID feedback filtering	A	
22	Id PID output	V	
23	Torque setting	A	The current value corresponding to the given torque = torque given/torque constant; Connected to the input end of the torque given filter; The display values of torque-related channels such as 24, 25 and 26 are the corresponding effective current values.
24	Torque filter is given	A	The output value of the torque given filter;
25	Torque feedback	A	Torque feedback value of sensor feedback; Connect to the input of the torque feedback filter
26	Torque feedback filtering	A	Output value of torque feedback filter;
27	Q axis PID output	V	Current loop Q axis current PID calculation voltage demand value;
28	Bus voltage	V	Bus voltage;
29	A Phase feedback current	A	Instantaneous value of phase A feedback current

Sample data summary table			
Serial number	Name	Unit	description
30	B phase feedback current	A	Instantaneous value of B-phase feedback current
31	C phase feedback current	A	Instantaneous value of phase C feedback current
32	A-phase voltage	V	Phase A output voltage
33	B-phase voltage	V	Phase B output voltage
34	C-phase voltage	V	Phase C output voltage
35	Output voltage RMS value	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	-	The servo enable flag bit is 1 when enabled and 0 when not enabled
40	Encoder communication state	-	Indicates the encoder communication status. When the channel is 0, the communication status is good. If the value is not 0, check whether the communication protocol matches and the cable is normal.
41	Control word	-	Indicates the control word delivered by the controller. The communication status is 0x6040
42	Status word	-	Servo status word feedback to controller, communication status 0x6041
43	DS402 Current control mode	-	The servo feeding back to the controller is in 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	microinching zero deviation Angle	pulse	
46	microinching zero	-	

Sample data summary table			
Serial number	Name	Unit	description
	proportional output		
47	microinching zero integration time	ms	
60	Overcurrent A phase feedback current	A	The instantaneous value of phase A current when the most recent over current error occurred
61	Overcurrent B-phase feedback current	A	The instantaneous value of phase B current when the most recent over current error occurred
62	Overcurrent C phase feedback current	A	The instantaneous value of phase C current when the most recent over current error occurred
63	Overcurrent A phase voltage	V	
64	Overcurrent B phase voltage	V	
65	Overcurrent C phase voltage	V	
66	Tovercurrent Q-axis current is set	A	The torque given when the most recent overcurrent error occurred
67	Overcurrent Q-axis current feedback	A	The torque given when the most recent overcurrent error occurred
68	Overcurrent bus voltage	V	The torque given when the most recent overcurrent error occurred
69	Probe 1 position	pulse	Communication object 0x60BA
70	Probe 2 position	pulse	Communication object 0x60BB
75	average load rate	☒	Motor load rate
88	Inertia identification speed	-	Inertia identification speed

Sample data summary table			
Serial number	Name	Unit	description
89	Inertia identification torque	-	Inertia identification torque curve
90	Inertia identification results	-	Inertia identification result curve
91	Self-tuning state	-	
96	Memory 0	-	Internal test variable
97	Memory 1	-	Internal test variable
98	Memory 2	-	Internal test variable
99	Memory 3	-	Internal test variable

9.5.2 Waveform sampling and analysis control

Icon	Name	description
	Drag view	Drag the current recorded waveform
	Default view	Scale back to the default view size
	Toggle cursor visibility	Show/hide the cursor to measure the waveform.
	Reset cursor	Restores the cursor to its default state
	X-axis scaling	Select the X-axis to scale
	Y-axis scaling	Select the Y-axis to scale
	Cursor channel selection	Select the channel object that the cursor measures
	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	Loaded waveform	Load the saved waveform file.
	Frequency domain analysis	Convert waveform frequency domain and time domain. By default, the waveform is a time domain waveform. When frequency domain analysis is required, you can click this function button to convert the view into a frequency domain waveform. Click this function button again to restore the time domain waveform. In the frequency domain waveform, the horizontal coordinate is the frequency (unit Hz), and the vertical coordinate is the decibel (unit dB). The waveform control can also be used to scale, measure and other operations.
	Reset bias	Restore all bias Settings to their initial values.
	Sampled data	To display the sampled data in the waveform file, click the CH button on the left of the sampling channel to hide or display the sampling channel data in the current curve.
	Data gain	The raw data channel can be scaled to the gain multiple.
	Data bias	The original data channel can be overlaid with the preset offset.

9.6 Self-tuning function

1☒ The encoder zero calibration function: the function used by the manufacturer, such as the need to use a third-party servo motor on site, please contact the company.

2☒ Motor pole number learning: manufacturers use the function, such as the need to use a third-party servo motor on site, please contact the company.

3☒ Self-tuning of inertia:

4☒ The inertia ratio (P63.01) refers to:

$$\frac{\text{Total inertia/deceleration ratio of load}^2}{\text{Moment of inertia of the motor}}$$

Note: When there is no reducer, the reduction ratio is 1.

5☒ Load inertia ratio is an important parameter of servo system, and correct setting of load inertia ratio is helpful to complete debugging quickly

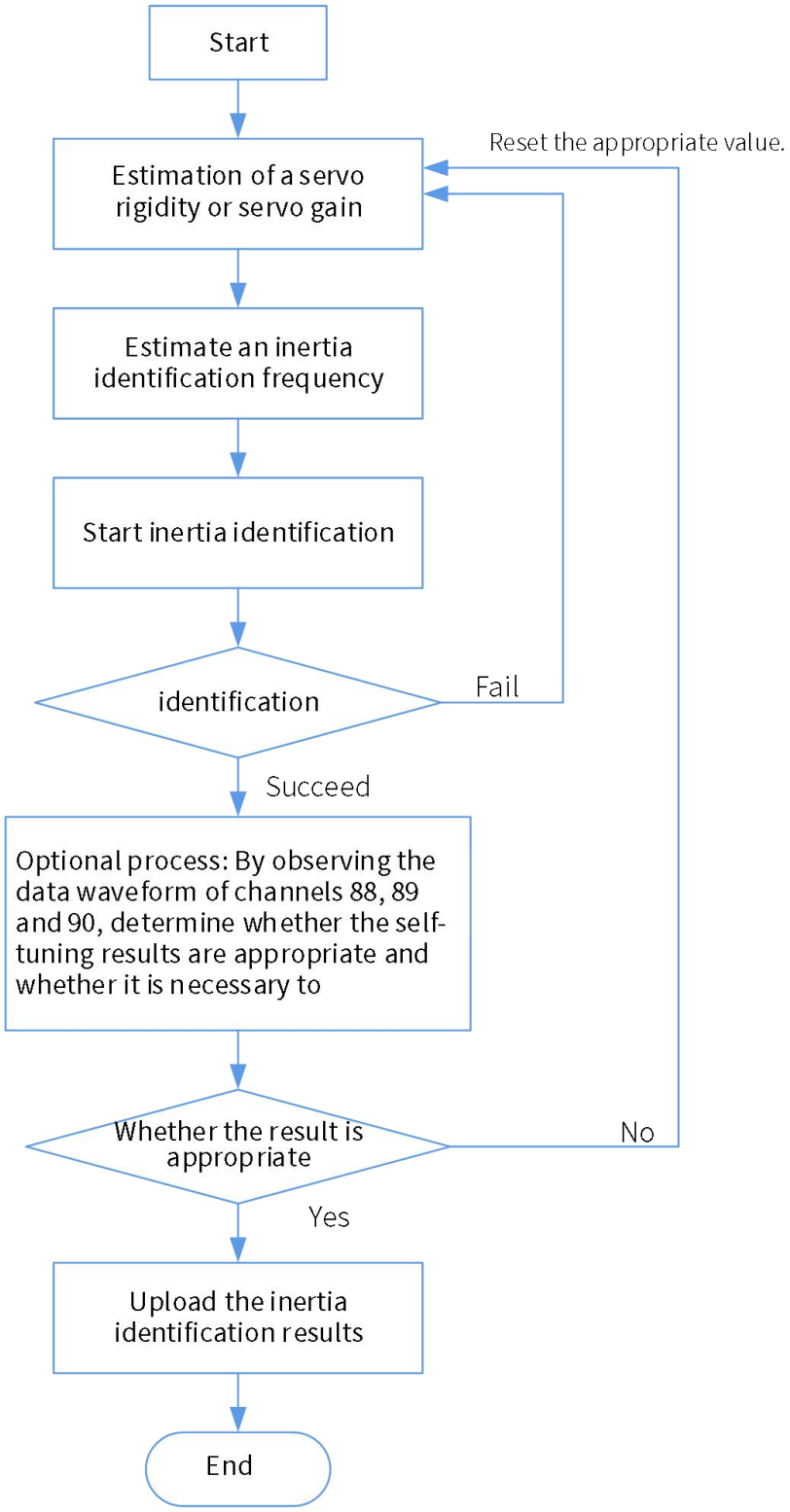
6☒ The load inertia ratio can be manually input, or can be identified by the inertia self-tuning function of the servo drive.

7☒ By applying a certain motion frequency and amplitude to the servo motor and reading the feedback information, the moment of inertia converted by the field load to the motor shaft can be estimated. The result is automatically filled into parameter P63.01.

9.6.1 Precautions for self-adjustment of inertia

- To accurately calculate the load inertia ratio when the inertia is self-adjusting, the following conditions must be met:
- The maximum speed of the motor in actual use is higher than 500rpm;
- When the acceleration and deceleration of the motor are actually used, the acceleration is above 3000rpm/s^2;
- The load connection is stable, can not be drastically changed;
- The actual load inertia ratio should not exceed 50 times, otherwise stall overload may occur in the learning process;
- When the transmission back backlash is large, or elastic load, it is not recommended to use the inertia self-setting function;
- If the actual load inertia ratio is large, and the driver gain or system rigidity is low, it will cause the motor to act slowly and cannot reach the maximum motor
- Speed and acceleration requirements, in this case, the inertia will fail to self-adjust, you should appropriately increase the system rigidity or speed loop gain, and then re-identify the inertia.
- If the driver gain or system rigidity is low and the inertia identification frequency is small, the inertia identification will also fail. In this case, the rigidity of the system or the speed loop gain should be properly adjusted and the inertia identification should be performed again (the maximum rigidity of the system is set to 18 when the inertia is self-adjusting).
- In the process of inertia self-tuning, if vibration or even shock occurs, the inertia identification should be stopped immediately, and the system rigidity, servo gain or inertia identification frequency should be reduced.
- Before the inertia self-setting begins, protective measures such as emergency stop and safety limit (with more than 3 cycles of movable travel in each direction between the mechanical limit) should be taken.

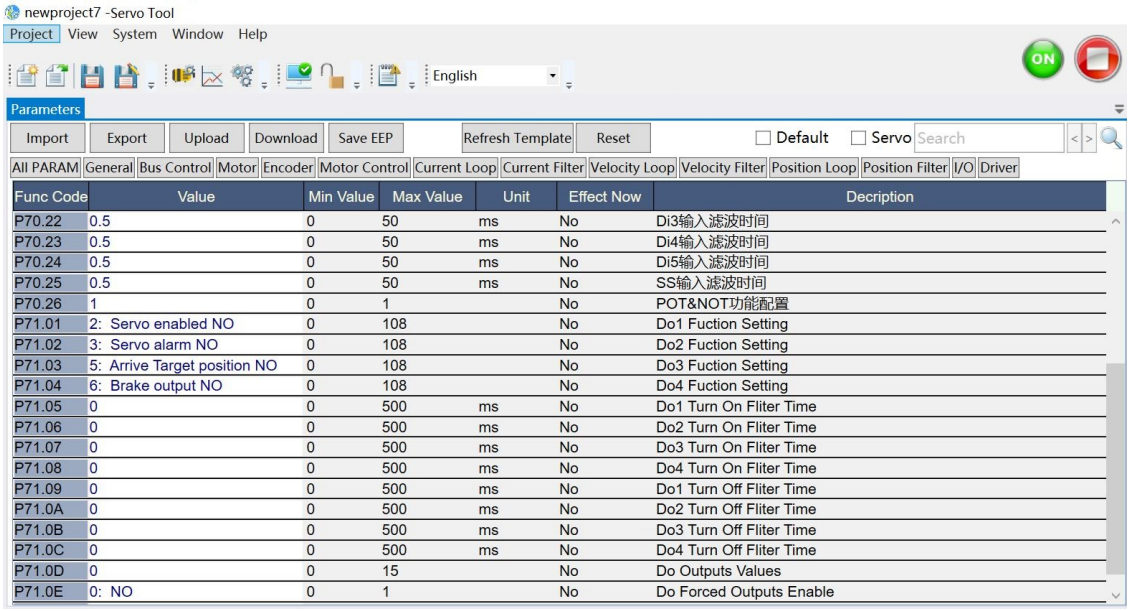
9.6.2 Inertia self-tuning process



9.7 Reset parameters and update parameter templates

9.7.1 Resetting Parameters

In some cases, you need to restore parameters to factory defaults. The following describes the procedure for resetting parameters in the debugging software:

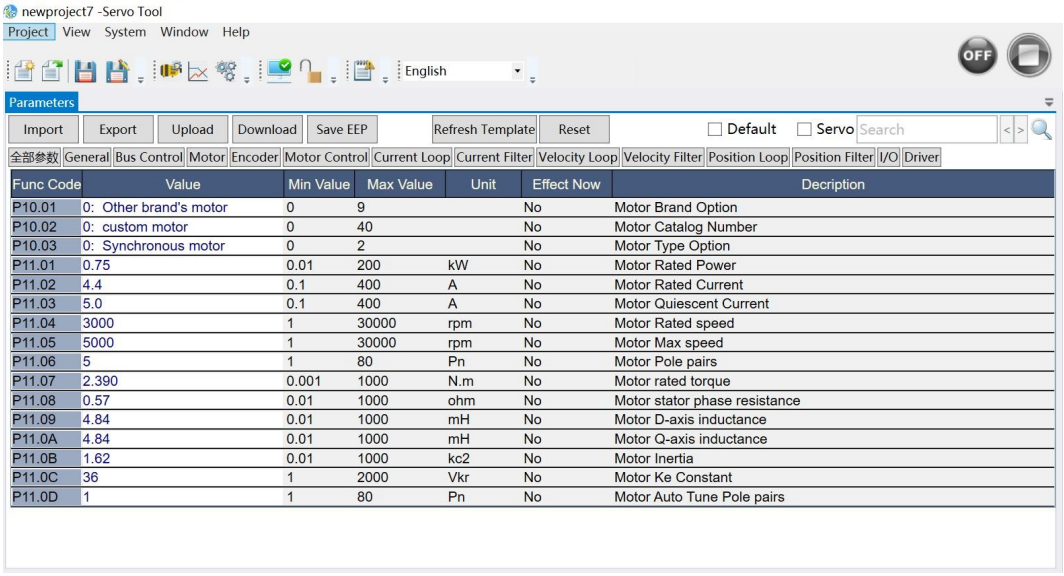


Func Code	Value	Min Value	Max Value	Unit	Effect Now	Decription
P70.22	0.5	0	50	ms	No	Di3输入滤波时间
P70.23	0.5	0	50	ms	No	Di4输入滤波时间
P70.24	0.5	0	50	ms	No	Di5输入滤波时间
P70.25	0.5	0	50	ms	No	SS输入滤波时间
P70.26	1	0	1		No	POT&NOT功能配置
P71.01	2: Servo enabled NO	0	108		No	Do1 Fuction Setting
P71.02	3: Servo alarm NO	0	108		No	Do2 Fuction Setting
P71.03	5: Arrive Target position NO	0	108		No	Do3 Fuction Setting
P71.04	6: Brake output NO	0	108		No	Do4 Fuction Setting
P71.05	0	0	500	ms	No	Do1 Turn On Fliter Time
P71.06	0	0	500	ms	No	Do2 Turn On Fliter Time
P71.07	0	0	500	ms	No	Do3 Turn On Fliter Time
P71.08	0	0	500	ms	No	Do4 Turn On Fliter Time
P71.09	0	0	500	ms	No	Do1 Turn Off Fliter Time
P71.0A	0	0	500	ms	No	Do2 Turn Off Fliter Time
P71.0B	0	0	500	ms	No	Do3 Turn Off Fliter Time
P71.0C	0	0	500	ms	No	Do4 Turn Off Fliter Time
P71.0D	0	0	15		No	Do Outputs Values
P71.0E	0: NO	0	1		No	Do Forced Outputs Enable

1) After the driver connection is successful, log in with the password, enter the parameter list TAB, and select Reset parameter function.

2) Click reset parameters, and the drive will perform the parameter reset function. After completion, a dialog box will pop up to inform the completion status.

3) After the reset is complete, power off and restart. After reconnecting the drive, click Update Parameters template and you will see that all parameters in the drive have been restored to factory defaults.



Func Code	Value	Min Value	Max Value	Unit	Effect Now	Decription
P10.01	0: Other brand's motor	0	9		No	Motor Brand Option
P10.02	0: custom motor	0	40		No	Motor Catalog Number
P10.03	0: Synchronous motor	0	2		No	Motor Type Option
P11.01	0.75	0.01	200	kW	No	Motor Rated Power
P11.02	4.4	0.1	400	A	No	Motor Rated Current
P11.03	5.0	0.1	400	A	No	Motor Quiescent Current
P11.04	3000	1	30000	rpm	No	Motor Rated speed
P11.05	5000	1	30000	rpm	No	Motor Max speed
P11.06	5	1	80	Pn	No	Motor Pole pairs
P11.07	2.390	0.001	1000	N.m	No	Motor rated torque
P11.08	0.57	0.01	1000	ohm	No	Motor stator phase resistance
P11.09	4.84	0.01	1000	mH	No	Motor D-axis inductance
P11.0A	4.84	0.01	1000	mH	No	Motor Q-axis inductance
P11.0B	1.62	0.01	1000	kc2	No	Motor Inertia
P11.0C	36	1	2000	Vkr	No	Motor Ke Constant
P11.0D	1	1	80	Pn	No	Motor Auto Tune Pole pairs

9.7.2 Updating a Parameter Template

If the parameter template in the project in use is inconsistent with the parameter information in the actual drive, the software prompts you whether to update the parameter template. If you select Yes, the parameter list in the project and the drive are automatically updated. If you select No, you can also use the Update Parameter template button to manually update the parameter list.

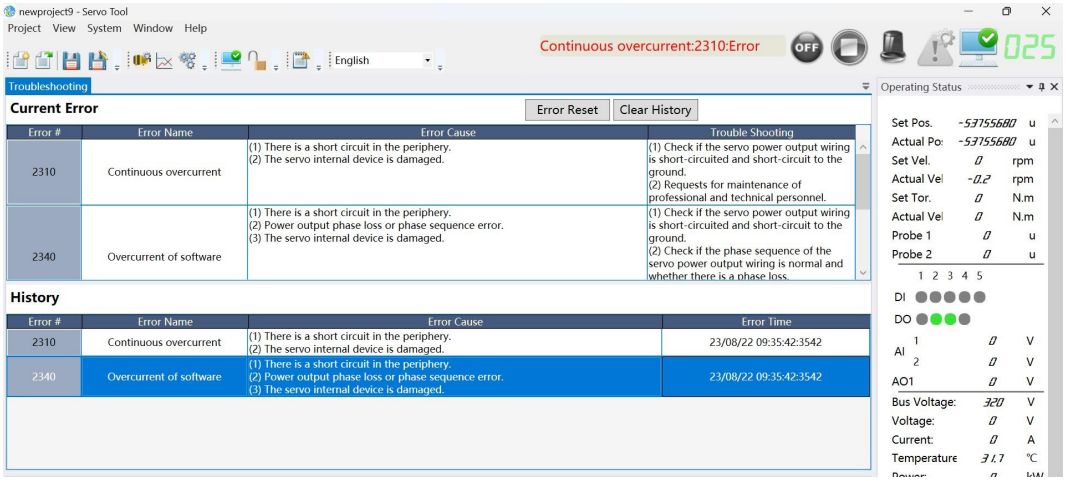
After the update parameter template starts, a progress bar displays the current progress. When the progress bar is full, a message indicating that uploading information is complete or failed is displayed.

Note:

Updating the parameter template is only to synchronize the parameter list in the project with that in the drive. After the upload is complete, you need to upload parameters to upload the parameter values in the drive to the PC

9.8 Fault process

If a fault occurs after the driver is successfully connected, the current fault information and historical fault information are displayed on the fault information page. The alarm number of the current alarm is displayed in the toolbar.



If the current control channel is Debug Software Control, you can use the fault reset button to reset the fault. If it is a controller control, it is necessary to operate the control word through the upper computer to complete the alarm reset.

Locate the fault according to the cause of the current alarm and refer to the troubleshooting method. For details, see Troubleshooting Chapter.

Note:

For some faults such as continuous overcurrent, in order to protect the internal components of the driver, the alarm information must be eliminated after the fault is removed, and the power off and restart can be eliminated.

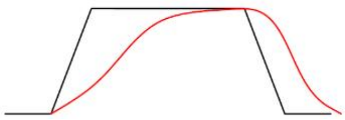
Chapter 10 N3 commissioning and trial operation

10.1 Overview

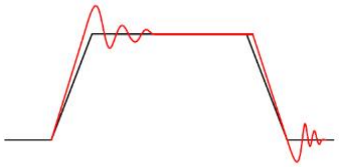
The characteristic of servo is that it can quickly and accurately follow the change of command signal. In practical applications, due to the different mechanical characteristics, the response performance of the servo system will be reduced. At this time, the gain of the servo system must be adjusted reasonably, so that the system can achieve the purpose of rapid and accurate response to the command signal to the maximum extent.

To illustrate the meaning of system gain:

System gain is too small



The system gain is too large



Appropriate system gain

The system gain is set by a combination of several parameters (position loop gain, speed loop gain, speed loop integral, filter, inertia ratio, etc.), which affect each other. Therefore, the gain adjustment of the servo system must take into account the balance between the various parameter Settings.

Note:

Before adjusting the system gain, it is recommended to use a point test run to confirm that the motor can work properly.

During the gain adjustment process, the adjustment range should be gradually increased or decreased to avoid excessive adjustment.

10.1.1 General process of system gain adjustment

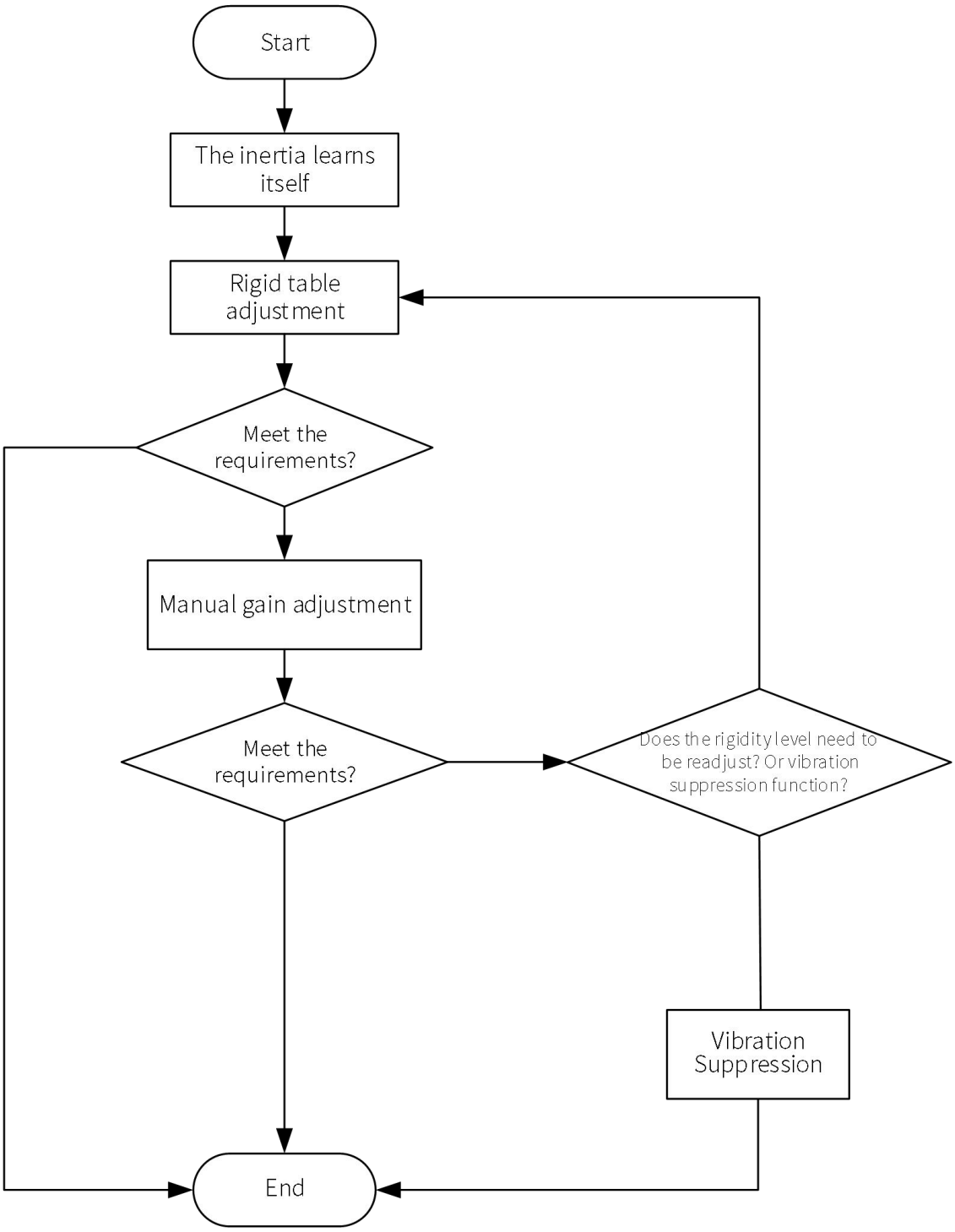


Figure 1 Gain adjustment process

Adjustment process			function
1	The inertia learns itself		The load inertia ratio is calculated automatically by the self-learning function of drive inertia.
2	Rigid table adjustment		On the premise that the inertia ratio is set correctly, a set of gain parameters can be obtained quickly by setting the rigidity class.
3	Manual gain adjustment	Basic gain	On the basis of automatic gain adjustment, the speed loop and position loop gain are manually fine-tuned to optimize the effect.
		Feedforward gain	Adjust feedforward Settings to optimize response performance.
		Filter setting	Filter Settings for position, speed, torque instructions.
4	Vibration suppression	Mechanical resonance	According to the observed frequency waveform, the appropriate notch frequency is set to suppress the mechanical resonance.
		Low frequency resonance	Set the low frequency suppression filter to suppress the low frequency resonance.

Form - Description of the gain adjustment process

10.2 Pre-operation preparation

1) Check the wiring, please refer to "Section 4 Wiring" for details.

2) Check the operating environment, please refer to "Chapter 1 Safety and Precautions".

3) Is the motor a smart brand motor? If it is a third-party brand motor, it is necessary to carry out the encoder zero self-learning.

4) Check the safety protection measures.

5) Check the load connection and mechanical transmission part.

6) Check whether the parameters of the drive and motor are normal.

10.3 Inertia identification

The concept of load inertia ratio:

$$\text{Load inertia ratio} = \frac{\text{Mechanical load total rotational inertial star } /(\text{Reduction ratio}^2)}{\text{The motor's own moment of inertia}} * 100\%$$

Load inertia ratio is an important parameter of servo system, and correct setting of load inertia ratio is helpful to complete debugging quickly.

The load inertia ratio can be set manually or identified using the inertia self-learning function.

Note:

When the inertia self-learning function is used, the following conditions must be met to accurately calculate the load inertia ratio:

- The maximum speed of the actual motor is higher than 500rpm;
- When the actual motor is accelerating and decelerating, the acceleration and deceleration speed are above 3000rpm/s;
- The load connection is stable and stable, and the load torque cannot change drastically;
- The actual load inertia ratio shall not exceed 50 times, otherwise stall and overload may occur in the learning process;
- When the back backlash is large or the load is elastic, the inertia identification may fail or cause large vibration. Please use the self-learning function of inertia with caution when applying such loads.
- If the actual load inertia ratio is large and the driver gain is low, the motor will be slow and cannot meet the requirements of the maximum speed and acceleration of the motor, which will lead to the failure of inertia self-learning, and the inertia self-learning should be re-implemented after the speed loop gain is appropriately increased.
- If the driver gain is low and the inertia identification frequency is low, the inertia identification will fail. At this time, the system gain should be increased (the recommended rigidity of the system is less than 18) and the identification frequency of the inertia (the recommended identification frequency is 200, the maximum cannot exceed 400), and then the inertia self-learning should be re-performed.In the process of self-learning of inertia, if vibration or shock occurs, inertia identification should be stopped immediately. And reduce the system gain or inertia identification frequency and re-self-learning;
- Before the beginning of inertia self-learning, protective measures such as emergency stop and safety limit should be done, and ensure that the motor has a movable stroke of 3 cycles or more each, to prevent the inertia self-learning process from overrunning, resulting in accidents!

10.3.1 Inertia self-learning process

Before inertia self-learning, please confirm and meet the following motor motion requirements:

- Between the mechanical limit switches, there is a movable stroke of 3 or more turns in each direction.
- Before performing inertia self-learning, ensure that the finite bit switch is installed on the machine and works properly.
- There is a movable stroke of ±3 turns between the mechanical limits to avoid overreach in the process of inertia identification, resulting in accidents!
- The load allows frequent forward and reverse motion.
- Mechanical equipment and liabilities are allowed to carry out positive and negative motion, positive and negative motion amplitude is about 60°, positive and negative frequency is about 00~500.

Estimated load inertia ratio:

If the inertia ratio P63.01 is the default value, and the actual load inertia ratio is greater than 30 times, it may cause inertia self-learning failure due to slow motor action, then the following two measures can be taken:

1) Preset inertia than P63.01 Parameter: A large 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) Properly increase the drive rigidity class P63.02, so that the speed and acceleration of the motor self-learning can meet the inertia identification needs.

Note:

Too much rigidity may cause faults such as motor overload. Therefore, increase rigidity with caution. The recommended rigidity for self-learning is less than or equal to 18.

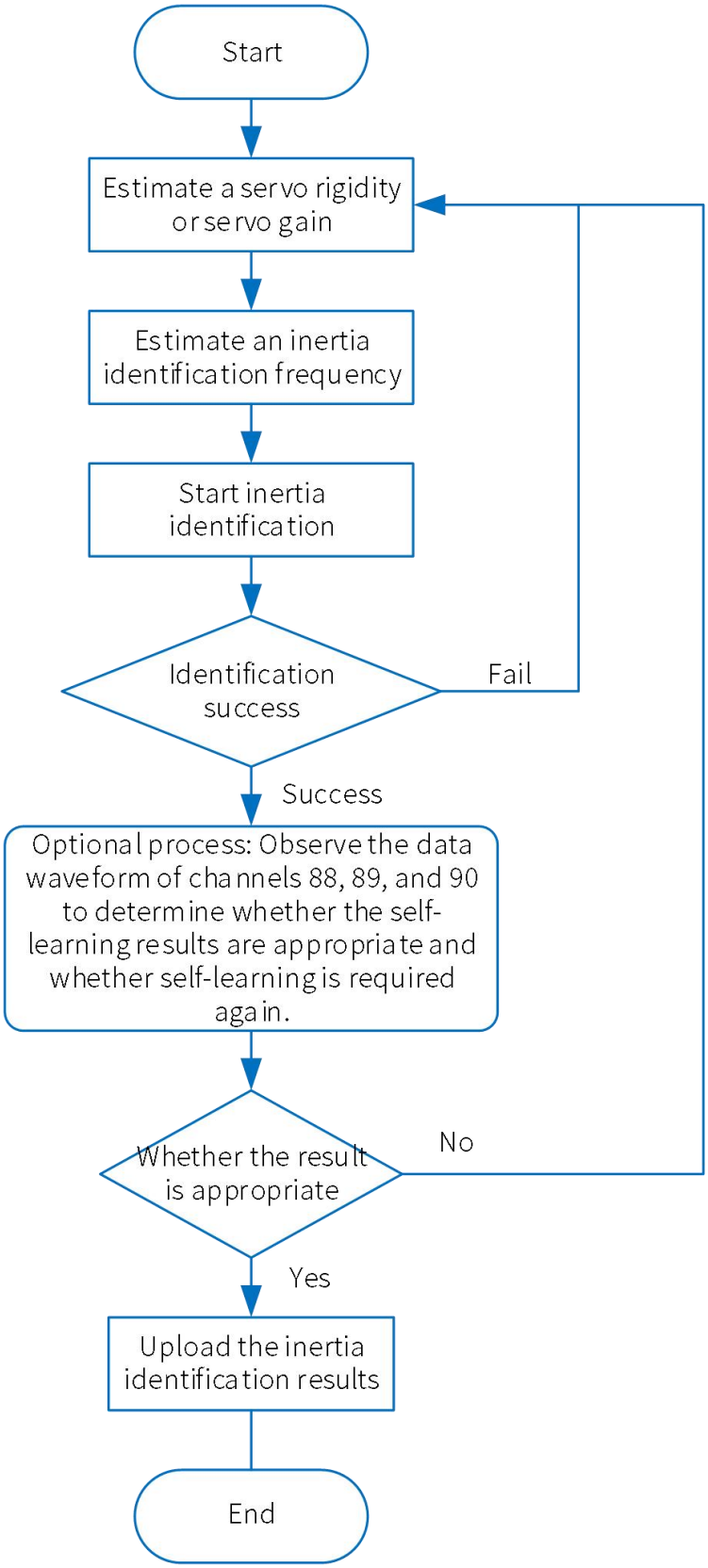


Figure - Inertia self-learning process

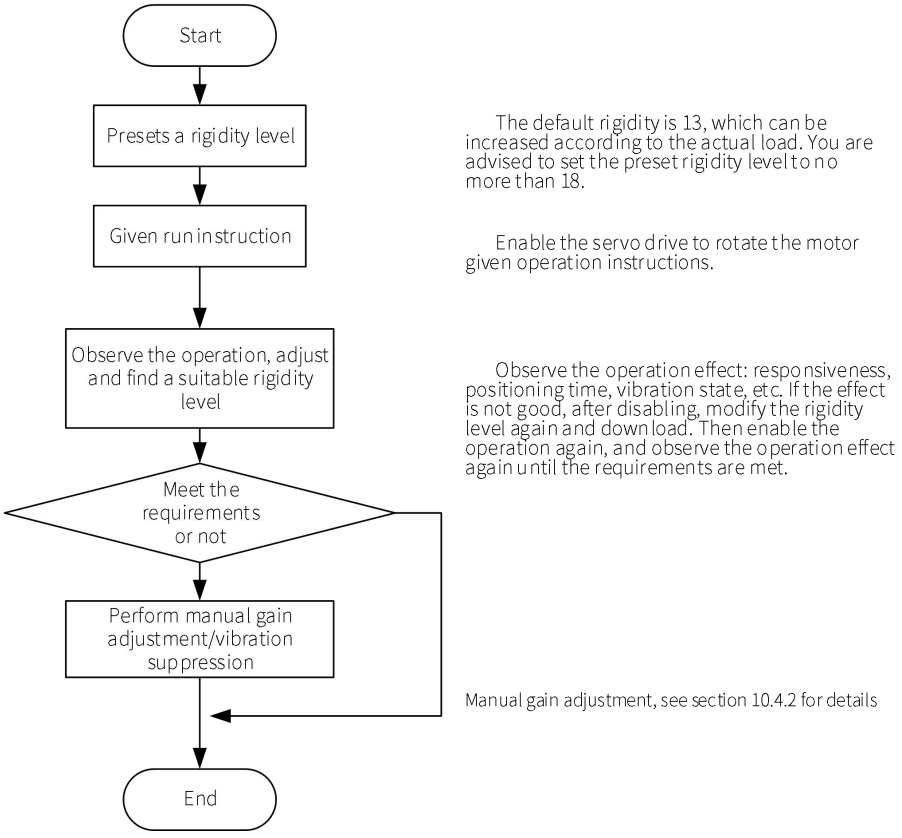
Associated parameters:

Parameter group	serial number	name	unit	Data range	Factory default	Change mode	Effective mode
P63	01	Ratio of inertia	%	0~5000	250	Stop setting	Shutdown effect
	02	Mechanical rigidity setting	-	0~31	13	Stop setting	Shutdown effect
	03	Inertia identification frequency		1~2000	200	Stop setting	Shutdown effect

10.4 Gain adjustment

10.4.1 Fast gain setting of rigid table

By selecting a rigidity class in the rigidity table, the servo drive automatically generates a set of matching gain parameters to meet speed and stability requirements.



The rigidity level ranges from 0 to 31. The rigidity level 0 corresponds to the weakest and the system gain is the smallest. Level 31 corresponds to the strongest rigidity and maximum gain. According to different load types, the following experience values can be used for reference:

Form - The experience value of rigidity class in general occasions

Rigidity class experience value	Type of load structure
4~8Level	Some large machinery, the responsiveness, positioning accuracy requirements are very low occasions.
8~15Level	Belts and other applications with low rigidity.
15~20Level	Ball screw, direct connection and other rigid requirements of the occasion.

Associated parameters:

Parameter group	serial number	name	unit	Data range	Factory default	Change mode	Effective mode
P60	01	Position loop gain	Hz	0~1000	48	Stop setting	Shutdown effect
P50	01	speed loop gain	Hz	0.1~500	27	Stop setting	Shutdown effect
	02	speed loop integration time	ms	0.1~370	40	Stop setting	Shutdown effect
/	/	Current set filtering time	ms	/	/	Stop setting	Shutdown effect

Note:

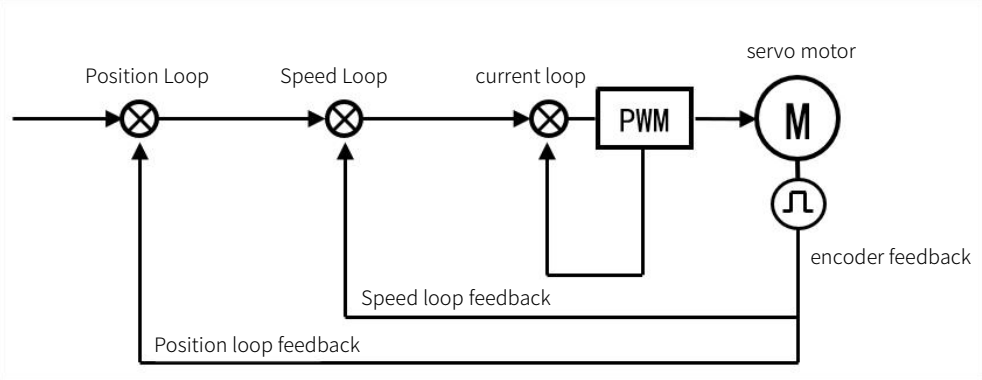
Before using the rigid setting, it is important to obtain the load inertia ratio correctly.

This manual was written based on the V11.2 servo firmware version. In this firmware version, the gain and rigidity parameters must be disabled before setting and taking effect. If the firmware version is updated later, check whether the firmware version description supports online setting.

10.4.2 Manually Adjusting the Gain

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, which are position loop, speed loop and current loop from outside to inside. The basic control block diagram is shown as follows:



Note:

In servo control, the more inside the loop, the higher the responsiveness is required. When adjusting the actual gain, follow this rule; otherwise, the system will be unstable! N3 Driver current, speed, position controller PID structure:

- Current and speed controller

The current and speed controller in the N3 series servo system uses PID architecture to ensure fast response while improving disturbance resistance. After ignoring the filtering and other aspects in the forward channel and feedback channel, the PID controller architecture designed is shown as follows:

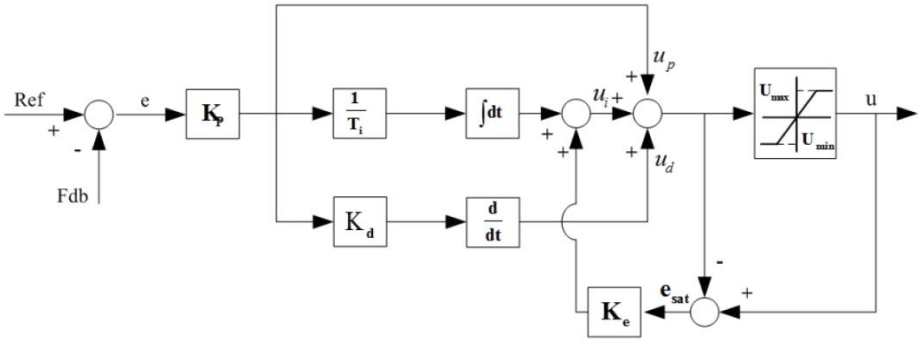


Figure - Current, speed PID controller structure diagram

- Position controller

The position controller in the N3 series servo system uses a composite feedforward proportional controller with a proportional + feedforward architecture to ensure a fast response to position setting and eliminate steady-state errors. Ignoring the filtering process in the controller, the frame structure of the designed position controller is shown as follows:

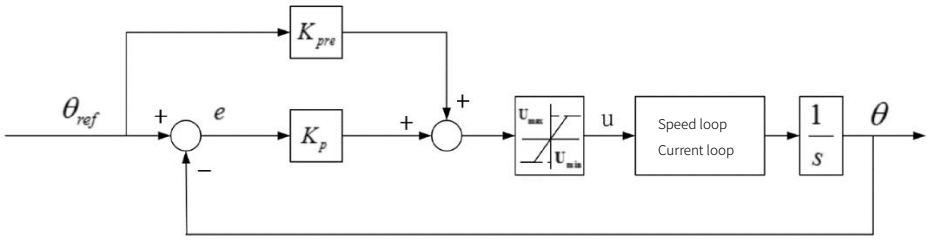


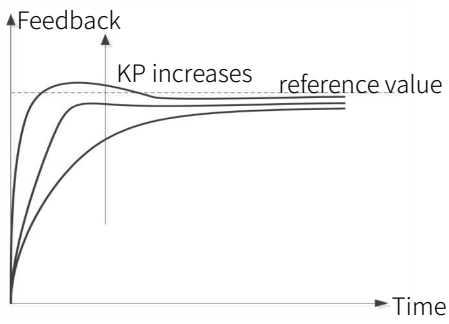
Figure - Schematic diagram of position controller structure

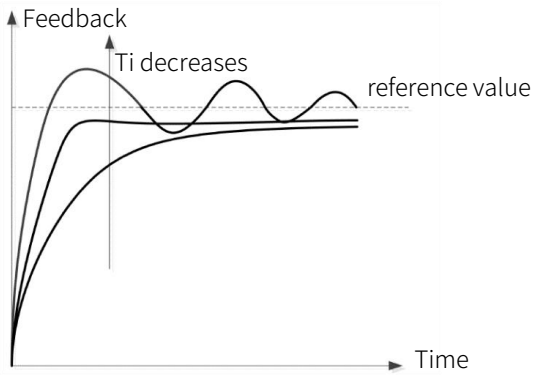
Position servo system does not allow position overshoot and shock, so as to avoid production accidents such as collision and processing scrap. If the integral controller is used, it will appear that when the position is set to reach the target value, the speed is set to remain high, and the motor will run at high speed, resulting in position overshoot. In order to reduce steady-state error of position control, it is necessary to increase the proportional gain of position controller, but too large gain will lead to system instability or shock, so add feedforward control to improve the position response of servo system and eliminate steady-state error.

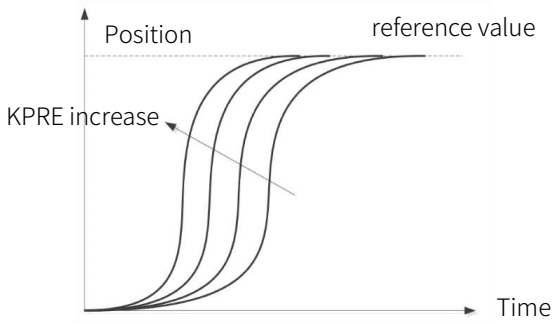
- PID parameter debugging method

When adjusting the gain, the more inside the loop, the more responsive it requires. When adjusting the actual gain, follow this rule; otherwise, the system will be unstable! Since the default current loop gain of the servo driver already ensures adequate responsiveness, adjustments are generally not required. Only the speed loop, position loop gain and other auxiliary gains need to be adjusted. Therefore, when adjusting the gain in position control mode, to ensure the stability of the system, it is necessary to increase the gain of the position loop while increasing the gain of the speed loop, and ensure that the response of the position loop is lower than that of the speed loop.

The functions of each parameter in PID are as follows:

PID parameter adjustment and function	
name	Adjustment instruction
Proportional gain parameter Kp (position loop gain parameter; speed loop gain parameter; Current loop gain parameter)	Parameter function: Speed up the response speed of the system and improve the adjustment accuracy of the system. Adjustment method: With the increase of Kp, the response speed of the system is accelerated and the adjustment precision of the system is improved. But the system is easy to produce overshoot, the stability of the system becomes worse, and even cause the system to oscillate. Kp value is too small, the adjustment accuracy is reduced, the response speed is slow, and the adjustment time is prolonged, which makes the dynamic and static performance of the system deteriorate. When the proportional gain changes, the step response trend is shown in the figure below: 

PID parameter adjustment and function	
name	Adjustment instruction
Integral time parameter Ti (speed loop integral time parameter; Current loop integration time parameter)	Parameter function: Eliminate system steady-state errors. Adjustment method: The smaller Ti is, the faster the steady-state error of the system will be eliminated, but Ti should not be too small, otherwise the integral saturation phenomenon will occur in the early stage of the response process. However, if Ti is too large, the steady-state error of the system will be difficult to eliminate, which will affect the adjustment accuracy of the system. In addition, in the forward channel of the control system, as long as there is an integral link, it can always achieve steady state without static error. From a phase point of view, an integral link has a 90° phase delay, which may destroy the stability of the system. When the integral time constant changes, the step response trend is shown in the figure below: 
Differential parameter Kd (speed loop differential parameter; Differential parameter of current loop)	Parameter function: To improve the dynamic performance of the system, its main function is to restrain the deviation change in any direction during the response process, and to forecast the deviation change in advance. Adjustment method: Since the control loop of the N3 servo system has a high refresh rate, it is generally not necessary to use differentiation.

PID parameter adjustment and function	
name	Adjustment instruction
Feedforward gain coefficient Kper (position feedforward)	Parameter function: Improve system position response and eliminate 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 feedforward coefficient will still cause the instability of the system. Reducing Kper can improve the stability of the system, but the system response will be slower. The influence of feedforward scale factor on position tracking performance is shown in the figure below: 

Associated parameters:

- Current ring parameter adjustment

Serial number P40.01	name	Current loop Kp			Set effective	Disable enable	Data range	0.1~99.99
	Access attribute	RW	Unit	0.01	Correlation model	ALL	Factory setting	0.54
Serial number P40.02	name	Current loop Ti			Set effective	Disable enable	Disable enable	0.1~999.9
	Access attribute	RW	unit	0.1	Correlation model	ALL	Factory setting	100

Under normal circumstances, the current ring does not need to be adjusted, and it can be analyzed by observing the current curve in the speed mode or torque mode to analyze its following, jitter, shock, and burr, and decide whether it needs to be fine-tuned according to actual needs.

- Speed ring parameter adjustment

Serial number P50.01	Name	Speed loop gain 1			Set effective	Disable enable	Data range	0.1~500
	Access attribute	RW	Unit	Hz	Correlation model	ALL	Factory setting	27
Serial number 50.02	name	speed loop integration time 1			Set effective	Disable enable	Data range	0.1~370
	Access attribute	RW	Unit	ms	Correlation model	ALL	Factory setting	40

When the load inertia ratio is set correctly, the speed loop gain parameter can determine the speed loop following performance. In the absence of noise and vibration, increasing this parameter can speed up the positioning time and bring better speed following and stability. If you produce whistling or noise, you need to lower the parameter Settings.

The speed loop integration time can be used to eliminate the speed loop deviation, and reducing the integration time can strengthen the integration effect and speed up the positioning time, but too small the setting value is easy to cause mechanical vibration. If the setting value is too high, it is easy to cause the speed loop deviation to be unable to return to zero.

- Position ring parameter adjustment

Serial number P60.01	Name	Position loop gain			Set effective	Disable enable	Data range	0~1000
	Access attribute	RW	unit	Hz	Correlation model	ALL	Factory setting	48
Serial number P60.02	name	Position loop feedforward coefficient			Set effective	Disable enable	Data range	0~1000
	Access attribute	RW	unit	%	Correlation model	ALL	Factory setting	50

The position loop gain determines how often the position instructions can be followed by the position loop. Increasing this setting helps to speed up the positioning time and improve the motor's ability to resist external disturbances when the motor is stationary. However, too large a setting value can easily cause system instability, shock, overload and other phenomena.

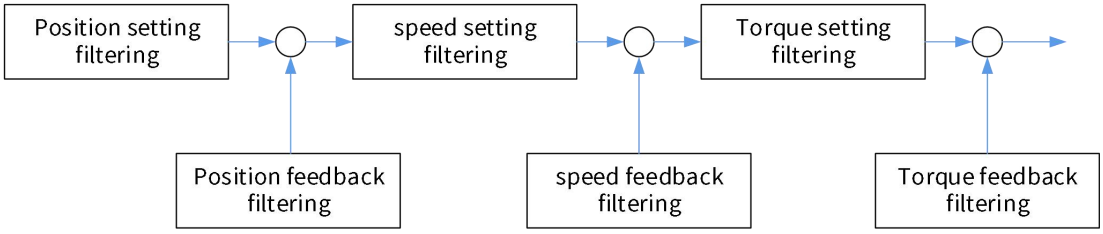
10.4.3 Vibration suppression

The mechanical system has a certain resonance frequency, and when the servo gain is increased, resonance may occur near the mechanical resonance frequency, resulting in an inability to continue to improve the gain.

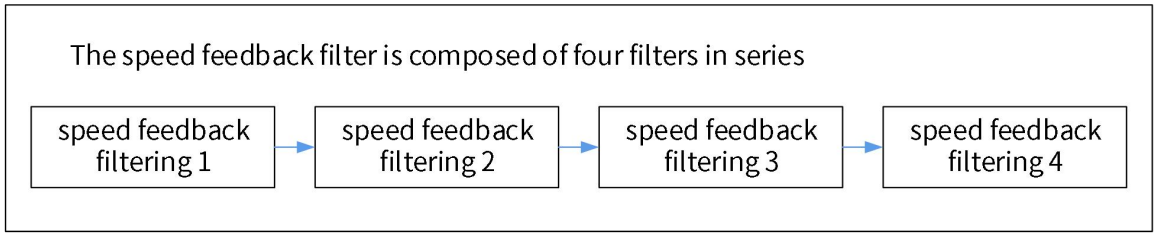
The suppression of mechanical resonance can be achieved by setting the filter reasonably, but if the filter parameters are set incorrectly, the system will vibrate and even damage the motor.

1) Filter structure

The N3 servo system has 6 filtering links: torque setting, torque feedback, speed setting, speed feedback, position setting and position feedback, and each filtering link contains 4 separate filter modules in series. Take the speed feedback filter bank as an example, as shown in the following figure:



Note: The current position setting and position feedback filter group are not valid, only the relevant interfaces are reserved.



Filter structure

2) Filter function introduction

The N3 servo system includes a low-pass filter and a notch filter. The functions of these two filters are described in detail below.

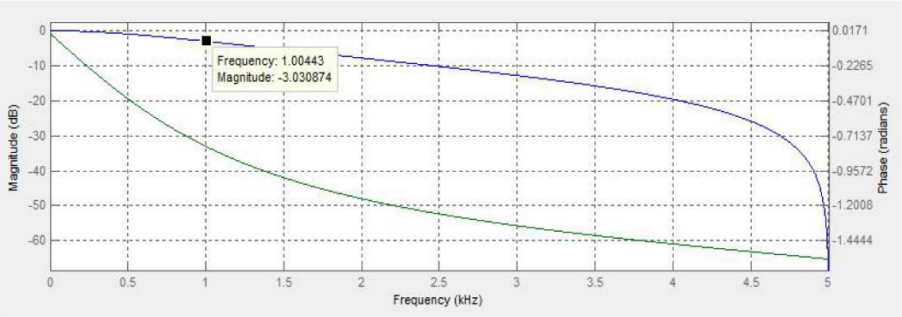
- Low pass filter

The ideal low-pass filter is a filter device that allows signals below the cutoff frequency to pass, but signals above the cutoff frequency cannot pass. However, the actual digital filter is that when the signal frequency is higher than the cutoff frequency, the amplitude of the signal is attenuated at the rate of the square of the frequency.

The following is a Bird diagram of a first-order low-pass filter, in which the cutoff frequency is 1kHz, and the higher the frequency of the input signal, the stronger the attenuation effect of the filter on the signal, and the larger the phase delay.

The second-order low-pass filter has a stronger effect on signal attenuation after the cutoff frequency, but the phase delay at the cutoff frequency is also larger. The third-order low-pass filter may cause overshoot and is not recommended for customers in the servo system.

Second-order low-pass filters are commonly used in N3 servo systems.

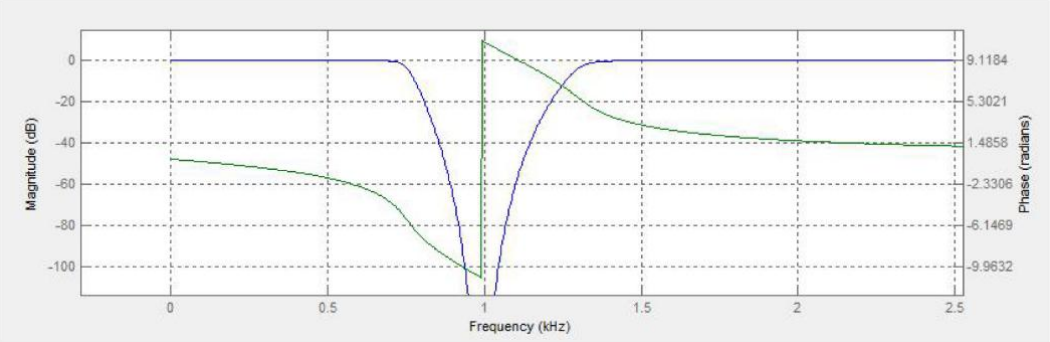


Bode diagram of a low-pass filter

- notch filter

A notch filter, also known as a band-stop filter, is a filter that can pass through most frequency components, but attenuates some range of frequency components to very low levels.

The following is the Bode diagram of the second-order notch filter, the central frequency of the notch is 1kHz, and the filter has the strongest attenuation effect on the signal near this frequency, and has little effect on the signal far from the center frequency. The greater the depth of the notch, the stronger the attenuation effect on the central frequency point.



Notch filter Bode diagram

- Filter parameter Settings

The speed feedback filter is taken as an example to introduce the parameter setting of the filter. The speed feedback filter is composed of four filter modules 1, 2, 3, 4 and 4 in series. Each filter module has 4 control parameters, as follows:

P52.01	1: First order low-pass filter	0	4		No	VelFbk Filter1 Type
P52.02	800	200	5000	Hz	No	Cut-off Frequency of VelFbk LPF1
P52.03	100	3	5000	Hz	No	VelFbk Filter1 Notch Frequency
P52.04	5	3	50	db	No	VelFbk Filter1 Notch Attenuation

Associated parameters:

In general, the notch filter is used only after the motor vibrates and the vibration frequency is detected.

Note

In the debugging process, if the filter needs to be enabled, it is generally recommended to use the filter in the speed feedback or current feedback. And the speed is given and the current is given. Attention:

- Before setting the filter, it is necessary to set the inertia ratio, rigidity (position loop and speed loop gain) parameters, and configure the filter reasonably on the basis of appropriate parameters.
- By default, a first-order low-pass filter with a cutoff frequency of 1000Hz is added to the speed feedback link to facilitate appropriate filtering of interference or noise signals.
- The filter will cause phase delay, which in severe cases will cause the system to wobble in response. If wobble occurs, try increasing the filter cutoff frequency, or disabling the filter.
- When it is used for industrial robots and the speed feedback low-pass filter is enabled, it is recommended that the cutoff frequency is not less than 2500Hz.
- If the servo is in position control mode, the default filter configuration can be used without change if the given change in position is excluded and the three ring parameters are out of place, and if the given speed fluctuation is less than ±1.5 . If the fluctuation exceeds ±1.5

Parameter number P52.01	name	speed feedback filter type 1			Set effective	Disable enable	Data range	0~4
	accessibility	RW	unit	-	Correlation model		Factory setting	0
	0: The filter is not enabled 1: first-order low-pass filter 2: second-order low-pass filter 3: second-order low-pass filter with zero 4: notch filter							
Parameter number P52.02	name	speed feedback 1 Cut-off frequency			Set effective	Disable enable	Data range	200~5000
	accessibility	RW	unit	Hz	Correlation model		Factory setting	200
	When the speed feedback filter type 1 is set to a low-pass filter, this parameter is used to set its cutoff frequency. When the filter type parameter is set to disable or notch filter, this parameter has no meaning.							
Parameter number P52.03	name	speed feedback 1 notch frequency			Set effective	Disable enable	Data range	3~5000
	accessibility	RW	unit	Hz	Correlation model		Factory setting	100
	When the speed feedback filter type 1 is set as a notch filter, this parameter is used to set its notch center frequency. This parameter has no meaning in cases where the filter type parameter is set to disable or low-pass filters.							

Parameter number P52.04	name	speed feedback 1 Notch depth			Set effective	Disable enable	Data range	3~50
	accessibility	RW	unit	db	Correlation model		Factory setting	5
	When the speed feedback filter type 1 is set as a notch filter, this parameter is used to set its notch depth. This parameter has no meaning in cases where the filter type parameter is set to disable or low-pass filters.							

10.5 Encoder zero correction

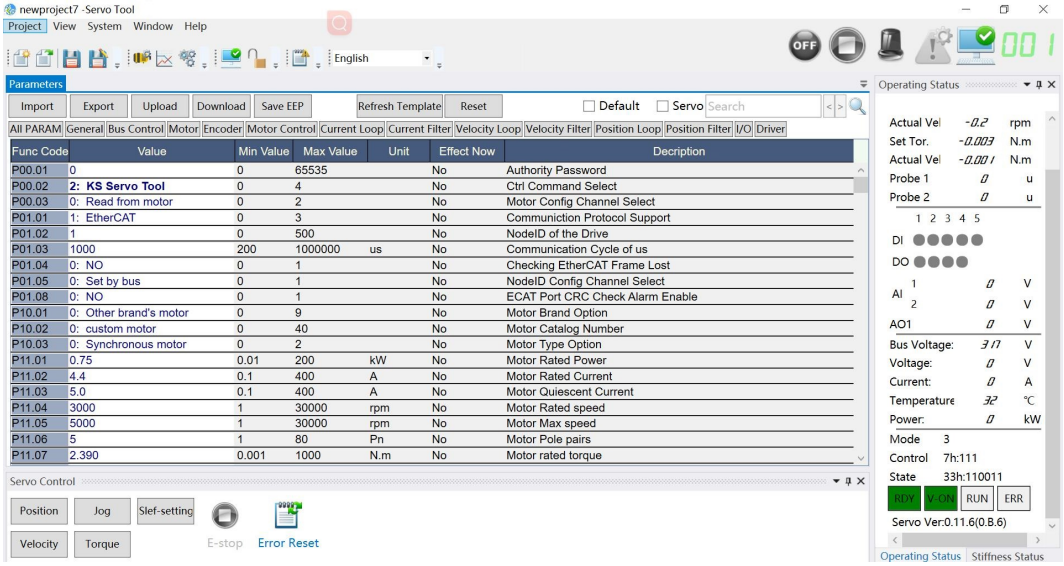
If the motor used is a servo motor of a non-KRO smart brand, and the encoder is one of the Tameragawa, Nikon, Panasonic, and EnDat agreements, the motor encoder zero correction must be carried out before the official operation. Otherwise, direct use of servo motor without encoder zero correction will lead to low drive performance, failure alarm, serious risk of endangering personal equipment safety such as flying car! It must be paid attention to.

The following are zero correction instructions for various encoder protocol types:

Tama Agawa, Nikon, Panasonic encoders zero calibration ensures that the motor is in the optical axis state (the shaft is completely free of load to ensure zero calibration accuracy).

After correctly wiring and connecting the servo motor to the N3 driver, connect the N3 driver on the PC using the ServoTool debugging software.

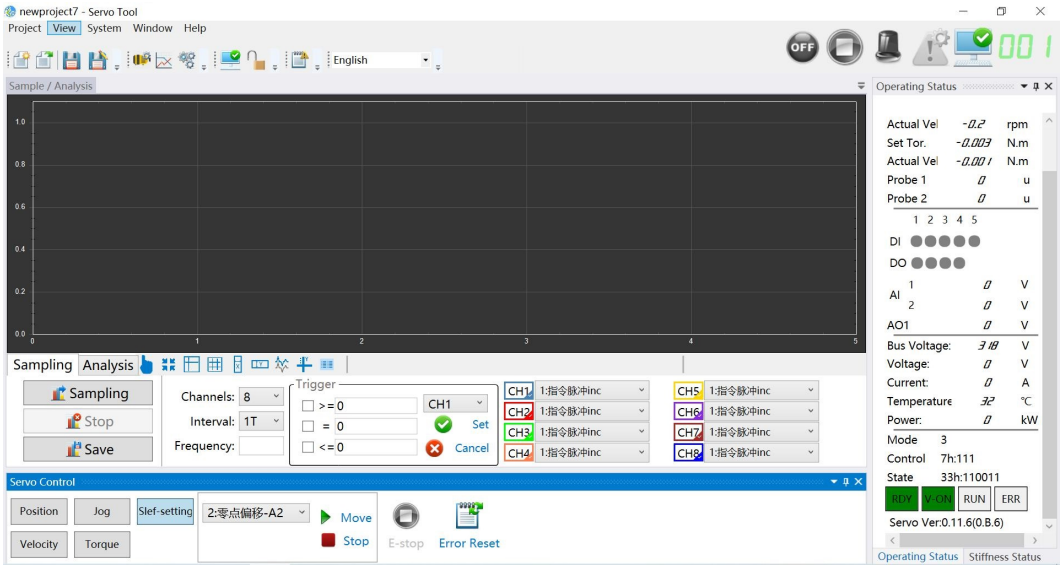
(1) Set P00.02 control channel to Debug Software Control and download the parameters.



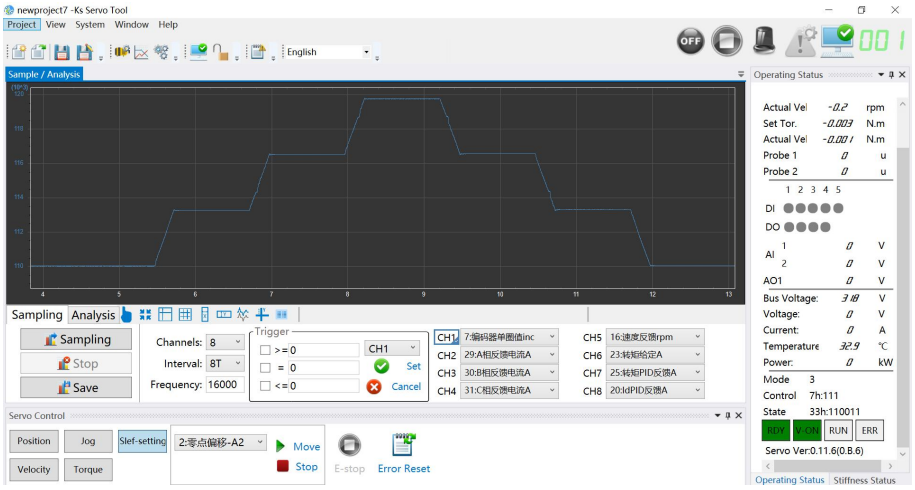
(2) Confirm that the servo currently has no alarm, accurately input and confirm the motor parameters of the third-party servo motor, P10.01~P11.0C; Download parameters for P20.01 to P20.03 and restart the servo control power supply.

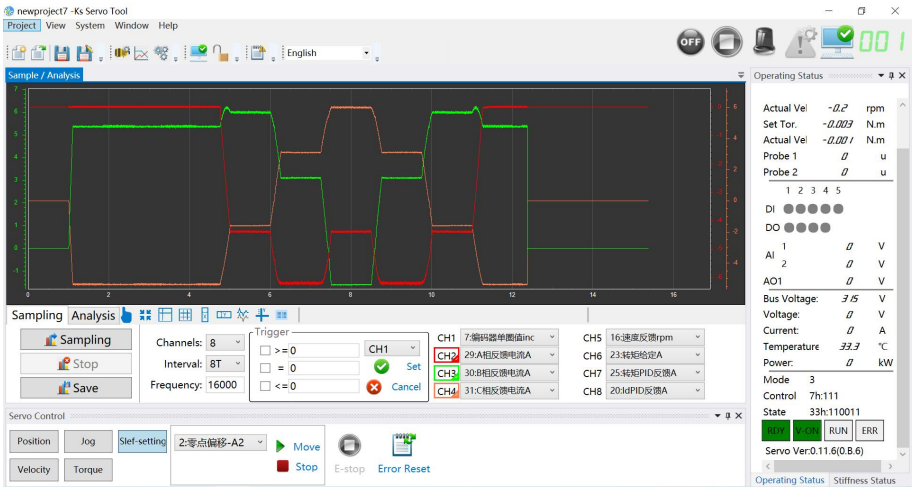
P10.01	0: Other brand's motor	0	9		No	Motor Brand Option
P10.02	0: custom motor	0	40		No	Motor Catalog Number
P10.03	0: Synchronous motor	0	2		No	Motor Type Option
P11.01	7.50	0.01	200	kW	No	Motor Rated Power
P11.02	32.0	0.1	400	A	No	Motor Rated Current
P11.03	38.4	0.1	400	A	No	Motor Quiescent Current
P11.04	1500	1	30000	rpm	No	Motor Rated speed
P11.05	1800	1	30000	rpm	No	Motor Max speed
P11.06	4	1	80	Pn	No	Motor Pole pairs
P11.07	48.000	0.001	1000	N.m	No	Motor rated torque
P11.08	0.05	0.01	1000	ohm	No	Motor stator phase resistance
P11.09	0.39	0.01	1000	mH	No	Motor D-axis inductance
P11.0A	0.39	0.01	1000	mH	No	Motor Q-axis inductance
P11.0B	95.00	0.01	1000	kc2	No	Motor Inertia
P11.0C	94	1	2000	Vkr	No	Motor Ke Constant

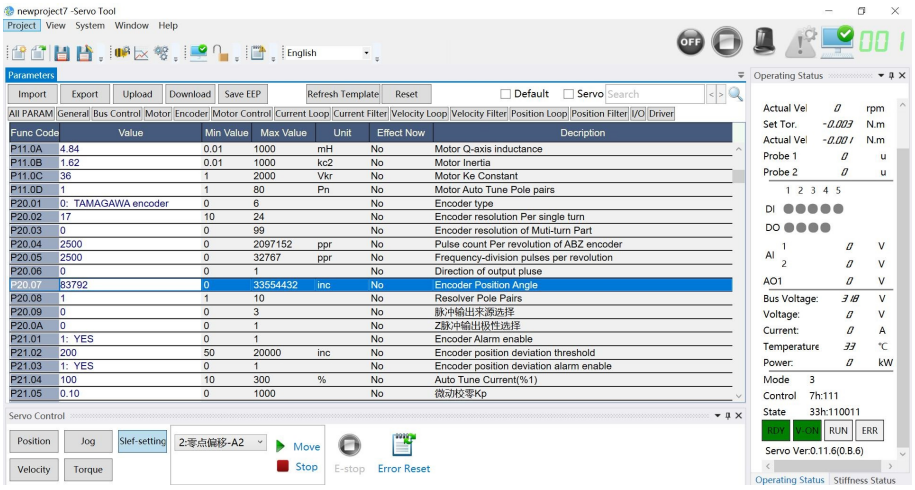
(3) After reconnection, switch the page to the "Servo Control" page, find the self-tuning area, select the No. 2 mode "zero offset -A2", click the run button below, the servo motor will be zero self-tuning.



(4) The normal encoder zero state is that the servo motor is first automatically enabled, then the motor shaft will turn counterclockwise 3 times (about 15° each time), then turn clockwise 3 times (about 15° each time), and then complete the zero calibration process, and the zero calibration result is written into the EEPROM of the motor encoder, when the drive is powered on again, The result will be read from the encoder EEPROM and the zero correction result can be uploaded for viewing in P20.07.







This way can ensure that after a successful zero self-tuning of the motor, even if the replacement of other N3 drivers do not have to perform zero self-tuning again, you can directly drive the motor to run. However, occasionally there will be some reasons to cause the zero correction failure, at this time there will be a corresponding alarm, for specific solutions, please refer to the troubleshooting chapter.

Attention:

1) In some cases, because the current loop Kp is too large, it may cause the motor to oscillate when the zero is corrected, resulting in false alarms such as phase loss and overload. At this time, the current loop Kp value can be appropriately reduced (the empirical value Kp=0.54,Ti=100) after downloading, re-calibrating the zero step, generally successful.

2) If the third party motor of the Panasonic encoder is only for trial use, the above method is not recommended, because once the zero correction result is written to the encoder EEPROM by the "zero offset -A2" method, only the servo drive of the brand can recognize the zero correction result in the future, and the original drive of Panasonic may not be recognized.

Therefore, if the third party motor is just a trial, it will be used back to the original driver in the future. It is recommended to use the "6: zero offset" zero calibration mode, which steps are the same as the "zero offset -A2" mode, the difference is that the "6: zero offset" mode zero calibration result is not written to the EEPROM of the motor encoder, but to the EEPROM of the driver. When the drive is powered back on, the result is read internally and the data in the original encoder EEPROM is not erased, so it can continue to work normally when the third-party motor is replaced with the original drive. However, the problem is that the third-party motor must be used one-to-one match with the drive that has been calibrated with "6: zero offset", and the drive replacement motor or the motor replacement drive will not operate normally! Please pay attention to it.

10.6 Use of third-party motors

In practical applications, if a third-party servo motor needs to be matched, the following steps must be strictly followed. Otherwise, it will lead to the motor can not be used normally, and in serious cases, it will cause serious harm to the safety of personal equipment such as flying cars. Please be sure to pay attention to it!

1) Confirm that the type of servo motor is a three-phase AC permanent magnet synchronous servo motor, and confirm that its voltage level matches the N3 drive.

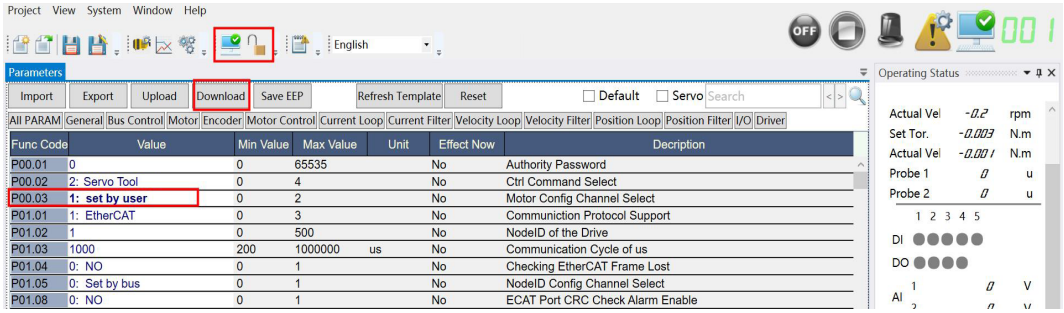
2) Confirm that the type of servo motor encoder is one of the agreements of Tamagawa, Nikon and Panasonic.

3) Make sure the encoder pin wiring is securely connected according to the N3 driver pin definition, please refer to the "Wiring" section for details.

4) Confirm that the power line phase sequence is correct (in some cases, due to different manufacturers' custom, it will cause the power line phase sequence to be opposite, be sure to pay attention to it when using)

5) Modify the relevant parameters about motor Settings in the drive, and download and save.

6) After connecting the server drive, use the "58Ks" advanced password to log in. Upload parameters: Set control channel to Debug Software Control, set motor configuration to User Settings, download parameters, power off and restart.



Func Code	Value	Min Value	Max Value	Unit	Effect Now	Decription
P00.01	0	0	65535		No	Authority Password
P00.02	2: Servo Tool	0	4		No	Ctrl Command Select
P00.03	1: set by user	0	2		No	Motor Config Channel Select
P01.01	1: EtherCAT	0	3		No	Communiction Protocol Support
P01.02	1	0	500		No	NodeID of the Drive
P01.03	1000	200	1000000	us	No	Communication Cycle of us
P01.04	0: NO	0	1		No	Checking EtherCAT Frame Lost
P01.05	0: Set by bus	0	1		No	NodeID Config Channel Select
P01.08	0: NO	0	1		No	ECAT Port CRC Check Alarm Enable

7) Confirm that the motor parameter data is filled in correctly

8) Modify the motor system 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 P11.01~P11.0C motor parameters correctly.

In particular, the inductance and resistance in the N3 driver motor parameters are phase to phase values; The unit of moment of inertia is kgcm^2; The unit of the back potential is V/1000rpm.

P10.01	5: KMY 200V motor	0	9		No	Motor Brand Option
P10.02	3: KMYL60-01330	0	40		No	Motor Catalog Number
P10.03	0: Synchronous motor	0	2		No	Motor Type Option
P11.01	0.40	0.01	200	kW	No	Motor Rated Power
P11.02	2.1	0.1	400	A	No	Motor Rated Current
P11.03	2.3	0.1	400	A	No	Motor Quiescent Current
P11.04	3000	1	30000	rpm	No	Motor Rated speed
P11.05	5000	1	30000	rpm	No	Motor Max speed
P11.06	5	1	80	Pn	No	Motor Pole pairs
P11.07	1.270	0.001	1000	N.m	No	Motor rated torque
P11.08	3.05	0.01	1000	ohm	No	Motor stator phase resistance
P11.09	6.90	0.01	1000	mH	No	Motor D-axis inductance
P11.0A	6.90	0.01	1000	mH	No	Motor Q-axis inductance
P11.0B	0.56	0.01	1000	kc2	No	Motor Inertia
P11.0C	38	1	2000	Vkr	No	Motor Ke Constant

12) Confirm that the encoder parameters are filled in correctly.

According to the data provided by the third-party motor manufacturer, fill in the encoder parameters of P11.01~P11.0C correctly

When the encoder is a multi-turn absolute encoder and the actual position of multiple turns needs to be recorded, set parameter P21.01 to 1.

Change the size of the position tracking threshold, which is generally changed to the resolution of the encoder circle. For example, set the parameter to 8388608 for the 23-bit encoder, 1048576 for the 20-bit encoder, and 131072 for the 17-bit encoder.

P20.01	0: TAMAGAWA encoder	0	6		No	Encoder type
P20.02	23	10	24		No	Encoder resolution Per single turn
P20.03	16	0	99		No	Encoder resolution of Muti-turn Part
P21.01	1: YES	0	1		No	Encoder Alarm enable
P60.0C	393216	0	1073741824	inc	No	Position Follow Error Threshold

13) Download the parameters and restart the servo drive power supply.

14) Perform the encoder zero calibration operation (according to the encoder zero calibration chapter).

15) No-load test run.

16) Test run with load.

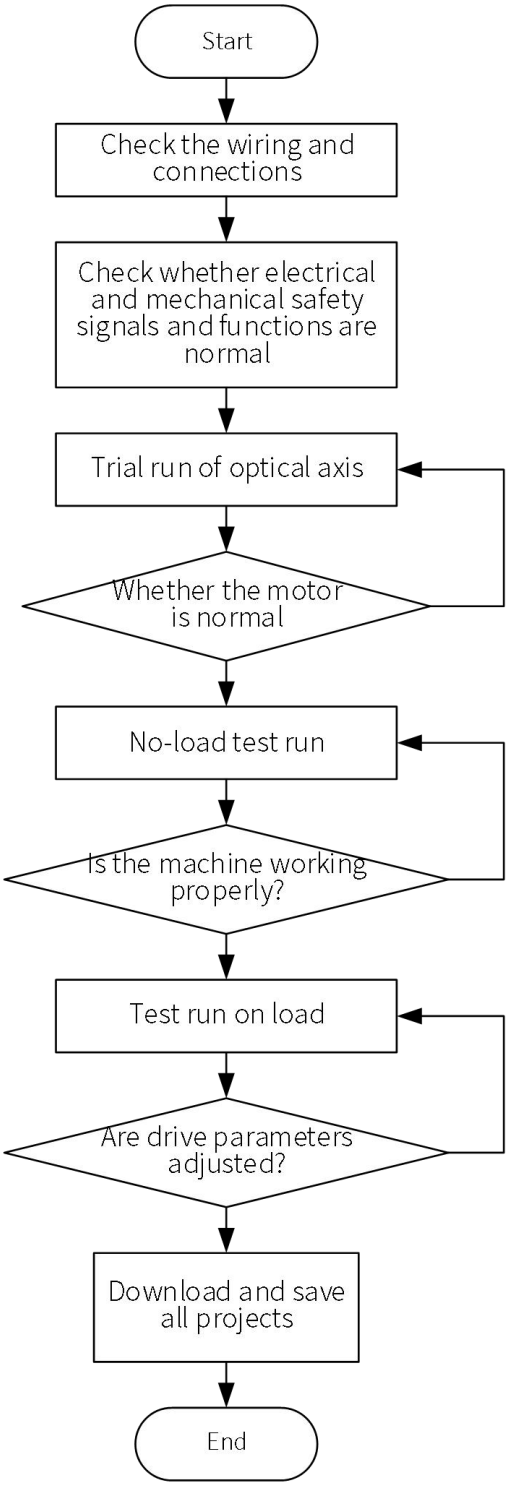
Note:

When using a third-party motor, make sure that the motor current, overload factor, voltage level and other parameters match the N3 driver.

10.7 Test run by using ServoTool debugging software

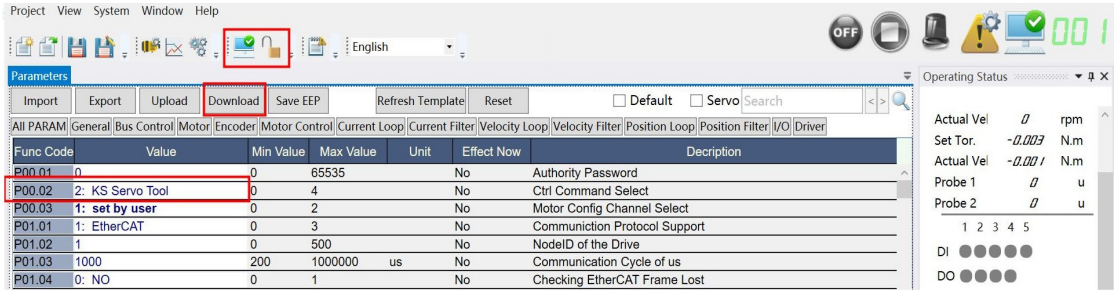
In order to check the servo parameter adjustment effect and mechanical condition, please first use the Servo Tool debugging software for trial run to ensure that the drive parameters, electrical connections, signals, machinery and other aspects are correct.

For trial run, follow these steps:

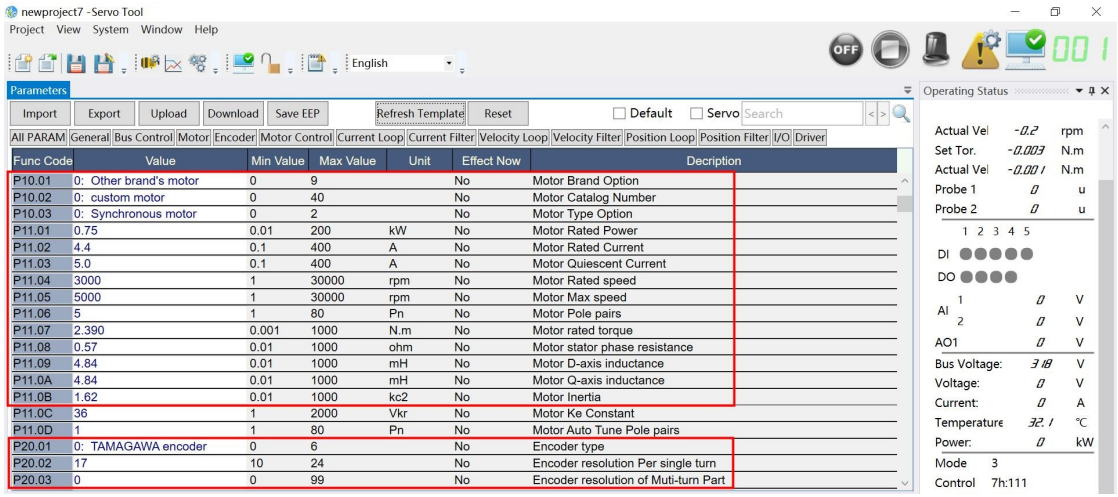


After cables are correctly routed and connected, use the ServoTool software on the PC to connect the driver.

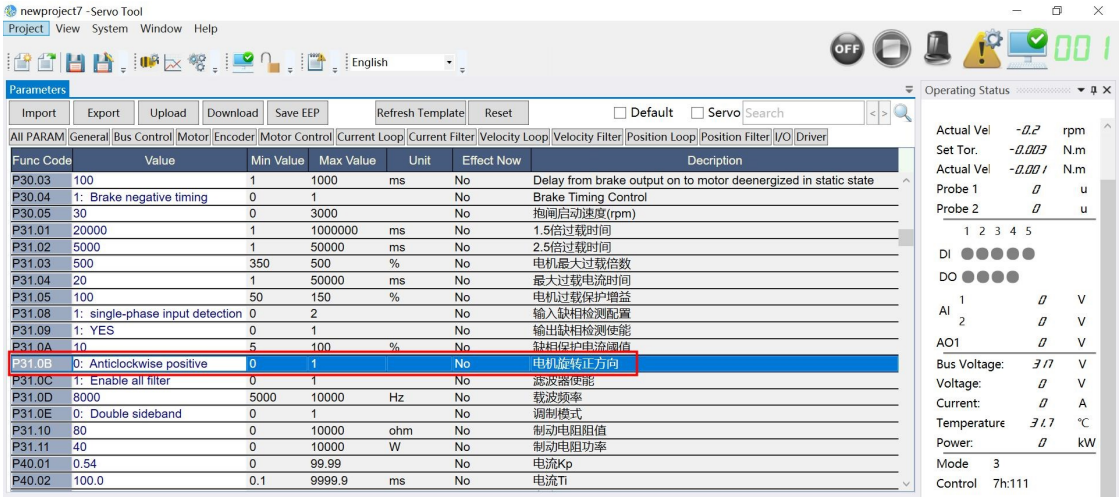
1) After uploading parameters, change the control channel to Debug Software Control to download and save.



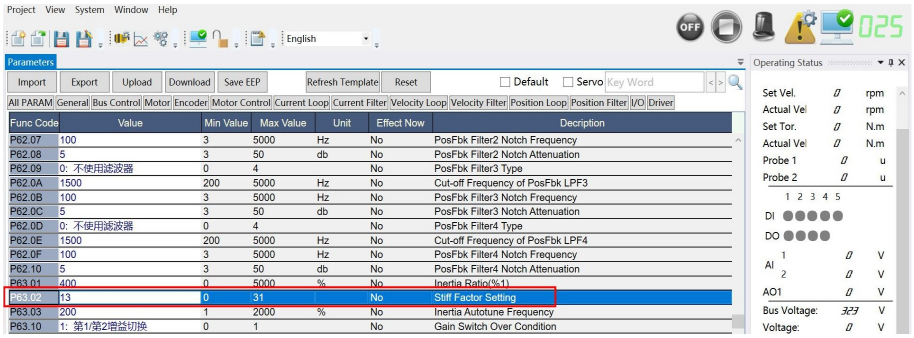
2) Upload the parameters again, and confirm that the motor data and encoder Settings are consistent with the actual motor.



3) Confirm that the motor rotation direction is consistent with the actual direction required.



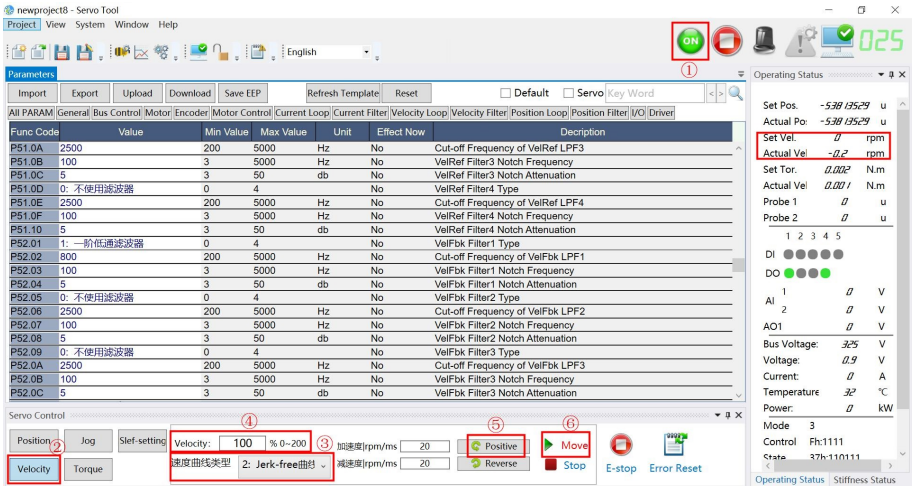
4) Check whether the rigidity setting and inertia ratio are within a reasonable range, please refer to the "table of general occasions of rigidity grade experience value" content.



5) Select the appropriate operation mode according to the load.

- **Use debugging software to run at speed:**

Speed mode operation means that the servo motor runs continuously in accordance with the set acceleration and deceleration speed and the target speed.



Click the "Enable" button in the toolbar to enable the servo operation.

a) Set the running mode to Speed Mode.

b) Set the type of speed curve and the acceleration and deceleration speed.

c) Fill in the running speed (or drag the scroll bar below to set), the unit is 100%= rated motor speed, it is recommended to set a lower running speed for easy observation, such as 2% or 5%.

d) Triggering the forward (or reverse) button will move according to the set speed, and clicking the forward (or reverse) button again will stop the motion command.

e) After starting the movement, the current given speed and the actual speed can be seen in the actual status area on the right.

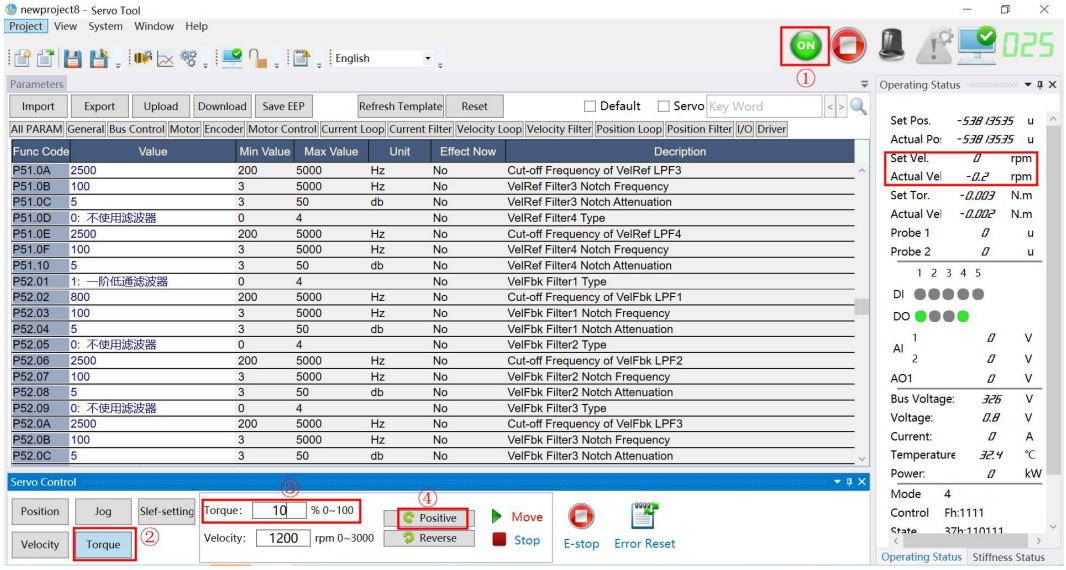
Note:

The speed operation mode is suitable for sports without mechanical limit and without mechanical interference, such as conveyor belt, conveyor roller, winding and other applications. The motion mode cannot be used in applications with mechanical limits, such as the lead screw, to prevent misoperation from making the machinery overreach or collision, causing harm to personal equipment.

- **Torque run with debugging software:**

Torque operation mode refers to the setting of target torque and speed limiting values. If the actual torque does not reach the target torque, it will continue to accelerate to the set speed limit. 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. For example, if the target torque is 10% and the force of the external load is 10%, the motor shaft is stationary; If the external load is greater than 10%, it will drag the motor shaft to move in the direction of the excess load.

In the debugging process of some stations, it is necessary to use the torque mode to simulate the actual operation. At this time, it is important to pay attention to the correct setting of torque and speed limiting.



a) Click the "Enable" button in the toolbar to enable the servo.

b) Select the operating mode as "Torque mode" in the functional area.

c) Set the operating torque and speed limiting, the unit of operating torque is percentage, 100%= rated torque of the motor. Speed limiting refers to the maximum speed in torque mode, and is 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 motion command.

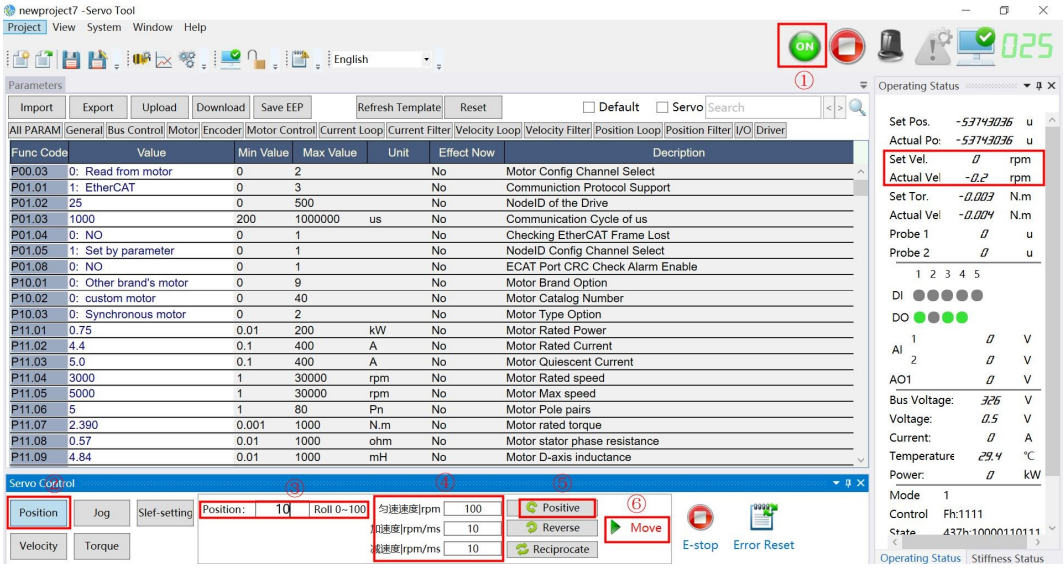
e) After starting the movement, the current given torque and the actual torque can be seen in the actual status area on the right side.

Note:

In the torque operation mode, please be sure to set the torque target value and speed limit value correctly, otherwise the machine may overreach or collision due to misoperation, causing harm to personal equipment.

- **Run in location mode using debugging software:**

Position mode refers to the relative positioning control according to the set target position, target speed, acceleration and deceleration speed. Suitable for applications with mechanical limit requirements.



a) Click the "Enable" button in the toolbar to enable the servo.

b) Select "Location Mode" in the ribbon.

c) Set relative target distance, unit circle, maximum set 100 laps.

d) Target speed and acceleration and deceleration setting, note that acceleration and deceleration unit is rpm/ms.

e) Trigger the forward (or reverse) button to select the direction of relative positioning motion.

f) Trigger the "Run" button in the flash to carry out relative positioning movement according to the set target distance and speed.

Note:

In debug software versions 0.9.3 and earlier, once the relative positioning motion has begun, the motion cannot be interrupted, and if it must be interrupted in an emergency, the motion can be stopped by disabling or triggering an external emergency stop button. However, it is necessary to consider the parking risk when the load stops freely. To prevent this from happening, please use the latest version of the debug software!

10.8 Sampling and analysis of data through debugging software

10.8.1 Signal Sampling

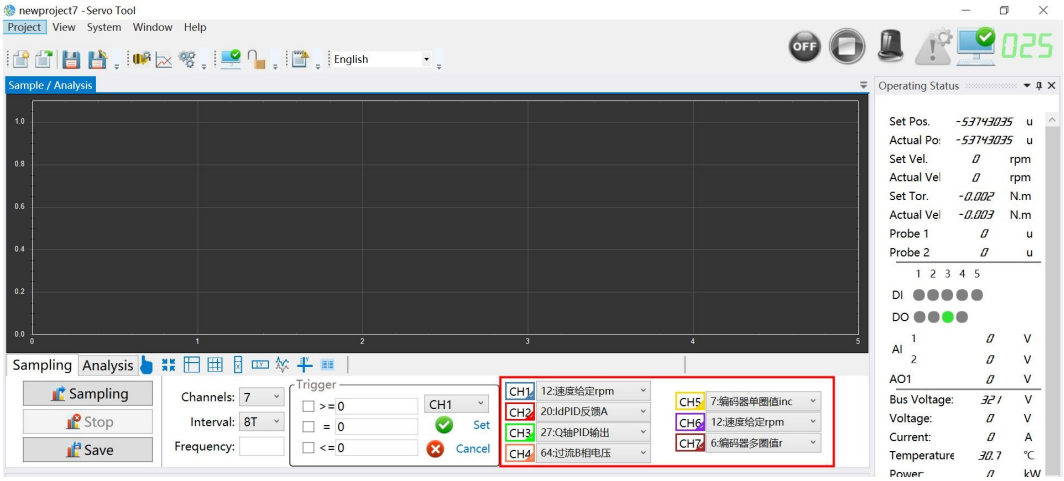
Usually, it is necessary to analyze the curve data to determine whether the gain parameter has the optimization space and the adjustment direction during debugging. The following describes the steps of signal sampling:

1. Open the debugging software, connect the servo driver, and find the "Signal Sampling" page. Configure the data channel to be collected.

2. In general, we help analyze whether the system gain is appropriate by monitoring the following channels.

channel	description
8	Target location of bus delivery, unit inc
9	According to the bus control cycle and the position loop cycle, the driver automatically interpolates the subdivided demand position of the "target position of the bus delivery".Unit inc
10	Actual feedback position,Unit inc
12	Speed loop given speed,Unit rpm
16	Actual feedback speed, unit rpm
23	Current loop set current, unit A
25	Actual feedback current, unit A

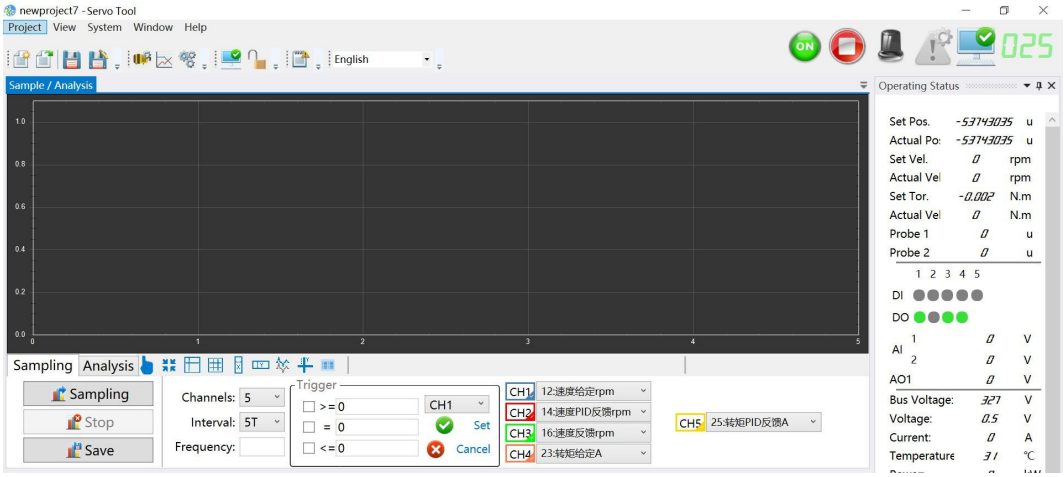
Note: Channel 8 has data only when the host computer controls it. This channel is meaningless when debugging software is used.



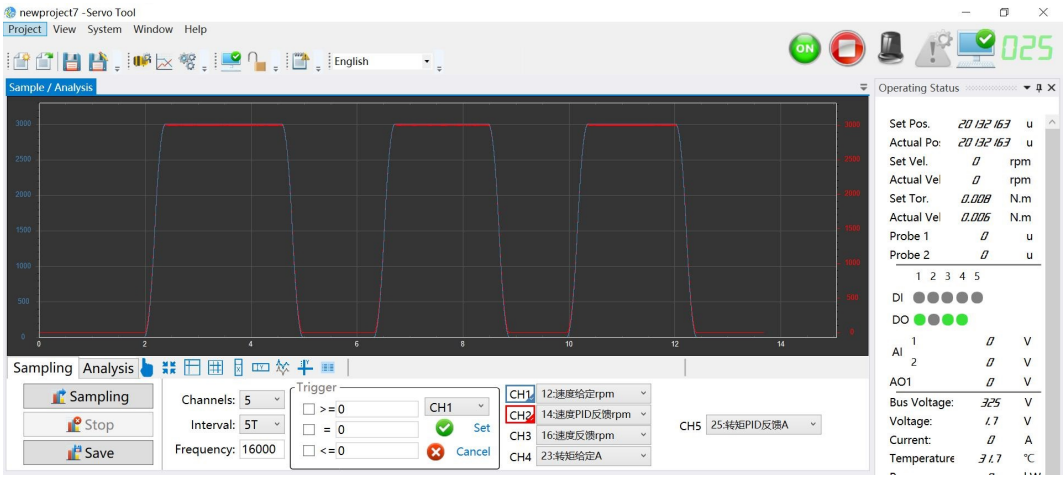
10.8.2 Example for Adjusting the Speed loop gain

The following is an example of speed loop adjustment, how to better adjust the speed loop gain by collecting and analyzing the data curve.

1) After the servo drive is successfully connected, configure the relevant channels, select channels 12, 16, 23 and 25 for data collection, and click the "Start sampling" button for data sampling.

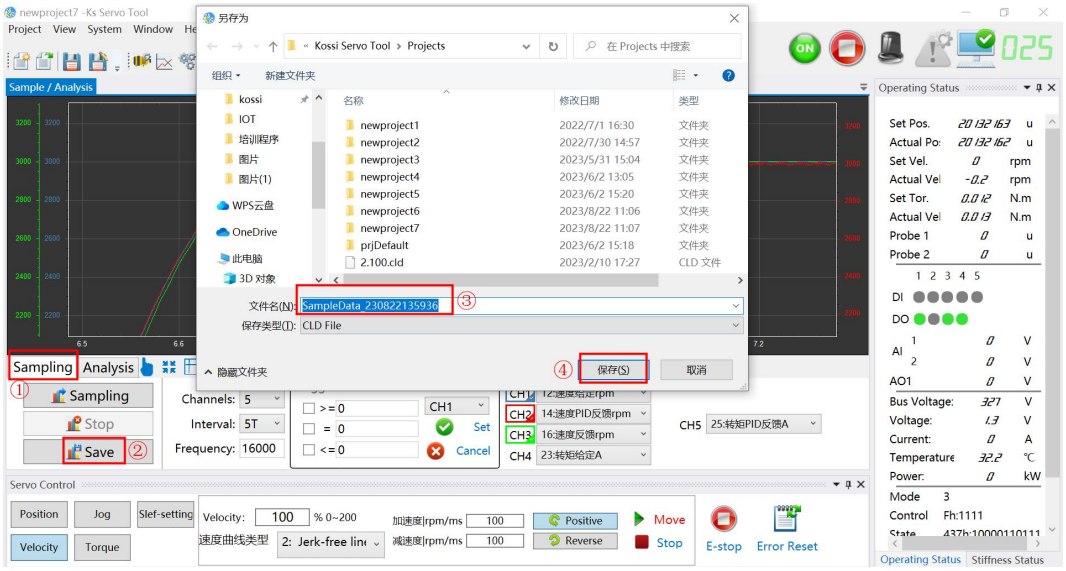


2) On the servo control page, select the speed mode after enabling it, set the target speed and curve type as well as the acceleration and deceleration speed. Here we set the target speed at 100%; The curve is trapezoidal curve; Acceleration and deceleration can be set to 100rpm/ms because it is no-load.



Click the forward button to trigger the movement, and the data on the monitoring page below will change accordingly.

3) Save the collected data.



a) Stop the current sampling

b) Save the current sample data

c) Select a path and name the saved file. By default, it is saved in the current project folder with the current system date as the file name.

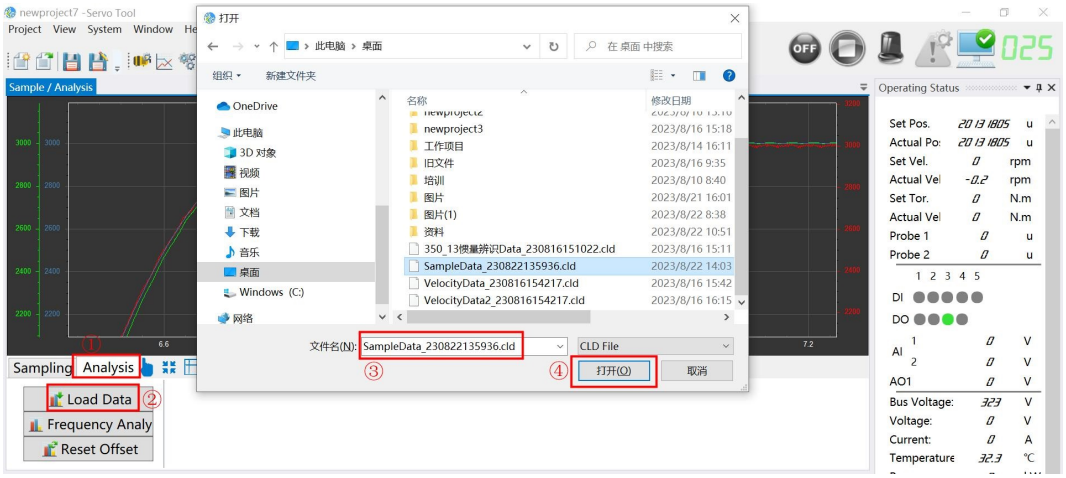
d) Save as sample file.

Note:

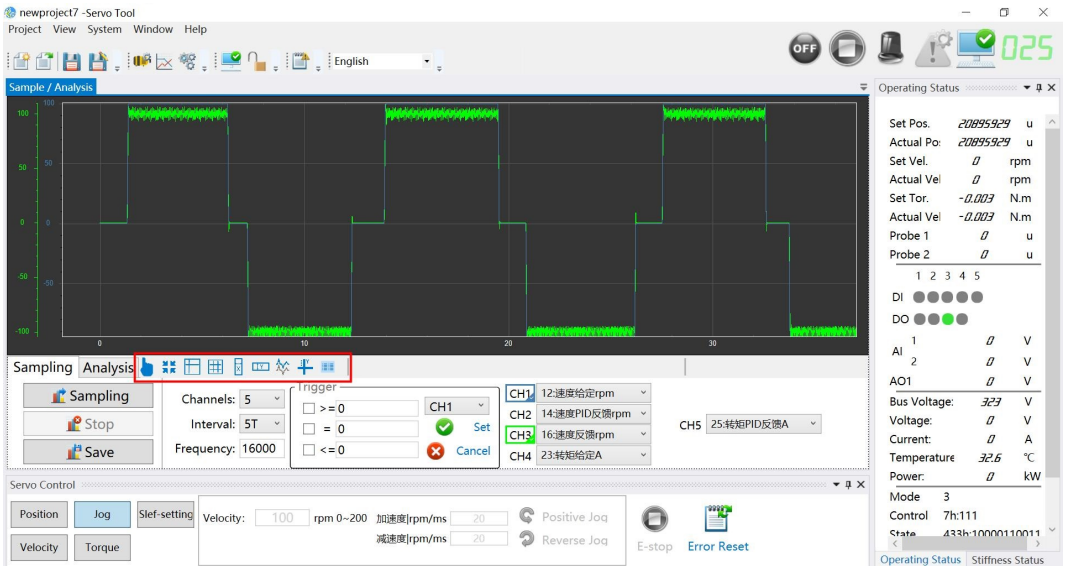
The maximum size of a single saved file is 600,000 data points. If the size exceeds this, only 600,000 data points before the end of sampling can be saved. (Data points: each channel records one data point in each sampling period. The shorter the sampling period and the more samples, the shorter the total recording time).

- Waveform analysis

After sampling the waveform file, you can import it for detailed analysis.

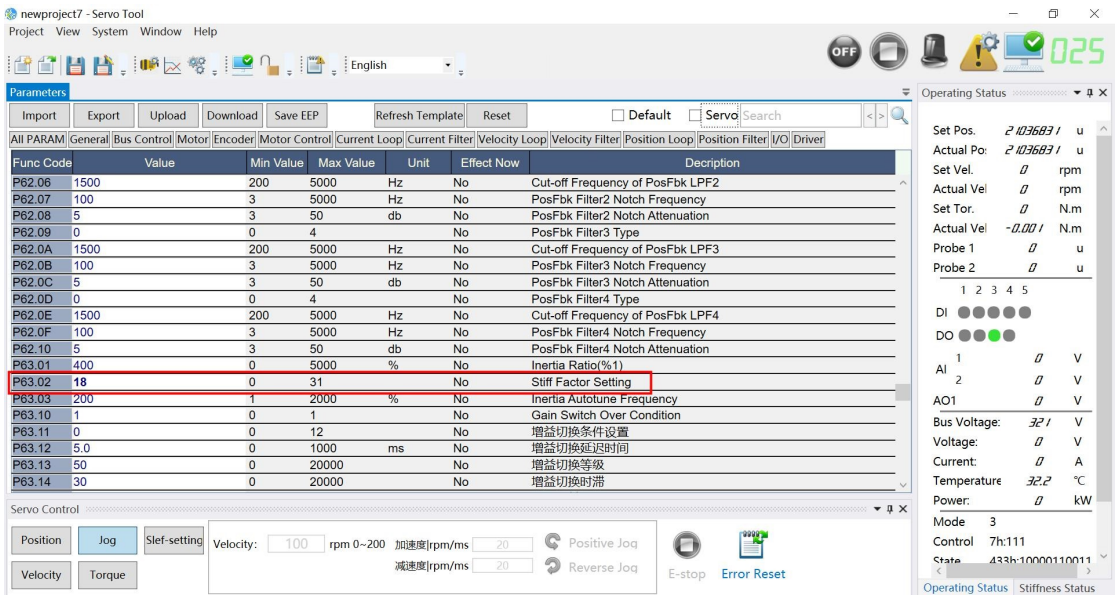


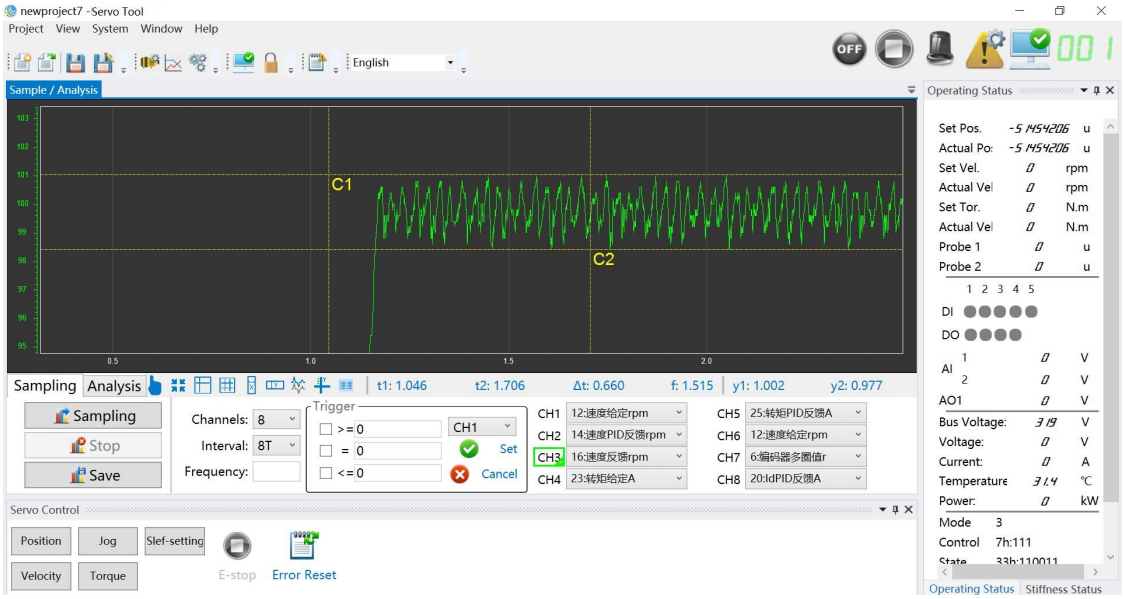
Click the "CH" icon on the left of the data channel and select the data that you want to analyze. Through the tool control below, waveform can be scaled, restored, cursor measurement, data coordinate alignment and other operations.



Through the vernier measurement, it is found that the overshoot is 5 , and there is no repeated adjustment phenomenon, and it can converge to the target speed within 132ms, so in the acceptable range, generally no optimization is required.

However, we tried to increase the system rigidity to 18, download and save. Run it again at the same speed and observe the changes.





After the rigidity of the system is changed, the performance is obviously changed and the overshoot is reduced to 2.6 .

Note:

This is only a demonstration of the adjustment under no-load conditions. In actual conditions, the system rigidity is too large, but it is more likely to cause overshoot and shock. Please consider the appropriate system gain according to the actual situation when adjusting.

10.8.3 General experience of waveform analysis

1) Analysis of current waveform

When the servo is in position mode or speed mode, the current setting mainly depends on the first two links, so just observe the actual current waveform does not shock, no burrs, can better follow the current given waveform. That is, the current loop has a good response and no optimization is required.

When there is a burr, it is first necessary to analyze whether it is caused by a given current. If it is not caused by the given current, it is necessary to analyze whether the ground is good, whether there is resonance and so on. The current loop TI can be adjusted appropriately, and the current feedback can be filtered to the second order.

2) For speed waveform analysis

The main consideration is whether the actual speed feedback has good followability, whether there is overshoot and shock. Whether the speed convergence time is too long. If the actual speed feedback has a serious burr, it is necessary to analyze whether the grounding is good and whether there is resonance. The speed loop TI can be adjusted appropriately, and the speed feedback can be filtered second-order.

3) For position waveform analysis

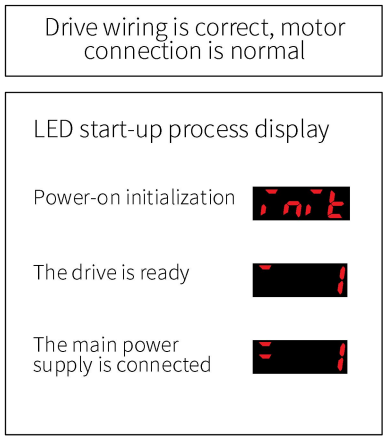
Generally, when the speed loop gain is adjusted correctly, the position loop can be guaranteed, and only the actual position response problem needs to be considered.

Chapter 11 Fault information and troubleshooting

11.1 Troubleshooting

11.1.1 Troubleshooting During Startup

Initiating normal process



General phenomena and treatment methods when starting abnormally:

Fault phenomenon	reason	Confirmation method
The digital tube doesn't light up	The control power supply voltage is faulty	Measure the AC voltage between L1c and L2c. The normal voltage should be AC220V.
	The position of the firmware burn switch is incorrect	Check whether the firmware write switch is set to 0.
	Servo drive fault	Please contact the company after sales.
LED left one most horizontal is not bright	The initialization fails or the driver is faulty. Procedure	Please contact the company after sales.
LED left one middle horizontal is not bright	The L1 and L2 main power supply is disconnected or the LED is damaged.	Measure the AC voltage between L1 and L2, see the product information section for standard values.
The LED has a fault code flashing	Refer to the troubleshooting section to locate the cause and rectify the fault	

Note:

After the above faults are eliminated, restart the power supply, and the LED panel should be the display when the main power supply is connected.

11.2 Fault Code Table

11.2.1 Fault Classification

The fault and warning of the servo drive can be divided into three categories according to the severity level, Class 1, Class 2, and Class 3. In terms of severity level, Category 1> Category 2> Category 3 are classified as follows:

Class 1 non-resettable faults;

Class 2 resettable faults;

Class 3 resettable warning;

Resettable means that the fault display can be cleared after the reset signal is given.

There are two ways to reset:

- Use the reset button on the debugging software interface to reset the disk. This operation is available only when the debugging software controls the disk.
- Reset bit7 of control word 6040 using the upper computer. This operation is valid only when controlled by the upper computer.

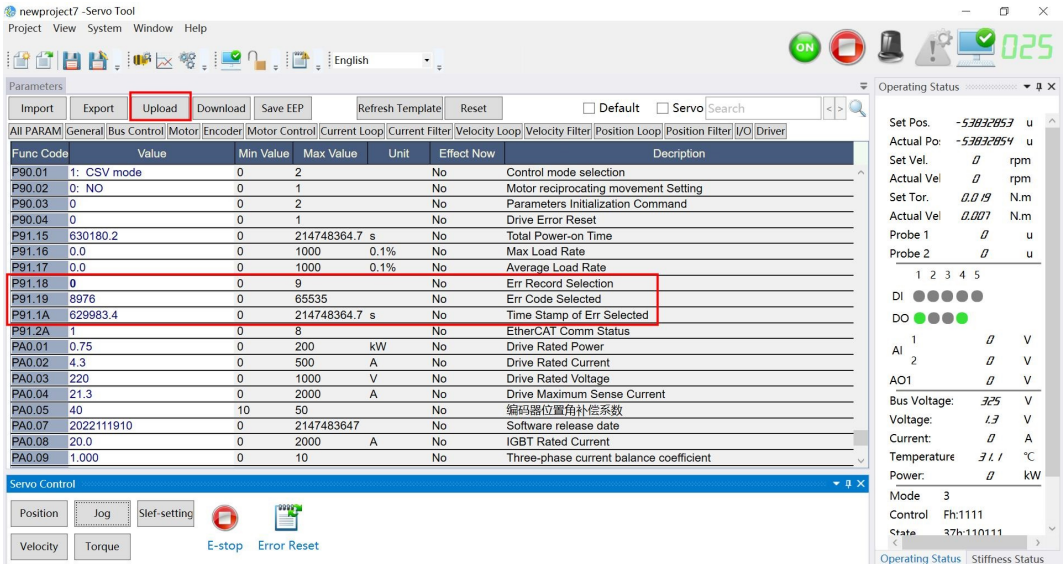
11.2.2 Fault and Warning Records

The N3 servo drive has a fault logging function that records the last 10 failures and warning codes, as well as the system time at the time of the failure. After the fault or warning is reset, the fault record is still saved to change the fault and warning.

Through debugging software, fault code records can be accessed and consulted. The specific methods are as follows:

Use the debugging software to view historical fault records

Use USB to connect the drive to the PC side of the debugging software.



1) Click Upload parameters to upload the driver information.

2) The historical fault records can be displayed in P91.18, P91.19, and P91.1A.

Parameter code	Example	Explain by example
P91.18	0	For the fault that occurred last time, a larger number indicates an earlier fault. The maximum number is 9.
P91.19	29568	The number displayed here is in decimal and needs to be manually converted to hexadecimal. The decimal 29568 is 7380 in hexadecimal, that is, the E73.80 encoder connection is faulty.
P91.1A	660135.9	System time when the fault occurs, in seconds.

11.2.3 Fault Code Overview

LED display	Fault definition	Fault type	Shutdown time (*1)	CiA402 fault code
no.SS	Scram effect	-	-	/
no.STO	STO function takes effect	-	-	/
E.2230	Busbar overcurrent	Resettable fault	1	2230h
E.2310	Continuous overflow	Non-resettable fault	1	2310h
E.2320	Output overcurrent	Non-resettable fault	1	2320h
E.2340	Software overflow	Resettable fault	1	2340h
E.2350	Module overload (I^2T)	Non-resettable fault	1	2350h
E.3130	Input missing 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 missing phase	Resettable fault	1	3381h
E.4310	Servo overtemperature	Resettable	0	4310h
E.5210	Power ID error	Non-resettable fault	1	5210h
E.5280	Drive internal error 1	Non-resettable fault	1	5280h
E.5281	Drive internal error 2	Non-resettable fault	1	5281h
E.5282	Drive 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 (I^2T)	Resettable fault	0	7180h
E.7181	Motor lock failure	Resettable fault	0	7181h
E.7182	Brake resistance 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 disconnect	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 fault	1	7385h
E.7386	Encoder internal fault	Non-resettable fault	1	7386h
E.7387	Motor information error	Non-resettable fault	1	7387h
E.7388	Encoder zero missing	Non-resettable fault	1	7388h
E.7581	EtherCAT communication is faulty	Resettable fault	0	7581h
E.7582	The synchronization period is incorrectly set	Resettable fault	0	7582h
E.7591	EtherCAT communication initialization error	Resettable fault	0	7591h
E.7592	The ECAT EEPROM error occurs	Resettable fault	0	7592h

E.8480	Simultaneous overspeed	Resettable fault	1	8480h
E.8481	Reverse overspeed	Resettable fault	1	8481h
E.8482	overspeed	Resettable fault	0	8482h
E.8483	The speed tracking error is too large	Resettable fault	0	8483h
E.8484	Acceleration overshoot	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 detection exception	Resettable fault	0	8612h
E.8613	Instruction given detection exception	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	The limit signal is abnormal	Resettable fault	0	9835h
E.9837	Lower pressure exceeds tolerance	Resettable fault	1	9837h
E.9838	Downward pressure overshoot	Resettable fault	1	9838h
E.9839	The pressure retention period times out	Resettable fault	0	9839h
E.9840	The pressure setting is too small	Resettable fault	0	9840h
E.9841	The pressure set value is too large	Resettable fault	0	9841h
E.9842	Excessive pressure during downpress operation	Resettable alarm	0	9842h
E.9843	Sensor failure	Resettable fault	0	9843h

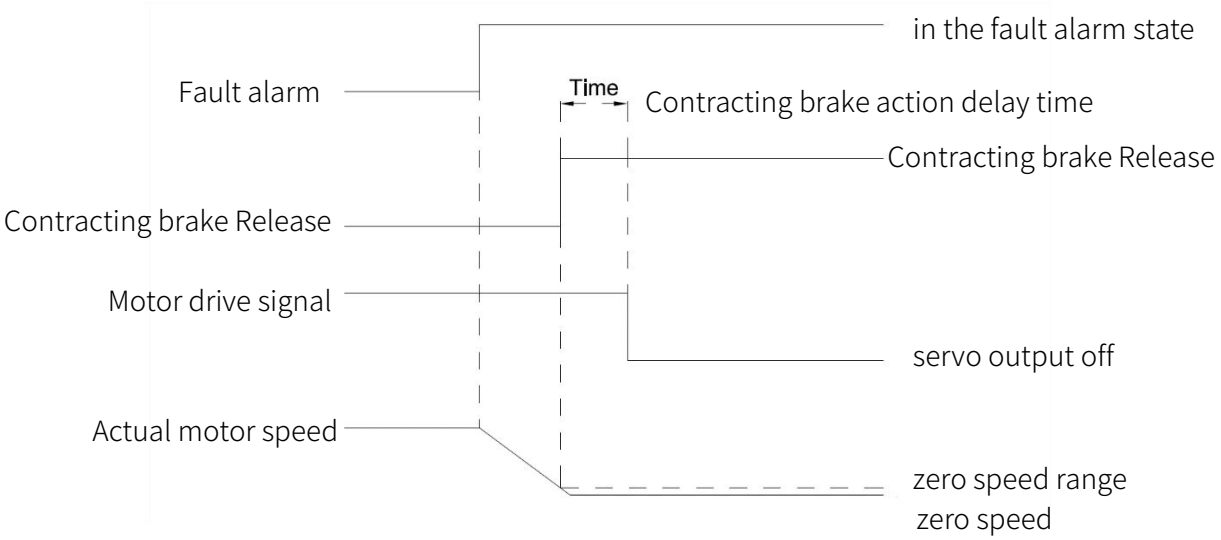
Note:

no.SS indicates that the servo is in the emergency stop state. It is displayed in the normal state and does not mean that the servo is faulty.

no.STO indicates that the server is in STO state. It is displayed in normal state and does not mean that the server is faulty.

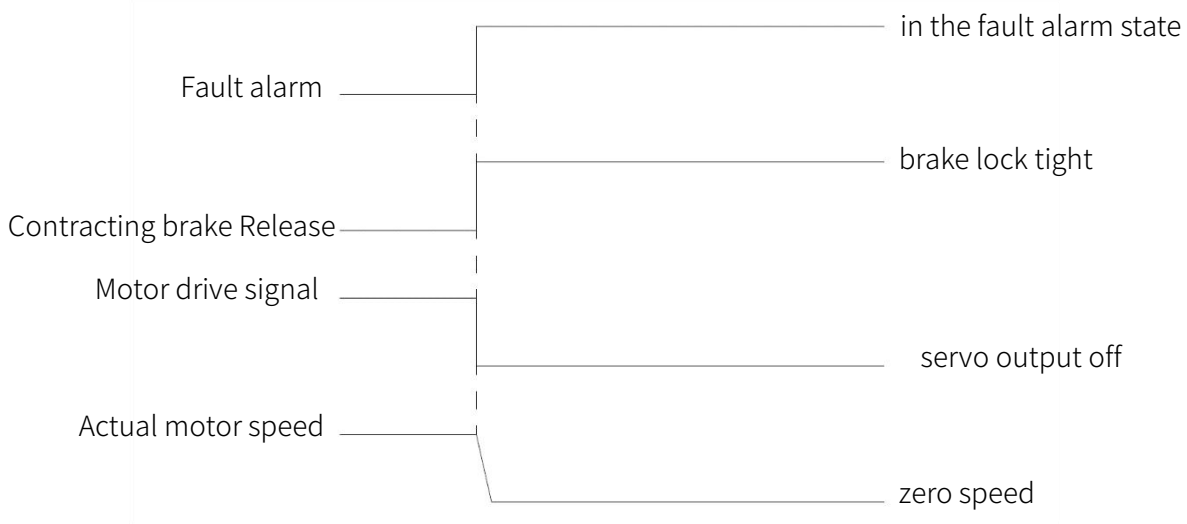
11.2.4 Breakdown shutdown timing interpretation

Failure shutdown sequence 0: The drive is still controllable when the failure occurs. After a fault occurs, the motor speed is reduced to the zero speed range using a scram mode inside the drive, then the lock brake (if the motor has a lock brake) is turned off, and finally the motor output is turned off.



Failure shutdown timing 0 Timing diagram

Fault shutdown sequence 1: When the fault occurs, the drive is not controllable. When a fault occurs, the drive will immediately turn off the lock brake (if the motor has a lock brake) and turn off the motor output.



Failure shutdown sequence 1 Sequence diagram:

11.2.5 Troubleshooting Methods

1) LED display: no.SS

2) Fault definition: The emergency stop takes effect

3) Mechanism: The servo scram input is valid, triggering the servo scram function.

reason	Treatment method
The servo scram function is triggered Parameter logic Parameter Settings are incorrect	Check whether the external emergency stop button is pressed; Check whether the external scram line is broken or for other reasons; Check whether the scram input signal logic is consistent with the valid logic configured in the servo drive; According to the wiring section in the user manual, check whether the scram wiring is correct. Check whether the parameter 0x3070:06 SCT on/off logic is set correctly.

4) LED display: no.STO

Fault definition: The STO function took effect

Generation mechanism: Because the STO function is normally closed, the STO function will take effect due to signal triggering, line interruption, missing terminals, and incorrect use of high and low level logic.

reason	Treatment method
The STO function is triggered	Check whether the external STO button is triggered; Check whether external STO lines are disconnected or for other reasons; Whether the STO terminal is loose or missing; Check whether the STO is correctly wired according to the wiring section in the user manual.

5) LED display: 2230

Fault definition: Busbar overcurrent

Production mechanism: The servo detects that the current on the DC bus is greater than the overcurrent point specified by the driver.

reason	Treatment method
The DC bus voltage is too high	Check whether the power grid voltage is too high; Check for a quick stop with a large inertial load, or no-energy braking.
There's a short circuit on the perimeter	Detect whether the servo power output wiring is short circuit, whether the ground is short circuit, and whether the brake resistance is short circuit.
Encoder fault	Check whether the encoder is damaged and whether the grounding is correct; Check whether the shielding layer of the encoder cable is properly grounded and whether there is strong interference sources near the cable.
The internal components of the servo are damaged	Contact the after-sales personnel for maintenance. This error needs to be rectified after power off and restart

6) LED display: 2310

Fault definition: continuous overcurrent

Generation mechanism: The servo detects multiple module over current in a short period of time.

reason	Treatment method
There's a short circuit on the perimeter	Detect whether the servo power output wiring is short circuit, whether the ground is short circuit, and whether the brake resistance is short circuit.
Encoder fault	Check whether the encoder is damaged and whether the grounding is correct; Check whether the shielding layer of the encoder cable is properly grounded and whether there is strong interference sources near the cable.
Motor parameters or wiring errors	The actual motor used is inconsistent with the motor parameters set by the user, for example, the actual motor is 4 pairs of poles, and the configuration is 5 pairs of poles. Or the motor encoder is 17-bit, the configuration is 23-bit and so on. The motor encoder does not have zero calibration, or zero calibration data is lost. Motor wiring failure, such as power line interphase short circuit and so on.
External load cause	The load inertia ratio is too large, which causes the motor to easily cause this fault.
The internal components of the servo are damaged	Contact the after-sales personnel for maintenance. This error needs to be rectified after power off and restart.

7) LED display: 2320

Fault definition: Output overcurrent

Generation mechanism: The phase current detected inside the servo is greater than the overcurrent point specified by the driver.

reason	Treatment method
The DC bus voltage is too high	Check whether the power grid voltage is too high; Check for a quick stop with a large inertial load, or no-energy braking.
There's a short circuit on the perimeter	Detect whether the servo power output wiring is short circuit, whether the ground is short circuit, and whether the brake resistance is short circuit.
Encoder fault	Check whether the encoder is damaged and whether the grounding is correct; Check whether the shielding layer of the encoder cable is properly grounded and whether there is strong interference sources near the cable.
The speed given instruction is abnormal Motor parameters or wiring errors	Check that the speed given command is normal The actual motor used is inconsistent with the motor parameters set by the user, for example, the actual motor is 4 pairs of poles, and the configuration is 5 pairs of poles. Or the motor encoder is 17-bit, the configuration is 23-bit and so on. The motor encoder does not have zero calibration, or zero calibration data is lost. Motor wiring failure, such as power line interphase short circuit and so on.
External load cause	The load inertia ratio is too large, which causes the motor to easily cause this fault. The load is stuck.
The internal components of the servo are damaged	Contact the after-sales personnel for maintenance. This error needs to be rectified after power off and restart.

8) LED display: 2340

Fault definition: Software overflows

Production mechanism: The sampled value of servo output phase current is greater than the overcurrent point specified by the servo driver.

reason	Treatment method
There's a short circuit on the perimeter	Detect whether the servo power output wiring is short circuit, whether the ground is short circuit, and whether the brake resistance is short circuit.
Encoder fault	Check whether the encoder is damaged and whether the grounding is correct; Check whether the shielding layer of the encoder cable is properly grounded and whether there is strong interference sources near the cable.
Motor fault	The actual motor used is inconsistent with the motor parameters set by the user, for example, the actual motor is 4 pairs of poles, and the configuration is 5 pairs of poles. Or the motor encoder is 17-bit, the configuration is 23-bit and so on. The motor encoder does not have zero calibration, or zero calibration data is lost. Motor wiring failure, such as power line phase or phase sequence error: check whether the servo power output wiring phase sequence is normal, whether the phase is missing.
The internal components of the servo are damaged	Contact the after-sales personnel for maintenance. This error needs to be rectified after power off and restart.

9) LED display: 2350

Fault definition: Module overload (I^2T)

Generation mechanism: The module temperature rise is greater than 75 degrees, and the temperature rise is greater than 60 degrees when the derating is used.

reason	Treatment method
Power module overload	Replace the servo drive with more power;
The motor power cable is faulty	Check the wiring condition of the servo output side according to the operating procedure, and exclude leakage, break, phase sequence error, short circuit, etc.
Motor stalling	Check whether the motor load is too large, or there is a mechanical jam, or the lock does not open normally.

10) LED display: 3130

Fault definition: The input phase is missing

Generation mechanism: There is a problem with the servo main power input.

reason	Treatment method
The main power input circuit is improperly connected, missing or disconnected	Check the wiring of the main power input side of the servo according to the operating procedures, and eliminate the phenomenon of missing connection, broken line and virtual connection.
The main power input terminal of the servo is loose	Check whether the terminal connection is secure, whether the terminal wiring is loose or virtual, and whether the power supply voltage is within a reasonable range.
Configure driver detection parameters Inconsistent with the actual power supply	If driver parameter P31.08 does not match the actual power supply, for example, if the parameter is set to Input three-phase detection but the actual power supply is single-phase, a fault alarm will be generated.

11) LED display: 3210

Fault definition: servo overvoltage

Production mechanism: AC 400V servo driver, DC bus voltage is higher than 810V, and lasts for 6ms; AC200V class servo drive, DC bus voltage above 410V, and continuous 6ms.

reason	Treatment method
The power input voltage is too high	Test whether the interphase voltage of the servo input main power supply is higher than the maximum operating voltage allowed by the drive
The power supply voltage fluctuates excessively	Check the input power supply, reset the fault alarm after the power supply voltage returns to normal, and restart the servo driver
The braking energy is too large, the braking resistance is not connected, or the braking resistance value is too large, or the braking resistance is damaged	Check whether the brake resistance is normal and the connection is firm Select the appropriate brake resistance value and power

12) LED display: 3220

Fault definition: servo undervoltage

Production mechanism: AC 400V servo driver, DC bus voltage is lower than 380V, and lasts 2ms; AC200V class servo drive, DC bus voltage below 160V, and continuous 2ms.

reason	Treatment method
The power input voltage is too low. Procedure	Check whether the interphase voltage of the servo input main power supply is lower than the minimum operating voltage allowed by the drive.
When the servo is working, the instantaneous load is too large, exceeding the rated overload power time limit	Please limit the use according to the maximum overload coefficient and overload time of the actual driver.
Instantaneous power failure, or power supply voltage fluctuation is too large	Check the input power supply. When the power supply voltage is normal, reset the fault alarm and restart the servo driver.
The power terminal is loose	Check the wiring of the main power input side of the servo according to the operating procedures, and eliminate loosening and virtual connection.
In the same power supply system, there are load devices with large starting currents	Improve the power supply system to ensure that the servo drive power environment meets its specifications.
The internal components of the servo are damaged	Contact the after-sales personnel for maintenance

13) LED display: 3380

Fault definition: Output phase sequence error

Production mechanism: the actual running direction of the servo motor is opposite to the given direction, or the actual running electrical Angle deviates too much from the given electrical Angle.

reason	Treatment method
Servo output power line sequence error	Check the servo power output wiring according to the operating procedures, and exclude the phase sequence error, missed connection, broken line and other conditions
Encoder resolution setting is incorrect	Check the encoder single-turn resolution configuration. Encoder self-tuning, each time the electrical Angle 45 degrees. Electrical Angle = encoder increment value/number of pulses per turn *360* motor pole number
The motor pole number is incorrectly configured	Check the number of motor poles
Mechanical gridlock or excessive load	Check whether the mechanical rotation is normal and the load is reasonable
Check 0x3021:04 Parameter Settings	Adjust the parameters 0x3021:04 appropriately to not exceed 150%

14) LED display: 3381

Fault definition: Output phase missing

Production mechanism: The three-phase current output of servo driver is abnormal.

reason	Treatment method
The servo output circuit wiring is abnormal, or there are leakage, break, loose virtual connection and other phenomena	Check the wiring of servo output loop according to the operating procedures, and eliminate the phenomenon of missing connection, broken line, wrong connection, loose virtual connection, etc.
The servo output terminal is loose	Check the wiring of servo output loop according to the operating procedures, and eliminate the phenomenon of missing connection, broken line, wrong connection, loose virtual connection, etc.
The three-phase output is unbalanced	Check whether the motor winding is normal and whether the resistance value between the three phases is equal.
The motor does not match the drive	When the rated motor current is less than 1/5 of the rated drive current, the output phase detection function may be abnormal. In this case, replace the matched driver. If the temporary debugging needs to use such a situation, you can set P31.09 "Output phase missing detection enable" parameter to "0", so as to shield this fault alarm.

15) LED display: 4310

Fault definition: servo overtemperature

Production mechanism: For AC200V-class drivers, the internal temperature of the servo exceeds 85 ; For AC200V class drives, the internal temperature of the servo exceeds 90 ° C.

reason	Treatment method
Ambient temperature is too high	Reduce ambient temperature and enhance ventilation and heat dissipation.
The servo heat dissipation system is abnormal	Check whether the fan is running properly, and whether the rotational speed and air volume are normal. If an exception occurs, replace the fan. Check whether the heat dissipation channel is blocked by foreign bodies and whether there are cables or foreign bodies around the heat dissipation space, which reduces the heat dissipation effect.
The actual braking power of the built-in braking resistance is too large	Follow the instructions to calculate whether the actual braking power is less than the maximum heat dissipation power. If the actual braking power is too large, please connect the external brake resistor
The temperature detection circuit is faulty	Contact the after-sales personnel for professional and technical maintenance.

16) LED display: 5210

Fault definition: The power ID is incorrect

Mechanism: The ID number of the driver board is not recognized, and the possible cause is hardware damage or assembly error.

reason	Treatment method
The power ID is faulty	Contact the after-sales personnel for professional and technical maintenance.

17) LED display: 5280

Fault definition: Drive internal error 1

Mechanism: The internal hardware or software of the driver is faulty. Please contact the after-sales service.

reason	Treatment method
Internal fault of servo drive	Contact the after-sales personnel for professional and technical maintenance.

18) LED display: 5281

Fault definition: Drive internal error 2

Mechanism: The internal hardware or software of the driver is faulty. Please contact the after-sales service.

reason	Treatment method
Internal fault of servo drive	Contact the after-sales personnel for professional and technical maintenance.

19) LED display: 5282

Fault definition: Drive internal error 3

Mechanism: The internal hardware or software of the driver is faulty. Please contact the after-sales service.

reason	Treatment method
Internal fault of servo drive	Contact the after-sales personnel for professional and technical maintenance.

20) LED display: 5283

Fault definition: inertia identification error

Generation mechanism: In the process of self-tuning, 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.

reason	Treatment method
The load inertia ratio is too large	Select or optimize the load inertia ratio based on the actual situation. For details, see the Adjustment section.
Inertia identification frequency setting error	According to the actual load, select the appropriate inertia identification frequency, see the adjustment chapter for details.
The rigidity gain is not set properly during inertia identification	According to the actual load, the appropriate system gain is selected for inertia identification. For details, see the relevant content of the Adjustment chapter.

21) LED display: 5284

Fault definition: Parameter check error

Mechanism: The driver verifies the parameters stored in the EEPROM of the driver during power-on. This fault occurs when parameters are abnormal.

reason	Treatment method
Power-on self-test, servo storage parameters exceed the allowed range.	After the fault occurs, use the signal sampling function of the debugging software to sample channels 71, 72, and 74, save the samples, and observe the result. Contact the after-sales personnel for maintenance.

22) LED display: 5480

Fault definition: servo overload

Production mechanism: When the actual output power of the servo exceeds 1,1 times the rated power, the duration exceeds 120 seconds.

reason	Treatment method
The output power exceeds the rated power by 1.1 times and lasts 120S	Select or optimize the load according to the actual situation, or replace the servo driver with a higher power.
Motor power line fault	Check the wiring of the servo output side according to the operating procedures, and eliminate short circuit, missing connection, broken line, phase sequence error and other phenomena.
Motor stalling	Check whether the motor has too much load or mechanical jam, or the lock does not open normally.

23) LED display: 7180

Fault definition: Motor overload (I^2T)

Generation mechanism: I^2T calculation is carried out on the servo phase current, and the I^2T energy is calculated at 1.x, 2.x, 3.x times overload and the energy threshold when it is greater than the corresponding overload time.

reason	Treatment method
The motor power does not match the load	Check whether the motor power meets the load requirements.
Motor stalling	Check whether the motor has too much load or mechanical jam, or the lock does not open normally.
Motor power line phase sequence fault	Check whether the motor power line sequence is correct.

24) LED display: 7181

Fault definition: motor lock failure

Generation mechanism: undervoltage or undercurrent of the lock or no lock of the motor

reason	Treatment method
Undervoltage or undercurrent of the Contracting brake	Check the Contracting brake mechanism and the Contracting brake power supply.
The motor has no Contracting brake	Block lock faults using parameter P21.06

25) LED display: 7182

Fault definition: brake resistance overload

Generation mechanism: The internal calculated braking resistance I^2T energy accumulation is greater than 20 times the power of the formulated dynamic resistance, and lasts for 1 second.

reason	Treatment method
Improper selection of brake resistance	Select the appropriate brake resistance according to the specifications.
Brake resistance Improper arameter setting	The brake resistance configuration parameters in the driver are inconsistent with the actual brake resistance specifications. AC200V, 400W and below drives have no built-in brake resistance, but rely on internal capacitors to absorb some of the braking energy. Therefore, the brake resistance parameters are set to 40W and 80Ω by default (0 is not recommended). Because once set to 0, there is a risk of damage to the drive capacitance when used for a long time with brake resistance overload). In this case, when the alarm occurs, please connect the appropriate external brake resistor.

26) LED display: 7380

Fault definition: encoder connection error

Mechanism: The servo and encoder cannot establish normal communication.

reason	Treatment method
Encoder parameter error	Check the encoder parameter Settings to see if they match the actual encoder.
Encoder cable fault	Check whether the encoder cable is broken, missed, misconnected, and the line sequence is correct.
The encoder cable is not connected or the connector is loose	Check the encoder cable connection.
The encoder cable is too long, and the encoder cable used is too thin. The line impedance is too large and the voltage attenuation is obvious.	Replace the cable whose length matches the wire diameter specification, see the Encoder Cable section for details.
Encoder connector metal layer oxidation, resulting in poor contact	Replace the connector.
Servo component damage	If the motor or driver component is damaged, please contact the after-sales personnel for maintenance by professional technicians.

27) LED display: 7381

Fault definition: encoder battery undervoltage

Production mechanism: absolute encoder battery undervoltage.

reason	Treatment method
The absolute encoder battery voltage is too low	Replace the battery.

28) LED display: 7382

Fault definition: The encoder battery is disconnected

Production mechanism: Absolute encoder detects no battery power supply.

reason	Treatment method
Absolute encoder battery voltage is too low, or the cell is disconnected from the encoder	Replace the battery; Check the connection between the absolute value encoder battery and the encoder, whether there is a broken line, leakage and other phenomena.

29) LED display: 7383

Fault definition: encoder overheating

Production mechanism: the internal temperature of the encoder exceeds the alarm value.

reason	Treatment method
The internal temperature of the encoder is too high	Improve the heat dissipation conditions of the motor, or reduce the ambient temperature of the motor.

30) LED display: 7384

Fault definition: encoder count error

Mechanism: encoder count error.

reason	Treatment method
Encoder count error	The servo is powered off and restarted. If the fault cannot be cleared, contact professional technicians to replace the encoder.

31) LED display: 7385

Fault definition: encoder overspeed

Production mechanism: Error feedback from the motor encoder, the possible cause is the actual motor speed beyond the encoder allowed range, or the encoder itself hardware damage.

reason	Treatment method
The actual speed before the servo is powered on is too high	The motor should be kept stationary before the servo is powered on.
Motor flying car	See Motor Stall Fault Handling
Instruction setting error	Check that position, speed and torque instructions are given correctly.
Load mutation	Check that the external load connection is good and check the cause of the sudden change in the external load.
Internal encoder error	The servo is powered off and restarted. If the fault cannot be cleared, contact professional technicians to replace the encoder.

32) LED display: 7386

Fault definition: An internal encoder fault

Production mechanism: An anomaly is detected inside the encoder.

reason	Treatment method
Internal encoder error	The servo is powered off and restarted. If the fault cannot be cleared, contact professional technicians to replace the encoder.

33) LED display: 7387

Fault definition: motor information error

Production mechanism: the servo does not detect the motor electronic nameplate, or the electronic nameplate data is wrong.

reason	Treatment method
Use of third-party motors	If a third-party motor is used, you need to log in with an advanced password, change parameter P00.03 to User Settings, and enter related parameters based on the actual motor information. For details, see Motor Configuration in the debugging software.
Electronic nameplate not written	Log in to the advanced password, change the parameter P00.03 to "User Settings", and configure the relevant motor and encoder parameters according to the actual motor, please refer to the debugging software "Motor Configuration" chapter for details.
Electronic nameplate data is incorrect	Try the preceding steps to solve the problem. If the problem persists after the power is powered off and restarted, contact the after-sales service for maintenance by professional technicians.

34) LED display: 7388

Fault definition: motor encoder zero missing

Production mechanism: The servo does not detect the encoder magnetic declination data, or the motor storage information is wrong.

reason	Treatment method
Use of third-party motors	When using a third party motor, encoder calibration is required, please refer to the "Third Party Motor Use Section" for details.
The motor is not zeroed for encoder	Please refer to the encoder zeroing section to zero the encoder.
The encoder zero correction data is incorrect	Try the preceding steps to solve the problem. If the problem persists after the power is powered off and restarted, contact the after-sales service for maintenance by professional technicians.

35) LED display: 7581

Fault definition: EtherCAT communication is faulty

Production mechanism: When enabled, the EtherCAT bus between the servo drive and the host computer cannot communicate normally.

reason	Treatment method
Controller exception	Check whether the controller communication state machine switches to the non-OP state when the servo is enabled. If "Enable EtherCAT Frame Drop Detection" is set to 1 at 0x3001:04, check the real-time performance of the controller. Whether continuous frame loss occurs.
The communication cable is improperly connected or disconnected	Check whether the communication cables are securely connected.
The communication cable is improperly grounded	Use a communication cable with a shielded layer. The shielded layer is well grounded.
Poor contact of network port	If the gold finger of the network port is deformed, the contact is poor. Contact the customer service engineers for maintenance.

36) LED display: 7582

Fault definition: The synchronization period is incorrectly set

Generation mechanism: The bus cycle time can not be exactly divided by the speed ring cycle time.

reason	Treatment method
When the upper computer is controlled, the bus cycle time cannot be exactly divided by the speed loop cycle time (speed loop cycle time = current loop cycle time (100 microseconds for unilateral modulation, 50 microseconds for bilateral modulation)* Speed loop cycle).	Change the bus cycle time of the host computer, or change the number of speed cycle times (3-5 recommended).

37) LED display: 7590

Fault definition: Drive communication error 1

Mechanism: Driver communication initialization error.

reason	Treatment method
Internal drive error	Contact the after-sales service for maintenance.

38) LED display: 7591

Fault definition: EtherCAT communication initialization error

Mechanism: An error occurred during driver EtherCAT communication initialization.

reason	Treatment method
The EEPROM Settings of the EtherCAT communication chip were incorrect	Check that servo communication parameter P01.01 is "EtherCAT". Use the TwinCAT software to check whether the XML file of the host computer is intact. You can also use the TwinCAT software to reconfigure the XML. For details, see "Using the N3 Servo Drive with the Beckfuk Host Computer".
The EtherCAT card is damaged	Contact the after-sales service for maintenance.
Servo drive internal damage	Contact the after-sales service for maintenance.

39) LED display: 7592

Fault definition: ECAT EEPROM

Cause: An error is returned when I read or write the ECAT EEPROM through the ESC interface. The possible cause is that the read and write permission is faulty or the EEPROM hardware is faulty.

reason	Treatment method
The controller disabled EtherCAT slave to modify EEPROM permissions	Check parameter P01.05 Node Number Configuration Selection. Some upper controllers, such as Powerfuk, do not allow the slave station to change the node number. Therefore, when using this type of controller, change P01.05 "Node Number Configuration Selection" to bus configuration.
The EtherCAT hardware is faulty	Contact the after-sales service for maintenance.

40) LED display: 8480

Fault definition: overspeed in the same direction

Production mechanism: When the actual speed is in the same direction as the given speed, the speed error value exceeds the motor rating value by more than 20%.

reason	Treatment method
Motor racing	For details, see Motor Stall.
Incorrect motor parameters	Check that motor parameters are set correctly, such as pole number, encoder single turn value, etc.
Wrong encoder parameter	Check whether the encoder parameter Settings are consistent with the actual motor.
Encoder fault	Check whether the encoder is damaged, whether the wiring is correct, whether the grounding is good, etc.
Excessive forward load	Check whether the actual motor power meets the load demand.
Improper parameter setting	Check whether the stall filtering time parameter of P50.17 is set correctly.

41) LED display: 8481

Fault definition: Reverse overspeed

Production mechanism: When the actual speed is reversed with the given speed, the speed error value exceeds the motor rating value by more than 20%.

reason	Treatment method
Motor racing	For details, see Motor Stall.
Incorrect motor parameters	Check that motor parameters are set correctly, such as pole number, encoder single turn value, etc.
Wrong encoder parameter	Check whether the encoder parameter Settings are consistent with the actual motor.
Encoder fault	Check whether the encoder is damaged, whether the wiring is correct, whether the grounding is good, etc.
Excessive forward load	Check whether the actual motor power meets the load demand.
Improper parameter setting	Check whether the stall filtering time parameter of P50.17 is set correctly.

42) LED display: 8482

Fault definition: The rotational speed exceeds the maximum

Production mechanism: the actual speed exceeds the maximum speed of the motor, and the duration exceeds the alarm value.

reason	Treatment method
Motor racing	For details, see Motor Stall.
Incorrect motor parameters	Check that motor parameters are set correctly, such as pole number, encoder single turn value, etc.
Wrong encoder parameter	Check whether the encoder parameter Settings are consistent with the actual motor.
Encoder fault	Check whether the encoder is damaged, whether the wiring is correct, whether the grounding is good, etc.
Instruction setting error	Check that position, speed and torque instructions are given correctly.
Load mutation	Check the cause of sudden change in external load.

43) LED display: 8483

Fault definition: The speed tracking error is too large

Generation mechanism: The absolute speed error is still greater than the speed error threshold after the filtering time.

reason	Treatment method
Over accelerated speed	Check whether the acceleration given by the command exceeds the response of the load, causing the actual speed to lag significantly behind the given speed.
Improper parameter setting	Check whether P50.14 Speed Following Error Threshold and P50.15 Following Error Filtering time are properly set. Appropriately increase the parameter P50.01 "speed loop gain 1" to accelerate the motor response.
overload	Check that the selected motor torque meets the load requirements.
Output missing phase	Troubleshoot the fault by referring to Output Phase Missing.

44) LED display: 8484

Fault definition: Acceleration is out of whack

Production mechanism: The acceleration calculated inside the servo lasts for 300 current loop cycles greater than the set acceleration threshold, or the encoder data frame has 300 consecutive errors.

reason	Treatment method
Over accelerated speed	Check whether the acceleration given by the command exceeds the response of the load, causing the actual speed to lag significantly behind the given speed.
Encoder fault	Check whether the encoder is damaged and whether the wiring is normal. Check whether the shielding layer of the encoder cable is properly grounded and whether strong interference sources exist near the cable.
Encoder interface short circuit	Check whether there is short circuit between pins, short circuit to ground or strong interference on the encoder and cable.

45) LED display: 8485

Fault definition: motor stall

Generation mechanism: The continuous stall filtering time of the motor speed exceeds the stall threshold (when the speed is lower than 10% of the rated speed, the stall threshold is 30% of the rated speed).

reason	Treatment method
The motor power cable is faulty	Check the wiring condition of the servo output side according to the operating rules, and exclude short circuit, missing connection, broken line, loose virtual connection, phase sequence connection reverse, etc.
Motor stalling	Check whether the motor has too much load, or the machine is stuck, or the lock does not open normally.
The internal components of the servo are damaged	Contact the after-sales service for maintenance by professional technicians.

46) LED display: 8611

Fault definition: The position deviation is too large

Generation mechanism: the position deviation is greater than the set position deviation threshold and lasts for 100ms.

reason	Treatment method
Over accelerated speed	Check whether the acceleration given by the command exceeds 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, which is generally set to the Inc value corresponding to one turn of the motor encoder, such as the 23-bit encoder set to 8388608; Set the 17-bit encoder to 131072. Appropriately increase parameters P60.01 "Position loop gain" and P60.02 "Position loop Feedforward".
Motor stalling	Check whether the motor has too much load, or the machine is stuck, or the lock does not open normally.
overload	Check that the selected motor torque meets the load requirements.
Output missing phase	Troubleshoot the fault by referring to Output Phase Missing.

47) LED display: 8612

Fault definition: instruction given anomaly detection

Generation mechanism: In the position or speed control mode, it detects whether the given acceleration is less than the parameter P60.11, and when the given instruction has a large mutation, the fault will be triggered, in order to prevent the servo system from running fast and other risks.

reason	Treatment method
Set the instruction to a given mutation	Check that the given instruction is appropriate.
Speed given instruction mutation	Check that the given instruction is appropriate.
In torque mode, the difference between the current time and the previous time speed limit exceeds the rated speed	Check that the given instruction is appropriate.
Parameter P60.11 is set too large	Appropriately reduce parameter P60.11 "Instruction detection acceleration time".
EtherCAT dropped frames	Check whether the real-time communication is good.
Return-zero deviation data is lost, resulting in a large difference between the given position and the current position.	Check whether the actual feedback position is consistent with the mechanical position

48) LED display: 8613

Fault definition: Forward motion disabled

Generation mechanism: The forward motion disabling function is triggered.

reason	Treatment method
The forward motion disable function is triggered	Check whether the functions of the DI function group and the DI logical configuration are correct. Check whether the DI channel configured with the forward motion disable function is consistent with the actual connection. Check whether the external DI input line is normal, whether the cable is properly connected, and whether there is poor contact.

49) LED display: 8614

Fault definition: Reverse motion is disabled

Mechanism: The reverse motion disable function is triggered.

reason	Treatment method
The reverse motion disable function is triggered	Check whether the functions of the DI function group and the DI logical configuration are correct. Check whether the DI channel configured with the reverse motion disable function is consistent with the actual connection. Check whether the external DI input line is normal, whether the cable is properly connected, and whether there is poor contact.

50) LED display: 8615

Fault definition: The limit signal is abnormal

Mechanism: The positive and reverse limit numbers are triggered at the same time or the logic is incorrect

reason	Treatment method
The positive and reverse limit numbers are triggered at the same time	Check whether the limit signal connection is correct and whether it is loose.
Motor running direction and triggered limit signal logic opposite, such as forward running, reverse limit triggered	1) Check whether the normally open and normally closed logic of the DI port corresponding to the limit signal is consistent with the actual. 2) Check whether the limit signal is consistent with the actual running direction. 3) Check whether there is a large interference source or whether the power supply is stable. 4) Check whether the driver DI input port is abnormal.

51) LED display: 9834

Fault definition: The Ai configuration is incorrect

Production mechanism: The two Ai channels are configured as pressure feedback input at the same time.

reason	Treatment method
Both Ai channels are configured as pressure feedback inputs	Check parameters P72.01 and P72.08

52) LED display: 9837

Fault definition: Lower pressure exceeds tolerance

Mechanism: The positive and reverse limit numbers are triggered at the same time or the logic is incorrect

reason	Treatment method
Position After reaching the press position + tolerance,Pressure sensor has no feedback,Prevent crushing of the pressed workpiece.	(1) Increase tolerance Settings. (2) Confirm that the pressure sensor feedback is good. (3) Check the cable connections of the pressure sensor. (4) Check whether the Settings of parameters P72.01 and P72.08 are pressure control feedback.

53) LED display: 9842

Fault definition: The pressure is too high during the pushdown operation

Mechanism: Sensor feedback error or analog setting error

reason	Treatment method
Excessive pressure value was detected during compression	Adjust the mechanical structure
Sensor feedback error	Acceleration and deceleration Time 0xB00D and 0xB025 This parameter is mandatory
The analog setting is incorrect	(1) Calibration of analog signal zero. (2) Check whether the tolerance setting is too small.

11.3 List of object groups

parameter	index.subindex	Name	Function	Setting method	Effective method
P42.01	0X3042.01	1st torque feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P42.02	0X3042.02	Torque feedback cutoff Frequency 1		Run settings	Interrupt can take effect
P42.03	0X3042.03	Torque feedback notch frequency 1		Run settings	Interrupt can take effect
P42.04	0X3042.04	Torque feedback notch depth 1		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P42.06	0X3042.06	Torque feedback cutoff frequency 2		Run settings	Interrupt can take effect
P42.07	0X3042.07	Torque feedback notch frequency 2		Run settings	Interrupt can take effect
P42.08	0X3042.08	Torque feedback notch depth 2		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P42.0A	0X3042.0A	Torque feedback cutoff frequency 3		Run settings	Interrupt can take effect
P42.0B	0X3042.0B	Torque feedback notch frequency 3		Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P42.0C	0X3042.0C	Torque feedback notch depth 3		Run settings	Interrupt can take effect
P42.0D	0X3042.0D	4th torque feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P42.0E	0X3042.0E	Torque feedback cutoff frequency 4		Run settings	Interrupt can take effect
P42.0F	0X3042.0F	Torque feedback notch frequency 4		Run settings	Interrupt can take effect
P42.10	0X3042.10	Torque feedback notch depth 4		Run settings	Interrupt can take effect
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 the parameter is, the faster the speed loop will respond. However, setting it too high may cause vibration, so you need to pay 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.	Run settings	Interrupt can take effect
P50.02	0X3050.02	Speed loop integration time 1	Set the integration time constant of the speed loop. The smaller the value set, the stronger the integral effect, and the deviation value at stop will approach 0 faster. When the Ti setting value is small, the system responds quickly, but if it is too small, oscillation may occur; when the Ti setting value is large, the system responds slowly.	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P50.03	0X3050.03	Speed ring Kd1	Differential time Kd: generally not adjusted. According to the default setting, this parameter can quickly respond to system feedback and given deviation changes. The larger the Kd value, the faster the response, but if it is too large, it will easily cause oscillation. When set to 0, differentiation is invalid.	Run settings	Interrupt can take effect
P50.04	0X3050.04	Speed loop gain 2	2nd speed loop gain.	Run settings	Interrupt can take effect
P50.05	0X3050.05	Speed loop integration time 2	The second speed loop integral time constant.	Run settings	Interrupt can take effect
P50.06	0X3050.06	Speed ring Kd2	2nd speed loop differential time coefficient.	Run settings	Interrupt can take effect
P50.10	0X3050.10	Torque feedforward control selection	0: No torque feedforward 1: Internal torque feedforward 2: 60B2h torque feedforward Currently only 2 options are supported	Run settings	Interrupt can take effect
P50.11	0X3050.11	speed control cycle	Set the ratio of speed control period to current control period. This parameter is mainly used to adjust the control cycle of the speed loop. Speed loop period=(P50.11*1000000)/(P31.0D* (2 P31.0E)) microseconds. When using bus control, the master station communication period 0x3001:03 needs to be an integer multiple of the speed loop period.	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P50.12	0X3050.12	Speed given upper limit	This parameter is used to set the upper limit of the speed reference value as a percentage of the motor's rated speed. In the position control and speed control modes, the speed reference during forward rotation is limited to the range of this parameter.	Run settings	Interrupt can take effect
P50.13	0X3050.13	Speed given lower limit	This parameter is used to set the lower limit of the speed reference value as a percentage of the motor's rated speed. In position control and speed control modes, the speed reference during forward rotation is limited to the range of this parameter.	Run settings	Interrupt can take effect
P50.14	0X3050.14	Speed tracking error threshold	This parameter is used to set the threshold of speed tracking error, and the base value is the current speed given. When the difference between the speed reference and speed feedback reaches or exceeds the threshold set by this parameter and the duration exceeds the filter time set in 0x3050:15 (such as speeding), the servo drive will stop and report a fault.	Run settings	Interrupt can take effect
P50.15	0X3050.15	Tracking error filter time	This parameter is used to set the filter time of speed tracking error protection. Generally, it is not adjusted and is set according to the default value.	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P50.16	0X3050.16	stall threshold	This parameter is used to set the stall protection threshold, and the base value is the current speed given. When the difference between the speed reference and the speed feedback reaches or exceeds the threshold set by this parameter and the duration exceeds the filter time set in 0X3050:17 (such as speeding), the servo drive will stop and report a fault.	Run settings	Interrupt can take effect
P50.17	0X3050.17	stall filter time	This parameter is used to set the filter time of stall protection. Generally, it is not adjusted and is set according to the default value.	Run settings	Interrupt can take effect
P50.18	0X3050.18	Stall protection enabled	This parameter is used to set whether to perform stall protection fault detection. 0: No 1: Yes	Run settings	Interrupt can take effect
P50.19	0X3050.19	Overspeed filter time	This parameter is used to set the filter time of overspeed protection. Generally, it is not adjusted and is set according to the default value.	Run settings	Interrupt can take effect
P51.01	0X3051.01	1st speed given filter type	The speed given filter is not turned on by default 0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P51.02	0X3051.02	Speed given	This parameter is used to set the low-pass cutoff	Run settings	Interrupt can take effect

		cutoff frequency 1	frequency of speed given filter module 1 (this parameter is only meaningful when the 0x3051:01 parameter is set to 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 notch frequency 1	The speed given notch frequency 1 is used to set the notch center frequency of the first speed given filter, and the speed given notch depth 1 is used to set the notch depth of the first speed given filter (when 0x3051: When 01 is selected as 4, these two parameters are meaningful; when 0x3051:01 is selected as 0, 1, 2, and 3, the values of these two parameters are meaningless.)	Run settings	Interrupt can take effect
P51.04	0X3051.04	Speed given notch depth 1	As described in 0x3051:04, it is used to set the notch depth of the first speed given notch filter. The greater the notch depth, the stronger the attenuation effect on the center frequency point.	Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P51.06	0X3051.06	Speed given cutoff frequency 2		Run settings	Interrupt can take effect
P51.07	0X3051.07	Speed given notch frequency 2		Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P51.08	0X3051.08	Speed given notch depth 2		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P51.0A	0X3051.0A	Speed given cutoff frequency 3		Run settings	Interrupt can take effect
P51.0B	0X3051.0B	Speed given notch frequency 3		Run settings	Interrupt can take effect
P51.0C	0X3051.0C	Speed given notch depth 3		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P51.0E	0X3051.0E	Speed given cutoff frequency 4		Run settings	Interrupt can take effect
P51.0F	0X305.0F	Speed given cutoff frequency 4		Run settings	Interrupt can take effect
P51.10	0X3051.10	Speed given notch depth 4		Run settings	Interrupt can take effect
P52.01	0X3052.01	1st speed feedback filter type	The first speed feedback filter turned on by default is 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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P52.02	0X3052.02	Speed feedback 1 cutoff frequency	The first speed feedback filter turned on by default is a first-order low-pass filter with a cutoff frequency of	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
			1000hz. The smaller the setting, the smaller the speed feedback fluctuation, but the greater the feedback delay. The cutoff frequency is 5000Hz and there is no filtering effect.		
P52.03	0X3052.03	Speed feedback 1 notch frequency		Run settings	Interrupt can take effect
P52.04	0X3052.04	Speed feedback 1 notch depth		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P52.06	0X3052.06	Speed feedback 2 cutoff frequency		Run settings	Interrupt can take effect
P52.07	0X3052.07	Speed feedback 2 notch frequency		Run settings	Interrupt can take effect
P52.08	0X3052.08	Speed feedback 2 notch depth		Run settings	Interrupt can take effect
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 low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P52.0A	0X3052.0A	Speed feedback 3 cutoff frequency		Run settings	Interrupt can take effect
P52.0B	0X3052.0B	Speed feedback 3 notch frequency		Run settings	Interrupt can take effect
P52.0C	0X3052.0C	Speed feedback 3 notch depth		Run settings	Interrupt can take effect
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	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
			3: Second-order low pass with zero point 4: Notch filter		
P52.0E	0X3052.0E	Speed feedback 4 cutoff frequency		Run settings	Interrupt can take effect
P52.0F	0X3052.0F	Speed feedback 4 notch frequency		Run settings	Interrupt can take effect
P52.10	0X3052.10	Speed feedback 4 notch depth		Run settings	Interrupt can take effect
P60.01	0X3060.01	Position loop gain	The P60.01 and P60.02 parameters mainly adjust the proportional gain and feedforward gain of the position regulator. When the position control gain value increases, the position response can be improved and the position control error can be reduced. However, if the setting is too large, vibration and noise may occur.	Run settings	Interrupt can take effect
P60.02	0X3060.02	Position feedforward coefficient	Set the value of the position feedforward coefficient and the feedforward speed percentage, usually set not to exceed 100%. In position control mode, increasing the feedforward value can improve the position following error. Reducing the feedforward value can reduce the operating vibration of the mechanism. When the proportional gain is too large, the motor rotor will oscillate. Reduce the proportional gain until the motor rotor no longer oscillates. When the external torque increases,	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
			the proportional gain that is too low cannot meet the reasonable position tracking error requirements. At this time, the feedforward gain can effectively reduce the position dynamic tracking error.		
P60.0B	0X3060.11	Position tracking error detection enabled	This parameter is used to set whether to perform position tracking error fault detection. 0: Turn off position tracking error fault detection 1: Enable position tracking error fault detection	Run settings	Interrupt can take effect
P60.0C	0X3060.12	Position tracking error threshold	This parameter sets the threshold of the position tracking error in the position control loop. The base value is the encoder single-turn resolution. When the difference between the position reference and the position feedback reaches or exceeds the threshold (such as speeding, motor shaft jamming), the servo drive will stop and report a fault.	Run settings	Effective immediately
P60.0D	0X3060.13	Soft limit function setting	0: Disable the software limit function.	Run settings	Interrupt can take effect
P60.0E	0X3060.14	Soft limit maximum value	Maximum software absolute position limit.	Run settings	Effective immediately
P60.0F	0X3060.15	Minimum value of soft limit	Minimum software absolute position limit.	Run settings	Effective immediately
P61.01	0X3061.01	The 1st position is given filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
			4: Notch filter		
P61.02	0X3061.02	Position given cutoff frequency 1		Run settings	Interrupt can take effect
P61.03	0X3061.03	Position given notch frequency 1		Run settings	Interrupt can take effect
P61.04	0X3061.04	Position given notch frequency 1		Run settings	Interrupt can take effect
P61.05	0X3061.05	2nd position given filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P61.06	0X3061.06	Position given cutoff frequency 2		Run settings	Interrupt can take effect
P61.07	0X3061.07	Position given notch frequency 2		Run settings	Interrupt can take effect
P61.08	0X3061.08	Position given notch depth 2		Run settings	Interrupt can take effect
P61.09	0X3061.09	3rd position given filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P61.0A	0X3061.10	Position given cutoff frequency 3		Run settings	Interrupt can take effect
P61.0B	0X3061.11	Position given notch frequency 3		Run settings	Interrupt can take effect
P61.0C	0X3061.12	Position given notch depth 3		Run settings	Interrupt can take effect
P61.0D	0X3061.13	4th position given filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P61.0E	0X3061.14	Position given cutoff frequency 4		Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
P61.0F	0X3061.0F	Position given notch frequency 4		Run settings	Interrupt can take effect
P61.10	0X3061.10	Position given notch depth 4		Run settings	Interrupt can take effect
P62.01	0X3062.01	1st position feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P62.02	0X3062.02	Position feedback cutoff frequency 1		Run settings	Interrupt can take effect
P62.03	0X3062.03	Position feedback notch frequency 1		Run settings	Interrupt can take effect
P62.04	0X3062.04	Position feedback notch depth 1		Run settings	Interrupt can take effect
P62.05	0X3062.05	2nd position feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P62.06	0X3062.06	Position feedback cutoff frequency 2		Run settings	Interrupt can take effect
P62.07	0X3062.07	Position feedback notch frequency 2		Run settings	Interrupt can take effect
P62.08	0X3062.08	Position feedback notch depth 2		Run settings	Interrupt can take effect
P62.09	0X3062.09	3rd position feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P62.0A	0X3062.0A	Position feedback cutoff frequency 3		Run settings	Interrupt can take effect
P62.0B	0X3062.0B	Position feedback notch frequency 3		Run settings	Interrupt can take effect
P62.0C	0X3062.0C	Position feedback		Run	Interrupt can

parameter	index.subindex	Name	Function	Setting method	Effective method
		notch depth 3		settings	take effect
P62.0D	0X3062.0D	4th position feedback filter type	0: No filter is used 1: First-order low-pass filter 2: Second-order low-pass filter 3: Second-order low pass with zero point 4: Notch filter	Run settings	Interrupt can take effect
P62.0E	0X3062.0E	Position feedback cutoff frequency 4		Run settings	Interrupt can take effect
P62.0F	0X3062.0F	Position feedback notch frequency 4		Run settings	Interrupt can take effect
P62.10	0X3062.10	Position feedback notch depth 4		Run settings	Interrupt can take effect
P63.01	0X3063.01	Inertia ratio	Load inertia ratio, when the external mechanical load is converted to the mechanical inertia on the motor shaft, divided by the rotational inertia of the motor itself, the inertia ratio is obtained. Example: When the inertia ratio is 1 times, this value is 100. This value can be entered manually or filled in automatically through inertia self-learning. Note: When used in rough position precision control situations, this drive supports a maximum load inertia ratio of 20 times. Please consider it carefully during the mechanical design and selection stage.	Run settings	Interrupt can take effect
P63.02	0X3063.02	Mechanical rigidity setting	Mechanical rigidity level setting, the level ranges from 0 to 31, 0 represents the weakest gain, and 31 represents the strongest gain. Each stiffness level	Run settings	Interrupt can take effect

parameter	index.subindex	Name	Function	Setting method	Effective method
			corresponds to a set of three-loop gain data.		
P63.03	0X3063.03	Inertia identification frequency		Run settings	Interrupt can take effect
P70.01	0X3070.01	Enter DI1 function	NO represents normally open logic, and options without NO represent normally closed logic; 0: DI function is not defined 1: Servo running NO 2: Forward movement is prohibitedNO 3: Reverse motion prohibited NO 6: Reserved 9: Zero return proximity switch NO 10: Bus IO input NO 11: Probe 1NO 12: Probe 2NO 101: Servo operation 102: Forward movement prohibited 103: Reverse movement prohibited 106: Reserved 109: Zero return proximity switch 110: Bus IO input 111: Probe 1 112: Probe 2	Run settings	Effective immediately
P70.02	0X3070.02	Input DI2 function	Same as DI1 input function configuration description.	Run settings	Effective immediately
P70.03	0X3070.03	Enter DI3 function	NO represents normally open logic, and options without NO represent normally closed logic; 0: DI function is not defined 1: Servo running NO 2: Forward movement is	Run settings	Effective immediately

parameter	index.subindex	Name	Function	Setting method	Effective method
			prohibited NO 3: Reverse motion prohibited NO 6: Reserved 9: Zero return proximity switch NO 10: Bus IO input NO 101: Servo operation 102: Forward movement prohibited 103: Reverse movement prohibited 106: Reserved 109: Zero return proximity switch 110: Bus IO input (11, 12, 111, 112 less than DI1)		
P70.04	0X3070.04	Enter DI4 function	Same as DI3 input function configuration description	Run settings	Effective immediately
P70.05	0X3070.05	Enter DI5 function	Same as DI3 input function configuration description.	Run settings	Effective immediately
P70.06	0X3070.06	Emergency stop logic	This parameter is used to select the emergency stop logic setting: 6: Normally open logic: The emergency stop is set to normally open logic. When the input state is valid, the servo is in the emergency stop state. 106: Normally closed logic: Emergency stop is set to normally closed logic. For high resistance state and valid input state, the servo is in emergency stop state.	Run settings	Effective immediately
P70.07	0X3070.07	Digital input filter time	This parameter is used to set the filtering time of digital quantities.	Run settings	Effective immediately
P70.08	0X3070.08	input status	Display the logic given state of DI. The binary bit4~bit0 of this parameter correspond to the logic	Run settings	Effective immediately

parameter	index.subindex	Name	Function	Setting method	Effective method
			state of DI5~DI1 respectively.		
P70.09	0X3070.09	Analog input enable	0: No 1: Yes Through the setting of this parameter, you can determine whether to turn on the input simulation function of DI~DI5. When this function is turned on, the DI logic can be given through parameter parameterP70.0A; when this function is turned off, the DI can be given through the corresponding DI physical interface. logic.	Run settings	Effective immediately
P70.0A	0X3070.10	Analog input	When parameterP70.09 is 1, the DI analog input function is enabled. The binary bit4~bit0 of this parameter correspond to the logic givens of DI5~DI1 respectively, which determines whether the function logic set by DI is triggered.	Run settings	Effective immediately
P71.01	0X3071.01	Output DO1 function	0: DO function is not defined 1: Servo zero return completed NO 2: Servo operation enable NO 3: Servo alarm NO 4: Position tracking exceeds limit NO 5: The target position reaches NO 6: Brake output NO 7: Bus IO output NO 101: Servo zero return completes NC 102: Servo operation	Run settings	Effective immediately

parameter	index.subindex	Name	Function	Setting method	Effective method
			enable NC 103: Servo alarm NC 104: Position tracking exceeds NC limit 105: Target position reaches NC 106: Brake output NC 107: Bus IO output NC		
P71.02	0X3071.02	Output DO2 function	Same as 0x3070:01 parameter description.	Run settings	Effective immediately
P71.03	0X3071.03	Output DO3 function	Same as 0x3070:01 parameter description.	Run settings	Effective immediately
P71.04	0X3071.04	Output DO4 function	Same as 0x3070:01 parameter description, DO4 is configured as brake normally open output by default. 0: DO function is not defined 1: Servo zero return completed 2: Servo operation enabled 3: Servo alarm 4: Location tracking exceeds limit 5: Target location reached 6: Brake output NO 7: Bus IO output 101: Servo zero return completed 102: Servo operation enable 103: Servo alarm 104: Location tracking exceeded 105: Target position reached 106: Brake output NC 107: Bus IO output	Run settings	Effective immediately
P71.05	0X3071.05	DO1 opening filter time	Setting of DO1 output signal opening filter time.	Run settings	Effective immediately
P71.06	0X3071.06	DO2 opening filter	Setting of DO2 output	Run	Effective

parameter	index.subindex	Name	Function	Setting method	Effective method
		time	signal opening filter time.	settings	immediately
P71.07	0X3071.07	DO3 opening filter time	Setting of DO3 output signal opening filter time.	Run settings	Effective immediately
P71.08	0X3071.08	DO4 opening filter time	Setting of DO4 output signal opening filter time.	Run settings	Effective immediately
P71.09	0X3071.09	DO1 turn-off filter time	Setting of DO1 output signal turn-off filter time.	Run settings	Effective immediately
P71.0A	0X3071.0A	DO2 turn-off filter time	Setting of DO2 output signal turn-off filter time.	Run settings	Effective immediately
P71.0B	0X3071.0B	DO3 turn-off filter time	Setting of DO3 output signal turn-off filter time.	Run settings	Effective immediately
P71.0C	0X3071.0C	DO4 turn-off filter time	Setting of DO4 output signal turn-off filter time.	Run settings	Effective immediately
P71.0D	0X3071.0D	Output status	Displays the current output logic status of DO1-DO4. The binary Bit0-Bit3 of this value corresponds to the actual output status of the DO1-DO4 port in turn. Taking the DO1 terminal as low level and the DO2~DO4 terminals as high level as an example: the corresponding binary code to "1110".	Run settings	Effective immediately
P71.0E	0X3071.0E	Force output enable	Through the setting of this parameter, you can choose the DO output terminal logic to be the functional logic of the DO configuration, or the user can directly control the DO output logic through 0x3071:0F; 0: No, the DO output is controlled by the internal function logic set in 0x3071:01~0x3071:04. 1: Yes, the user directly controls the DO output logic through 0x3071:0F.	Run settings	Effective immediately
P71.0F	0X3071.0F	Force output	When the 0x3071:0E parameter is set to 1, the	Run settings	Effective immediately

parameter	index.subindex	Name	Function	Setting method	Effective method
			user directly controls the DO output logic through this parameter. Use the binary Bit0-Bit3 of this value to control the actual output of the DO1-DO4 ports in sequence. Take the DO1 terminal as low level and the DO2~DO4 terminals as high level as an example: the corresponding binary code is "1110".		
P80.01	0X3080.01	Speed curve type	0: trapezoidal curve 1: sin2 curve (not supported yet) 2: Jerk-free curve 3: Jerk-limited curve	Run settings	Effective immediately
P80.02	0X3080.02	acceleration	Parameter parameter specifies the acceleration and deceleration of the speed curve.	Run settings	Effective immediately
P80.03	0X3080.03	deceleration	This parameter specifies the acceleration and deceleration of the speed curve.	Run settings	Effective immediately
P80.04	0X3080.04	Accelerate corner fillet Jerk0	This parameter is used to set the value of acceleration fillet Jerk0.	Run settings	Effective immediately
P80.05	0X3080.05	Accelerate corner fillet Jerk1	This parameter is used to set the value of acceleration fillet Jerk1.	Run settings	Effective immediately
P80.06	0X3080.06	Accelerate corner fillet Jerk2	This parameter is used to set the value of deceleration fillet Jerk2.	Run settings	Effective immediately
P80.07	0X3080.07	Accelerate corner fillet Jerk3	This parameter is used to set the value of deceleration fillet Jerk3.	Run settings	Effective immediately
P81.01	0X3081.01	uniform speed	This parameter is used for the uniform segment velocity of the given position profile.	Run settings	Effective immediately
P81.02	0X3081.02	acceleration	This parameter group is	Run	Effective

parameter	index.subindex	Name	Function	Setting method	Effective method
			used for speed planning of position mode control when the channel is not controlled by the controller.	settings	immediately
P81.03	0X3081.03	deceleration	This parameter group is used for speed planning of position mode control when the channel is not controlled by the controller.	Run settings	Effective immediately
P82.01	0X3082.01	Return to zero mode	No function yet, please use CiA402 standard object settings (to be associated).	-	-
P82.02	0X3082.02	Home offset	No function yet, please use CiA402 standard object settings.	-	-
P82.03	0X3082.03	Return to zero speed 1	No function yet, please use CiA402 standard object settings (to be associated).	-	-
P82.04	0X3082.04	Return to zero speed 2	No function yet, please use CiA402 standard object settings (to be associated).	-	-
P83.01	0X3083.01	Emergency stop selection code	Please set via 0x605A.	-	-
P83.02	0X3083.02	Emergency stop acceleration	No function yet, please use CiA402 standard object settings (to be associated).	-	-
P90.01	0X3090.01	M control mode selection	When the command channel of the servo drive is selected as panel control, debugging software control, analog 1, or analog 2, this parameter is used to set the control operation mode of the servo drive. This parameter is invalid under controller control. 0: Torque control mode 1: Speed control mode 2: Position control mode	Run settings	Effective immediately
P90.02	0X3090.02	Reciprocating motion enabled	This parameter is used to set the reciprocating motion and is controlled by the panel control and	Run settings	Effective immediately

parameter	index.subindex	Name	Function	Setting method	Effective method
			debugging software. 0: No 1: Yes		
P91.15	0X3091.15	Total power-on time	The total power-on time of the system is displayed cumulatively. This function code is used to record the total running time of the servo drive. When the drive is powered on and off multiple times in a short period of time, the total power-on time record may deviate by a few minutes.	-	-
P91.16	0X3091.16	Maximum load rate	The parameter parameter is reserved and has no function yet.	-	-
P91.17	0X3091.17	average load rate	The parameter parameter is reserved and has no function yet.	-	-
P91.18	0X3091.18	Fault record selection	Select and display the faults of the servo drive and the system power-on time when the fault occurs in sequence. A total of 10 recent fault records can be recorded, of which 0 is the most recent fault.	Run settings	Effective immediately
P91.19	0X3091.19	Selected fault code	The selected fault code 0x3091:18 is displayed. Note that the displayed value in the error code table is in hexadecimal.	Run settings	Effective immediately
P91.1A	0X3091.1A	Failure time	Displays the system power-on time when the selected fault record 0x3091:18 occurs.	Run settings	Effective immediately
P91.2A	0X3091.2A	EtherCAT communication status	1: INT communication initialization 2:PreOP 3: SafeOP, the controller can normally read the	-	-

parameter	index.subindex	Name	Function	Setting method	Effective method
			communication object of the servo drive TPDO 4: OP, this state can operate the communication state normally		
PA0.07		Software version release time		-	-
PA0.0B	P0A.11	Software version	This parameter parameter mainly displays the fixed parameter parameter of the servo, which is generally set directly by the manufacturer and does not need to be set by the user.	-	-