



A6N Series AC Servo Driver
User Manual

©V1.00



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1

Safety precautions

* Please observe them

1 Safety Precautions

Before operating the A6N servo drive system, please carefully read the relevant precautions of the equipment and be sure to follow the installation, debugging, safety precautions, and operating procedures. COTRUST is exempt from liability for equipment damage or personal injury caused by failure to operate as required.

To prevent harm to people and damage to property, the following instructions are made for the matters that must be followed. The potential harm and degree of damage caused by incorrect use of this product are indicated by relevant symbols.

 Danger	Indicates operation against requirements may result in severe personal injuries or even death.
 Notice	Indicates operation against requirements may result in personal injuries or device damage
 Note	Indicates necessary supplements or explanations

 Danger	
Professional electrical engineer wiring.	Risk of electric shock and fire
Before wiring, verify that the main power input is off.	Risk of electric shock and fire
Securely connect the power input terminals to the motor drive cable terminals.	Risk of electric shock and fire
Do not directly touch the output terminal, do not short-circuit the output line of the servo driver to the housing, and do not short-circuit the output wire.	Risk of electric shock and fire
Please install safety devices such as circuit breakers to prevent external circuit short circuits and equipment failures, and to promptly cut off the power supply.	Risk of electric shock and fire
Do not disassemble the servo drive after it is powered on.	Risk of electric shock
After the drive is powered off, the high voltage will still be maintained for a period of time, do not disassemble the wires or touch the terminals within fifteen minutes	Risk of electric shock



Danger

of the power failure.	
Do not work in places with severe vibration and shock.	Electric shock, injury, and fire.
Do not immerse the cable in oil or water.	Risk of electric shock, faulty or broken equipment.
Do not connect or operate wires with wet hands.	Electric shock or fire.
Do not insert your hands into the interior of the drive.	Electric shock or fire.
Do not use in corrosive environments, flammable gas environments, humid environments, or near explosive materials.	Electric shock or fire.
Do not place flammable objects near motors, drivers, or regenerative resistors.	Electric shock or fire.
The temperature of the heat sink and regenerative resistor of the motor and driver will increase, please do not touch them.	There is a risk of electric shock and burns, equipment malfunction or damage.
The ground of the driver and motor must be well grounded.	If not grounded, there is a possibility of electric shock.
The output circuit may malfunction due to wiring errors or the application of abnormal voltage.	The brake does not operate, Mechanical damage or personal injury.
Please wire correctly and reliably, and be sure to confirm with the technical data.	Product malfunction or misoperation.
Before starting operation, set the switches and parameters to match the machine.	Mechanical accidents, malfunctions, or personnel injuries.
Do not change parameter values to the extreme.	Unstable work, mechanical damage, or personal injury.
To avoid accidents, please install limit switches or baffles at the mechanical	Mechanical damage or



Danger

terminals.	personal injury.
Do not enter the operating range of the machinery during operation.	May be injured.
Do not touch the movable parts of the servo motor and machinery during operation.	May be injured.
In the event of a power outage or abnormal voltage, there may be a sudden restart. Please use a mechanical design that ensures that it does not endanger personal safety.	May be injured.



Notice

Do not grip cables and motor shafts when handling motors.	May be injured, causing equipment malfunction or damage.
Do not operate damaged or missing servo drives.	May be injured.
Do not operate in direct sunlight.	May cause a fire.
Do not block the heat dissipation holes of the drive, and there should be no foreign objects inside the servo drive.	May cause a fire.
Follow the installation methods and directions specified.	May be injured, causing equipment malfunction or damage.
Do not connect the input power to the output U, V, and W.	Equipment malfunction or damage.
When two or more servo drives are placed in the same cabinet, ensure servo spacing and heat dissipation.	May be injured, causing equipment malfunction or damage.
If the equipment malfunctions, remove the cause of the malfunction and confirm that it is safe before starting the equipment.	If the cause of the alarm error is not ruled out, injury may occur.
If the drive fails, disconnect the drive power.	If a large current continues to flow, it may cause a fire.

**Notice**

If an external braking resistor is required, prepare it separately and do not touch the braking resistor during operation.	Electric shock and injury.
Please test run the servo motor without connecting it to the mechanical drive axis.	May be injured.
The rated torque of the servo motor should be greater than the actual load torque.	Long term work may cause equipment failure or breakage.
Non professionals are not allowed to perform repairs and maintenance on servo drives.	May be injured, causing equipment malfunction or damage.
When the servo is not working for a long time, cut off the power.	May be injured.
For the dangerous state of moving under external force (such as gravity) when stopped due to power switching or abnormality, safety cannot be ensured by the brake of the servo motor. At this point, please make sure to install a braking structure externally to ensure safety.	May be injured.



2

Selection of servo system

*** Servo System Specifications**

2 Introduction

2.1 Servo Drives

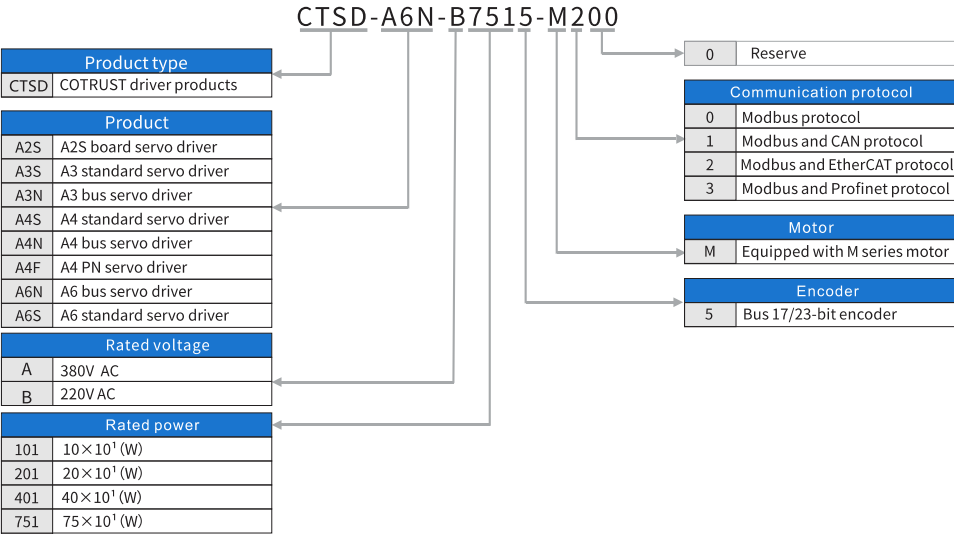
The A6N series drivers currently support powers of 0.1kW, 0.2kW, 0.4kW, 0.75kW, and 1kW.

The servo communicates with the upper computer through Modbus RTU protocol and supports EtherCAT protocol. The servo comes with 5 digital inputs (5DI) and 3 digital outputs (3DO). Supports the function of returning to the original position, supports trial operation, supports multiple communication control modes, and can complete various control tasks such as position, velocity, torque, and returning to the original position with triggering methods.

A6N series driver model:

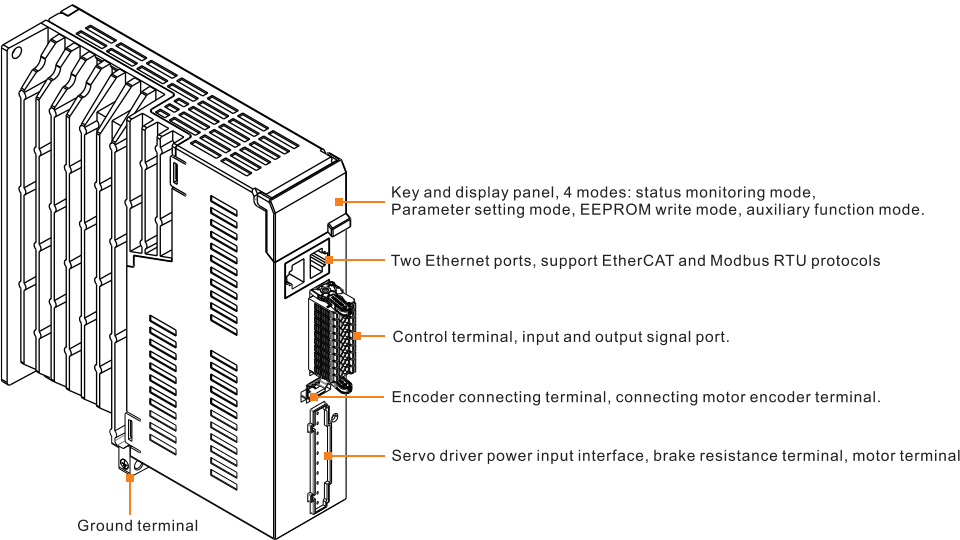
Power Input	Order Number	Description
Single phase 220VAC	CTSD A6N-B1015-M200	Supports 17Bit/23Bit encoders, Modbus RTU, EtherCAT protocols.
	CTSD A6N-B2015-M200	
	CTSD A6N-B4015-M200	
	CTSD A6N-B7515-M200	
	CTSD A6N-B1025-M200	

2.1.1 Servo Models

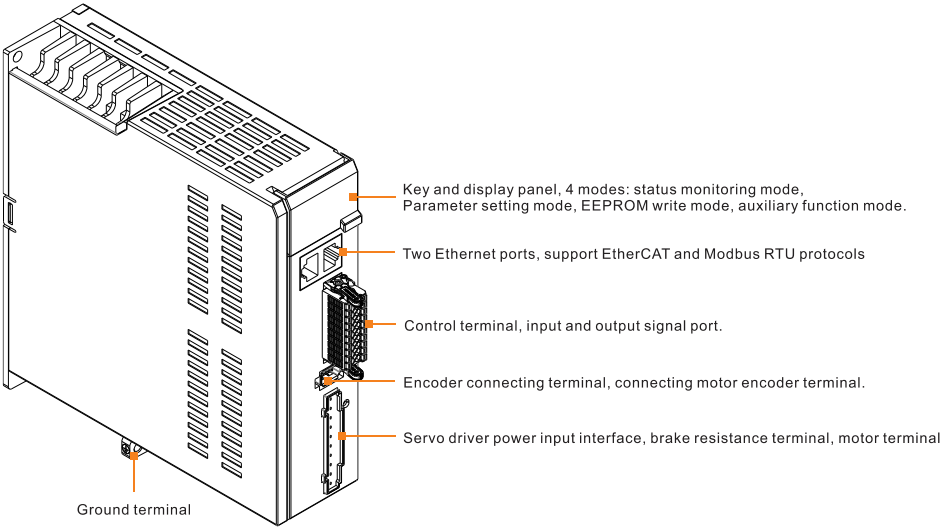


2.1.2 Servo Appearance

0.1kW, 0.2kW, 0.4kW servo drivers:



0.75kW, 1kW servo drivers:



2.1.3 Servo Specifications

Specification

Function		Descriptions
Power supply	Main power supply	Single phase AC 220V, $\pm 10\%$, 50/60Hz
Output power	Power range supports 0.1kW-1.0kW	
Encoder Feedback	17bit/23bit bus based absolute value encoder	
Display Operations	Numbers and buttons	5-digit 7-segment code display, 5-digit key operation
	Bus power indicator light	Display DC bus power light (red)
Control terminal	Terminal form	20 pin terminal
Digital input	Number of input channels	5 channels, support bipolar
Digital output	Number of output channels	3 channels
Probe input	Number of high-velocity input channels	2 channels

Communication function	Physical interface	RJ45
	485 interface	Supports Modbus RTU interface with baud rates ranging from 4800bps to 115200bps
	EtherCAT	Two 100Mbps baud rate EtherCAT interfaces
Storage function	Power-down hold	Permanently save parameters
Cooling method	Fan cooling (natural cooling below 750W)	
Isolation function	Power Isolation	YES
	Communication Isolation	YES
	Encoder Input Isolation	NO
	Digital Input Isolation	YES
	Digital Output Isolation	YES
Overload capability	Max. overload level	3 times overload
Driving current	Allowable current of the drive IPM module	Rated current 0.1kW~0.4kW: 20A (220VAC) 0.75W~1.0kW: 30A (220VAC)
Protective function	overcurrent	Activated when the main circuit current exceeds the rated instantaneous maximum current value by 4 times.
	Overvoltage	Activated when the main circuit voltage value is higher than the specification (395VDC)
	Undervoltage	Activated when the main circuit voltage value falls below the specification (200VDC).
	Overheating	Activated when IGBT temperature is too high (85°C)
	Overload	Activated when motor and drive are overloaded
	Over velocity	Activated when the motor control velocity exceeds the normal velocity too much
	Communication Abnormal	Activated in case of EtherCAT/CAN communication exception
	Register Abnormal	Activated on EE-PROM access exception
	Encoder error	Activated when the encoder communication is abnormal

Built-in braking resistor	0.1kW~0.4kW: No. 0.75W~1.0kW Yes
Common DC bus	Support

Functional specifications

Function	Descriptions
Control Method	Using FOC (Field Orientation Control) and SVPWM (Space Vector Control)
Control Input	Positive travel limit, reverse travel limit, latch signal, origin signal, etc. Pin functions can be assigned through parameters to input valid logic levels.
Control output	Servo preparation, alarm output, brake release, command completion output, positioning completion output, velocity reaching, torque limit reaching, etc. Pin functions can be assigned through parameter allocation, select the output effective logic level.
Key display panel	5-digit LED display, 5-digit button operation, main power bus status indicator light.
Jogging function	Key JOG function
Factory reset	Restore factory through panel
Instruction input	Instructions based on EtherCAT communication input
Electronic gear ratio	1/2147483647~2147483647 倍
Smooth filter	For instruction input, one can choose a delay filter, low-pass filter, or smoothing time constant.
Instruction variation saturation function	Prevents sudden changes in communication position commands and stabilises motor movements. Function to set the amount of saturation command position change. Sets the maximum speed of the motor.
Soft start/stop	Can set acceleration and deceleration from 0 to 60s/1000rpm.
S-curve acceleration and deceleration	You can choose S-curve acceleration and deceleration control
Homing function	Set speed, acceleration, and origin reset, supporting 36 homing modes.
Soft limit function	Sets the absolute position limit value for the software in the forward and reverse directions; position commands exceeding this value will stop when the limit is reached.

Braking resistor protection function	The resistance value and power of the built-in and external braking resistor can be set, and the driver automatically calculates the output duty cycle to limit the braking tube discharge and prevent the driver and braking resistor from being damaged by overheating.	
Running Positive Direction	For position/speed/torque commands and for each offset, the polarity (i.e. direction of motor rotation) can be set.	
Incremental or absolute encoders	Incremental or absolute encoders can be set up. The multi-turn absolute encoder can be backed up by the battery when the drive is powered off, and the drive calculates the absolute position of the machine from the absolute position of the encoder when it is powered on.	
Absolute value multiple circle data reset	The multi cycle data of the encoder can be cleared through the upper computer or button panel.	
Optional parameters stored in EEPROM	The communication change parameters should be able to be set and saved to EEPROM, making it easy for customers to directly configure servo parameters through communication.	
Modbus communication	Number of communication interfaces	1 RS485 communication port
	Communication Protocol	Standard ModBus RTU communication protocol, supporting the master station to read and write single/multiple parameters
	Communication baud rate (bps)	4.8k、9.6k、19.2k、38.4k、57.6k、115.2k
	Maximum cable length per section	With isolated relays: up to 187.5kbps for a length of 1000 meters.For a length of 1200 meters, it can reach 38.4 kbps. No isolation relay: 50 meters
	Maximum number of sites	127 stations per section
	isolate	YES
EtherCAT communication	Supporting service	CoE(PDO、SDO)
	synchronous mode	DC-distributed clock

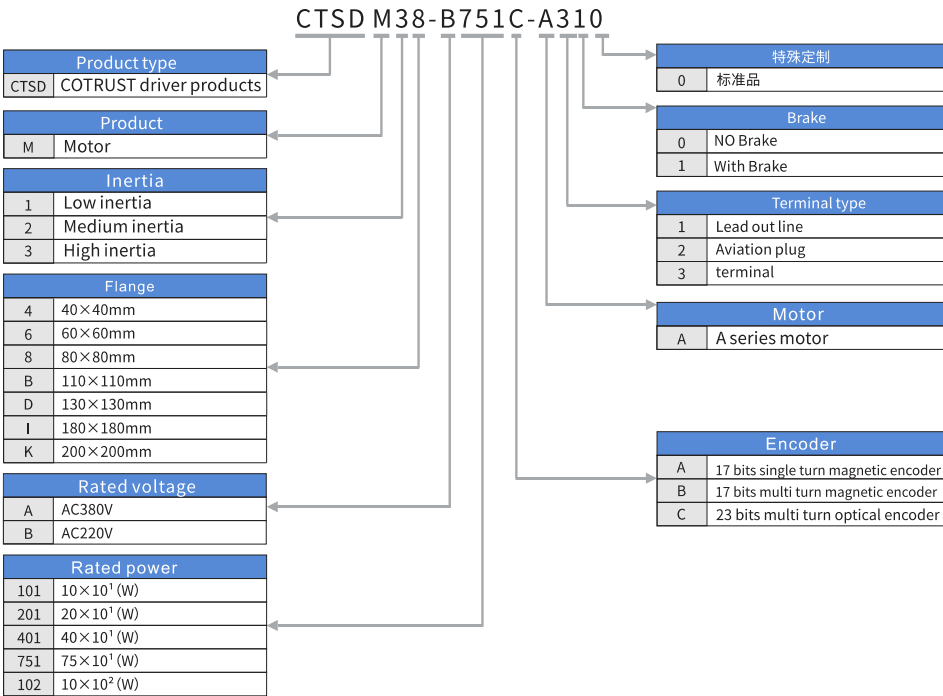
	Baud rate	100Mbit/s（100base-TX）
Alarm data traceability	Refer to the historical records of alarm data	
Monitoring function	Internal oscilloscope	PC can monitor operating parameters such as velocity, position, current, etc. on WINDOWS application software.

2.1.4 Braking Resistor Specifications

Servo drives	Built-in resistor resistance value and power	Minimum resistance of external braking resistor
0.1kW~0.4kW	-	50Ω
0.75kW~1.0kW	100Ω、80W	50Ω

2.2 Motors

2.2.1 Motor Models



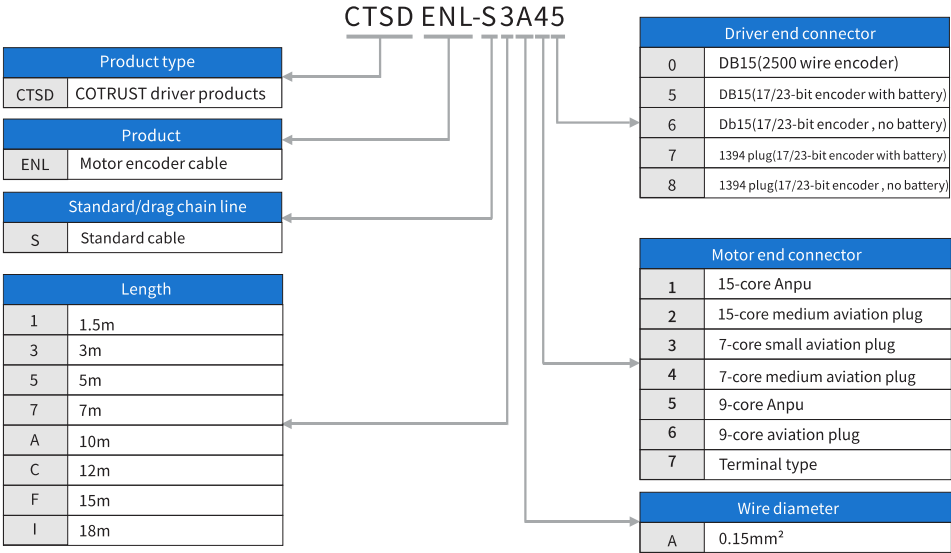
2.2.2 Motor Specifications

17 bit multi turn magnetic encoder, 23 bit multi turn optical encoder motor specifications

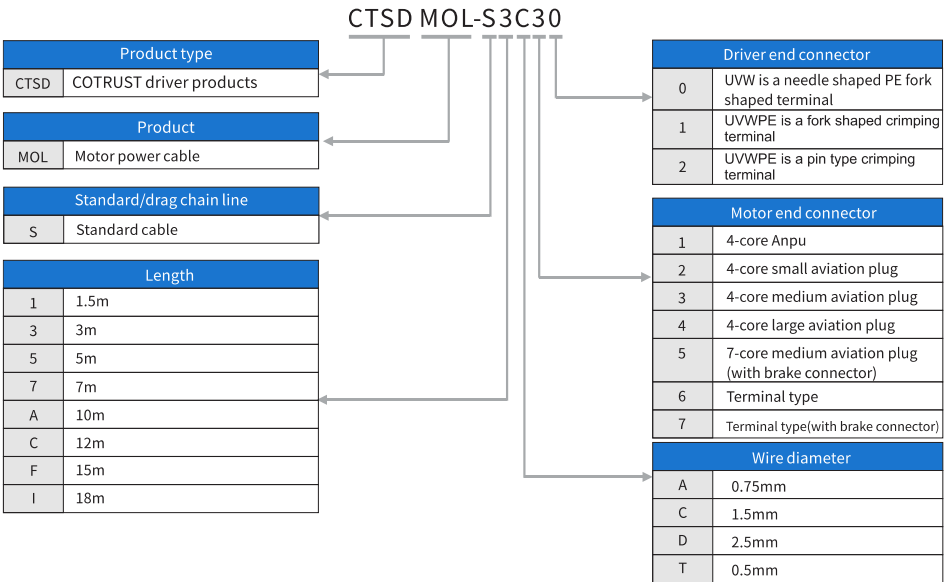
Motor modelCTSD- ***_*****_****	Rated power kW	Rated voltage VAC	Rated current A	flange	Rated torque N·m	peak torque N·m	rated velocity rpm	Back EMF Constant V/krpm	Polar logarith m	Rotor inertia kg·m ²
M34-B101B-A300	0.1	220	0.98	40	0.32	1.12	3000	20.1	5	0.031*10 ⁻⁴
M34-B101C-A300										
M34-B101B-A310	0.1	220	0.98	40	0.32	1.12	3000	20.1	5	0.034*10 ⁻⁴
M34-B101C-A310										
M36-B201B-A300	0.2	220	1.30	60	0.64	2.23	3000	32.0	5	0.34*10 ⁻⁴
M36-B201C-A300										
M36-B201B-A310	0.2	220	1.30	60	0.64	2.23	3000	32.0	5	0.35*10 ⁻⁴
M36-B201C-A310										
M36-B401B-A300	0.4	220	2.60	60	1.27	4.45	3000	33.9	5	0.59*10 ⁻⁴
M36-B401C-A300										
M36-B401B-A310	0.4	220	2.60	60	1.27	4.45	3000	33.9	5	0.6*10 ⁻⁴
M36-B401C-A310										
M38-B751B-A300	0.75	220	4.60	80	2.39	8.36	3000	34.4	5	1.72*10 ⁻⁴
M38-B751C-A300										
M38-B751B-A310	0.75	220	4.60	80	2.39	8.36	3000	34.4	5	1.77*10 ⁻⁴
M38-B751C-A310										
M38-B102B-A300	1.0	220	6.30	80	3.18	11.13	3000	33.9	5	2.23*10 ⁻⁴
M38-B102C-A300										
M38-B102B-A310	1.0	220	6.30	80	3.18	11.13	3000	33.9	5	2.28*10 ⁻⁴
M38-B102C-A310										

2.3 Cable Models

Model description of motor encoder cable:



Model description of motor power cable:



2.4 Servo System Matching

A6N series with 17bit multi-turn magnetically programmed motor

Power (output)	Servo Order No.CTSD-****	Motor Order No.CTSD-****	Mating Cable	
0.1kW	A6N-B1015-M200	M34-B101B-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M34-B101B-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.2kW	A6N-B2015-M200	M36-B201B-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M36-B201B-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.4kW	A6N-B4015-M200	M36-B401B-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M36-B401B-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.75kW	A6N-B7515-M200	M38-B751B-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M38-B751B-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
1.0kW	A6N-B1025-M200	M38-B102B-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M38-B102B-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable

A6N series with 23 bit multi turn optical encoder motor

Power	Servo Order No. CTSD_****	Motor Order No. CTSD_****	Mating Cable	
0.1kW	A6N-B1015-M200	M34-B101C-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M34-B101C-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.2kW	A6N-B2015-M200	M36-B201C-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M36-B201C-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.4kW	A6N-B4015-M200	M36-B401C-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M36-B401C-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
0.75kW	A6N-B7515-M200	M38-B751C-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M38-B751C-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable
1.0kW	A6N-B1025-M200	M38-B102C-A300	CTSD-MOL-S3T62	Motor power cable
			CTSD-ENL-S3A77	Absolute Encoder cable
		M38-B102C-A310	CTSD-MOL-S3T72	Motor power cable (holding brake)
			CTSD-ENL-S3A77	Absolute Encoder cable



3

Wiring, interfaces, and terminal



3 Wiring, interfaces, and connecting terminal

3.1 External Port Wiring

⚠ The wiring engineering personnel involved in wiring or inspection must have sufficient ability to do this work.

⚠ Wiring and inspection of wiring must be carried out 15 minutes after the power is cut off to avoid electric shock accidents.

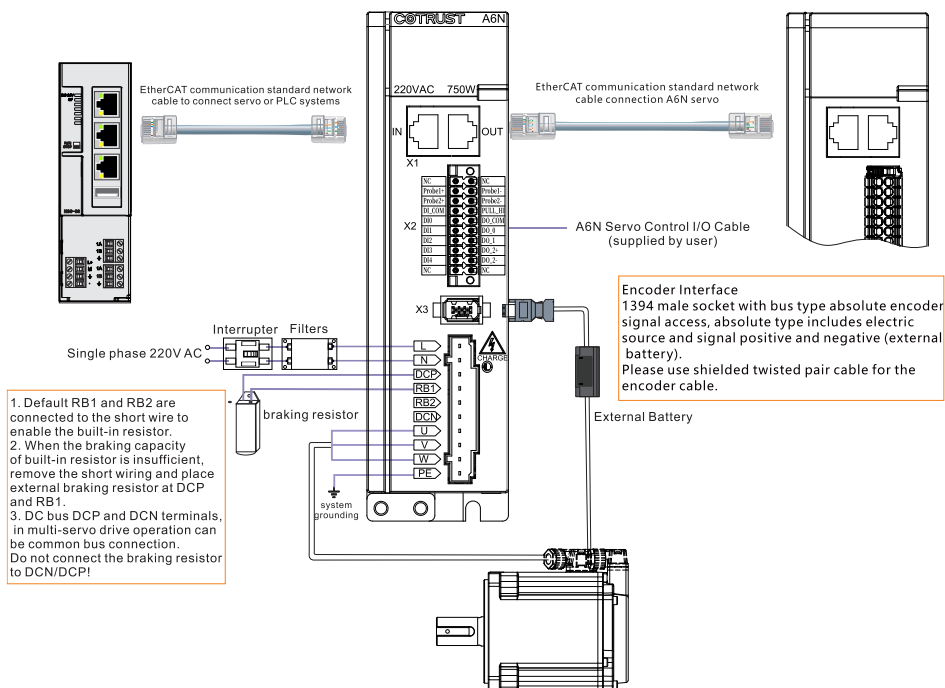
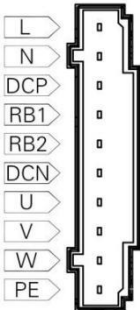


Figure 3-1 Servo Drive External Port Diagram

3.2 Power Input Interface

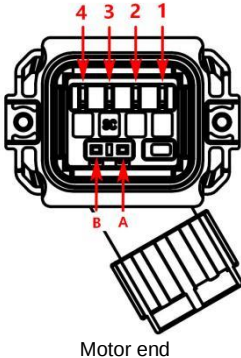
Connector No.	Signal	Name	Descriptions
	L	Single-phase power input	Input single-phase 220V AC ±10%, 50/60Hz
	N		
	DCP	DC bus+	Drive internal bus +
	RB1	Brake Resistor Terminal	External brake terminal of the drive
	RB2	Internal brake resistor terminals	Internal brake terminal of the drive
	DCN		
	U	DC bus-	--
	V	Motor U-phase	--
	W	Motor V-phase	--
	PE	Motor W-phase	--
		Motor PE terminal	--
	 注意	• It is recommended that the power supply be fed through an EMC filter to improve immunity to interference. • It is recommended that a non-fused circuit breaker be installed so that the external power supply can be cut off promptly in the event of a drive failure. • To reduce the possibility of electric shock injury, an isolation transformer can be used to supply power. • The grounding terminal PE must be connected together with the earth of the cabinet and well grounded, do not connect the grounding in series for multiple servos. • When the built-in resistor is enabled, do not connect short wires to DCP and RB1/RB2, otherwise the driver will be damaged. • Do not short directly to DCN and DCP, otherwise the drive will be damaged.	
Drive peripheral list specification: Mains power cable thickness: ≥1mm ² /AWG17, recommended 1.6mm ² /AWG15 EMC filter: single-phase power filter Rated voltage: AC 220V, 50/60Hz			

3.3 Encoder Signal Terminal X3

A6N series servo motor bus type absolute value encoder signal connection, absolute type battery external connection, encoder signal definition:

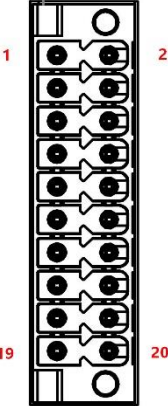
Connector No.	Connector	Servo terminal	Motor terminal	Name
X3	 Servo terminal Motor terminal	1	5	5V
		2	6	GND
		--	3	BAT+
		--	4	BAT-
		5	1	SIGN+
		6	2	SIGN-
		outer shell	7	PE grounding (shield)
The encoder lines are as follows. 				
 Attention	The encoder PE earth wire should not be shorted to the encoder signal wire, otherwise it will cause the servo drive to fail to work properly.			

Motor power line wiring definition:

Motor type	Pin	Definition of Pin	Cable
 Motor end	1	V	 Motor Servo driver
	2	U	
	3	W	
	4	PE	
	A	Brake (without positive or negative)	
	B		

3.4 Control Signal Terminal X2

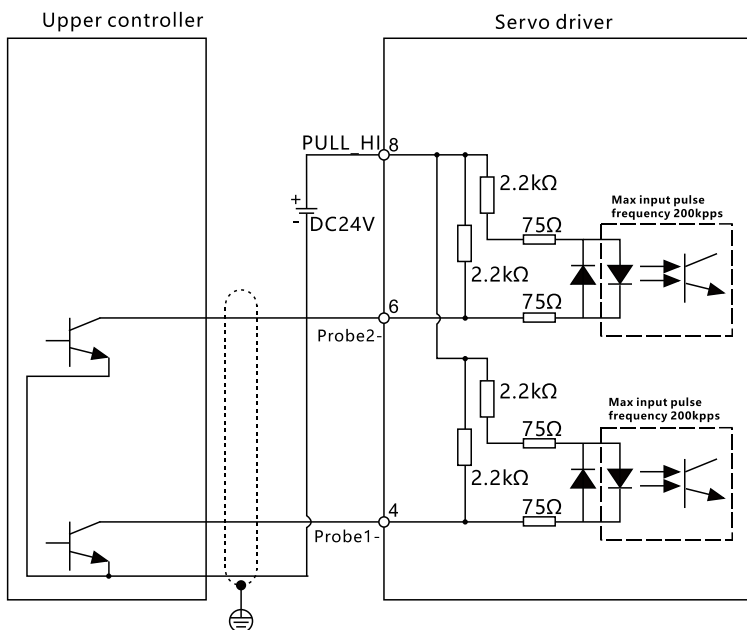
A6N series servo control signal terminal pin definition

Control terminal	Pin	Name	Description	Pin	Name	Description
	1	NC	NC	2	NC	NC
	3	Probe1+	Probe 1+(pulse)	4	Probe1-	Probe 1- (Pulse)
	5	Probe2+	Probe 2+(direction)	6	Probe2-	Probe 2- (Direction)
	7	DI_COM	DI common terminal	8	PULL_HI	24V pulse command power input
	9	DI0	Digital input 0	10	DO_COM	DO common terminal
	11	DI1	Digital input 1	12	DO_0	Digital output 0
	13	DI2	Digital input 2	14	DO_1	Digital output 1
	15	DI3	Digital input 3	16	DO_2+	Digital output 2+
	17	DI4	Digital input 4	18	DO_2-	Digital output 2-
	19	NC	NC	20	NC	NC

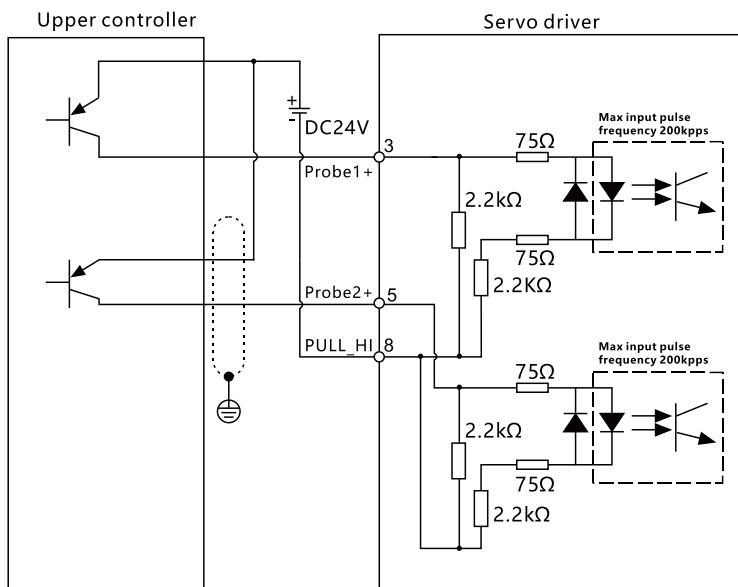
3.4.1 Probe Input

Pulse input includes collector open circuit mode and differential drive mode. The maximum input pulse frequency for collector open circuit mode is 200kHz, and the maximum input pulse frequency for differential drive mode is 500kHz.

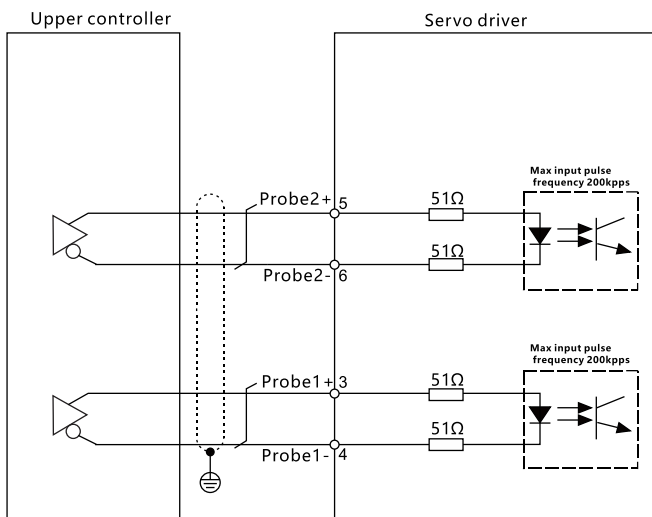
1. The upper controller is open-collector NPN type:



2. The upper controller is open-collector PNP type:



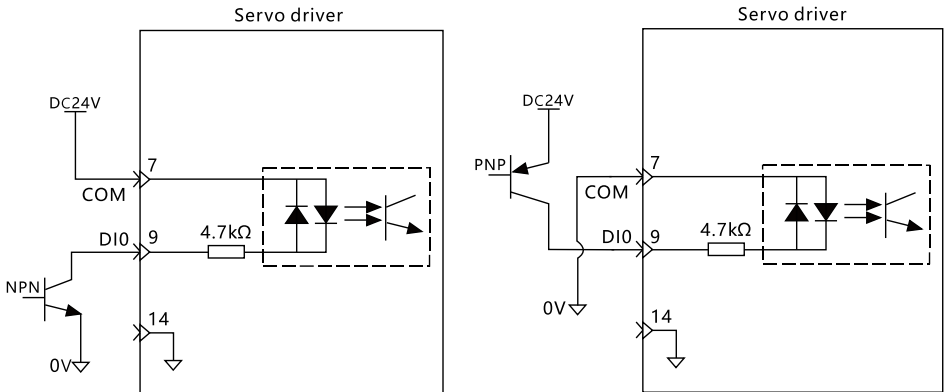
3. Differential drive mode (this system is a 5V system, please do not input 24V power supply)



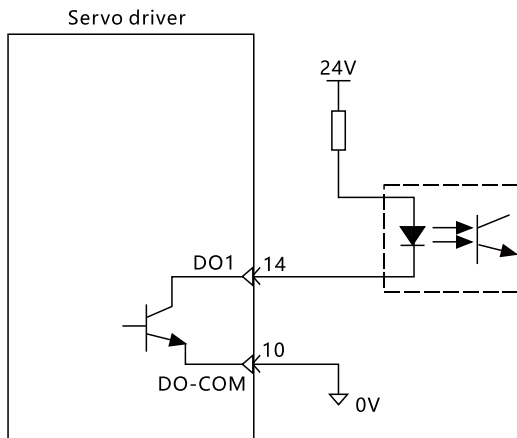
3.4.2 Digital Inputs and Outputs

To ensure the control signal input is valid, the voltage range of COM and the signal input at this point is 12V~24V (when using contact input, please use micro-current special switches and relays to avoid poor contact). The output transistor is rated at 30V, 100mA maximum. The recommended current output value is 10mA.

1. Digital Input Circuit

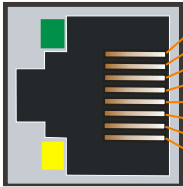


2. Digital output circuit (take DO1 as an example)



3.5 Communication Port Terminal X1

The A6N series servo RJ45 network port serves as a communication interface, featuring two Ethernet ports, with the left one for input and the right one for output. It supports EtherCAT and Modbus RTU protocols, and the pin definition is shown in the following table:

RJ45 pin		Signal	Description
	1	DP_PHY0_TX+	EtherCAT send +
	2	DP_PHY0_TX-	EtherCAT sends -
	3	DP_PHY0_RX+	EtherCAT receives +
	4	RS485+	RS485+
	5	RS485-	RS485-
	6	DP_PHY0_RX-	EtherCAT receives -
	7	GND	RS485 ground cable
	8	NC	reserve
Shielding layer		EARTH	EARTH



Note

To prevent communication faults, set the parity check or odd check when communicating with the RS485 port.

Make a network cable connector

The RJ45 connector of the network cable is made according to the 568B standard, and the green and white cables are drawn out at the other end, which can be used as the EtherCAT communication input cable (the communication distance can be up to 100m using the twisted-pair network cable). The two lines of orange and white orange are drawn out and can be used as EtherCAT communication output lines, as shown in the following figure:

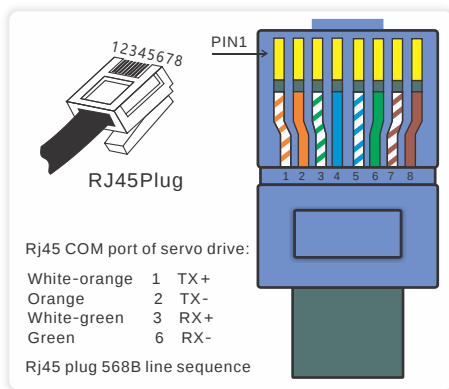
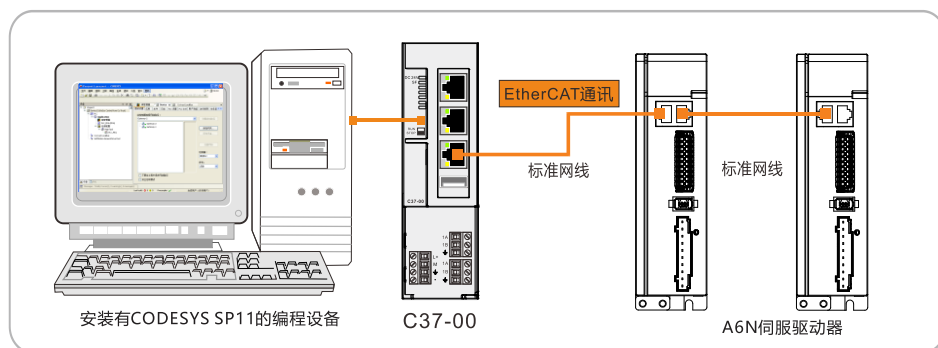


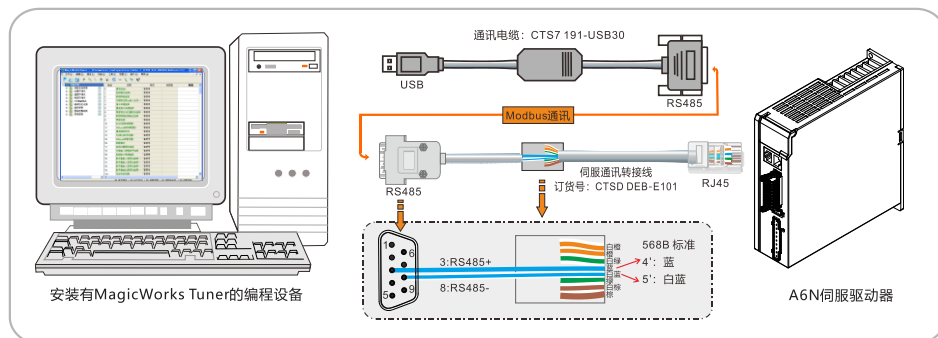
Figure 3-2 Schematic diagram of communication line fabrication

Upper computer connected to A6N servo

◆ EtherCAT communication diagram



◆ Modbus communication diagram



3.6 Brake

The default brake output of A6N servo drive is DOUT2.

The connection method of the brake motor and brake is shown in the following table:

Motor Specifications	Wire
Power: 0.1kW, 0.2kW, 0.4kW, 0.75kW Brake voltage: 24V Brake power: < 15W	伺服驱动器

Note

The holding current must not exceed 700mA.



4

Installation



4 Installation

Install the driver and motor

Please install the servo driver and servo motor correctly to avoid malfunctions or accidents.

4.1 Installing The Driver

1、Precautions for driver installation

- ◆ The storage and installation of products must meet the requirements of environmental conditions.
- ◆ The servo drive must be installed in the specified direction and interval, and maintain good heat dissipation conditions.
- ◆ Fire resistant materials must be used for installation and should not be installed on or near flammable materials to prevent fires.
- ◆ The electrical cabinet for installing the servo drive should be able to prevent the intrusion of dust, corrosive gases, conductive objects (such as copper shavings), liquids, and flammable materials.
- ◆ The servo drive and servo motor should avoid vibration and impact.

Driver environmental conditions

Item	Conditions
Working temperature	0°C ~ 45°C
Storage temperature	-20°C ~ 70°C
Ambient humidity	Work/storage ≤ 90% RH without condensation
Altitude	Altitude ≤ 1000m
Anti vibration	10~57Hz 3.5mm, 57~150Hz 1g
Atmospheric environment	No corrosive gases, flammable gases, oil stains or dust, etc

2. Installation size

The A6N servo drive adopts a bottom plate installation method, with the installation direction perpendicular to the installation face upwards.

The dimensions and installation dimensions of A6N servo drive products (unit: mm) are

shown in the figure:

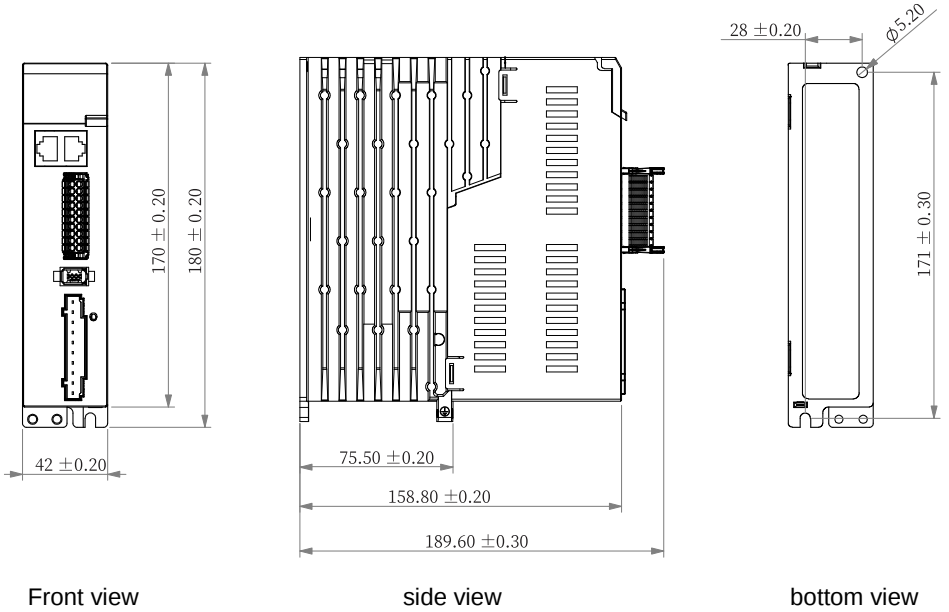


Figure 4-1 Size of 0.1kW~0.4kW servo drive

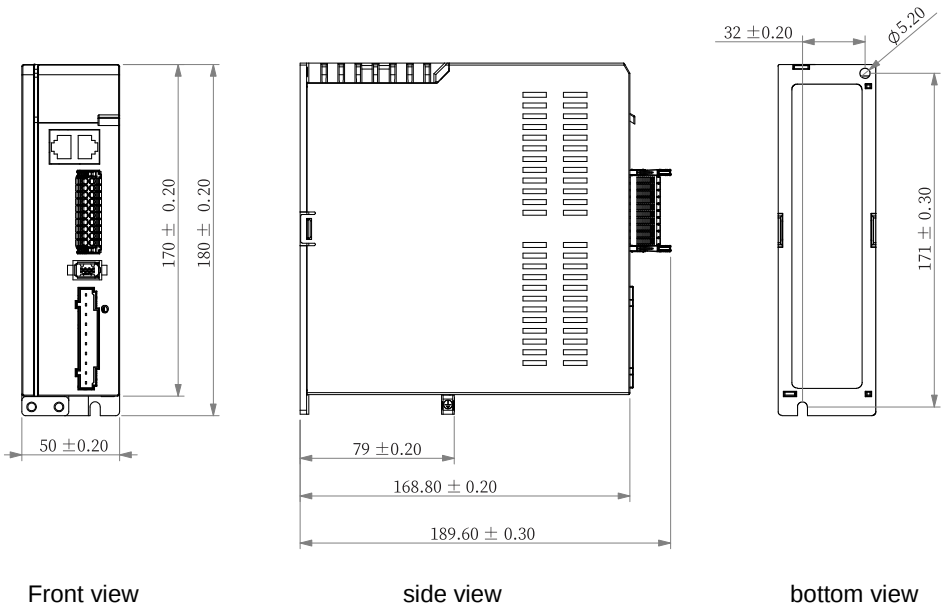


Figure 4-1 Size of 0.75kW~1kW servo drive

4.2 Driver installation direction and spacing

- ◆ Please leave as much space as possible during actual installation to ensure good heat dissipation conditions.
- ◆ To prevent the temperature around the drive from continuously rising, it is best to have a heat sink in the electrical cabinet that blows convective air towards the drive.

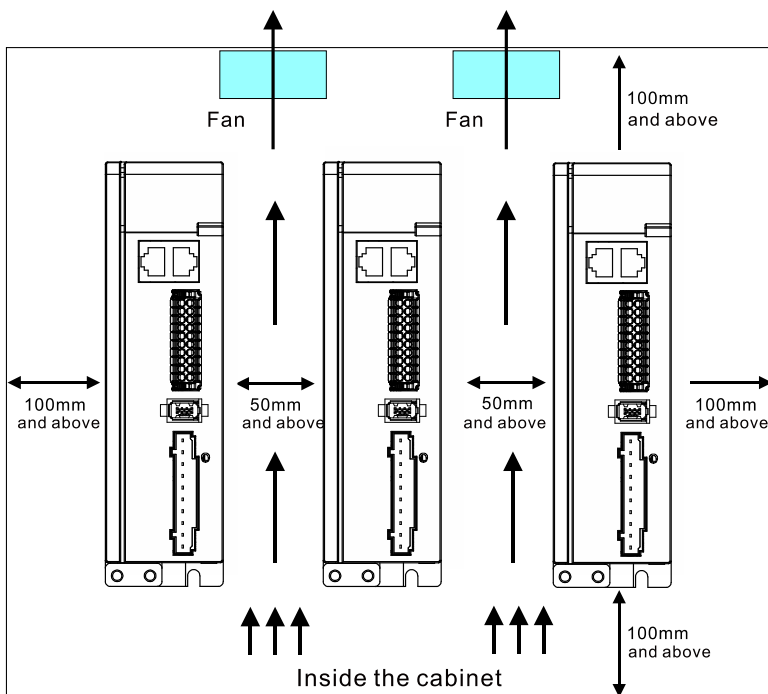


Figure 4-3 Installation Interval of Single or Multiple Servo Drivers

4.3 Installing The Motor

1. Installation precautions

- ◆ Please install it indoors without rain or direct sunlight.
- ◆ Do not operate servo motors in environments with dust, corrosive gases, conductive objects, liquids, and flammable materials.
- ◆ The driver works in a well ventilated area without moisture, oil, or water infiltration.
- ◆ The working temperature should be maintained between 0 ~ 45℃. If the motor runs for

a long time and heats up, forced heat dissipation should be considered when the surrounding space is small or there are heating devices nearby.

- ◆ The humidity should be $\leq 90\%$ RH and there should be no condensation.
- ◆ The servo motor should avoid vibration and must not withstand impact.
- ◆ The encoder is a high-precision device, and attention should be paid to protection during handling or installation to prevent knocking or collision.
- ◆ Do not use a hammer to directly strike the shaft end when installing or removing the coupling at the motor shaft end.
- ◆ W must be fully coaxial, otherwise it may cause vibration and noise, and may damage the bearings.
- ◆ Do not drag the motor shaft, lead wires, or encoder when handling the motor.
- ◆ When installing the W motor, please lower the cable outlet to prevent oil and water from seeping into the interior of the motor.
- ◆ The servo motor cannot operate under overload for a long time, otherwise it may damage the motor.
- ◆ The motor installation must be firm and equipped with anti loosening measures.

2. Installation method

The A6N servo motor can be mounted vertically or horizontally, and the mechanical dimensions of the motor are shown below:

Power (output)	0.1kW	0.1kW(with brake)
Models	CTSD-M34-B101B-A300 CTSD-M34-B101C-A300	CTSD-M34-B101B-A310 CTSD-M34-B101C-A310
L (mm)	74.4	100.1

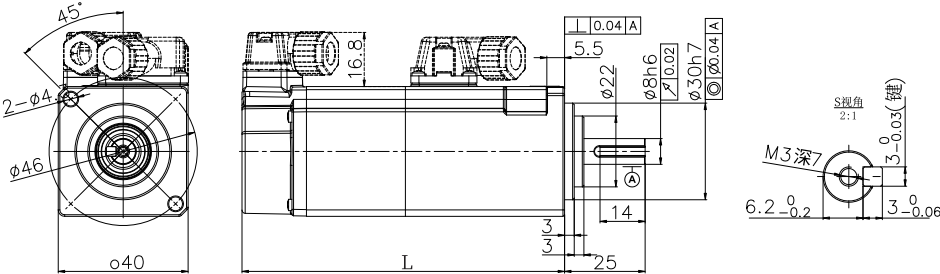


Figure 4-4 0.1kW Motor Dimensions (mm)

[illegible]

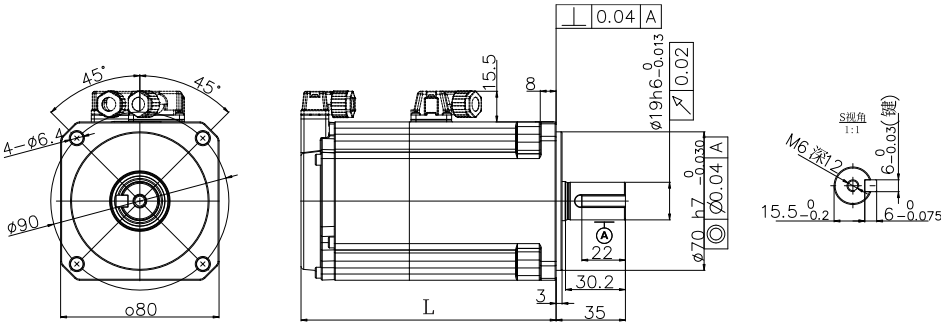


Figure 4-5 0.75kW, 1kW Motor Dimensions (mm)



5

Control Signal Details



5 Control Signal Details

Input/output signals, communication/external commands and their functions

5.1 Definition of control signals

The following section details the configuration related to digital input/output signals and the command sources for each control mode.

5.1.1 DI function allocation

1) Digital Input Default Function

Sign	Pin	Position, velocity, torque mode (default assignment)	Parameter	Function
DI0	9	Positive travel limit	P8.006	0 - No definition. 1~2-Reserve 3-Quick stop (valid when control command source P2.004_bit1=1). 4-Run enable (valid when control command source P2.004_bit0=1). 5~7-Specially defined commands for different operation modes: Velocity mode: 5~7- Reserve Position mode: 5-command effective, valid on rising edge.
DI1	11	Reverse Travel Limit	P8.009	6- Command effective mode, 0- immediate effect, 1- Function terminal No. 5 rising edge trigger effect. 7-Absolute/relative command, 0-absolute, 1-relative.
DI2	13	Home switch	P8.012	Torque mode: 5~7 - Reserved. 8-Fault reset. 9-Halt. 10- Reserve 11-Clear encoder alarm. 12-Relative position command undo. 13-Clear encoder multi-turn value bit0.

DI3	15	fault reset	P8.015	14-Clear position deviation (valid in pulse input mode). 15-Forward jog. 16-Reverse jog. 17-Control mode bit0. 18-Control mode bit1. 19-Electronic gear selection.
DI4	17	Servo Enable	P8.018	20-Loop gain selection. 21-Multi-segment command selection bit0. 22-Multi-segment command selection bit1. 23-Multi-segment command selection bit2. 24-Multi-segment command selection bit3. 25-Torque limit selection. 26-Multi-segment operation start. 27-Forward limit. 28-Reverse limit. 29-Home origin 30-Disable pulse command input in case of external pulse command input. 31 - Fault record reset (fault reset is active at the same time). 32-Clear encoder multi-turn value bit1. 33-Switching of motor rotation direction. 34- Start homing. 35~80- Reserve

2) The allocation mode of DI0~DI4 is determined by P8.006, P8.009, P8.012, P8.015, and P8.018.

※ Examples:

In external position control mode, set the functions of signal terminals DI0 to DI3 to reverse limit, forward limit, home, and start homing. Find the function codes corresponding to DI0 to DI3 from the above table, and set P8.006=28, P8.009=27, P8.012=29, and P8.015=34 respectively.

5.1.2 Configuring the DI Signal taking Effect

- 1) 1) Default enable mode for external control mode: If the external digital input is valid on pin 17 of DI4, it will enter the servo enable state
- 2) 2) Communication control mode enable mode: P2.009=1 (power on automatic enable) or P2.030=12 enters servo enable state. In order to ensure that the servo can be forcibly

turned off when there is an abnormality in the servo, the setting method for turning off the servo enable when there is an abnormality in the servo is as follows:

parameter	Parameter values	Communication control mode			external control mode		
P2.009	0	Enable Input (pin17)	communications enable (P2.030)	enable	Enable Input (pin17)	communications enable (P2.030)	enable
		0	0	NO	0	0	NO
		0	12	YES	0	12	NO
		1	0	NO	1	0	YES
		1	12	YES	1	12	YES
	1	Servo power-up enable, the user can still write 0 to P2.030 to select shutdown enable by communication. That is, P2.030 is 0 to enable off and 4 to enable on.					

※Example: Communication position control

Configure P2.002=1 (position mode), P2.004=0 and P2.030=12, the servo enters the enable state, P2.004=1 and P2.030=12, the servo does not enter the enable state.

3) DI Effective Configuration

Parameter	Signal function	Parameter Definition	Default
P8.007	Valid logic level selection for DI0 input terminal	0-High level active. 1-Low level active.	0
P8.010	Valid logic level selection for DI1 input terminal		
P8.013	Valid logic level selection for DI2 input terminal		
P8.016	Valid logic level selection for DI3 input terminal		
P8.019	Valid logic level selection for DI4 input terminal		

5.1.3 DO function assignment

The control output pins are marked as factory default functions, and users can configure DO0~DO2 functions through the upper computer software or servo panel. Unlike the allocation of digital input pin functions, DO0~DO2 has three parameters to set the output function of the digital output:

sign	pin	Default Function No.	parameter	Function
------	-----	----------------------	-----------	----------

DO0	12/10	2	P8.036	0 - No definition. 1 - Reserved. 2-Main circuit status: 0-not strong electricity, 1-strong electricity. 3-Operation enable status: 0- not enabled, 1-enabled. 4-Fault status: 0-normal, 1-fault. 5-Bus relay status: 0 - open, 1 - close. 6-Quick stop status.
DO1	14/10	4	P8.038	7-Reserved. 8-Warning status. 9- Reserved. 10-Remote control status. 11-Target arrival: Position mode - position arrival. Velocity mode - velocity arrival. Torque mode - torque arrival.
DO2	16/18	16	P8.040	12-Internal limit. 13--Reserved. 14-Reserved. 15-homing complete. 16-Brake output. 17 to 22-Reserved. 23-Torque arrival. 24-Reserved. 25-Warning/Fault status. 26~80-Reserved. 81~96-DO forced output control word P8.35_bit0~bit15.

5.1.4 Virtual IO and External IO

The MagicWorks Tuner allows to configure the pinout and analogue IO functions of the target device as follows:

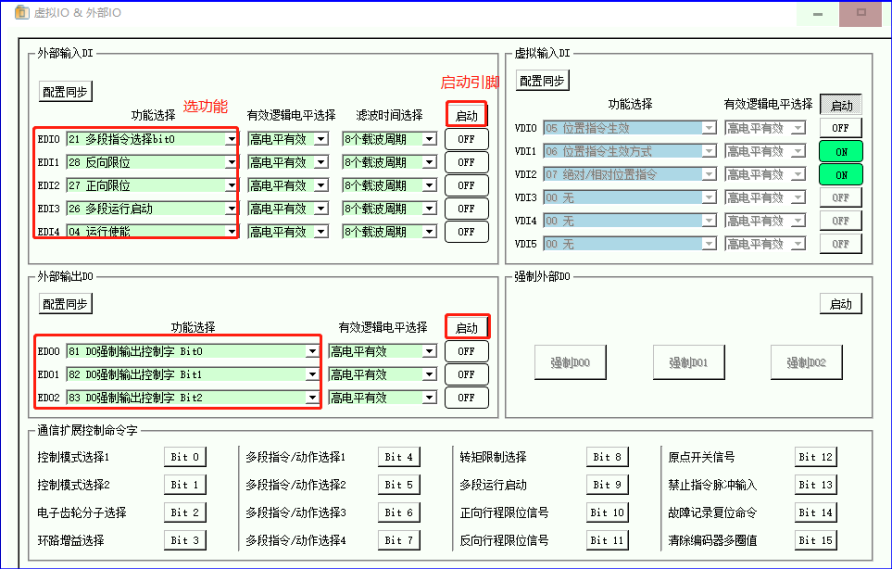
Select menu item [Function] → [Virtual IO & External IO].



Select the pin function assignment method and control command source.

External IO

1. The pin functions for DI0~DI4 signal input and DO0~DO2 signal output are optional. Please refer to 5.1.1 [DI function allocation](#) configuration for DI0~DI4 pin functions, and 5.1.3 [DO function assignment](#) configuration for DO0~DO2 pin functions.
2. After completing the pin function settings, select the desired logic level, click the [Start] button, and press the [Start] button. Changes in the external IO signal will directly cause changes in the corresponding ON/OFF box.



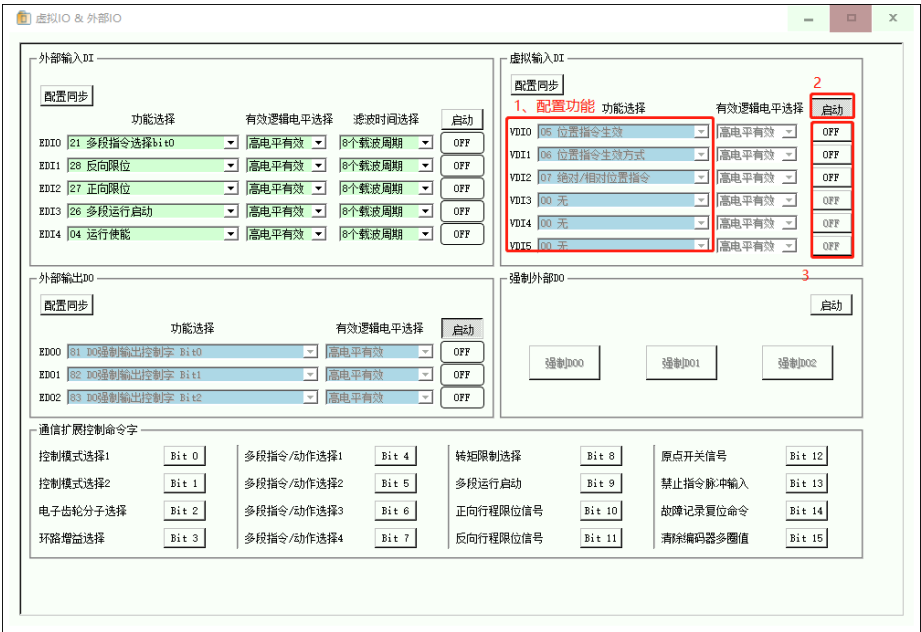
3. Force external DO, which can force DO output.



4. Stop starting [Force output DO], and the corresponding signals from DO0 to DO2 will be output based on the current output status of the servo.

Virtual IO

Configure simulated DI, select the corresponding function and start it. After starting, perform ON or OFF operations on the corresponding VDI to make it effective or ineffective.



5. Stop the virtual input DI, and the corresponding signals DI0~DI4 are input through external pins.

5.2 Control signal function

The A6N series servo has two methods: external control and communication control. Different control methods use different control signals. The specific control signal functions are shown in the table below:

Signal	Symb ol	Status bit	Function
Emergency STOP	E- STOP	P2.030_bit2	Quick shutdown: 0 valid 1 is invalid
Servo Enable	SRV- ON	P2.030_bit3 P2.009	1) This signal input servo enable status. 2) In external control mode, external IO is used as the servo enable control pin. 3) In communication control mode, P2.030_bit3 acts as the servo enable control bit. 4) P2.009=1, even if the servo power can be effective. 5) Do not start or stop the motor through the servo enable signal. 6) When the servo enters the enable state, the PD.044

Signal	Symb ol	Status bit	Function		
			user position coordinates are written into the PD.040 user position command to prevent the motor from rotating when the enable is working.		
Homing startup	Homin g	P2.030_bit4	Home start command P2.030_bit4 0: invalid. 1: Valid.		
Fault reset	R-SET	P2.030_bit7 P2.031_bit14	1) When P2.030_bit7 is 1, the fault is reset 2) When P2.030_bit7 is 1 and P2.031_bit14 is 1, the fault history is reset		
Halt	Suspend	P2.030_bit8	Halt 0: invalid. 1: Valid.		
The relative position instruction is revoked	--	P2.030_bit11	P2.030_bit11 Relative position instruction revoked 0: invalid. 1: Valid.		
Clear encoder multiturn value	--	P2.030_bit12 P2.031_bit15	P2.030_bit12: Clear encoder multi-turn values bit0. P2.031_bit15: Clear encoder multi-turn values bit1. When P2.030-bit12=1 and P2.031-bit15 is the rising edge, trigger this command to clear encoder multi-turn values.		
Clear relative position deviation	CL	P2.030_bit13	1) The content of the deviation counter is cleared to zero. 2) When this signal is valid, it can be used to clear the contents of the position deviation counter to zero. A bit13 of 0 is invalid and a bit13 of 1 is valid.		
Positive jog	JOG+	P2.030_bit14	P4.012: Jog speed command (set the desired speed) P4.013: Jog acceleration/deceleration time (set the desired acceleration/deceleration time) P2.030_bit14=1 (positive jog trigger)		
Reverse jog	JOG-	P2.030_bit15	P4.012: Jog speed command (set the desired speed) P4.013: Jog acceleration/deceleration time (set the desired acceleration/deceleration time) P2.030_bit15=1 (negative jog trigger)		
Control mode bit0	C-MODE	P2.031_bit0	P2.002	P2.031_Bit0~1	Mode
			3	0	Torque mode
				1	Velocity Mode
			4	0	Velocity Mode
				1	Position Mode

Signal	Symb ol	Status bit	Function																																						
Control mode bit1		P2.031_bit1	5	0	Torque mode																																				
				1	Position Mode																																				
			6	0	Position Mode																																				
				1	Velocity Mode																																				
				2	Torque mode																																				
Selection of electronic gears	--	P2.031_bit2	Selects numerator 0 or numerator 1 for the electronic gear ratio numerator setting in position control mode. If this signal is active, the numerator of the electronic gear ratio changes from P3.074 (electronic gear ratio numerator 0) to value P3.076 (electronic gear ratio numerator 1).																																						
Loop gain selection	GAIN	P2.031_bit3	The function of this signal can be set with P2.031_bit3 (gain switching mode). For the specific function, refer to Section 10.5 Gain Switch																																						
Multi-segment instruction selection bit0	--	P2.031_bit4~ bit7	P2.031-bit4~bit7 multi-stage instruction/action selection, binary selection																																						
Multi-segment instruction selection bit1			<table><tr><th>Item</th><th>Bit7</th><th>Bit6</th><th>Bit5</th><th>Bit4</th></tr><tr><td>Position 1/Speed 1/Torque 1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Position 2/Speed 2/Torque 2</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>Position 3/Speed 3/Torque 3</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td></tr><tr><td>Position 15/Speed 15/Torque 16</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>Position 16/Speed 15/Torque 16</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>				Item	Bit7	Bit6	Bit5	Bit4	Position 1/Speed 1/Torque 1	0	0	0	0	Position 2/Speed 2/Torque 2	0	0	0	1	Position 3/Speed 3/Torque 3	0	0	1	0	...	...	...	...	...	Position 15/Speed 15/Torque 16	1	1	1	0	Position 16/Speed 15/Torque 16	1	1	1	1
Item			Bit7	Bit6	Bit5	Bit4																																			
Position 1/Speed 1/Torque 1			0	0	0	0																																			
Position 2/Speed 2/Torque 2			0	0	0	1																																			
Position 3/Speed 3/Torque 3	0	0	1	0																																					
...	...	...	...	...																																					
Position 15/Speed 15/Torque 16	1	1	1	0																																					
Position 16/Speed 15/Torque 16	1	1	1	1																																					
Multi-segment instruction selection bit2																																									
Multi-segment instruction selection bit3																																									
Torque limiting source	--	P5.020	0 - Determined by P2.063 torque limiting selection parameter, P2.063 = 0 for both forward and reverse direction is torque limiting 0, P2.63 = 1 for both positive and negative direction is torque limiting 1. 1- Positive torque limit 0, negative torque limit 1.																																						
Torque limit option	TL- SEL	P2.031_bit8	1) Input torque limit switching signal (TL-SEL). 2) When P2.031_bit8 is 0, P5.021 (torque limit 0) is valid. When bit8 is 1, P5.022 (torque limit 1) is valid.																																						
Multistage running starts	Pos_Start	P2.031_bit9	Multistage running starts 0: invalid. 1: Valid.																																						
Negative limit	CWL	P2.031_bit10	1) Both external control and communication control travel limit are controlled by external IO or digital positive limit. 2) This terminal input the travel limit signal in the CW																																						

Signal	Symb ol	Status bit	Function
			direction. 3) When parameter P3.083 (position limit source) is 0, the travel limit function is invalid. 4) When parameter P3.083 is set to 2, parameter P2.031-bit12=1 (sequence setting for travel limit) is used to select the action when the positive limit input is valid.
Reverse limit	CCWL	P2.031_bit11	1) Both external control and communication control travel limit are controlled by external IO or digital reverse limit. 2) This signal inputs the travel limit signal in the CCW (counterclockwise) direction. 3) When parameter P2.031_bit11 is 0, the travel limit function is invalid. 4) When parameter P3.083 is 2, parameter P2.031_bit11=1 (sequence setting for travel limit) is used to select the action when the CCWL input is valid.
Origin	ORG_S W	P2.031_bit12	Home switch signal, 0: invalid, 1: valid
Prohibit pulse command input	INH	P2.031_bit13	P02.031_bit13: Disable command pulse input when external pulse command is input 0: Invalid. 1: Valid.
Internal command switching 1-4	INTSP D 1~4	P2.031_bit4~ bit7	1) The 1st to 16th internal speed is selected by P2.031_bit4~bit7. 2) Command selection for communication control mode (at P3.000, P4.000, P5.000), select the given command source by P2.030_bit4~bit7
Fault record reset	RET	P2.030_bit7 P2.031_bit14	P2.030_bit7: fault reset command P2.031_bit14: Reset the fault record command When P2.030_bit17=1 and P2.031_bit15=1, the fault record is reset.
Servo ready	S-RDY	P2.040_bit1	When P2.040_bit1 is 1, the strong current part is ready and enters the standby state.
Servo alarm output	ALM	P2.040_bit3	P2.040_bit3 0: No fault. 1: Faulty.
Target arrival	POS- OK	P2.040_bit10	Target achieved 0: Not arrived 1: arrived Position mode - position arrival Speed mode - speed arrival Torque mode - torque arrival
Servo brake	BK	P2.040_bit15	1) Before holding the brake, please set the sequence of

Signal	Symb ol	Status bit	Function
output		P8.036 P8.038 P8.040 =16	mechanical brake action P2.019 and P2.020 of the motor first. 2) This output is switched on when the holding brake is released. Note: Connect the control end of the brake through the relay (control end: DC 24V, load capacity greater than or equal to 1A) and connect the control end of the relay in parallel with a Schottky diode (recommended diode type 1N4148, package: DO-35 glass package, plug-in).
Motor rotates in the positive direction	--	P2.007	Motor rotates in the positive direction 0: CCW is the positive direction 1: CW is the positive direction
Torque limit output	TLC	P5.021 P5.022	Output when the actual torque output reaches the torque limit value.

5.3 Bus Absolute Encoder System

1) Overview

Bus type absolute encoder means that the system detects the position of the motor within 1 revolution and at the same time records the number of revolutions of the motor. Currently the encoder has a single-turn resolution of 17 bit/23 bit and can memorise 16 bit multi-turn values. Bus-type absolute servo drive power failure, the encoder through the battery backup data, power on the drive through the encoder absolute value of the calculation of position, without repeating the mechanical back to the original.

Absolute value series servo drive matching absolute value encoder, according to the actual application can be set P3.035 (encoder operating mode), choose to use the absolute value encoder way. Use absolute value mode, connect the cable can be, PD.034 will read out the current encoder position value.

2) Servo related parameter settings

Absolute value system parameter settings:

Address	Name	Description
P1.041	Multiple turns of motor 0 encoder	--

P1.089	Multi turn number of motor 1 encoder	--
P3.035	Encoder working mode	Absolute value encoder is effective: 0-incremental position mode 1- Multi turn absolute position mode 2-Single turn absolute position mode.
P3.036	Initial position of encoder	Absolute encoder is valid, the difference between the absolute position of the motor encoder and this parameter is the mechanical position after power up. This parameter is automatically updated to the absolute position of the encoder when the encoder operating mode is set to incremental position mode, or when power is applied in incremental position mode. When the encoder working mode is absolute position mode, this parameter is automatically updated to 0. This parameter is automatically updated to the encoder singleturn value after the homing is completed. This parameter is automatically updated to 0 when the encoder multi-turn value is cleared successfully. Unit: Encoder Unit
P3.070	Mechanical position offset	Offset expressed in encoder position at machine '0' position (home position). Unit: Command unit
PD.034	Encoder unit position feedback	Range: -9223372036 854770000~9223372036854770000, Unit: Encoder Unit.
P3.040	Encoder single turn position	Record the value of the bus type absolute value encoder within a single turn, range: -2147483648~2147483647.
P3.042	Encoder turns	Encoder turns (effective for multi turn absolute value encoders) Scope: -2147483648~2147483647
P3.034	编码器错误类型	Absolute value encoder is effective: Bit0~Bit7- Encoder fault number: Bit0- Over speed Bit1- reserved Bit2- Calculation error Bit3- counter overflow

		Bit4- Overheating Bit5- Multiple turn value error Bit6- Battery malfunction Bit7- Battery low voltage warning Bit8~bit15 encoder state domain SF: Bit8~11- reserved Bit12- Same as Bit2 Bit13- corresponds to the logical OR operation result of bit4~7 Bit14~15- reserved
P2.030	Communication control command word	Effective bits of absolute value encoder Bit12: Clears the encoder's multi turn value bit0 (P2.030-bit12=1, and P2.031-bit15 is triggered when the rising edge)

The following are the reasons why the servo has a battery error:

- Initial power up.
- Bad encoder cable.
- Bad motor encoder interface.
- The encoder cable is not tightened to the servo interface.
- The battery connector at the encoder cable is loose or the battery cable in the battery compartment is broken due to environmental reasons.
- The battery in the battery compartment is 3.6V, when its voltage drops to 3.0V battery error.

In the case of a battery error, the user can troubleshoot the problem by troubleshooting the hardware problem or checking the servo's internal P3.034 encoder alarm type.

Encoder battery error will cause an alarm, in this case, need to power off to replace the battery on the encoder cable, and then power on again. Clear the multiturn value and clear the error when P2.030_bit12=1 and P2.031_bit15 rising edge according to the demand, clear the alarm power off and then power on (only need to perform this operation to the control power supply). After resetting the multiturn value and clearing the error, the device has to perform a mechanical home reset operation.

3) Precautions for battery box

When the battery error is turned on for the first time, set P2.030_bit12=1 and clear the multiturn value and clear the error on the rising edge of P2.031_bit15, and then execute the absolute position system.

When the detected battery voltage is less than 3.0V, the encoder battery alarm will occur, please replace the battery, the replacement method is as follows:

Step 1: The drive is powered up and in non-operational state .

Step 2: Replace the battery.

Step 3: The drive automatically lift the alarm, no other abnormal warnings can be normal operation.

Note:

In case of servo power down, replacing the battery and powering up again will result in encoder battery error and sudden change of multi-turn data, set P2.030 bit12=1 and P2.031 bit15 rising edge to clear the multi-turn value and clear the error, and then reopen the operation of the home return function. Before operation, please use the panel auxiliary function of , specifically refer to 7.3.3 [Auxiliary Function Mode](#) to view the clearing of the encoder multi-turn value.

- ◆ Under the power-down state of the drive, the maximum speed of the motor must not exceed 6000 rpm to ensure that the encoder position information is accurately remembered.
- ◆ During the storage period, please store it according to the specified ambient temperature and make sure the battery contact is reliable and the power is sufficient, otherwise it may lead to the loss of encoder position information.

5.4 Electronic gear ratio setting

In position control mode, adjusting the electronic gear ratio can change the motor velocity and displacement corresponding to the unit command pulse. (Example: 2500 line incremental photoelectric encoder with a resolution of 10000, 17 bit bus absolute encoder with a resolution of 131072)

每转所需脉冲数计算公式如下：

每转所需脉冲数*（P3.074 或 P3.076/P3.078）=编码器分辨率

When the parameter value of P3.074 (electronic gear ratio molecule 0) or P3.076 (electronic gear ratio molecule 1) is 0, the parameter value of P3.078 (electronic gear ratio unit) is the number of pulses required per revolution.

Example: Set 2500 pulses for one turn:

1) $2500 = 10000 * (P3.078 / P3.074 \text{ or } P3.076)$

That is $(P3.074 \text{ or } P3.076) : P3.078 = 4:1$, you can set P3.074 or P3.076 to 400 and P3.078 to 100.

2) Setting P3.074 or P3.076 to 0 and P3.078 to 2500 is equivalent to the encoder resolution of 10000, resulting in an electronic gear ratio of 10000:2500.



6

Parameter



6 Parameters

6.1 Parameter List

Servo parameter group	Description
P0 driver parameter group 2000H	System parameters and related detailed addresses
P1 motor parameter group 2001H	Parameters and detailed addresses related to motor configuration
P2 Basic Control Parameter Group 2002H	Basic control configuration related parameters and detailed addresses
P3 Position Control Parameter Group 2003H	Parameters and detailed addresses related to position control mode
P4 Velocity Control Parameter Group 2004H	Parameters and detailed addresses related to velocity control mode
P5 Torque Control Parameter Group 2005H	Parameters and detailed addresses related to torque control mode
P7 Enhanced Function Parameter Group 2007H	Enhanced functionality related parameters and detailed addresses
P8 External Terminal Parameter Group 2008H	External DI/DO, AI/AO related parameters and detailed addresses
P9 Virtual Terminal Parameter Group 2009H	Virtual terminal parameters and related detailed addresses
PA multi-stage instruction parameter group 200AH	Parameters and detailed addresses related to multi-stage control functions
PB Communication Interaction Parameter Group 200BH	Communication interaction related parameters and detailed addresses
PC Fault Management Parameter Group 200CH	Details of fault alarm, troubleshooting methods, and basic handling methods
PD status monitoring parameter group 200DH	Real time monitoring parameters

6.2 Parameter details

 Before adjusting parameters, it is important to understand the meaning of the parameters, as incorrect settings may cause equipment failure.

 If the servo fails, you can try to restore the factory default parameters.

 It is recommended to adjust the parameters when the servo motor is unloaded.

6.2.1 P0 Driver parameter group 2000H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
0.000 (01H)	Drive Solutions	4702120 0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	
0.002 (03H)	MCU Software Master Version Number	1206	0 ~ 65535	R	Immediate change, immediate effect	word	MCU software major version number (in 2 decimal format)
0.003 (04H)	MCU Software Subversion Number	1409	0 ~ 65535	R	Immediate change, immediate effect	word	MCU software sub version number (in 2 decimal format)
0.004 (05H)	MCU Software Date	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	MCU software date: Display in decimal format, year YY-month MM-day DD
0.014 (0FH)	Manufacturer's Recipe	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	0-Default 1~65535- Formula 1~65535
0.015 (10H)	Manufacturer Password	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
0.016 (11H)	User Password	0	0 ~ 65535	R/W	Immediate change,	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					immediate effect		
0.017 (12H)	System Privileges	0	0 ~ 2	R	Immediate change, immediate effect	word	
0.018 (13H)	Axis number	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.019 (14H)	Control board type	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.022 (17H)	Rated Input Voltage	2200	0 ~ 65535	R	Immediate change, immediate effect	word	Rated input voltage of the driver Unit: 0.1V
0.023 (18H)	Rated Bus Voltage	3111	0 ~ 65535	R	Immediate change, immediate effect	word	Rated DC bus voltage of the driver Unit: 0.1V
0.024 (19H)	Allowable derating factor	80	70 ~ 100	R	Immediate change, immediate effect	word	Unit:% (percentage)
0.025 (1AH)	Rated power	75	0 ~ 65535	R	Immediate change, immediate effect	word	Rated power of the driver Unit: 0.01kW
0.026 (1BH)	Maximum instantane ous power	300	0 ~ 65535	R	Immediate change, immediate effect	word	The driver allows for instantaneous output of maximum power Unit: 0.01kW
0.027 (1CH)	Rated current	566	0 ~ 65535	R	Immediate change, immediate effect	word	Rated current of the driver Unit: 0.01A
0.028 (1DH)	Maximum instantane	2264	0 ~ 65535	R	Immediate change,	word	The driver allows for instantaneous output of

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	ous current				immediate effect		maximum current Unit: 0.01A
0.029 (1EH)	Carrier Frequency	80	0 ~ 65535	R	Immediate change, immediate effect	word	PWM carrier frequency Unit: 0.1kHz
0.030 (1FH)	Dead time	20	0 ~ 65535	R	Immediate change, immediate effect	word	PWM dead time Unit: 0.1us (microseconds)
0.031 (20H)	Built in discharge resistor resistance value	50	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: Ω (ohms)
0.032 (21H)	Built in discharge resistor power	50	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: W (Watt)
0.033 (22H)	Type of cooling fan	3	0 ~ 5	R	Immediate change, immediate effect	word	
0.034 (23H)	DC bus overvoltage fault value	4100	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
0.035 (24H)	DC bus undervoltage fault value	2000	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
0.036 (25H)	DC bus undervoltage warning value	2300	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
0.037 (26H)	DC bus relay suction voltage value	2300	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
0.038 (27H)	DC bus feedback discharge voltage value	3850	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
0.039 (28H)	Digital quantity of DC bus overvoltage fault value	21048	0 ~ 65535	R	Immediate change, immediate effect	word	
0.040 (29H)	Digital quantity of DC bus undervoltage fault value	10267	0 ~ 65535	R	Immediate change, immediate effect	word	
0.041 (2AH)	Digital quantity of DC bus feedback discharge opening value	19764	0 ~ 65535	R	Immediate change, immediate effect	word	
0.042 (2BH)	Digital quantity of DC bus feedback discharge shutdown value	18738	0 ~ 65535	R	Immediate change, immediate effect	word	
0.045 (2EH)	Hardware overcurrent protection value	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
0.046 (2FH)	Software overcurrent protection value	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.047	Drive	850	0 ~ 65535	R	Immediate	word	Unit: 0.1°C (degrees Celsius)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(30H)	overheat protection temperatur e				change, immediate effect		
0.048 (31H)	Continuous overload time	12	0 ~ 100	R/W	Immediate change, restart take effect.	word	Unit: s (seconds)
0.049 (32H)	Instantane ous overload time	3	0 ~ 10	R/W	Immediate change, restart take effect.	word	Unit: s (seconds)
0.050 (33H)	Overload detection base current	115	50 ~ 300	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
0.051 (34H)	Overload detection intermediat e current	230	50 ~ 300	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
0.052 (35H)	Maximum current for overload detection	100	50 ~ 200	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
0.053 (36H)	Overload multiplier	40	0 ~ 65535	R	Immediate change, immediate effect	word	
0.054 (37H)	Current loop type	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.055 (38H)	Current sampling type	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.056 (39H)	Number of external high- velocity	0	0 ~ 65535	R	Immediate change, immediate effect	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	pulse terminals						
0.057 (3AH)	Number of external DI terminals	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.058 (3BH)	Number of external DO terminals	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.059 (3CH)	Number of external AI terminals	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.060 (3DH)	Number of temperatur e samples	0	0 ~ 65535	R	Immediate change, immediate effect	word	
0.062 (3FH)	Sampling coefficient of phase current	0	0 ~ 65535	R	Immediate change, immediate effect	word	Sampling range of motor phase currents. Unit: 0.01A
0.063 (40H)	Phase current sampling linear area coefficient	100	50 ~ 100	R	Immediate change, immediate effect	word	Percentage of linear area within the motor phase current sampling range. Unit:% (percentage)
0.064 (41H)	Main loop bus sampling coefficient	6383	0 ~ 65535	R	Immediate change, immediate effect	word	Power DC bus voltage sampling range. Unit: 0.1V
0.066 (43H)	Sampling coefficient of external analog quantity	1550	0 ~ 65535	R	Immediate change, immediate effect	word	External analogue voltage sample range. Unit: 0.01V
0.067 (44H)	Temperatur e sampling coefficient	1500	0 ~ 65535	R	Immediate change, immediate effect	word	Temperature sample range. Unit: 0.1°C (degrees Celsius)

6.2.2 P1 Motor parameter group 2001H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
1.000 (01H)	Select Motor	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0 - Motor 0 parameters. 1 - Motor 1 parameters.
1.002 (03H)	Motor 0 Model	3	0 ~ 65535	R	Immediate change, immediate effect	word	
1.003 (04H)	Motor 0 Rated Input Voltage	1	0 ~ 65535	R	Immediate change, immediate effect	word	0-AC380. 1-AC220. 2-DC24. 3-DC48. 4-DC80.
1.004 (05H)	Motor 0 max Vd	65535	0 ~ 65535	R	Immediate change, immediate effect	word	
1.005 (06H)	Motor 0 max Vq	65535	0 ~ 65535	R	Immediate change, immediate effect	word	
1.006 (07H)	Motor 0 rated power	75	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01kW
1.007 (08H)	Motor 0 rated current	480	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
1.008 (09H)	Motor 0 max. current	1440	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
1.009 (0AH)	Motor 0 rated torque	240	0 ~ 65535	R	Immediate change, immediate	word	Unit: 0.01N·m

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
1.010 (0BH)	Motor 0 max. torque	720	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01N·m
1.011 (0CH)	Motor 0 rated velocity	3000	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: rpm
1.012 (0DH)	Motor 0 Maximum velocity	5000	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: rpm
1.013 (0EH)	Motor 0 Maximum acceleration	65535	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: m/s ²
1.014 (FH)	Motor 0 pole pairs	5	0 ~ 65535	R	Immediate change, immediate effect	word	
1.016 (11H)	Motor 0 moment of inertia	1720	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.001kg.cm ²
1.018 (13H)	Motor 0 stator resistance	1300	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: mΩ
1.019 (14H)	Motor 0 stator D-axis inductance	340	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01mH
1.020 (15H)	Motor 0 stator Q-axis inductance	340	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01mH
1.021 (16H)	Motor 0 back EMF coefficient	350	0 ~ 65535	R	Immediate change, immediate	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
1.022 (17H)	Motor 0 torque coefficient	50	0 ~ 65535	R	Immediate change, immediate effect	word	
1.023 (18H)	Motor 0 mechanical time constant	63	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01ms
1.024 (19H)	Motor 0 current loop proportional gain	300	0 ~ 65535	R	Immediate change, immediate effect	word	
1.025 (1AH)	Motor 0 current loop integration time constant	900	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: us
1.030 (1FH)	Motor 0 continuous overload time	10	0 ~ 100	R	Immediate change, immediate effect	word	Unit: s (seconds)
1.031 (20H)	Motor 0 instantaneous overload time	3	0 ~ 10	R	Immediate change, immediate effect	word	Unit: s (seconds)
1.032 (21H)	Motor 0 overload detection base current	115	50 ~ 150	R	Immediate change, immediate effect	word	Unit:% (percentage)
1.033 (22H)	Motor 0 overload detection intermediate current	230	50 ~ 250	R	Immediate change, immediate effect	word	Unit:% (percentage)
1.034 (23H)	Motor 0 overload detection max. current	370	50 ~ 400	R	Immediate change, immediate effect	word	Unit:% (percentage)
1.038 (27H)	Motor 0 type	0	0 ~ 65535	R	Immediate change,	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					immediate effect		
1.039 (28H)	Principle of Motor 0 Encoder	2	0 ~ 65535	R	Immediate change, immediate effect	word	0-None. 1-Optical encoder. 2-Magnetic encoder. 3-Hall. 4-Inductive. 5-Rotary.
1.040 (29H)	Motor 0 Encoder Type	12	0 ~ 65535	R	Immediate change, immediate effect	word	12- Tamagawa Protocol Absolute Value Encoder
1.041 (2AH)	Motor 0 encoder multiturn digits	16	0 ~ 65535	R	Immediate change, immediate effect	word	
1.042 (2BH)	Motor 0 encoder resolution	13107 2	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	Number of pulse changes for one revolution of the encoder.
1.044 (2DH)	Motor 0 Encoder Mount Offset	6553	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	The offset angle between the encoder "0" position (absolute value encoder 0 position or incremental encoder Index (Z) signal) and the FOC coordinate system 0 electrical angle is calibrated to $0-2^{17}$
1.046 (2FH)	Motor 0 Hall Mount Offset	0	0 ~ 65535	R	Immediate change, immediate effect	word	Offset angle between Hall sensor '0' position and FOC coordinate system 0 electrical angle, data calibrated to 0 to 65535;
1.047 (30H)	Motor 0 encoder overheat point	120	0 ~ 255	R	Immediate change, immediate effect	word	Unit: °C (degrees Celsius)
1.048 (31H)	Motor 0 holding brake release action time	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: ms (milliseconds)
1.049	Motor 0	0	0 ~ 65535	R	Immediate	word	Unit: ms (milliseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(32H)	holding brake locking action time				change, immediate effect		
1.050 (33H)	Motor 1 model	3	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.051 (34H)	Motor 1 rated input voltage	1	0 ~ 65535	R/W	Shutdown change, immediate effect	word	0-AC380. 1-AC220. 2-DC24. 3-DC48. 4-DC80.
1.052 (35H)	Motor 1 max. Vd	65535	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.053 (36H)	Motor 1 max. Vq	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.054 (37H)	Motor 1 rated power	75	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01kW
1.055 (38H)	Motor 1 rated current	480	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01A
1.056 (39H)	Motor 1 max. current	1440	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01A
1.057 (3AH)	Rated torque of motor 1	240	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01N·m
1.058 (3BH)	Max. torque of motor 1	720	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01N·m

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
1.059 (3CH)	Motor 1 Rated velocity	3000	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: rpm
1.060 (3DH)	Motor 1 Maximum velocity	5000	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: rpm
1.061 (3EH)	Motor 1 Maximum acceleration	65535	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: m/s ²
1.062 (3FH)	Motor 1 pole number	5	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.064 (41H)	Motor 1 moment of inertia	1720	0 ~ 4294967295	R/W	Shutdown change, immediate effect	Dword	Unit: 0.001kg.cm ²
1.066 (43H)	Motor 1 stator resistance	1300	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: mΩ
1.067 (44H)	Motor 1 stator D-axis inductance	340	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01mH
1.068 (45H)	Motor 1 stator Q-axis inductance	340	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01mH
1.069 (46H)	Motor 1 back electromotive force constant	350	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.070 (47H)	Torque coefficient of motor 1	50	0 ~ 65535	R/W	Shutdown change, immediate effect	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
1.071 (48H)	Motor 1 mechanical time constant	63	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: 0.01ms
1.072 (49H)	Motor 1 current loop proportional gain	300	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.073 (4AH)	Motor 1 current loop integration time constant	900	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: us
1.078 (4FH)	Motor 1 continuous overload time	10	0 ~ 100	R/W	Immediate change, restart take effect.	word	Unit: s (seconds)
1.079 (50H)	Motor 1 instantaneous overload time	3	0 ~ 10	R/W	Immediate change, restart take effect.	word	Unit: s (seconds)
1.080 (51H)	Motor 1 overload detection base current	115	50 ~ 150	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
1.081 (52H)	Motor 1 overload detection intermediate current	230	50 ~ 250	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
1.082 (53H)	Motor 1 overload detection max. current	370	50 ~ 400	R/W	Immediate change, restart take effect.	word	Unit:% (percentage)
1.086 (57H)	Motor 1 type	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.087 (58H)	Principle of Motor 1 Encoder	2	0 ~ 65535	R/W	Shutdown change, immediate	word	0-None. 1-Optical encoder. 2-Magnetic encoder.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		3-Hall. 4-Inductive. 5-Rotary.
1.088 (59H)	Motor 1 Encoder Type	12	0 ~ 65535	R/W	Shutdown change, immediate effect	word	12- Tamagawa Protocol Absolute Value Encoder
1.089 (5AH)	Motor 1 encoder multiturn digits	16	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
1.090 (5BH)	Motor 1 encoder resolution	13107 2	0 ~ 2147483647	R/W	Shutdown change, immediate effect	Dword	Number of pulse changes for one revolution of the encoder.
1.092 (5DH)	Motor 0 Encoder Mount Offset	6553	0 ~ 2147483647	R/W	Shutdown change, immediate effect	Dword	The offset angle between the encoder "0" position (absolute value encoder 0 position or incremental encoder Index (Z) signal) and the FOC coordinate system 0 electrical angle is calibrated to $0-2^{17}$
1.094 (5FH)	Motor 0 Hall Mount Offset	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Offset angle between Hall sensor '0' position and FOC coordinate system 0 electrical angle, data calibrated to 0 to 65535.
1.095 (60H)	Motor 01encoder overheat point	120	0 ~ 255	R/W	Immediate change, restart take effect.	word	Unit: °C (Celsius)
1.096 (61H)	Motor 1 holding brake release action time	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: ms (milliseconds)
1.097 (62H)	Motor 1 brake locking action time	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit: ms (milliseconds)
1.108 (6DH)	Motor 0 Serial No. 0	0	0 ~ 65535	R	Immediate change,	word	SN character bits 11H, 12L

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					immediate effect		
1.109 (6EH)	Motor 0 Serial No. 1	0	0 ~ 65535	R	Immediate change, immediate effect	word	SN character bits 9H, 10L
1.110 (6FH)	Motor 0 Serial No. 2	0	0 ~ 65535	R	Immediate change, immediate effect	word	SN character bits 7H, 8L
1.111 (70H)	Motor 0 Serial No. 3	0	0 ~ 65535	R	Immediate change, immediate effect	word	SN character bits 5H, 6L
1.112 (71H)	Motor 0 parameter check code	3	0 ~ 65535	R	Immediate change, immediate effect	word	
1.113 (72H)	Motor 0 Parameter List ID	54	0 ~ 65535	R	Immediate change, immediate effect	word	Fixed value=Motor parameter table version * 256+54
1.124 (7DH)	Motor 1 Serial No. 0	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	SN character bits 11H, 12L
1.125 (7EH)	Motor 1 Serial No. 1	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	SN character bits 9H, 10L
1.126 (7FH)	Motor 1 Serial No. 2	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	SN character bits 7H, 8L
1.127 (80H)	Motor 1 Serial No. 3	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	SN character bits 5H, 6L
1.128 (81H)	Motor 1 parameter	3	0 ~ 65535	R/W	Immediate change,	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	check code				immediate effect		
1.129 (82H)	Motor 1 Parameter table ID	54	0 ~ 65535	R/W	Immediate change, immediate effect	word	

6.2.3 P2 Basic Control Parameter Group 2002H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
2.001 (02H)	Application selection	0	0 ~ 9	R/W	Shutdown change, immediate effect	word	0- Universal control. 1- Reserve. 2- Reserve. 3- Motor encoder parameter identification. 4- Off-line load inertia identification. 5- Off-line motor parameters self- tuning. 6- Offline loop parameter self-tuning. 7- Off-line mechanical friction identification. 8- Reserve. 9- Torque fluctuation self-learning.
2.002 (03H)	Control mode	7	0 ~ 7	R/W	Shutdown change, immediate effect	word	0- Velocity mode. 1- Position mode. 2- Torque mode. 3- Torque - velocity mode switching. 4- Velocity - Position mode switch. 5- Torque - Position mode switch. 6- Position - Velocity - Torque mode switch. 7-DS402 over CAN/EtherCAT mode.
2.004 (05H)	Control command source	0	0 ~ 3	R/W	Shutdown change, immediate effect	word	bit0- Run enable command source, 0- communication control command word bit3, 1- External terminal control command word bit3(DI terminal needs to configure function 4).

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit1- Quick stop command source, 0-communication control command word bit2, 1- external terminal control command word bit2(DI terminal function 3 needs to be configured), power on enable the configuration of communication or terminal control command for quick stop. bit2~bit15- Reserved. This parameter is valid only for running the enable command and quick stop command. The control command word and other commands or configurations in the extended control command word are valid only when any corresponding signal in the communication and DI terminals is true, and has nothing to do with the parameter configuration.
2.005 (06H)	External or virtual DI selection	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- External terminal. 1- Virtual terminal.
2.006 (07H)	External or virtual DO selection	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0-External terminal 1- Virtual terminal
2.007 (08H)	Rotate positive direction selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0-CCW is positive direction. 1-CW is positive direction.
2.008 (09H)	Select Input Power	0	0 ~ 2	R	Immediate change, immediate effect	word	0-Three-phase 220V AC. 1-Three-phase 380V AC. 2-80V DC.
2.009 (0AH)	Setting servo power-up control commands	0	0 ~ 65535	R/W	Immediate change, restart take effect.	word	Bit0- Servo power on enable, fast stop command is invalid and there is no shutdown fault, keep enabled state, 0-invalid, 1-valid

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Bit1- After the servo is powered on and enabled, it starts once to return to its original state. 0-Invalid, 1-Valid Bit2- Default position command type after servo power on, 0-Absolute position command, 1-Relative position command Bit3- Automatically clear the alarm once when starting back to the original state, 0-invalid, 1-valid
2.010 (0BH)	Running Enable OFF Mode S0	0	0 ~ 5	R/W	Shutdown change, immediate effect	word	0 - Free running stop, free rotation after motor stop. 1-Runs and stops when the deceleration time is set to 0, and the motor can rotate freely after it stops. 2-Running stop according to the deceleration time 0 setting, the motor can rotate freely after stopping. 3-(Reserved). 4-(Reserved). 5-(Reserved).
2.011 (0CH)	Emergency stop mode S1	0	0 ~ 2	R/W	Shutdown change, immediate effect	word	0 - Free-running stop, free rotation after motor stop. 1- (Reserved) . 2 - (Reserved) .
2.012 (0DH)	Quick stop mode S2	0	0 ~ 4	R/W	Shutdown change, immediate effect	word	0 - Free running stop, free rotation after motor stop. 1-Running stop according to the setting of quick stop deceleration time, the motor can rotate freely after stopping. 2-Stop the motor by outputting reverse braking torque according to the setting of quick stop torque, the motor can rotate freely after stopping. 3-Running stop by quick stop deceleration time setting, the motor stops and runs in position mode with zero position locked. 4-Set the quick stop torque to output

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							reverse braking torque to stop the motor, after the motor stops, the motor runs in position mode with zero position locked.
2.013 (0EH)	Halt Mode S3	0	0 ~ 2	R/W	Shutdown change, immediate effect	word	0 - Set run stop by deceleration time 0, run in position mode with zero speed lock after motor stop. 1 - Set the stop by deceleration time 1, the motor will run in position mode with zero speed lock after stopping. 2 - (Reserved).
2.014 (0FH)	External discharge resistor value	0	0 ~ 65535	R/W	Immediate change, restart take effect.	word	When this parameter is set to 0, the internal discharge resistor parameter will be used by default to protect the overload of the discharge resistor. When one of 'External Discharge Resistor Resistance' parameter and 'External Discharge Resistor Power' parameter is zero and the other one is non-zero, the servo will be alarmed when it is powered on. Unit: Ω
2.015 (10H)	External Discharge Resistor Power	0	0 ~ 65535	R/W	Immediate change, restart take effect.	word	For example, if the rated power of external resistor is 1kW, set this parameter in the following way: (1) If the external resistor is air-cooled, derate to 40% of the rated power, i.e. set this parameter to 400. (2) When the external resistor heat dissipation method is natural cooling, it will be reduced to 10% of the rated power, i.e. this parameter is set to 100. (3) According to the actual heat dissipation situation can be fine-tuned this parameter. When this parameter is set to 0, the internal discharge resistor parameter will be used by default for the discharge resistor overload

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							protection. When one of the parameter 'External Discharge Resistor Resistance' and 'External Discharge Resistor Power' is zero and the other one is non-zero, the servo will be alarmed when it is powered on. Unit: W
2.016 (11H)	External Discharge Resistor Heat Dissipation Factor	30	10 ~ 100	R/W	Immediate change, restart take effect.	word	When using external discharge resistors, set this parameter to no more than 30 per cent for natural cooling of the resistor, and to no more than 50 per cent for forced air cooling of the resistor. Unit:% (percentage)
2.017 (12H)	Busbar Discharge Operation Selection	2	0 ~ 3	R/W	Immediate change, restart take effect.	word	0 - No discharge. 1-Braking discharge of the motor winding (reserved). 2-Braking resistor discharged, resistor overload protection enabled. 3-Braking resistor discharged without resistor overload protection.
2.018 (13H)	Delay between opening the brake and receiving a command	250	0 ~ 500	R/W	Immediate change, immediate effect	word	The delay time between the opening of the holding brake and the receipt of the command when the holding brake output function is available. Unit: ms (milliseconds)
2.019 (14H)	Closed brake to closed PWM delay at standstill	150	0 ~ 1000	R/W	Immediate change, immediate effect	word	The delay between closing the holding brake and switching off the PWM when the motor is stationary. Unit: ms (milliseconds)
2.020 (15H)	Rotation break enable to brake off delay	500	1 ~ 1000	R/W	Immediate change, immediate effect	word	The delay in triggering the closing of the brake after the driver is disabled while the motor is rotating. Unit: ms (milliseconds)
2.021 (16H)	Rotation off speed threshold	30	0 ~ 3000	R/W	Immediate change, immediate effect	word	The speed threshold that triggers the closing of the holding brake in the rotating state of the motor after the drive break is enabled.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Unit: rpm
2.022 (17H)	Mechanical end reduction ratio	100	0 ~ 65535	R/W	Immediate change, immediate effect	word	Motor shaft end travel / Mechanical end travel. Unit:% (percentage)
2.023 (18H)	Software Reset	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- Do not reset 1. Reset
2.024 (19H)	Automatic zero speed clamp	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Turn off 1- Turn on After activation, in speed mode, when the speed command is 0 and the speed feedback is less than 10rpm, it automatically switches to position mode lock axis. When the speed command is not 0, it automatically exits position mode to execute the speed command
2.030 (1FH)	Communication control command word	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Bit0- standby mode Bit1- Power bus relay engaged, 0- invalid, 1-effective Bit2- Quick shutdown, 0-Effective, 1- Invalid Bit3- Enable operation, 0-Enable OFF, 1-Enable ON Bit4-6- commands specifically defined for different operating modes: Speed mode: bit4~6- reserved Position mode: Bit4- instruction effective command, rising edge effective Bit5- instruction effective mode, 0- immediate effective, 1-bit4 rising edge triggered effective Bit6- Absolute/Relative Instruction, 0- Absolute, 1-Relative Torque mode: bit4~6- reserved Return to original mode (valid in 402

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							mode, otherwise retained): bit4- return to original startup Bit5~6- reserved Bit7- Fault reset command Bit8- Pause shutdown, 0-Invalid, 1- Valid Bit9- reserved Bit10- Clear encoder alarm Bit11- Relative Position Command Revocation, 0-Invalid, 1-Valid Bit12- Clears the encoder's multi cycle value bit0 (P2.30ubit12=1, and P2.31_bit15 is triggered when the rising edge occurs) Bit13- Clear position deviation (valid in pulse input mode), 0-invalid, 1- valid Bit14 positive jog, 0-invalid, 1-valid Bit15- Reverse jog, 0-Invalid, 1-Valid
2.031 (20H)	Communication extension control command word	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Bit0~1- Control mode selection (effective when control mode=3~6): When control mode=3, 0-torque mode, 1-speed mode When control mode=4, 0-speed mode, 1-position mode When control mode=5, 0-torque mode, 1-position mode Control mode=6, 0-position mode, 1- speed mode, 2-torque mode Bit2- Electronic gear selection, 0- Electronic gear ratio molecule 0, 1- Electronic gear ratio molecule 1 Bit3- Loop gain selection, 0-Loop gain 0, 1-Loop gain 1 Bit4-7- Multi segment instruction/action selection, binary value selection Bit8 torque limit selection, 0-torque limit 0, 1-torque limit 1 Bit9- Multi segment startup, 0- invalid, 1-valid

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Bit10 forward travel limit signal, 0- invalid, 1-valid Bit11- Reverse travel limit signal, 0- Invalid, 1- Valid Bit12- Origin switch signal, 0- Invalid, 1- Valid Bit13- Prohibit instruction pulse input when external pulse command input, 0-invalid, 1-valid Bit14- Fault record reset command (must be effective simultaneously with the fault reset command) Bit15- Clears the encoder's multi cycle value Bit1 (P2.30ubit12=1, and P2.31_bit15 is triggered when the rising edge is present)
2.032 (21H)	Communication extension control command word 1	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	bit0- Motor rotation direction switch, 0-forward, 1-reverse. bit1- Homing start, rising edge effective. bit2- Acceleration and deceleration switch, 0- acceleration and deceleration 0, 1- acceleration and deceleration 1. bit3~15- Reserved.
2.034 (23H)	Function code operation command word	0	0 ~ 8	R/W	Immediate change, immediate effect	word	0- Reserved. 1- All factory-recoverable parameters are restored to factory defaults (non-enabled state). 2- All recoverable factory parameters except motor parameter group are restored to factory (non-enabled state). 3- All motor related parameters are restored to factory (non-enabled state). 4- All recoverable and unrecoverable factory parameters are restored to factory defaults (not enabled, level 2 permission). 5- Save all savable parameters to

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							EEPROM. 6 to 8- Reserve.
2.035 (24H)	Terminal control command word	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~1- Reserve. bit2-quick stop, 0-valid, 1-invalid. bit3-Run enable, 0-enable OFF, 1- enable ON. bit4~6-Specially defined commands for different operation modes: Velocity mode: bit4~6-Reserve . Position mode: bit4-instruction validation, valid on rising edge. bit5-command validity mode, 0- immediate validity, 1-bit4 rising edge trigger validity. bit6-Absolute/relative command, 0- absolute, 1-relative. Torque mode: bit4~6- Reserve. bit7-Fault reset. bit8-Pause stop, 0-invalid, 1-valid. bit9- Reserve. bit10-Clear encoder alarm. bit11-Relative position command undo, 0-invalid, 1-valid. bit12 - Clear encoder multiturn value bit0. bit13-clear position deviation (valid in pulse input mode), 0-invalid, 1-valid. bit14- forward jog, 0-invalid, 1-valid. bit15-reverse jog, 0-invalid, 1-valid.
2.036 (25H)	Terminal expansion control command word	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~1-control mode selection (valid for control mode = 3~6): Control mode = 3, 0-torque mode, 1- velocity mode. Control mode = 4, 0-velocity mode, 1-position mode. Control mode = 5, 0-torque mode, 1- position mode. Control mode = 6, 0-position mode,

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							1-velocity mode, 2-torque mode. bit2-electronic gear selection, 0- electronic gear ratio numerator 0, 1- electronic gear ratio numerator 1. bit3-loop gain selection, 0-loop gain 0, 1-loop gain 1. bit4~7-Multi-segment command/action selection, binary value selection. bit8-Torque limit selection, 0-torque limit 0, 1-torque limit 1. bit9-Multi-segment operation start, 0- invalid, 1-valid. bit10 - Forward travel limit signal, 0- invalid, 1-valid. bit11-Reverse travel limit signal, 0- invalid, 1-valid. bit12-Home switch signal, 0-invalid, 1-valid. bit13 - Command pulse input is prohibited when external pulse command is input, 0-invalid, 1-valid. bit14 - Fault record reset (must be reset at the same time as the fault reset). bit15 - Clear encoder multiturn value bit1.
2.037 (26H)	Terminal expansion control command word 1	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0-motor rotation direction switching, 0-forward, 1-reverse. bit1-return to the original start, the rising edge is effective. bit2-0 means acceleration/deceleration 0, 1 means acceleration/deceleration 1. bit3~15- reserved.
2.040 (29H)	Control status word	0	0 ~ 65535	R	Immediate change, immediate effect	word	Bit0- initialization completed, waiting for the strong electrical part to be ready Bit1- The high-voltage part is ready and enters standby mode Bit2- Run enabled, 0- not enabled, 1-

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							enabled Bit 3- Fault, 0- No Fault, 1- Fault Bit4- Power bus relay engaged, 0- relay not engaged, 1-relay engaged Bit5- Fast Shutdown, 0-Normal Operating Status, 1-Fast Shutdown Status. Bit6-Relay not engaged Bit7- Warning, 0-No Warning, 1- Warning Bit8- Reserved Bit9- Remote control Bit10- Target arrived, 0-Not arrived, 1-Arrived: Position Mode - Location Arrival Velocity mode - velocity reached Torque mode - torque reached Bit11- Internal restriction activation Bit12~bit13- Special defined states for different operating modes: Velocity mode: Bit12~Bit13- Reserved Position mode: Bit12~Bit13- Reserved Torque mode: Bit12~Bit13- reserved Bit14- Return to original completed, 0- Not completed, 1- Completed Bit15- Brake output, 0-Invalid, 1- Valid Bit0~1- Servo fault reset status: 0- Idle/Busy, 1- Successful, Other - Failed Bit2-3 encoder fault reset status: 0- Idle/Busy, 1- Successful, Other - Failed Bit4~5-encoder multi cycle value reset state: 0- Idle/Busy, 1- Successful, Other - Failed Bit6- torque reached

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Bit7- Read the motor and encoder parameter status stored in the encoder when powered on: 0-Failure, 1-Success Bit8- Warning/Fault, 0-No Warning/Fault, 1-Warning/Fault Bit9~15- reserved
2.041 (2AH)	Extended Control Status Word	0	0 ~ 65535	R	Immediate change, immediate effect	word	Bit0~1- Servo fault reset status: 0- Idle/Busy, 1- Successful, Other - Failed Bit2-3 encoder fault reset status: 0- Idle/Busy, 1- Successful, Other - Failed Bit4~5-encoder multi cycle value reset state: 0- Idle/Busy, 1- Successful, Other - Failed Bit6- torque reached Bit7- Read the motor and encoder parameter status stored in the encoder when powered on: 0-Failure, 1-Success Bit8- Warning/Fault, 0-No Warning/Fault, 1-Warning/Fault Bit9~15- reserved
2.044 (2DH)	Function code operation status word	0	0 ~ 65535	R	Immediate change, immediate effect	word	0-Idle, 1-Busy, 2-Successful, Other-Failure.

6.2.4 P3 Position Control Parameter Group 2003H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
3.000 (01H)	Position instruction source	0	0 ~ 3	R/W	Shutdown change, immediate effect	word	0-P3.002. 1- External pulse 2- Multi segment position command (requires P2.31_BIT9 or terminal 26 function (P2.36_SIT9) multi segment start signal, combined with P2.31_BIT4_7/terminal 21-24 function (P2.36_SIT4_7) for selection) 3- Multi segment position command (does not require P2.31_BIT9 or terminal 26 function (P2.36_SIT9) multi segment start signal, combined with P2.31_BIT4_7/terminal 21-24 function (P2.36_SIT4_7) for selection)
3.002 (03H)	Digital position instruction	0	-281474976 710655 ~ 2814749767 10655	R/W	Immediate change, immediate effect	quad word	Unit: Instruction Unit
3.006 (07H)	Upper limit of location planning velocity	500	0 ~ 60000	R/W	Immediate change, immediate effect	Dword	The upper limit of speed for position instruction planning, When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
3.008 (09H)	Location planning mode	0	0 ~ 3	R/W	Shutdown change, immediate effect	word	(Non uniform speed segment): 0-Position quadratic curve, velocity slope planning Planning of position SIN curve and velocity COS curve 2- Unplanned, with a step change in location 3-Position slope planning (linear interpolation)
3.009	Location	0	0 ~ 65535	R	Immediate	word	0- Instruction planning is not

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(0AH)	planning status				change, immediate effect		complete, 1- instruction planning is complete.
3.010 (0BH)	Position instruction mean filtering time constant	0	0 ~ 128	R/W	Shutdown change, immediate effect	word	
3.011 (0CH)	Position instruction low-pass filtering time constant	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
3.012 (0DH)	Position loop proportional gain 0	400	1 ~ 20000	R/W	Immediate change, immediate effect	word	Unit: 0.1Hz
3.013 (0EH)	Position loop proportional gain 1	560	1 ~ 20000	R/W	Immediate change, immediate effect	word	Unit: 0.1Hz
3.015 (0FH)	Speed feedforward selection	0	0 ~ 2	R/W	Immediate change, immediate effect	word	0 - No speed feedforward. 1-Internal velocity feedforward. 2 - 60B1 object as velocity feedforward.
3.016 (10H)	Speed Feedforward Gain	300	0 ~ 2000	R/W	Immediate change, immediate effect	word	0-speed feedforward is invalid Other - speed feedforward gain Unit: ‰ (parts per thousand)
3.017 (11H)	Time constant of speed feedforward filtering	50	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
3.030 (1FH)	Encoder status	0	0 ~ 65535	R	Immediate change, immediate effect	word	Absolute value encoder is effective: Bit0~bit7 encoder state domain SF: Bit0~3- reserved Bit4- Same as P3.34-bit2 Bit5- corresponds to the logical

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							OR operation result of P3.34-bit4-7 Bit6-7- reserved Bit8 FPGA retrieves data completion flag from encoder, 0- invalid, 1-valid Bit9- Encoder busy flag, 0- Invalid, 1- Valid. When valid, it indicates that the logic and encoder are transmitting frames. Reading a 3-byte frame is approximately 33 us There is a position data in the bit10 encoder position register that has not been read by the MCU yet Bit11~Bit15- reserved.
3.031 (20H)	Encoder temperature	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: °C (Celsius)
3.032 (21H)	Maximum number of consecutive encoder errors	0	0 ~ 65535	R	Immediate change, immediate effect	word	
3.033 (22H)	Encoder error count	0	0 ~ 65535	R	Immediate change, immediate effect	word	
3.034 (23H)	Encoder error type	0	0 ~ 65535	R	Immediate change, immediate effect	word	Absolute encoder valid bit0~bit7- Encoder fault number: bit0- Overvelocity. bit1- Reserved. bit2- Calculation error. bit3- Counter overflow. bit4- Overheat. bit5 - Encoder multiturn value error. bit6- Battery failure. Bit7- Battery low voltage warning. bit8~bit15- Encoder state field SF:

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit8~11- Reserved. bit12- Same as bit2. bit13- corresponds to the logical or operational result of bit4 to 7. bit14~15- Reserved.
3.035 (24H)	Encoder operating mode	0	0 ~ 2	R/W	Shutdown change, immediate effect	word	Absolute encoder valid: 0-Incremental position mode. 1-Multi-turn absolute position mode. 2-Single-turn absolute position mode.
3.036 (25H)	Encoder initial position	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quad word	The absolute value encoder is effective, and the mechanical position after power on is the difference between the absolute position of the motor encoder and this parameter The encoder working mode is set to incremental position mode, or when incremental position mode is powered on, this parameter is automatically updated to the absolute position of the encoder When the encoder working mode is set to absolute position mode, this parameter is automatically updated to 0. After returning to its original state, the parameter is automatically updated to the encoder's single loop value. After successfully clearing the encoder's multi turn value operation, the parameter is automatically updated to 0 Unit: Encoder Unit
3.040 (29H)	Encoder single turn position	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	Unit: Encoder Unit

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
3.042 (2BH)	Encoder turns	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	Multi turn absolute value encoder is effective
3.070 (47H)	Mechanical position offset	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	The offset represented by the encoder position at the mechanical "0" position (origin). Unit: Instruction Unit
3.074 (4BH)	Electronic gear ratio molecules 0	1	0 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	When the numerator of the electronic gear ratio is 0, the number of command pulses required for the motor to rotate one revolution is the value of the denominator of the electronic gear ratio When the numerator of the electronic gear ratio is non-zero, the number of pulses required for the motor to rotate one revolution multiplied by the numerator of the electronic gear ratio divided by the denominator of the electronic gear ratio equals the encoder resolution When a non pulse position command is input, this parameter is only valid when modified during shutdown
3.076 (4DH)	Electronic gear ratio molecules 1	1	0 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	When the numerator of the electronic gear ratio is 0, the number of command pulses required for the motor to rotate one revolution is the value of the denominator of the electronic gear ratio When the numerator of the electronic gear ratio is non-zero, the number of pulses required for the motor to rotate one revolution multiplied by the numerator of the electronic gear ratio divided by the

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							denominator of the electronic gear ratio equals the encoder resolution When a non pulse position command is input, this parameter is only valid when modified during shutdown
3.078 (4FH)	The denominator of electronic gear ratio	1	1 ~ 2147483647	R/W	Immediate change, immediate effect	Word	When the numerator of the electronic gear ratio is 0, the number of command pulses required for the motor to rotate one revolution is the value of the denominator of the electronic gear ratio When the numerator of the electronic gear ratio is non-zero, the number of pulses required for the motor to rotate one revolution multiplied by the numerator of the electronic gear ratio divided by the denominator of the electronic gear ratio equals the encoder resolution When a non pulse position command is input, this parameter is only valid when modified during shutdown
3.080 (51H)	Encoder frequency division output pulse direction	0	0 ~ 1	R/W	Immediate change, restart take effect.	word	Encoder frequency division output pulse direction (this parameter can be used to invert the logic of B-phase pulse and change the phase relationship between A-phase pulse and B-phase pulse): When the motor rotates clockwise, the output pulse of phase A leads phase B by 90 degrees. When the motor rotates counterclockwise, the output pulse of phase A lags phase B by 90 degrees When the motor rotates clockwise, the output pulse A lags behind phase B by 90 degrees. When the motor rotates counterclockwise,

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							the output pulse A leads phase B by 90 degrees
3.081 (52H)	Encoder crossover output numerator	1	1 ~ 65535	R/W	Immediate change, restart take effect.	word	Set the number of pulses output by the terminal feedback interface for each rotation of the encoder When the denominator of the frequency division output is 0, for every 1 rotation of the encoder, the number of output pulses at the terminal is equal to the numerator of the encoder's frequency division output multiplied by 4 When the denominator of the frequency division output is not 0: For every 1 revolution of the encoder, the number of pulses output by the terminal is equal to (the numerator of the encoder's frequency division output/the denominator of the encoder's frequency division output) multiplied by the encoder resolution multiplied by 4 Encoder resolution: 2500p/r, the number of feedback pulses per revolution shall not exceed the resolution of the encoder. If it exceeds 1, it shall still be calculated as 1 The motor outputs a Z-phase pulse signal for each revolution, and the Z-phase pulse width varies with the frequency division ratio setting
3.082 (53H)	Encoder crossover output denominator	1	0 ~ 65535	R/W	Immediate change, restart take effect.	word	Set the number of pulses output by the terminal feedback interface for each rotation of the encoder When the denominator of the frequency division output is 0, for every 1 rotation of the encoder, the number of output pulses at the terminal is equal to the numerator

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							of the encoder's frequency division output multiplied by 4 When the denominator of the frequency division output is not 0: For every 1 revolution of the encoder, the number of pulses output by the terminal is equal to (the numerator of the encoder's frequency division output/the denominator of the encoder's frequency division output) multiplied by the encoder resolution multiplied by 4 Encoder resolution: 2500p/r, the number of feedback pulses per revolution shall not exceed the resolution of the encoder. If it exceeds 1, it shall still be calculated as 1 The motor outputs a Z-phase pulse signal for each revolution, and the Z-phase pulse width varies with the frequency division ratio setting
3.083 (54H)	Position Limit Sources	0	0 ~ 2	R/W	Shutdown change, immediate effect	word	0 – No position limit. 1-Digital forward and reverse position limit. 2 - DI or communication position limit signals.
3.084 (55H)	Digital Forward Position Limit	0	-2814749767 10656 ~ 2814749767 10655	R/W	Immediate change, immediate effect	quad word	Unit: Instruction Unit
3.088 (59H)	Digital Reverse Position Limit	0	-2814749767 10656 ~ 2814749767 10655	R/W	Immediate change, immediate effect	quad word	Unit: Instruction Unit
3.092 (5DH)	Position Limit Status	0	0 ~ 2	R	Immediate change, immediate	word	0-No triggered limit 1. Trigger positive limit 2- Trigger reverse limit

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
3.093 (5EH)	Position arrival conditions	0	0 ~ 6	R/W	Immediate change, immediate effect	word	Position arrival condition (output position arrival signal if condition is met): 0 - Position deviation is within the position arrival threshold. 1 - No position command after filtering and the position deviation is within the position arrival threshold. 2 - No position command before filtering, and the position deviation is within the position arrival threshold. 3 - No position instruction after filtering, and the position deviation is within the position arrival threshold after the hold time. 4 - No position command before filtering, the position deviation is within the position arrival threshold after the hold position reaches the hold time. 5 - No position command after filtering and the position deviation is within the position arrival threshold, hold position arrives at the hold time. 6-Position command before filtering none and position deviation within position arrival threshold, keep position arrival hold time.
3.094 (5FH)	Position reaches threshold	500	0 ~ 2147483647	R/W	Immediate change, immediate effect	Word	When the static deviation of the position is less than this value, output the position arrival signal Using 17 bit resolution encoder units as a reference. Unit: Encoder Unit
3.096	Position	0	0 ~ 30000	R/W	Immediate	word	Unit: ms

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(61H)	arrival holding time				change, immediate effect		
3.097 (62H)	Threshold for excessive positional deviation	500	0 ~ 65535	R/W	Immediate change, immediate effect	word	The position deviation exceeds the threshold. Unit: 0.01r
3.098 (63H)	Excessive position deviation time	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: ms
3.100 (65H)	Homing mode selection	37	0 ~ 41	R/W	Immediate change, immediate effect	word	
3.101 (66H)	Homing limit point torque upper limit	500	0 ~ 3000	R/W	Immediate change, immediate effect	word	In the homing mode of the infinite switch signal input (homing mode 38-41), when the torque feedback reaches the set parameter during the homing process, it is considered to have reached the mechanical limit position. Unit: ‰
3.102 (67H)	Speed before homing switch	500	0 ~ 6000	R/W	Immediate change, immediate effect	word	Find the home velocity before the home signal. Unit: rpm
3.103 (68H)	Speed after homing origin switch	100	0 ~ 6000	R/W	Immediate change, immediate effect	word	The home speed after finding the origin signal. Unit: rpm
3.104 (69H)	Homing offset	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	After finding the 'home position', continue through the position offset and reset the home position. Unit: rpm
3.106 (6BH)	Homing timeout period	20000	0 ~ 65535	R/W	Immediate change, immediate effect	word	After starting homing, if the homing is not completed after the specified time, a timeout warning will be triggered 0- Do not start

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Other - Start timeout detection Unit: ms (milliseconds)
3.107 (6CH)	Homing position and reach the threshold	200	0 ~ 65535	R/W	Immediate change, immediate effect	word	When the static deviation of the position during the homing process is less than this value, it is considered that the position has been reached Using a 17 bit resolution encoder unit as a reference. Unit: Encoder Unit
3.108 (6DH)	Homing torque limit judgement time	200	50 ~ 65535	R/W	Immediate change, immediate effect	word	38-41 home mode is effective. Unit: ms (milliseconds)
3.120 (79H)	1 Digital Position Command 1	0	-281474976 710655~ 2814749767 10655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 1 Unit: Instruction Unit
3.124 (7DH)	Digital Position Command 2	0	-281474976 710655~281 4749767106 55	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 2 Unit: Instruction Unit
3.128 (81H)	Digital Position Command 3	0	-281474976 710655~281 4749767106 55	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 3 Unit: Instruction Unit
3.132 (85H)	Digital Position Command 4	0	-281474976 710655~281 4749767106 55	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 4 Unit: Instruction Unit
3.136 (89H)	Digital Position Command 5	0	-281474976 710655~281 4749767106 55	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 5 Unit: Instruction Unit
3.140 (8DH)	Digital Position Command 6	0	-281474976 710655~281 4749767106 55	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 6 Unit: Instruction Unit
3.144 (91H)	Digital Position	0	-281474976 710655~281	R/W	Immediate change,	quad word	Multi segment digital position instruction 7

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	Command 7		474976710655		immediate effect		Unit: Instruction Unit
3.148 (95H)	Digital Position Command 8	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 8 Unit: Instruction Unit
3.152 (99H)	Digital Position Command 9	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 9 Unit: Instruction Unit
3.156 (9DH)	Digital Position Command 10	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 10 Unit: Instruction Unit
3.160 (A1H)	Digital Position Command 11	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 11 Unit: Instruction Unit
3.164 (A5H)	Digital Position Command 12	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 12 Unit: Instruction Unit
3.168 (A9H)	Digital Position Command 13	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 13 Unit: Instruction Unit
3.172 (ADH)	Digital Position Command 14	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 14 Unit: Instruction Unit
3.176 (B1H)	Digital Position Command 15	0	-281474976 710655~281 474976710655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 15 Unit: Instruction Unit
3.180 (B5H)	Digital Position Command 16	0	-281474976 710655~ 2814749767 10655	R/W	Immediate change, immediate effect	quad word	Multi segment digital position instruction 16 Unit: Instruction Unit
3.200 (C9H)	Low- frequency	0	0 ~ 2	R/W	Immediate change,	word	0-Off. 1-Enable (manual

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	vibration suppression modes				immediate effect		parameterisation). 2-Automatic recognition.
3.201 (CAH)	Low- frequency vibration detection amplitude	100	0 ~ 1000	R/W	Immediate change, immediate effect	word	Setting the vibration detection amplitude (relative to the positioning completion range). Unit:% (percentage)
3.202 (CBH)	Low frequency vibration suppression frequency 0	1	1 ~ 1000	R/W	Immediate change, immediate effect	word	Low frequency vibration frequency 0, 1-1000 (0.1Hz) (where 1-9 traps are not actually valid). Unit: 0.1Hz
3.203 (CCH)	Low frequency vibration suppression frequency ratio0	10	1 ~ 100	R/W	Immediate change, immediate effect	word	Set notch correction coefficient 0
3.204 (CDH)	Low- frequency vibration suppression trap width class 0	6	0 ~ 10	R/W	Immediate change, immediate effect	word	Set notch width 0
3.205 (CEH)	Low frequency vibration suppression trap depth level 0	1	0 ~ 16	R/W	Immediate change, immediate effect	word	Set notch depth 0
3.206 (CFH)	Low frequency vibration	1	1 ~ 1000	R/W	Immediate change, immediate effect	word	Low-frequency vibration frequency1, 1-1000 (0.1Hz) (the trap is invalid when the frequency

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	suppression frequency1						is 1~9). Unit: 0.1Hz
3.207 (D0H)	Low frequency vibration suppression frequency ratio1	10	1 ~ 100	R/W	Immediate change, immediate effect	word	Set notch correction coefficient 1
3.208 (D1H)	Low frequency vibration suppression trap width class 1	6	0 ~ 10	R/W	Immediate change, immediate effect	word	Set notch width 1
3.209 (D2H)	Low frequency vibration suppression trap depth class 1	1	0 ~ 16	R/W	Immediate change, immediate effect	word	Set notch depth 1
3.215 (D8H)	Model tracking control	0	0 ~ 2	R/W	Immediate change, immediate effect	word	Model Tracking Control
3.216 (D9H)	Model tracking control gain 0	500	10 ~ 20000	R/W	Immediate change, immediate effect	word	Model tracking control gain. Unit: 0.1Hz
3.217 (DAH)	Model tracking control gain 1	500	10 ~ 20000	R/W	Immediate change, immediate effect	word	Model Tracking Control Gain Unit: 0.1Hz
3.218 (DBH)	Model tracking control speed feedforward	950	0 ~ 2000	R/W	Immediate change, immediate effect	word	Model Tracking Control Speed Feedforward Gain Unit: ‰

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	gain						
3.219 (DCH)	Model tracking control torque feedforward gain	950	0 ~ 2000	R/W	Immediate change, immediate effect	word	Model tracking control torque feedforward gain Unit: %
3.220 (DDH)	Model tracking control adjustment coefficient	1000	500 ~ 2000	R/W	Immediate change, immediate effect	word	Model tracking control adjustment factor.

6.2.5 P4 Velocity Control Parameter Group 2004H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
4.000 (01H)	Source of velocity command	0	0 ~ 5	R/W	Shutdown change, immediate effect	word	0-P4.002. 1~3-保留. 4-多段速度指令(需要 P2.31_BIT9 或端子 26 号功能 (P2.36_BIT9) 多段启动信号, 结合 P2.31_BIT4_7/端子 21~24 号功能 (P2.36_BIT4_7) 进行选择). 5-多段速度指令(不需要 P2.31_BIT9 或端子 26 号功能 (P2.36_BIT9) 多段启动信号, 结 合 P2.31_BIT4_7/端子 21~24 号功 能 (P2.36_BIT4_7) 进行选择).
4.002 (03H)	Digital velocity command	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm When P4.004 "Speed Unit Selection" is 1, the unit is 1rpm
4.004 (05H)	Velocity unit selection	1	0 ~ 1	R/W	Shutdown change, immediate effect	word	(Only valid for P3.006, P4.002, P4.040~P4.070, PD.048~PD.50): 0-0.1rpm. 1-1rpm.
4.005 (06H)	Velocity planning	0	0 ~ 3	R/W	Shutdown change,	word	0-Slope acceleration and deceleration

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	mode				immediate effect		1-S curve 1 acceleration and deceleration 2-S curve 2 acceleration and deceleration 3-velocity step acceleration and deceleration
4.006 (07H)	Rapid shutdown deceleration time	10	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: ms (milliseconds)
4.007 (08H)	Acceleration and deceleration time selection	0	0 ~ 1	R/W	Immediate change, immediate effect	word	(Valid in non shutdown state): 0-Acceleration and deceleration time 0 1. Acceleration and deceleration time 1
4.008 (09H)	Acceleration time 0	100	0 ~ 65535	R/W	Immediate change, immediate effect	word	The time required for the speed command to go from 0 to 1000 or 0 to 1000 rpm. Unit: ms (milliseconds)
4.009 (AH)	Deceleration time 0	100	0 ~ 65535	R/W	Immediate change, immediate effect	word	The time required for the speed command to go from 1000 or - 1000rpm to 0. Unit: ms (milliseconds)
4.010 (BH)	Acceleration time 1	50	0 ~ 65535	R/W	Immediate change, immediate effect	word	The time required for the speed command to go from 0 to 1000 or - 1000 rpm Unit: ms (milliseconds)
4.011 (CH)	Deceleration time 1	50	0 ~ 65535	R/W	Immediate change, immediate effect	word	The time required for the speed command to go from 1000 or - 1000rpm to 0. Unit: ms (milliseconds)
4.012 (DH)	Jog velocity command	200	0 ~ 6000	R/W	Immediate change, immediate effect	word	unit: rpm
4.013 (EH)	Jogging acceleration and deceleration time	100	0 ~ 32767	R/W	Immediate change, immediate effect	word	Unit: ms (milliseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
4.014 (FH)	Speed command filtering time constant	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	unit: 0.01ms
4.016 (11H)	Zero speed detection threshold	10	0 ~ 65535	R/W	Immediate change, immediate effect	word	In speed mode, if the feedback speed is below the threshold, a zero speed signal will be output.
4.018 (13H)	Speed loop proportional gain 0	250	1 ~ 20000	R/W	Immediate change, immediate effect	word	Unit: 0.1Hz
4.019 (14H)	Speed loop integral time constant 0	3183	15 ~ 51200	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
4.020 (15H)	Speed feedback filtering time constant 0	20	0 ~ 15000	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
4.021 (16H)	Speed loop proportional gain 1	250	1 ~ 20000	R/W	Immediate change, immediate effect	word	Unit: 0.1Hz
4.022 (17H)	Speed loop integral time constant 1	51200	15 ~ 51200	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
4.023 (18H)	Speed feedback filtering time constant 1	10	0 ~ 15000	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
4.025 (1AH)	Over speed fault threshold	0	0 ~ 6000	R/W	Immediate change, immediate effect	word	If the speed feedback exceeds this set value, the overspeed fault protection will be triggered When the set value is 0, the overspeed threshold is set to be 1.2 times the maximum motor speed. Unit: rpm

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
4.026 (1BH)	Torque feedforward selection	0	0 ~ 2	R/W	Immediate change, immediate effect	word	0-No torque feedforward 1. Internal torque feedforward 2-60B2 object is used as torque feedforward
4.027 (1CH)	Torque feedforward gain	0	0 ~ 1000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
4.028 (1DH)	Time constant of torque feedforward filtering	10	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
4.029 (1EH)	Source of speed limit	0	0 ~ 2	R/W	Immediate change, immediate effect	word	0- Both forward and reverse directions have a speed limit of 0 1. Forward direction has a speed limit of 0, while reverse direction has a speed limit of 1
4.030 (1FH)	velocity limit 0	6000	0 ~ 10000	R/W	Immediate change, immediate effect	Dword	Unit: rpm
4.032 (21H)	velocity limit 1	6000	0 ~ 10000	R/W	Immediate change, immediate effect	Dword	Unit: rpm
4.034 (23H)	Speed limit status	0	0 ~ 2	R	Immediate change, immediate effect	word	0- Speed limit not triggered 1- Trigger forward speed limit 2- Trigger reverse speed limit
4.035 (24H)	Speed mode position limit status	0	0 ~ 1	R	Immediate change, immediate effect	word	0- Position limit not triggered 1- Trigger position limit
4.036 (25H)	Speed reaches threshold	10	0 ~ 100	R/W	Immediate change, immediate effect	word	When the speed deviation is less than the threshold, the output speed reaches signal Unit: rpm
4.038 (27H)	Load rotor inertia ratio 0	100	100 ~ 65535	R/W	Immediate change,	word	The ratio of the total inertia of the load machinery and motor rotor to

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					immediate effect		the inertia of the motor rotor Unit:% (percentage)
4.039 (28H)	Load rotor inertia ratio 1	100	100 ~ 65535	R/W	Immediate change, immediate effect	word	The ratio of the total inertia of the load machinery and motor rotor to the inertia of the motor rotor Unit:% (percentage)
4.040 (29H)	Digital speed instruction 1	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.042 (2BH)	Digital speed instruction 2	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.044 (2DH)	Digital speed instruction 3	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.046 (2FH)	Digital speed instruction 4	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.048 (31H)	Digital speed instruction 5	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.050 (33H)	Digital speed instruction 6	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.052 (35H)	Digital speed instruction 7	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.054 (37H)	Digital speed instruction 8	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.056 (39H)	Digital speed instruction 9	0	-60000 ~ 60000	R/W	Immediate change,	Dword	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					immediate effect		P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.058 (3BH)	Digital speed instruction 10	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.060 (3DH)	Digital speed instruction 11	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.062 (3FH)	Digital speed instruction 12	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.064 (41H)	Digital speed instruction 13	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.066 (43H)	Digital speed instruction 14	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.068 (45H)	Digital speed instruction 15	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.070 (47H)	Digital speed instruction 16	0	-60000 ~ 60000	R/W	Immediate change, immediate effect	word	When P4.004 "Speed Unit Selection" is 0, the unit is 0.1rpm P4.004 "Speed Unit Selection" is 1, unit: 1rpm
4.080 (51H)	VF torque increase	30	0 ~ 200	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control" Unit: ‰ (parts per thousand)
4.081 (52H)	VF curve type	2	0 ~ 2	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control"
4.082 (53H)	Number of multi	2	1 ~ 4	R/W	Immediate change,	word	P2.0 is effective when the "control strategy" is "VF speed open-loop

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	segment VF reference points				immediate effect		control"
4.083 (54H)	Multi segment VF reference point 1 speed	180	0 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.084 (55H)	Multi segment VF reference point 1 voltage	194	0 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.085 (56H)	Multi segment VF reference point 2 speed	1000	P4.083 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.086 (57H)	Multi segment VF reference point 2 voltage	1000	P4.084 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.087 (58H)	Multi segment VF reference point 3 speed	1000	P4.085 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.088 (59H)	Multi segment VF reference point 3 voltage	1000	P4.086 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.089 (5AH)	Multi segment VF reference point 4 speed	1000	P4.087 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.090 (5BH)	Multi segment VF reference point 4 voltage	1000	P4.088 ~ 1000	R/W	Immediate change, immediate effect	word	P2.0 is effective when the "control strategy" is "VF speed open-loop control". Unit: ‰ (parts per thousand)
4.120	Nonlinear	0	0 ~ 1	R/W	Immediate	word	0-not enabled, 1-enabled

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(79H)	velocity PI				change, immediate effect		
4.121 (7AH)	Speed pseudo differential feedforward feedback control coefficient	100	0 ~ 200	R/W	Immediate change, immediate effect	word	Pseudo differential feedforward feedback control coefficient. Unit:% (percentage)
4.122 (7BH)	Damping coefficient of speed loop	100	50 ~ 200	R/W	Immediate change, immediate effect	word	Unit:% (percentage)
4.130 (83H)	Load torque compensation gain	0	0 ~ 200	R/W	Immediate change, immediate effect	word	Percentage of load torque disturbance compensation. Unit:% (percentage)
4.131 (84H)	Pole of load torque observer	5000	0 ~ 10000	R/W	Immediate change, immediate effect	word	Load torque observer pole, the larger the pole, the faster the torque observer converges.
4.132 (85H)	Load torque compensation interval	100	0 ~ 65535	R/W	Immediate change, immediate effect	word	When the speed deviation exceeds the load torque compensation interval, the load torque compensation filter is switched off.
4.133 (86H)	Load torque observation value filtering time constant	10000	0 ~ 65535	R/W	Immediate change, immediate effect	word	The final value of the load torque filter time constant when the speed deviation is consistently less than the load torque compensation interval. Unit: 0.1us
4.140 (8DH)	Friction compensation switch	0	0 ~ 3	R/W	Immediate change, immediate effect	word	
4.141 (8EH)	Positive friction compensation	0	-1000 ~ 1000	R/W	Immediate change, immediate	word	Unit: ‰ (parts per thousand)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	n value				effect		
4.142 (8FH)	Reverse friction compensation value	0	-1000 ~ 1000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
4.143 (90H)	Friction offset compensation value	0	-1000 ~ 1000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
4.144 (91H)	Coefficient of viscous friction	0	0 ~ 3000	R/W	Immediate change, immediate effect	word	
4.145 (92H)	Friction compensation speed threshold	0	-10 ~ 300	R/W	Immediate change, immediate effect	word	Unit: rpm
4.146 (93H)	Friction compensation filtering time constant	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.01ms

6.2.6 P5 Torque Control Parameter Group 2005H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
5.000 (01H)	Source of torque command	0	0 ~ 5	R/W	Shutdown change, immediate effect	word	1-3- Reserved 4- Multi segment torque command (requires P2.31_BIT9 or terminal 26 function (P2.36_SIT9) multi segment start signal, combined with P2.31_BIT4_7/terminal 21-24 function (P2.36_SIT4_7) for selection) 5-stage torque command (does not require P2.31_BIT9 or terminal 26 function (P2.36_SIT9) multi- stage start signal, combined with P2.31_BIT4_7/terminal 21-24

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							function (P2.36_SIT4_7) for selection)
5.001 (02H)	Digital torque command	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.002 (03H)	Digital magnetic flux command	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.003 (04H)	Quick stop torque command	1000	0 ~ 3000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.004 (05H)	Torque slope limit	100	0 ~ 1000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.005 (06H)	Torque command filtering time constant 0	80	0 ~ 3000	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
5.006 (07H)	Torque command filtering time constant 1	10	0 ~ 3000	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
5.008 (09H)	Proportional gain of current loop	300	1 ~ 3000	R/W	Immediate change, immediate effect	word	
5.009 (AH)	Current loop integral time constant	900	1 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: us
5.010 (BH)	Proportional gain of D-axis current loop	300	1 ~ 3000	R/W	Immediate change, immediate effect	word	
5.011 (CH)	Integration time constant	900	1 ~ 65535	R/W	Immediate change,	word	Unit: us

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	of D-axis current loop				immediate effect		
5.016 (11H)	Torque feedback filtering time constant 0	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	单位: 0.01ms
5.017 (12H)	Torque feedback filtering time constant 1	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	单位: 0.01ms
5.020 (15H)	Source of torque limitation	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0-由 P2.63 转矩限制选择参数决定, P2.63=0 时正反方向均为转矩限制 0, P2.63=1 时正反方向均为转矩限制 1. 1-正向转矩限制 0, 反向转矩限制 1.
5.021 (16H)	Torque limit 0	3000	0 ~ 3500	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.022 (17H)	Torque Limit 1	3000	0 ~ 3500	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.023 (18H)	Torque limit state	0	0 ~ 2	R	Immediate change, immediate effect	word	0-Failure to trigger torque limit 1. Trigger forward torque limit 2- Trigger reverse torque limit
5.024 (19H)	Torque mode position limit state	0	0 ~ 1	R	Immediate change, immediate effect	word	0- Non triggered position limit 1. Trigger position restriction
5.025 (1AH)	Torque mode speed limit state	0	0 ~ 1	R	Immediate change, immediate effect	word	0- Speed limit not triggered 1. Trigger speed limit
5.026 (1BH)	Torque reaches threshold	500	P5.027 ~ 3000	R/W	Immediate change, immediate effect	word	When the actual output torque is greater than the threshold, output the torque reaches signal. Unit: ‰ (parts per thousand)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
5.027 (1CH)	Torque reaches bias	100	0 ~ P5.026	R/W	Immediate change, immediate effect	word	When the actual output torque is less than (torque reaching threshold - torque reaching bias), output the closes the torque reaching signal Unit: ‰ (parts per thousand)
5.029 (1EH)	Sampling digital quantity of rated current of motor	0	0 ~ 65535	R	Immediate change, immediate effect	word	The unit digital quantity corresponding to the rated current of the selected motor.
5.030 (1FH)	Digital torque command 1	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 1 Unit: ‰ (parts per thousand)
5.031 (20H)	Digital torque command 2	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 2 Unit: ‰ (parts per thousand)
5.032 (21H)	Digital torque command 3	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 3 Unit: ‰ (parts per thousand)
5.033 (22H)	Digital torque command 4	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 4 Unit: ‰ (parts per thousand)
5.034 (23H)	Digital torque command 5	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 5 Unit: ‰ (parts per thousand)
5.035 (24H)	Digital torque command 6	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 6 Unit: ‰ (parts per thousand)
5.036 (25H)	Digital torque command 7	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 7 Unit: ‰ (parts per thousand)
5.037	Digital torque	0	-3000 ~ 3000	R/W	Immediate	word	Multi segment digital torque

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(26H)	command 8				change, immediate effect		command 8 Unit: ‰ (parts per thousand)
5.038 (27H)	Digital torque command 9	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 9 Unit: ‰ (parts per thousand)
5.039 (28H)	Digital torque command 10	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 10 Unit: ‰ (parts per thousand)
5.040 (29H)	Digital torque command 11	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 11 Unit: ‰ (parts per thousand)
5.041 (2AH)	Digital torque command 12	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 12 Unit: ‰ (parts per thousand)
5.042 (2BH)	Digital torque command 13	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 13 Unit: ‰ (parts per thousand)
5.043 (2CH)	Digital torque command 14	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 14 Unit: ‰ (parts per thousand)
5.044 (2DH)	Digital torque command 15	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 15 Unit: ‰ (parts per thousand)
5.045 (2EH)	Digital torque command 16	0	-3000 ~ 3000	R/W	Immediate change, immediate effect	word	Multi segment digital torque command 16 Unit: ‰ (parts per thousand)
5.090 (5BH)	Bus voltage compensation coefficient	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: % (percentage)
5.091	PWM dead	0	0 ~ 1	R/W	Shutdown	word	0- turn off, 1- turn on

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(5CH)	zone compensation				change, immediate effect		
5.092 (5DH)	PWM dead zone compensation threshold	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
5.093 (5EH)	PWM dead zone compensation slope	100	0 ~ 65535	R/W	Shutdown change, immediate effect	word	
5.094 (5FH)	PWM dead zone compensation time	80	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Unit:% (percentage)
5.095 (60H)	Selection of current decoupling function	0	0 ~ 65535	R/W	Shutdown change, immediate effect	word	Bit0~1-current decoupling mode, 0-no decoupling, 1-feedback decoupling, 2-feedforward decoupling, 3-deviation decoupling Bit2- current decoupling back electromotive force compensation, 0- not turned on, 1- turned on Bit3- current decoupling coefficient adjustment, 0- not turned on, 1- turned on Bit4-Q axis current decoupling (used for feedback/feedforward decoupling), 0-compensation, 1-no compensation
5.096 (61H)	Current decoupling loop damping	0	-10 ~ 200	R/W	Shutdown change, immediate effect	word	
5.097 (62H)	Inductance saturation current 0	1000	500 ~ 4000	R/W	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
5.098 (63H)	Inductance saturation current 1	3000	1000 ~ 4000	R/W	Immediate change, immediate	word	Unit: ‰ (parts per thousand)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
5.099 (64H)	Inductance saturation value 1	100	1 ~ 100	R/W	Immediate change, immediate effect	word	Unit:% (percentage)
5.120 (79H)	Mechanical resonance suppression trap selection	0	0 ~ 16	R/W	Immediate change, immediate effect	word	Bit0- notch filter 0 switch (0-OFF, 1-ON) Bit1- notch filter 1 switch Bit2- notch filter 2 switch Bit3- notch filter 3 switch
5.121 (7AH)	Frequency of notch filter 0	4000	50 ~ 4000	R/W	Immediate change, immediate effect	word	The frequency of notch filter 0 Unit: Hz
5.122 (7BH)	Width of notch filter 0	70	10 ~ 2000	R/W	Immediate change, immediate effect	word	
5.123 (7CH)	Depth of notch filter 0	1000	0 ~ 1000	R/W	Immediate change, immediate effect	word	
5.124 (7DH)	Frequency of notch filter 1	4000	50 ~ 4000	R/W	Immediate change, immediate effect	word	The frequency of notch filter 1 Unit: Hz
5.125 (7EH)	Width of notch filter 1	70	10 ~ 2000	R/W	Immediate change, immediate effect	word	
5.126 (7FH)	Depth of notch filter 1	1000	0 ~ 1000	R/W	Immediate change, immediate effect	word	
5.127 (80H)	Frequency of notch filter 2	4000	50 ~ 4000	R/W	Immediate change, immediate effect	word	The frequency of notch filter 2 Unit: Hz

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
5.128 (81H)	Width of notch filter 2	70	10 ~ 2000	R/W	Immediate change, immediate effect	word	
5.129 (82H)	Depth of notch filter 2	1000	0 ~ 1000	R/W	Immediate change, immediate effect	word	
5.130 (83H)	Frequency of notch filter 3	4000	50 ~ 4000	R/W	Immediate change, immediate effect	word	The frequency of notch filter 3 Unit: Hz
5.131 (84H)	Width of notch filter 3	70	10 ~ 2000	R/W	Immediate change, immediate effect	word	
5.132 (85H)	Depth of notch filter 3	1000	0 ~ 1000	R/W	Immediate change, immediate effect	word	
5.133 (86H)	vibration threshold	50	1 ~ 200	R/W	Immediate change, immediate effect	word	Threshold value for judging vibration during vibration detection. Unit: ‰ (parts per thousand)
5.134 (87H)	Adaptive Trap	0	0 ~ 4	R/W	Immediate change, immediate effect	word	0-No operation. 1-Automatic trap setting (up to two). 2-Restore trap 0 and trap 1 parameters to before automatic setting. 3-Frequency detection only. 4-Restore trap 0 and trap 1 parameters to default values.
5.135 (88H)	Adaptive Trap Vibration Detection Frequency0	0	0 ~ 4000	R	Immediate change, immediate effect	word	Vibration frequency detection frequency 0. Unit: Hz
5.136 (89H)	Adaptive Trap	0	0 ~ 65535	R	Immediate change,	word	Vibration frequency detection amplitude 0. Unit: ‰ (parts per

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	Vibration Detection Amplitude 0				immediate effect		thousand)
5.137 (8AH)	Adaptive Trap Vibration Detection Frequency 1	0	0 ~ 4000	R	Immediate change, immediate effect	word	Vibration frequency detection frequency 1 Unit: Hz
5.138 (8BH)	Adaptive Trap Vibration Detection Amplitude1	0	0 ~ 65535	R	Immediate change, immediate effect	word	Vibration frequency detection amplitude 1. unit: ‰ (parts per thousand)
5.139 (8CH)	Adaptive notch vibration determinatio n times	2	1 ~ 10	R/W	Immediate change, immediate effect	word	Vibration determination frequency
5.140 (8DH)	Adaptive notch exit time	20	5 ~ 100	R/W	Immediate change, immediate effect	word	Adaptive notch exit time Unit: s (seconds)
5.141 (8EH)	Adaptive notch exit state	0	0 ~ 65535	R	Immediate change, immediate effect	word	Adaptive notch exit state
5.142 (8FH)	Adaptive notch initial depth	10	1 ~ 650	R/W	Immediate change, immediate effect	word	Adaptive notch filter initial depth value
5.143 (90H)	Adaptive notch depth minimum value	1	0 ~ 400	R/W	Immediate change, immediate effect	word	Minimum depth of adaptive notch filter
5.144 (91H)	Maximum adaptive notch width	400	200 ~ 1000	R/W	Immediate change, immediate effect	word	Maximum width of adaptive notch filter
5.145 (92H)	Adaptive notch	100	100 ~ 1000	R/W	Immediate change,	word	Adaptive notch filter minimum frequency. Unit: Hz

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	minimum frequency				immediate effect		
5.150 (97H)	Torque fluctuation compensation switch	0	0 ~ 1	R/W	Immediate change, immediate effect	word	
5.151 (98H)	Torque fluctuation compensation frequency 0	0	0 ~ 500	R/W	Immediate change, immediate effect	word	
5.152 (99H)	Torque fluctuation compensation amplitude 0	0	0 ~ 10000	R/W	Immediate change, immediate effect	word	Unit: One ten thousandth.
5.153 (9AH)	Torque fluctuation compensation phase 0	0	0 ~ 359	R/W	Immediate change, immediate effect	word	Unit: degree (deg).
5.154 (9BH)	Torque fluctuation compensation frequency 1	0	0 ~ 500	R/W	Immediate change, immediate effect	word	
5.155 (9CH)	Torque fluctuation compensation amplitude 1	0	0 ~ 10000	R/W	Immediate change, immediate effect	word	Unit: One ten thousandth.
5.156 (9DH)	Torque fluctuation compensation phase 1	0	0 ~ 359	R/W	Immediate change, immediate effect	word	Unit: degree (deg).
5.157 (9EH)	Torque fluctuation compensation frequency 2	0	0 ~ 500	R/W	Immediate change, immediate effect	word	
5.158 (9FH)	Torque fluctuation compensation	0	0 ~ 10000	R/W	Immediate change, immediate	word	Unit: One ten thousandth.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	n amplitude 2				effect		
5.159 (A0H)	Torque fluctuation compensation phase 2	0	0 ~ 359	R/W	Immediate change, immediate effect	word	Unit: degree (deg).
5.160 (A1H)	Torque fluctuation compensation frequency 3	0	0 ~ 500	R/W	Immediate change, immediate effect	word	
5.161 (A2H)	Torque fluctuation compensation amplitude 3	0	0 ~ 10000	R/W	Immediate change, immediate effect	word	Unit: One ten thousandth.
5.162 (A3H)	Torque fluctuation compensation phase 3	0	0 ~ 359	R/W	Immediate change, immediate effect	word	Unit: degree (deg).
5.163 (A4H)	Torque fluctuation compensation frequency 4	0	0 ~ 500	R/W	Immediate change, immediate effect	word	
5.164 (A5H)	Torque fluctuation compensation amplitude 4	0	0 ~ 10000	R/W	Immediate change, immediate effect	word	Unit: One ten thousandth.
5.165 (A6H)	Torque fluctuation compensation phase 4	0	0 ~ 359	R/W	Immediate change, immediate effect	word	Unit: degree (deg).
5.166 (A7H)	Torque fluctuation compensation adjustment coefficient	100	0 ~ 1000	R/W	Immediate change, immediate effect	word	Unit:% (percentage)
5.167 (A8H)	Torque fluctuation compensation frequency	1000	10 ~ 16000	R/W	Immediate change, immediate effect	word	Unit: Hz

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	limit						

6.2.7 P7 Enhanced Function Parameter Group 2007H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
7.000 (01H)	Current date	2020 101	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Current date, format: Year Month Day, such as "20200101" indicating January 1, 2020, starts counting from the date read from the EEPROM after power on
7.002 (03H)	Current time	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Current time, format: Hours, minutes, and seconds, such as "120101" indicating 12:1 minutes and 1 second, start counting from the time read from the EEPROM after power on
7.004 (05H)	Set the date	0	0 ~ 4294967295	R/W	Immediate change, immediate effect	Dword	Set date, format: Year Month Day, if "20200101" means January 1, 2020, it will automatically reset to zero after setting. If the setting is successful, the "current date" will be changed to the set date
7.006 (07H)	Set time	0	0 ~ 4294967295	R/W	Immediate change, immediate effect	Dword	Set time, format: Hours, minutes, and seconds, such as "120101" indicating 12:01:1, will automatically reset after setting. If set successfully, the "current time" will be changed to the set time
7.008 (09H)	Rigid level selection	12	0 ~ 31	R/W	Immediate change, immediate effect	word	0~31: Rigid level from 0 to 31
7.010 (BH)	Gain switching mode	0	0 ~ 10	R/W	Immediate change, immediate	word	0-gain 0 (ps), controlled by external IO/communication gain switching command to switch

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		speed loop PI/P Gain 1 (ps), controlled by external IO/communication gain switching command to switch speed loop PI/P 2- External IO/Communication (PS) 3. High torque command (ps), switching level/delay, unit:%. Rated torque 4- High speed command (ps), switching level/delay, unit: 1rpm 5- High rate of change in speed command (ps), switching level/delay, unit: 10rpm/s 6- Large position deviation (p), switching level/delay, unit: pulse. 7- There is a position instruction (p) 8-Positioning not completed (p) 9- High actual speed (p), switching level/delay unit: 1rpm 10- Position command+actual speed (p), switching level/delay, unit: 1rpm Note: P indicates that the position mode is valid, and ps indicates that the position velocity mode is valid Modes 3~6, 9: If it is greater than the switching level+threshold, switch to gain 1; if it is less than the switching level threshold, switch to gain 0.
7.011 (CH)	Gain switching delay time	50	0 ~ 10000	R/W	Immediate change, immediate effect	word	Gain switching delay time, unit: 0.1ms
7.012 (DH)	Gain switching level	50	0 ~ 20000	R/W	Immediate change, immediate	word	Gain switching level

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
7.013 (EH)	Gain switching delay	30	0 ~ 20000	R/W	Immediate change, immediate effect	word	Gain switching delay
7.014 (FH)	Position gain switching time	30	0 ~ 10000	R/W	Immediate change, immediate effect	word	Position gain switching time, unit: 0.1ms
7.015 (10H)	Magnification of position gain 2	100	50 ~ 500	R/W	Immediate change, immediate effect	word	Magnification of position gain 2, Unit: % (percentage)
7.016 (11H)	Action time of position gain 2	0	0 ~ 10000	R/W	Immediate change, immediate effect	word	Position gain 2 effective time, unit: 0.1ms
7.030 (1FH)	Online inertia identification switch	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
7.031 (20H)	Online inertia identification results	100	100 ~ 65535	R	Immediate change, immediate effect	word	Unit: % (percentage)
7.032 (21H)	Online inertia identification error code	0	0 ~ 65535	R	Immediate change, immediate effect	word	
7.035 (24H)	Identification of capacitance capacity of main circuit busbar	0	0 ~ 1	R/W	Immediate change, immediate effect	word	
7.036 (25H)	Main circuit bus capacitor capacity	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: uf (microfarads)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
7.040 (29H)	Program segment timing selection	0	0 ~ 8	R/W	Immediate change, immediate effect	word	0 - No monitoring. 1-Running time of cyclic programme Scan. 2-Interrupt programme ScanA running time . 3-Interrupt programme ScanB running time . 4-Interrupt programme Position loop running time . 5-Interrupt programme speed loop running time . 6-Run time of interrupt programme current loop. 7-Default programme segment 0 runtime. 8-Default program 1 runtime.
7.041 (2AH)	Main loop program Scan runtime	0	0 ~ 65535	R	Immediate change, immediate effect	word	The main loop run time is monitored with the 'Segment Run Timing Selection' parameter. Unit: 0.1us (microseconds)
7.042 (2BH)	Interrupt program ScanA runtime	0	0 ~ 65535	R	Immediate change, immediate effect	word	Main interrupt ScanA runtime is monitored with the 'Segment runtime selection' parameter. Unit: 0.1us (microseconds)
7.043 (2CH)	Interrupt program ScanB runtime	0	0 ~ 65535	R	Immediate change, immediate effect	word	Auxiliary interrupt program ScanB runtime, monitored with the 'Segment runtime selection' parameter. Unit: 0.1us (microseconds)
7.044 (2DH)	Interrupt program location loop running time	0	0 ~ 65535	R	Immediate change, immediate effect	word	Running time of the position loop programme in the main interrupt programme ScanA, monitored in conjunction with the 'Segment running time selection' parameter. Unit: 0.1us (microseconds)
7.045 (2EH)	Interrupt program speed loop running time	0	0 ~ 65535	R	Immediate change, immediate effect	word	The run time of the speed loop programme in the main interrupt ScanA is monitored with the parameter 'Segment run time selection'.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							Unit: 0.1us (microseconds)
7.046 (2FH)	Interrupt program current loop running time	0	0 ~ 65535	R	Immediate change, immediate effect	word	Running time of the current loop programme in the main interrupt programme ScanA, monitored with the parameter 'Timing selection for programme segment running'. Unit: 0.1us (microseconds)
7.047 (30H)	Default program running time 0	0	0 ~ 65535	R	Immediate change, immediate effect	word	Customised program run time, monitored with the 'Segment run time selection' parameter. Unit: 0.1us (microseconds)
7.048 (31H)	Default program running time 1	0	0 ~ 65535	R	Immediate change, immediate effect	word	Customised program run time, monitored with the 'Segment run time selection' parameter. Unit: 0.1us (microseconds)
7.050 (33H)	Factory test main circuit overvoltage point	4100	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.1V
7.051 (34H)	Factory test main circuit undervoltage point	2000	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.1V
7.052 (35H)	Factory test main circuit brake voltage point	3850	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.1V
7.060 (3DH)	Motor encoder identification enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Do not enable 1- Enable
7.062 (3FH)	Motor encoder identification direction matching	0	0 ~ 65535	R	Immediate change, immediate effect	word	0-Idle. 1 - Encoder position growth direction does not correspond to the drive control direction (wrong motor phase sequence). 2 - The encoder position growth direction is the same as the drive control direction (motor phase sequence is correct).

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
7.063 (40H)	Motor encoders recognise the number of motor pole pairs	0	0 ~ 65535	R	Immediate change, immediate effect	word	
7.064 (41H)	Motor encoder recognises mounting offset angle	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	
7.066 (43H)	Motor encoder recognises resolution	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	
7.068 (45H)	Motor encoder recognises operating status	0	0 ~ 65535	R	Immediate change, immediate effect	word	0 - Initialisation stage. 1-Voltage adaptation stage. 2-Motor positive direction recognition. 3-Encoder resolution recognition stage. 4- Electro-mechanical angle return stage. 5-Motor forward rotation (given electro-mechanical angle self- increasing). 6-Motor rotation in the opposite direction (given electro-mechanical angle self-decreasing). 7-Calculation of the results. 8-Error handling. 9-Discrimination complete.
7.069 (46H)	Motor encoder recognises the type of error	0	0 ~ 65535	R	Immediate change, immediate effect	word	0- No errors 1. Timeout 2-Single phase overcurrent 3-Idlq overcurrent 4- Unfinished identification of accidental disconnection activation The 5-pole logarithm exceeds the identification range

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							6- Abnormal interruption, possibly due to loose cables 7-Phase sequence error or missing phase
7.070 (47H)	Motor parameter recognition enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	
7.071 (48H)	Motor parameter recognition phase resistance	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: mΩ
7.072 (49H)	Motor parameter recognition d-axis inductance	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01mH
7.073 (4AH)	Motor parameters identification q-axis inductance	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01mH
7.074 (4BH)	Motor Parameter Recognition Magnetic Chain	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V *ms/rad
7.080 (51H)	Offline inertia recognition positive rotation enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Do not enable 1- Enable
7.081 (52H)	Offline Inertia Recognition Reverse Enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Do not enable 1- Enable
7.082 (53H)	Offline inertia recognises arrival speed	640	100 ~ 1000	R/W	Immediate change, immediate	word	Maximum speed for offline inertia recognition manoeuvre planning. Unit: rpm

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
7.083 (54H)	Offline inertia recognises the upper limit of unidirectional travel.	300	100 ~ 20000	R/W	Immediate change, immediate effect	word	Offline inertia identification planning for one-way travel upper limit. Unit: 0.01r
7.084 (55H)	Offline inertia recognises acceleration	6400	160 ~ 48000	R/W	Immediate change, immediate effect	word	Offline inertia recognition for motion planning acceleration. Unit: rpm/s
7.085 (56H)	Offline Inertia Recognition Mode Setting	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0 - Forward and Reverse Motion Recognition Mode. 1 - Unidirectional motion recognition mode.
7.086 (57H)	Offline Inertia Recognition Result	0	0 ~ 65535	R	Immediate change, immediate effect	word	0-Identification failure (re identification is required after adjusting the speed loop gain based on the current speed rigidity. If the speed rigidity is weak, it should be strengthened; otherwise, it should be weakened) Other values (≥ 100) - Identification result=(load mechanical inertia+motor rotor inertia)/motor electronic inertia Unit:% (percentage)
7.090 (5BH)	Self-tuning mode	0	0 ~ 4	R/W	Immediate change, immediate effect	word	0-Off. 1-Standard mode. 2-Positioning mode (focus on overshoot) . 3-Positioning mode (time sensitive) . 4-Trajectory mode.
7.091 (5CH)	Self-tuning response mode	1	0 ~ 2	R/W	Immediate change, immediate effect	word	0-Low response. 1-Medium response. 2-High response.
7.092 (5DH)	Self-tuning inertia	1	0 ~ 1	R/W	Immediate change,	word	0- Do not use inertia identification (correct inertia ratio needs to be

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	recognition				immediate effect		manually set) 1. Use inertia identification
7.093 (5EH)	Self-tuning parameter operation	0	0 ~ 3	R/W	Immediate change, immediate effect	word	1-Save the set of parameters to EEPROM . 2 - Restore the parameters before adjustment . 3-No EEPROM saving and no recovery.
7.094 (5FH)	Self-tuning command source	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0-Internal instructions. 1-User instructions.
7.095 (60H)	Self-tuning internal command displacement	500	50 ~ 65535	R/W	Immediate change, immediate effect	word	Self- tuning internal command motor end displacement. Unit: 0.01r
7.096 (61H)	Self-tuning internal command maximum speed	500	10 ~ 3000	R/W	Immediate change, immediate effect	word	Self- tuning internal command maximum speed. Unit: rpm
7.097 (62H)	Self-tuning internal command acceleration time	100	1 ~ 32767	R/W	Immediate change, immediate effect	word	Self- tuning internal command acceleration time. Unit: ms (milliseconds)
7.098 (63H)	Self-tuning internal command deceleration time	100	1 ~ 32767	R/W	Immediate change, immediate effect	word	Self- tuning internal command deceleration time. Unit: ms (milliseconds)
7.099 (64H)	Self-tuning internal command cycle mode	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0-Forward and reverse 1-One direction operation
7.100 (65H)	Self-tuning internal instruction start direction	0	0 ~ 2	R/W	Immediate change, immediate effect	word	1-Forward start 2-Reverse start
7.101	Self-tuning	300	200 ~ 2000	R/W	Immediate	word	Position command interval time.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(66H)	internal command wait time				change, immediate effect		Unit: ms (milliseconds)
7.102 (67H)	Self-tuning positioning time	0	0 ~ 65535	R	Immediate change, immediate effect	word	Self- tuning positioning time. Unit: ms (milliseconds)
7.103 (68H)	Self- adjustment overshoot	0	0 ~ 65535	R	Immediate change, immediate effect	word	17-bit resolution encoder unit as reference. Unit: Encoder Unit
7.104 (69H)	Self- adjustment overshoot permissible value	10	0 ~ 65535	R/W	Immediate change, immediate effect	word	Self- tuning positioning focuses on the permissible values for overshooting overshoot. 17-bit resolution encoder unit as reference. Unit: Encoder Unit
7.105 (6AH)	Self- tuning gain factor	100	40 ~ 100	R/W	Immediate change, immediate effect	word	Self- tuning factor. Unit:% (percentage)
7.106 (6BH)	Self- tuning state	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	1-Inertia recognition is in progress. 2-Velocity loop parameters are being adjusted. 3, 4 - Position loop and velocity feed forward related gain adjustment. 5-Self- tuning successful (no overshoot). 6-Self- tuning successful (overshoot). 9-Vibration detected at minimum gain. 10-Inertia recognition failed. 15 - External mode does not allow inertia recognition.
7.107 (6CH)	Self-tuning servo enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0 - Invalid. 1-valid.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
7.108 (6DH)	Self-tuning function selection	1	0 ~ 65535	R/W	Immediate change, immediate effect	word	bit0-Self- tuning to enable auto-trapping function, 0-invalid, 1-valid. bit4-Self- tuning enables low-frequency vibration suppression, 0-invalid, 1-effective. bit8-Self- tuning is enabled by current gain, 0-invalid, 1-valid. bit12-Automatically corrects the torque command filter time constant according to the trap setting, 0-invalid, 1-valid.
7.109 (6EH)	Self- tuning speed feedforward limit	1000	0 ~ 1000	R/W	Immediate change, immediate effect	word	Self- tuning speed feedforward permissible maximum value. Unit: %o(kpi)
7.110 (6FH)	Self- tuning automatic trap frequency limit	18004	0 ~ 65535	R/W	Immediate change, immediate effect	word	Trap frequency and speed loop gain limit, 0xFFFF, low to high, corresponding to self-tuning low, medium and high response, and auto-trapping, respectively.
7.111 (70H)	Self- tuning error code recognition	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~3 - Online inertia recognition error code: bit0-Velocity command does not satisfy the recognition condition. bit1-Acceleration command does not fulfil the recognition condition. bit2-Torque command does not fulfil the recognition condition. bit3-System vibration detected. bit4~7-Offline inertia recognition error code: bit4-System vibration detected. bit5-Motor travel too short. bit6-Acceleration/deceleration time too short. bit7 - Failed identification. bit8~11-Mechanical friction recognition error code: bit8-Command does not fulfil the recognition conditions.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit9-Insufficient valid data. bit10-Speed limit, position limit or other faults are triggered. bit11 - Failed to recognise.
7.120 (79H)	Friction Recognition Mode	1	1 ~ 3	R/W	Immediate change, immediate effect	word	Friction Recognition Mode
7.121 (7AH)	Friction recognition positive enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Disable 1- Enable
7.122 (7BH)	Friction identification reversal enable	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- Disable 1- Enable
7.123 (7CH)	Friction identification arrival speed	600	200 ~ 2000	R/W	Immediate change, immediate effect	word	Upper speed limit for friction recognition motion planning. Unit: rpm
7.124 (7DH)	Friction identification one-way travel upper limit	300	100 ~ 65535	R/W	Immediate change, immediate effect	word	Friction recognition planning for unidirectional travel. Unit: 0.01r
7.125 (7EH)	Friction identification acceleration	6400	160 ~ 48000	R/W	Immediate change, immediate effect	word	Acceleration for friction recognition motion planning. Unit: rpm/s
7.126 (7FH)	Friction identification bias value	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: ‰ (thousandths)
7.127 (80H)	Friction identification Coulomb friction value	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: ‰ (thousandths)
7.128 (81H)	Friction identification of viscous	0	0 ~ 3000	R	Immediate change, immediate	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	friction coefficient				effect		
7.130 (83H)	Torque fluctuation self-learning	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- Disable 1- Enable
7.131 (84H)	Torque fluctuation self-learning speed command	30	1 ~ 100	R/W	Shutdown change, immediate effect	word	Speed during self-learning of torque fluctuations. Unit: rpm
7.132 (85H)	Torque fluctuation self-learning state	0	0 ~ 2	R/W	Immediate change, immediate effect	word	0 - Waiting for self-study. 1-Self-study in progress. 2-Self-study completed.
7.133 (86H)	Torque fluctuation self-learning direction of rotation	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0 - Forward rotation. 1 - Reverse rotation.

6.2.8 P8 External Terminal Parameter Group 2008H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
8.000 (01H)	High speed input pulse command type	0	0 ~ 3	R/W	Immediate change, restart take effect.	word	0-P+D pulse input mode 1-A+B orthogonal pulse input mode 2- Reserved 3- Probe position capture mode
8.001 (02H)	High speed input filtering time constant	2	0 ~ 13	R/W	Immediate change, restart take effect.	word	0-222ns. 1-444ns. 2-666ns. 3-888ns. 4-1.333us. 5-1.777us. 6-2.666us. 7-3.555us. 8-4.444us. 9-5.333us.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							10-7.111us. 11-8.888us. 12-10.666us. 13-14.222us.
8.005 (06H)	DIO filtering time constant	2	0 ~ 6	R/W	Immediate change, immediate effect	word	0-500us. 1-1000 us. 2-2000 us. 3-4000 us. 4-8000 us. 5-16000 us. 6-32000 us.
8.006 (07H)	DIO function selection	27	0 ~ 48	R/W	Shutdown change, immediate effect	word	0 - No definition. 1~2-Reserve 3-Quick stop (valid when control command source P2.004_bit1=1). 4-Run enable (valid when control command source P2.004_bit0=1). 5~7-Specially defined commands for different operation modes: Velocity mode: 5~7- Reserve Position mode: 5-command effective, valid on rising edge. 6- Command effective mode, 0- immediate effect, 1- Function terminal No. 5 rising edge trigger effect. 7-Absolute/relative command, 0- absolute, 1-relative. Torque mode: 5~7 - Reserved. 8-Fault reset. 9-Halt. 10- Reserve 11-Clear encoder alarm. 12-Relative position command undo. 13-Clear encoder multi-turn value bit0. 14-Clear position deviation (valid in pulse input mode). 15-Forward jog. 16-Reverse jog.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							17-Control mode bit0. 18-Control mode bit1. 19-Electronic gear selection. 20-Loop gain selection. 21-Multi-segment command selection bit0. 22-Multi-segment command selection bit1. 23-Multi-segment command selection bit2. 24-Multi-segment command selection bit3. 25-Torque limit selection. 26-Multi-segment operation start. 27-Forward limit. 28-Reverse limit. 29-Home origin 30-Disable pulse command input in case of external pulse command input. 31 - Fault record reset (fault reset is active at the same time). 32-Clear encoder multi-turn value bit1. 33-Switching of motor rotation direction. 34- Start homing. 35~80- Reserve
8.007 (08H)	DI0 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.008 (09H)	DI1 filtering time constant	2	0 ~ 6	R/W	Immediate change, immediate effect	word	0-500us. 1-1000 us. 2-2000 us. 3-4000 us. 4-8000 us. 5-16000 us. 6-32000 us.
8.009	DI1 Function	28	0 ~ 48	R/W	Shutdown	word	Reference DI0 Description

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(AH)	Selection				change, immediate effect		
8.010 (BH)	DI1 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.011 (CH)	DI2 filtering time constant	2	0 ~ 6	R/W	Immediate change, immediate effect	word	0-500us. 1-1000 us. 2-2000 us. 3-4000 us. 4-8000 us. 5-16000 us. 6-32000 us.
8.012 (DH)	DI2 function selection	29	0 ~ 48	R/W	Shutdown change, immediate effect	word	Reference DI0 Description
8.013 (EH)	DI2 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.014 (FH)	DI3 Filter Time Constant	2	0 ~ 6	R/W	Immediate change, immediate effect	word	0-500us. 1-1000 us. 2-2000 us. 3-4000 us. 4-8000 us. 5-16000 us. 6-32000 us.
8.015 (10H)	DI3 function selection	8	0 ~ 48	R/W	Shutdown change, immediate effect	word	Reference DI0 Description
8.016 (11H)	DI3 active logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.017 (12H)	DI4 filtering time constant	2	0 ~ 6	R/W	Immediate change, immediate	word	0-500us. 1-1000 us. 2-2000 us.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		3-4000 us. 4-8000 us. 5-16000 us. 6-32000 us.
8.018 (13H)	DI4 function selection	4	0 ~ 48	R/W	Shutdown change, immediate effect	word	Reference DI0 Description
8.019 (14H)	DI4 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.035 (24H)	DO forced output control word	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	bit0~bit15: DO0~DO15 forced output control command word.
8.036 (25H)	DO0 function selection	2	0 ~ 96	R/W	Shutdown change, immediate effect	word	0 - No definition. 1 - Reserved. 2-Main circuit status: 0-not strong electricity, 1- strong electricity. 3-Operation enable status: 0- not enabled, 1- enabled. 4-Fault status: 0-normal, 1-fault. 5-Bus relay status: 0 - open, 1 - close. 6-Quick stop status. 7-Reserved. 8-Warning status. 9- Reserved. 10-Remote control status. 11-Target arrival: Position mode - position arrival. Velocity mode - velocity arrival. Torque mode - torque arrival. 12-Internal limit. 13--Reserved. 14-Reserved. 15-homing complete. 16-Brake output. 17 to 22-Reserved.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							23-Torque arrival. 24-Reserved. 25-Warning/Fault status. 26~80-Reserved. 81~96-DO forced output control word P8.35_bit0~bit15.
8.037 (26H)	DO0 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.038 (27H)	DO1 function selection	4	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to P8.036 for description
8.039 (28H)	DO1 effective logic level selection	1	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
8.040 (29H)	DO2 function selection	16	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to P8.036 for description
8.041 (2AH)	DO2 effective logic level selection	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective

6.2.9 P9 Virtual Terminal Parameter Group 2009H

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
9.000 (01H)	Virtual input VDI setting value	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	bit0~bit15: The setting bit of virtual inputs VDI0~VDI15
9.001 (02H)	Virtual input VDI logic status	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~bit15: The result of valid logic judgement of the set state of virtual input terminals VDI0~VDI15.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
9.002 (03H)	Virtual output VDO output flag	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~bit15: Status bits of virtual output terminals VDO0~VDO15.
9.003 (04H)	Virtual output VDO logic state	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~bit15: Virtual output terminals VDO0~VDO15 output logic state 0-Invalid. 1-Valid.
9.004 (05H)	VDIO function selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	0 - No definition. 1~2- Reserve. 3-Quick stop (valid when control command source P2.004_bit1=1). 4-Run enable (valid when control command source P2.004_bit0=1). 5~7-Specially defined commands for different operation modes: Velocity mode: 5~7-Reserved. Position mode: 5-command effective, valid on rising edge. 6- Command effective mode, 0- immediate effect, 1- Function terminal No. 5 rising edge trigger effect. 7-Absolute/relative command, 0- absolute, 1-relative. Torque mode: 5~7-Reserve. 8-Fault reset. 9-Suspend stop. 10- Reserve. 11-Clear encoder alarm. 12-Relative position command undo. 13-Clear encoder multi-turn value bit0. 14-Clear position deviation (valid in pulse input mode). 15-Forward jog. 16-Reverse jog.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							17-Control mode bit0. 18-Control mode bit1. 19-Electronic gear selection. 20-Loop gain selection. 21-Multi-segment command selection bit0. 22-Multi-segment command selection bit1. 23-Multi-segment command selection bit2. 24-Multi-segment command selection bit3. 25-Torque limit selection. 26-Multi-segment operation start. 27-Forward limit. 28-Reverse limit. 29-Home return. 30-Disable pulse command input in case of external pulse command input. 31 - Fault record reset (fault reset is active at the same time). 32-Clear encoder multi-turn value bit1. 33-Switching of motor rotation direction. 34- Start homing. 35~80 - Reserved.
9.005 (06H)	VDI0 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.006 (07H)	VDI1 Function Selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	Refer to VDI0 description
9.007 (08H)	VDI1 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
9.008 (09H)	VDI2 function selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	Refer to VDI0 description
9.009 (AH)	VDI2 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.010 (BH)	VDI3 function selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	Refer to VDI0 description
9.011 (CH)	VDI3 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.012 (DH)	VDI4 function selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	Refer to VDI0 description
9.013 (EH)	VDI4 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.014 (FH)	VDI5 function selection	0	0 ~ 48	R/W	Shutdown change, immediate effect	word	Refer to VDI0 description
9.015 (10H)	VDI5 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.036 (25H)	VDO0 function selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	0 - No definition. 1 - Reserved. 2-Main circuit status: 0-not strong electricity, 1- strong electricity. 3-Operation enable status: 0- not enabled, 1- enabled. 4-Fault status: 0-normal, 1-fault. 5-Bus relay status: 0 - open, 1 -

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							close. 6-Quick stop status. 7-Reserved. 8-Warning status. 9- Reserved. 10-Remote control status. 11-Target arrival: Position mode - position arrival. Velocity mode - velocity arrival. Torque mode - torque arrival. 12-Internal limit. 13--Reserved. 14-Reserved. 15-homing complete. 16-Brake output. 17 to 22-Reserved. 23-Torque arrival. 24-Reserved. 25-Warning/Fault status. 26~80-Reserved. 81~96-DO forced output control word P8.35_bit0~bit15.
9.037 (26H)	VDO0 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.038 (27H)	VDO1 function selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to VDO0 description
9.039 (28H)	VDO1 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.040 (29H)	VDO2 function selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to VDO0 description
9.041 (2AH)	VDO2 logic effective	0	0 ~ 1	R/W	Shutdown change,	word	0- High level effective 1- Low level effective

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	level				immediate effect		
9.042 (2BH)	VDO3 function selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to VDO0 description
9.043 (2CH)	VDO3 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.044 (2DH)	VDO4 function selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to VDO0 description
9.045 (2EH)	VDO4 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective
9.046 (2FH)	VDO5 Function Selection	0	0 ~ 96	R/W	Shutdown change, immediate effect	word	Refer to VDO0 description
9.047 (30H)	VDO5 logic effective level	0	0 ~ 1	R/W	Shutdown change, immediate effect	word	0- High level effective 1- Low level effective

6.2.10 PA Multi- segment instruction parameter group (200AH)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.000 (01H)	Multi- segment running mode selection	0	0 ~ 3	R/W	Shutdown change, immediate effect	word	0- Multi-stage action consecutive single run. 1- Multi-stage action continuous cycle operation. 2-DI terminal Select multi- segment operation. 3- Run sequentially (only positional action planning works).

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.001 (02H)	Start segment selection	0	0 ~ 15	R/W	Shutdown change, immediate effect	word	Select one of the 0 to 15 actions as the start action.
A.002 (03H)	End segment selection	0	0 ~ 15	R/W	Shutdown change, immediate effect	word	Select one of the movements from 0 to 15 as the end movement.
A.003 (04H)	Current running segment	0	0 ~ 65535	R	Immediate change, immediate effect	word	Displays the currently running action segment.
A.004 (05H)	The 0th position/ velocity command	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.006 (07H)	Acceleration time for segment 0	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.007 (08H)	Deceleration time for segment 0	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.008 (09H)	Max. running velocity for segment 0	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.009 (AH)	Segment 0 Run/wait time	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.010 (BH)	Position/velo city command for segment 0	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.012 (DH)	Acceleration time for	100	1 ~ 65535	R/W	Immediate change,	word	Acceleration time. Unit: ms (milliseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
	segment 1				immediate effect		
A.013 (EH)	Deceleration time for segment 1	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.014 (FH)	Max. running velocity for segment 1	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.015 (10H)	Run/wait time for segment 1	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.016 (11H)	Position/velo city command for segment 2	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.018 (13H)	Acceleration time for segment 2	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.019 (14H)	Deceleration time for paragraph 2	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.020 (15H)	Max. running velocity for segment 2	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.021 (16H)	Run/wait time for segment 2	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.022 (17H)	Position/velo city	0	-2147483648 ~	R/W	Immediate change,	Dword	Position commands for position planning and velocity commands

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
	command for segment 0		2147483647		immediate effect		for velocity planning.
A.024 (19H)	Acceleration time for segment 3	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.025 (1AH)	Deceleration time for paragraph 3	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.026 (1BH)	Max. running velocity for segment 3	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.027 (1CH)	Run/wait time for segment 3	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.028 (1DH)	Position/velo city command for segment 0	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.030 (1FH)	Acceleration time for segment 4	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.031 (20H)	Deceleration time for paragraph 4	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.032 (21H)	Max. running velocity for segment 4	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.033 (22H)	Run/wait time for segment 4	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
							the motion. Unit: 0.1s
A.034 (23H)	Position/velocity command for segment 0	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.036 (25H)	Acceleration time for segment 5	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.037 (26H)	Deceleration time for paragraph 5	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.038 (27H)	Max. running velocity for segment 5	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.039 (28H)	Run/wait time for segment 5	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.040 (29H)	Position/velocity command for segment 0	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.042 (2BH)	Acceleration time for segment 6	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.043 (2CH)	Deceleration time for paragraph 6	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.044 (2DH)	Max. running velocity for segment 6	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.045 (2EH)	Run/wait time for segment 6	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.046 (2FH)	Position/velocity command for segment 7	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.048 (31H)	Acceleration time for segment 7	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.049 (32H)	Deceleration time for paragraph 7	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.050 (33H)	Max. running velocity for segment 7	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.051 (34H)	Run/wait time for segment 7	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.052 (35H)	Position/velocity command for segment 8	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.054 (37H)	Acceleration time for segment 8	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.055 (38H)	Deceleration time for paragraph 8	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.056 (39H)	Max. running velocity for segment 8	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.057 (3AH)	Run/wait time for segment 8	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.058 (3BH)	Position/velo city command for segment 9	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.060 (3DH)	Acceleration time for segment 9	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.061 (3EH)	Deceleration time for paragraph 9	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.062 (3FH)	Max. running velocity for segment 9	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.063 (40H)	Run/wait time for segment 9	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.064 (41H)	Position/velo city command for segment 10	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.066 (43H)	Acceleration time for segment 10	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.067 (44H)	Deceleration time for segment 10	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.068 (45H)	Max. running velocity for segment 10	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.069 (46H)	Run/wait time for segment 10	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.070 (47H)	Position/velo city command for segment 11	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.072 (49H)	Acceleration time for segment 11	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.073 (4AH)	Deceleration time for segment 11	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.074 (4BH)	Max. running velocity for segment 11	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.075 (4CH)	Run/wait time for segment 11	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.076 (4DH)	Position/velo city command for segment 12	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
A.078 (4FH)	Acceleration time for segment 12	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.079 (50H)	Deceleration time for segment 12	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.080 (51H)	Max. running velocity for segment 12	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.081 (52H)	Run/wait time for segment 12	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.082 (53H)	Position/velocity command for segment 13	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.084 (55H)	Acceleration time for segment 13	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.085 (56H)	Deceleration time for segment 13	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.086 (57H)	Max. running velocity for segment 13	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.087 (58H)	Run/wait time for segment 13	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.088	Position/velocity	0	-2147483648	R/W	Immediate	Dword	Position commands for position

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
(59H)	city command for segment 14		~ 2147483647		change, immediate effect		planning and velocity commands for velocity planning.
A.090 (5BH)	Acceleration time for segment 14	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.091 (5CH)	Deceleration time for segment 14	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.092 (5DH)	Max. running velocity for segment 14	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity when planning the location. Unit: rpm
A.093 (5EH)	Run/wait time for segment 14	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	When planning position, it is the waiting time after the motion is completed, and when planning velocity, it is the running time of the motion. Unit: 0.1s
A.094 (5FH)	Position/velo city command for segment 15	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	Position commands for position planning and velocity commands for velocity planning.
A.096 (61H)	Acceleration time for segment 15	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Acceleration time. Unit: ms (milliseconds)
A.097 (62H)	Deceleration time for segment 15	100	1 ~ 65535	R/W	Immediate change, immediate effect	word	Deceleration time. Unit: ms (milliseconds)
A.098 (63H)	Max. running velocity for segment 15	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	Maximum velocity limit when planning location. Unit: rpm
A.099 (64H)	Paragraph 15 run/wait time	0	0 ~ 65535	R/W	Immediate change, immediate	word	When planning the position, the parameter indicates the waiting time after the completion of the

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	Length	Description
					effect		movement of the segment, and when planning the velocity, the parameter indicates the running time of the segment. Unit: 0.1s

6.2.11 PB Communication Interaction Parameter Group 200BH

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
B.000 (01H)	Panel software version	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.001 (02H)	Panel Password	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.002 (03H)	Panel Lock	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.003 (04H)	Panel Display Menu Type	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.004 (05H)	Panel parameter backup/downlo ad	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.005 (06H)	Panel Input Digital Quantity	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	
B.006 (07H)	Panel Default Display Settings	0	0 ~ 17	R/W	Immediate change, restart take effect.	word	0-Feedback rotation speed. 1-Feedback torque. 2-Position deviation. 3-Control mode. 4-Status of DI terminal.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							5-DO terminal status. 6-History of faults. 7-Drive programme. 8-Braking load ratio. 9-Load inertia ratio. 10-Feedback pulse. 11-Command pulse. 12-External deviation count (reserved). 13-External feedback pulses (reserved). 14-Automatic motor recognition (reserved). 15-Analogue input. 16- Reasons for motor non-rotation. 17-System operation status.
B.010 (BH)	Panel display speed feedback filter time constant	3000	0 ~ 65535	R/W	Immediate change, immediate effect	word	Unit: 0.01ms
B.020 (15H)	Modbus slave address	1	0 ~ 127	R/W	Immediate change, restart take effect.	word	Modbus slave address, when the master requests a slave address of 0 (i.e. broadcast mode), the Modbus slave will execute the master's request command but will not answer, when the master requests a non-zero slave address, the slave with the same address as the request will execute the master's command and answer.
B.021 (16H)	Modbus baud rate	2	0 ~ 5	R/W	Immediate change, restart take effect.	word	0-4800bps. 1-9600bps. 2-19200bps. 3-38400bps.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							4-57600bps. 5-115200bps.
B.022 (17H)	Modbus data format	0	0 ~ 3	R/W	Immediate change, restart take effect.	word	0-even check, 1 stop bit 1-Odd check, 1 stop bit 2- No verification, 1 stop bit 3- No verification, 2 stop bits
B.023 (18H)	Modbus master big-endian and little-endian	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0- big-endian. 1- little-endian
B.024 (19H)	Modbus High/Low Bit Word Sequence	0	0 ~ 1	R/W	Immediate change, immediate effect	word	0 - High16 bits in front, low 16 bits in back. 1 - Low 16 bits before, high 16 bits after. (valid only for 32-bit parameters, or when a 64-bit parameter is split into two 32-bit parameter accesses)
B.025 (1AH)	Modbus communication disconnection detection time	0	0 ~ 200	R/W	Immediate change, immediate effect	word	(When the connection is disconnected for more than that time, a communication disconnection warning is reported): 0-No detection. 1~200-0.1~20s. Unit: 0.1s
B.026 (1BH)	Modbus command response delay Time	0	0 ~ 200	R/W	Immediate change, immediate effect	word	Delay time for Modbus communication in response to a command from the master. Unit: ms (milliseconds)
B.030 (1FH)	Data logging operating mode	0	0 ~ 1	R/W	Immediate change, immediate effect	word	
B.031	Data logging	0	0 ~ 11	R/W	Immediate	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(20H)	fault record number request				change, immediate effect		
B.032 (21H)	Data logging execution status	0	0 ~ 1	R/W	Immediate change, immediate effect	word	
B.033 (22H)	Data Logging Trigger Objects	0	0 ~ 12	R/W	Immediate change, immediate effect	word	
B.034 (23H)	Data logging trigger level	0	-922337203 6854770000 ~ 9223372036 854770000	R/W	Immediate change, immediate effect	quadw ord	
B.038 (27H)	Data Logging Arbitrary Trigger Parameter Address	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.039 (28H)	Data logging trigger conditions	0	0 ~ 2	R/W	Immediate change, immediate effect	word	
B.040 (29H)	Data logging trigger setting	0	0 ~ 100	R/W	Immediate change, immediate effect	word	
B.041 (2AH)	Data record trigger success data index	0	0 ~ 8191	R/W	Immediate change, immediate effect	word	
B.042 (2BH)	Data Logging Data Upload Handshake Flag	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.043 (2CH)	Data logging data upload failure reasons	0	0 ~ 65535	R	Immediate change, immediate	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
B.044 (2DH)	Data logging sampling period setting	1	1 ~ 1000	R/W	Immediate change, immediate effect	word	
B.045 (2EH)	Data logging sample point setting	0	0 ~ 8192	R/W	Immediate change, immediate effect	word	
B.046 (2FH)	Data logging channel number setting	1	1 ~ 8	R/W	Immediate change, immediate effect	word	
B.047 (30H)	Data logging channel 0 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.048 (31H)	Data logging channel 1 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.049 (32H)	Data logging channel 2 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.050 (33H)	Data logging channel 3 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.051 (34H)	Data logging channel 4 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.052 (35H)	Data logging channel 5 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.053 (36H)	Data logging channel 6 setting	0	0 ~ 65535	R/W	Immediate change, immediate	word	

Address (Sub index)	Param Name	Default t value	Parameter range	R/W	Change and effective	length	Description
					effect		
B.054 (37H)	Data logging channel 7 setting	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
B.055 (38H)	Curve Trace Execution Status	0	0 ~ 4	R/W	Immediate change, immediate effect	word	
B.056 (39H)	Curve Trace Given Type	0	0 ~ 2	R/W	Immediate change, immediate effect	word	
B.070 (47H)	CAN Baud Rate	0	0 ~ 5	R/W	Immediate change, restart take effect.	word	0-1Mbps;1-500kbps;2- 250kbps;3-125kbps;4- 100kbps;5-50kbps;
B.080 (51H)	EtherCAT link layer status	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit4-Port 0 physical link, 0-no link, 1-link detected. bit5-Port 1 physical link, 0-no link, 1-link detected. Other - Reserved.
B.081 (52H)	EtherCAT Port0 Error Statistics	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.082 (53H)	EtherCAT Port1 Error Statistics	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.083 (54H)	EtherCAT Receive Error Statistics	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.084 (55H)	EtherCAT Processing Unit Error Statistics	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.085 (56H)	EtherCAT Sync0 Signal Time	0	0 ~ 65535	R	Immediate change, immediate	word	Unit: 0.1us (microseconds)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
B.086 (57H)	EtherCAT packet loss compensation	0	0 ~1	R/W	Immediate change, immediate effect	word	0 - do not enable packet loss compensation function, 1 - enable packet loss compensation function
B.090 (5BH)	EtherCAT Synchronous Scan Cycle	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	EtherCAT synchronous scan period. Unit: ns (nanoseconds)
B.092 (5DH)	EtherCAT Application Layer PDO Inhibit Time	100	0 ~ 65535	R/W	Immediate change, restart take effect.	word	単位: 0.1ms
B.093 (5EH)	EtherCAT Application Layer Status	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0~3-Actual state of slave, 1-Initialisation state. 2-Pre-run state. 3 - Bootstrap state. 4-Safe operation state. 8-Operation state. bit4-AL error indication, 0- Slave is in the requested state or flag is cleared, 1- Device is not in the requested state or changed state after local operation. bit5~15-Reservation .
B.100 (65H)	DS402 Control Word	0	0 ~ 65535	R	Immediate change, immediate effect	word	6040h
B.101 (66H)	DS402 status word	0	0 ~ 65535	R	Immediate change, immediate effect	word	6041h
B.102 (67H)	DS402 speed mode target speed	0	-32768 ~ 32767	R	Immediate change, immediate	word	6042h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
B.103 (68H)	DS402 Speed Ramp Command	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	6043h
B.104 (69H)	DS402 output control speed	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	6044h
B.106 (6BH)	DS402 lower speed limit (positive and negative)	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6046h-1
B.108 (6DH)	DS402 upper speed limit (forward and reverse)	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6046h-2
B.110 (6FH)	DS402 acceleration step amount	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6048h-1
B.112 (71H)	DS402 acceleration step corresponding time	0	0 ~ 65535	R	Immediate change, immediate effect	word	6048h-2
B.114 (73H)	DS402 deceleration step amount	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6049h-1
B.116 (75H)	DS402 deceleration step corresponding time	0	0 ~ 65535	R	Immediate change, immediate effect	word	6049h-2
B.117 (76H)	DS402 operating mode	8	-128 ~ 127	R	Immediate change, immediate effect	word	6060h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
B.118 (77H)	DS402 display operation mode	0	-128 ~ 127	R	Immediate change, immediate effect	word	6061h
B.119 (78H)	DS402 control mode	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.120 (79H)	DS402 Position Deviation Excessive Threshold	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6065h Unit: Encoder Unit
B.122 (7BH)	The time when the position deviation of DS402 is large	0	0 ~ 65535	R	Immediate change, immediate effect	word	6066h Unit: ms (milliseconds)
B.124 (7DH)	DS402 speed sensor value	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	6069h
B.126 (7FH)	DS402 speed sensor selection	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	606Ah
B.127 (80H)	DS402 speed arrival time window	0	0 ~ 65535	R	Immediate change, immediate effect	word	606Eh Unit: ms (milliseconds)
B.128 (81H)	DS402 zero speed reaches threshold	10	0 ~ 65535	R	Immediate change, immediate effect	word	606Fh Unit: rpm
B.129 (82H)	DS402 Zero Speed Arrival Time Window	10	0 ~ 65535	R	Immediate change, immediate effect	word	6070h Unit: ms (milliseconds)
B.130 (83H)	DS402 target torque	0	-4000 ~ 4000	R	Immediate change, immediate effect	word	6071h Unit: ‰ (parts per thousand)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
B.131 (84H)	DS402 maximum current in thousandths	3000	0 ~ 4000	R	Immediate change, immediate effect	word	6072h
B.132 (85H)	DS402 target position synchronized interpolation rhythm	0	0 ~ 65535	R	Immediate change, immediate effect	word	
B.134 (87H)	DS402 target position	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	607Ah
B.136 (89H)	DS402 synchronizes target position	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	
B.138 (8BH)	DS402 home deviation	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	607Ch
B.141 (8EH)	DS402 instruction polarity	0	0 ~ 65535	R	Immediate change, immediate effect	word	607Eh
B.142 (8FH)	DS402 maximum profile speed	65536 00	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	607Fh
B.144 (91H)	DS402 profile speed	10922 67	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6081h
B.146 (93H)	DS402 profile acceleration	21845 333	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6083h
B.148 (95H)	DS402 profile deceleration	21845 333	0 ~ 4294967295	R	Immediate change, immediate	Dword	6084h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
B.150 (97H)	DS402 profile maximum acceleration	4.29E +09	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	60C5
B.152 (99H)	DS402 profile maximum deceleration	4.29E +09	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	60C6
B.154 (9BH)	DS402 rapid parking deceleration	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6085h
B.156 (9DH)	DS402 motion profile type	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	6086h
B.158 (9FH)	DS402 torque ramp	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6087h
B.160 (A1H)	DS402 torque profile type	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	6088h
B.162 (A3H)	DS402 motor shaft resolution	1	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6091h-1
B.164 (A5H)	DS402 drive axis resolution	1	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6091h-2
B.166 (A7H)	DS402 homing mode	0	-128 ~ 127	R	Immediate change, immediate effect	word	6098h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
B.168 (A9H)	DS402 homing speed	10922 67	0 ~ 429496729 5	R	Immediate change, immediate effect	Dword	6099h-1
B.170 (ABH)	DS402 homing Zero Speed	21845 3	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	6099h-2
B.172 (ADH)	DS402 homing acceleration	21845 333	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	609Ah
B.174 (AFH)	DS402 position offset	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	60B0h
B.176 (B1H)	DS402 speed bias	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	60B1h
B.178 (B3H)	DS402 torque bias	0	-4000 ~ 4000	R	Immediate change, immediate effect	word	60B2h Unit: ‰ (thousandths)
B.179 (B4H)	DS402 Forward Maximum Torque Limit	3000	0 ~ 4000	R	Immediate change, immediate effect	word	60E0h Unit: ‰ (thousandths)
B.180 (B5H)	DS402 Reverse Maximum Torque Limit	3000	0 ~ 4000	R	Immediate change, immediate effect	word	60E1h Unit: ‰ (thousandths)
B.182 (B7H)	DS402 Digital Switching Input Status	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	60FDh
B.184 (B9H)	DS402 Trajectory Planning Target Speed	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	60FFh

Address (Sub index)	Param Name	Default t value	Parameter range	R/W	Change and effective	length	Description
B.186 (BBH)	DSP402 Reverse Maximum Position	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	607Dh-1
B.188 (BDH)	DSP402 Positive Maximum Position	0	-2147483648 ~ 2147483647	R/W	Immediate change, immediate effect	Dword	607Dh-2
B.190 (BFH)	DS402 digital switching output control	0	0 ~ 4294967295	R/W	Immediate change, immediate effect	Dword	60FE

6.2.12 PC Fault Management Parameter Group 200CH

Address (Sub index)	Param Name	Default t value	Parameter range	R/W	Change and effective	length	Description
C.000 (01H)	Severe Fault Shutdown Mode S4	0	0 ~ 2	R/W	Shutdown change, immediate effect	word	0 - Free-running stop, free rotation after motor stop. 1- (Reserved) . 2- (Reserved) .
C.001 (02H)	General Fault/Warning Shutdown Mode S5	0	0 ~ 10	R/W	Shutdown change, immediate effect	word	0 - Free running stop, free rotation after motor stop. 1- (Reserved). 3-(Reserved). 4-Set the running stop according to the deceleration time 0, the motor can rotate freely after stopping. 5-Running stop by deceleration time 1, motor can rotate freely after stopping. 6-(Reserved). 7-(Reserved). 8-(Reserved). 8-(Reserved). 9-(Reserved). 10-(Reserved)..
C.002	Over-travel	0	0 ~ 2	R/W	Shutdown	word	0 - Run stop set by quick stop

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(03H)	warning stop mode S6				change, immediate effect		deceleration time, in position mode the motor runs in position mode and locks in position after stopping, in other modes the motor runs in speed mode and locks in zero speed after stopping. 1 - Running stop set by quick stop deceleration time, motor can rotate freely after stopping. 2-Free running stop, the motor can rotate freely after stopping.
C.006 (07H)	General Fault Mask Word 0	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Power supply & inverter: bit0-Er.030 Main circuit overvoltage - not maskable. bit1-Er.031 Main circuit undervoltage - not maskable. bit2-Er.032 Control overvoltage - non-maskable. bit3-Er.032 Control overvoltage - not shieldable. bit3-Er.033 Control undervoltage - not shieldable. bit4-Er.034 DC bus discharge resistor overload - not maskable. bit5-Er.035 Soft start resistor overload (reserved) - not maskable. bit16-Er.130 Mains inverter - not maskable. bit16-Er.130 Main inverter bridge overheat - not maskable. bit17-Er.131 Continuous overload of the main inverter bridge - not maskable. bit18-Er.132 Continuous overload of the main inverter bridge - not maskable. bit18-Er.132 Instantaneous overload of the main inverter bridge - not maskable.
C.008 (09H)	General Fault Mask Word 1	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Motor & Encoder: bit0-Er.230 Flying car - shieldable . bit1-Er.231 Motor overspeed - not maskable.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit2-Er.232 Motor sustained overload - not maskable. bit3-Er.233 Motor transient overload - not maskable. bit4-Er.234 Motor overload - not maskable. bit4-Er.234 Motor blocking (hold) - can be masked. bit5-Er.235 Motor overload - not maskable. bit5-Er.235 Motor overheat (reserved) - can be blocked. bit6-Er.236 Enable motor overheating (reserved) - can be blocked. bit6-Er.236 Motor speed too fast when enabled - can be blocked. bit7-Er.237 Abnormal motor vibration - can be blocked. bit16-Er.330 Encoder battery failure -maskable. bit17-Er.331 Error in encoder revolution calculation - maskable. bit18-Er.332 Error in encoder revolution calculation - maskable. bit18-Er.332 Encoder multiturn count overflow-maskable. bit19-Er.333 Encoder overheating (reserved) -maskable. bit20-Er.334 Encoder overspeed - maskable. bit21-Er.335 Encoder multiturn value abnormality - maskable. bit22-Er.336 Encoder operating mode not supported - unmaskable.
C.010 (BH)	General Fault Mask Word 2	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Interaction: bit0-Er.530 EDI function setting error - not maskable. bit1-Er.531 Position deviation too large - not maskable. bit2-Er.532 Position command increment abnormality (reserved) - maskable.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit3-Er.533 Electronic gear ratio setting range exceeded - not maskable. bit4-Er.534 STO signal input alarm (reserved) - not maskable. bit5-Er.535 485 communication disconnection - maskable. bit6- Er.536 CAN/EtherCAT communication disconnected - can be blocked. bit7-Er.537 Runtime limit reached - not maskable. bit8-Er.538 Profinet communication disconnected - can be masked. bit9-Er.539 VDI function setting error - not maskable. bit10-Er.540 Parameter self-tuning failure - not maskable. bit11-Er.541 Control board over- temperature - not maskable. bit12-Er.542 Excessive position deviation due to speed limit - not maskable. bit13-Er.543 Position command data too large - not maskable. bit14-Er.544 Position command increment too large - not maskable. bit15-Er.545 Loss of bus synchronisation signal - not maskable. bit16-Er.546 Bus network state switching abnormality - not maskable. bit17-Er.547 Unreliable bus network connection - not maskable. bit18-Er.548 Digital limit position setting error - not maskable. bit19-Er.549 Error in home position

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							setting - not maskable. bit20-Er.550 EtherCAT synchronisation period setting error - not maskable. bit21-Er.551 EtherCAT sync period error too large - not maskable. bit22-Er.552 Missing PLC control - unmaskable.
C.012 (DH)	General Fault Mask Word 3	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Reserved
C.014 (FH)	Warning Masked Word 0	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Power Supplies & amp. inverters & amp. motors & amp. Encoder: bit0-AL.080 DC bus discharge resistor overload warning - shieldable . bit1-AL.081 Mains undervoltage warning -maskable. bit2-AL.082 Abnormal main circuit power input -maskable. bit8-AL.180 Inverter overload warning -maskable. bit16-AL.280 Motor overload warning -maskable. bit24-AL.380 Absolute encoder battery low -maskable. bit25-AL.381 Encoder overheat warning -maskable.
C.016 (11H)	Warning Masked Word 1	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	Interaction:
C.018 (13H)	internal anomaly mask word	0x000 00000	0 ~ 4294967295	R/W	Immediate change, restart take effect.	Dword	bit0-AL.580 Back to original action timeout -maskable. bit1-AL.581 ESC startup failure -maskable. bit2-AL.582 Parameter save frequently -maskable. bit3-AL.583 Positive overtravel warning -

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							maskable. bit4-AL.584 Reverse overtravel warning -maskable. bit5-AL.585 Speed output range overrun (4-axis frequency converter) -maskable.
C.020 (15H)	Current worst fault code	0	0 ~ 65535	R	Immediate change, immediate effect	word	Specific reference to chapter 9 Fault Description (V9 version)
C.021 (16H)	All current alarm code rounds	0	0 ~ 65535	R	Immediate change, immediate effect	word	If multiple faults or warnings have occurred at the same time, all faults or warnings are displayed at 300ms intervals, otherwise it is the same as P12.20.
C.022 (17H)	Alarm Trigger Status Record	0	0 ~ 65535	R	Immediate change, immediate effect	word	The marking of whether the system has been faulted at the time of alarm corresponds to the alarm history bit by bit, and the lowest bit corresponds to the alarm history 0.
C.024~ C.039 (19H~28 H)	Alarm History 0~15	0	0 ~ 65535	R	Immediate change, immediate effect	word	Specific reference to chapter 9 Fault Description (V9 version)
C.040 (29H)	Alarm history timestamp 0	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.042 (2BH)	Alarm history timestamp 1	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.044	Alarm history	0	0 ~	R	Immediate	Dword	Unit: 0.1h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(2DH)	timestamp 2		4294967295		change, immediate effect	rd	
C.046 (2FH)	Alarm history timestamp 3	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.048 (31H)	Alarm history timestamp 4	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.050 (33H)	Alarm history timestamp 5	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.052 (35H)	Alarm history timestamp 6	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.054 (37H)	Alarm history timestamp 7	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.056 (39H)	Alarm history timestamp 8	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.058 (3BH)	Alarm history timestamp 9	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.060 (3DH)	Alarm history timestamp 10	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.062 (3FH)	Alarm history timestamp 11	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.064	Alarm history	0	0 ~	R	Immediate	Dword	Unit: 0.1h

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(41H)	timestamp 12		4294967295		change, immediate effect	rd	
C.066 (43H)	Alarm history timestamp 13	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.068 (45H)	Alarm history timestamp 14	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.070 (47H)	Alarm history timestamp 15	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Unit: 0.1h
C.072 (49H)	Power-on locked the last fault	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	
C.073 (4AH)	Bus voltage at last failure	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
C.074 (4BH)	Output torque at last failure	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
C.075 (4CH)	Rotational velocity at the time of the latest fault	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	単位: rpm
C.078 (4FH)	The highest bus voltage in history	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
C.079 (50H)	Historical maximum output current	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
C.080 (51H)	Historical highest inverter module temperature	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1 °C (Celsius)
C.081 (52H)	Reason for motor not turning	0	0 ~ 65535	R	Immediate change, immediate effect	word	
C.082 (53H)	Overload detection base current gain	100	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.083 (54H)	Intermediate current gain for overload detection	100	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.084 (55H)	Maximum current gain for overload detection	100	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.085 (56H)	Motor overload detection derating	100	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.086 (57H)	Inverter overload detection derating	50	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.087 (58H)	Overload warning ratio	70	0 ~ 65535	R	Immediate change, immediate effect	word	Unit:% (percentage)
C.088 (59H)	Motor continuous overload alarm threshold	0	0 ~ 2147483647	R	Immediate change, immediate effect	Word	
C.090 (5BH)	Motor instantaneous	0	0 ~ 2147483647	R	Immediate change,	Word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	s overload alarm threshold				immediate effect		
C.092 (5DH)	Accumulated value of continuous overload detection of motor	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.094 (5FH)	Accumulated value of motor instantaneous overload detection	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.096 (61H)	Servo continuous overload alarm threshold	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.098 (63H)	Servo instantaneous overload alarm threshold	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.100 (65H)	Cumulative value of servo continuous overload detection	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.102 (67H)	Cumulative value of servo instantaneous overload detection	0	0 ~ 2147483647	R	Immediate change, immediate effect	Dword	
C.104 (69H)	Discharge resistance load rate	0	0 ~ 65535	R	Immediate change, immediate	word	Average loading ratio of discharge resistor in 10s. Unit:% (percentage)

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
	(10s)				effect		
C.105 (6AH)	Discharge resistance load ratio (2ms)	0	0 ~ 65535	R	Immediate change, immediate effect	word	Instantaneous load rate of discharge resistance. Unit:% (percentage)
C.106 (6BH)	Flying car torque judgement threshold	2000	1000 ~ 4000	R/W	Immediate change, immediate effect	word	This alarm can be blocked by a mask.
C.107 (6CH)	Speed judgement threshold	100	1 ~ 1000	R/W	Immediate change, immediate effect	word	Unit: ‰
C.108 (6DH)	Velocity filtering time for flying cars	40	1 ~ 1000	R/W	Immediate change, immediate effect	word	Sets the speed feedback filtering time for fly-by-wire protection detection. This alarm can be masked by the mask word. Unit: 0.1ms
C.109 (6EH)	Flying car protection detection time	600	10 ~ 1000	R/W	Immediate change, immediate effect	word	The flyer is effectively detected continuously for more than that time, reporting a flyer fault. This alarm can be blocked by a mask. Unit: ms

6.2.13 PD status monitoring parameter group 2000DH

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
D.000 (01H)	Run time	0	0 ~ 4294967295	R	Immediate change, immediate effect	Dword	Total power-on time of the drive. Unit: 0.1h
D.002 (03H)	High velocity input pulse counting	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	External terminal high-velocity pulse input counts.
D.004	DI terminal	0	0 ~ 65535	R	Immediate	word	bit0 ~ bit15: indicates the level

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(05H)	level status				change, immediate effect		of external input terminals DI0 to DI15.
D.005 (06H)	DO terminal level status	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0 ~ bit15: level status of external output terminals DO0 to DO15.
D.006 (07H)	AI0 digital input voltage	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	
D.007 (08H)	AI1 digital input voltage	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	
D.008 (09H)	AI2 input voltage digital	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	
D.009 (AH)	AI0 input voltage	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: 0.01V
D.010 (BH)	AI1 Input Voltage	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: 0.01V
D.011 (CH)	AI2 input voltage	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: 0.01V
D.012 (DH)	AO0 output voltage	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01V
D.013 (EH)	AO1 output voltage	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01V
D.014	AO2 output	0	0 ~ 65535	R	Immediate	word	Unit: 0.01V

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(FH)	voltage				change, immediate effect		
D.020 (15H)	Physical value of main circuit bus voltage	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
D.021 (16H)	Physical value of control bus voltage	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1V
D.022 (17H)	Physical value of phase A feedback current	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
D.023 (18H)	Physical value of phase B feedback current	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
D.024 (19H)	Physical value of phase C feedback current	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.01A
D.025 (1AH)	Physical value of inverter bridge temperature	0	0 ~ 65535	R	Immediate change, immediate effect	word	Unit: 0.1°C (degrees C)
D.029 (1EH)	Number of times the main circuit bus is powered on	0	0 ~ 65535	R	Immediate change, immediate effect	word	
D.030	Encoder	0	-9223372036	R	Immediate	quadw	Unit: Encoder Unit

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
(1FH)	unit position instruction		854770000 ~ 9223372036 854770000		change, immediate effect	ord	
D.034 (23H)	Encoder unit position feedback	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Encoder Unit
D.038 (27H)	Encoder unit position deviation	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	Unit: Encoder Unit
D.040 (29H)	User position instruction	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Instruction Unit
D.044 (2DH)	User position feedback	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Instruction Unit
D.048 (31H)	User velocity instruction	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	Unit: var (variable) P4.4 'Velocity unit selection' = 0, 0.1rpm. When P4.4 'Velocity unit selection' = 1, 1rpm.
D.050 (33H)	User velocity feedback	0	-2147483648 ~ 2147483647	R	Immediate change, immediate effect	Dword	Unit: var (variable) P4.4 'Velocity unit selection' = 0, 0.1rpm. When P4.4 'Velocity unit selection' = 1, 1rpm.
D.052 (35H)	User micrometer ratio torque instruction	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
D.053 (36H)	User micrometer ratio torque feedback	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Unit: ‰ (parts per thousand)
D.054 (37H)	User digital torque instruction	0	-32768 ~ 32767	R	Immediate change, immediate	word	

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
					effect		
D.055 (38H)	User digital torque feedback	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	
D.060 (3DH)	System state	0	0 ~ 65535	R	Immediate change, immediate effect	word	0- Initialization status. 1- Prepare to be powered on. 2- Standby state. 3- Enable status. 4- Reserve. 5- Fault diagnosis status. 6- Firmware program upgrade status. 7- User program upgrade status. 8- Power off status.
D.064 (41H)	PWM enable status	0	0 ~ 65535	R	Immediate change, immediate effect	word	
D.065 (42H)	Source of control	0	0 ~ 65535	R	Immediate change, immediate effect	word	
D.066 (43H)	Control mode output	0	0 ~ 65535	R	Immediate change, immediate effect	word	0- Velocity mode. 1- Position mode. 2- Torque mode.
D.067 (44H)	Load instantane ous power ratio	0	-32768 ~ 32767	R	Immediate change, immediate effect	word	Feedback torque * Feedback velocity/rated velocity. Unit: ‰ (parts per thousand)
D.070 (47H)	Probe 0 and probe 1 functions	0	0 ~ 65535	R/W	Immediate change, immediate effect	word	bit0- Probe 0 switch, 0- off, 1- Enable. bit1- Probe 0 trigger mode, 0- single trigger, 1- continuous trigger. bit2~3- Probe 0 trigger source, 0- external probe 0, 1- encoder index signal, 2- Reserved, 3- Reserved.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
							bit4- Probe 0 triggers source rise edge sampling switch, 0- Off, 1- Enable. bit5- Probe 0 triggers source falling edge sampling switch, 0- Off, 1- Enable. bit6~7- Reserved. bit8- Probe 1 switch, 0- off, 1- Enable. bit9- Probe 1 trigger mode, 0- single trigger, 1- continuous trigger. bit10~11- Probe 1 trigger source, 0- external probe 1, 1- encoder index signal, 2- Reserved, 3- Reserved. bit12- Probe 1 triggers source rise edge sampling switch, 0- Off, 1- Enable. bit13- Probe 1 triggers the source falling edge sampling switch, 0- Off, 1- Enable. bit14~15- Reserved.
D.071 (48H)	Status of probe 0 and probe 1	0	0 ~ 65535	R	Immediate change, immediate effect	word	bit0- Switch status of probe 0, 0- Off, 1- Enabled. bit1- Probe 0 trigger source rising edge position latch state, 0-no, 1-yes. bit2- Probe 0 trigger source falling edge position latch state, 0-no, 1-yes. bit3~7- Reserved. bit3~7- Reserved. bit8- Probe 1 Switch status, 0- Off, 1- Enabled. bit9- Probe 1 trigger source rising edge position latch state, 0-no, 1-yes. bit10- Probe 1 trigger source falling edge position latch state, 0-no, 1-yes. bit11~15- Reserved.

Address (Sub index)	Param Name	Default value	Parameter range	R/W	Change and effective	length	Description
D.072 (49H)	Probe 0 rising edge latch position	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Encoder Unit
D.076 (4DH)	Probe 0 drops along latch position	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Encoder Unit
D.080 (51H)	Probe 1 rising edge latch position	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Encoder Unit
D.084 (55H)	Probe 1 falling edge latch position	0	-9223372036 854770000 ~ 9223372036 854770000	R	Immediate change, immediate effect	quadw ord	Unit: Encoder Unit



Display panel and keys



7 Display panel and keys

7.1 Key

Key	Name	Function	
M	Mode switching	Switch between the following 4 modes: • Condition Monitoring Mode (Monitor) • Parameter setting mode • Function mode • Return to the upper-level menu under the submenu	
S	SET	• Enter the menu • Write data in parameter mode	
▲	Up	The flashing cursor moves one digit to the left of the digital tube, starting from digital tube 0 by default. After moving left to digital tube 4, it jumps back to digital tube 0. You can try to change the value of the flashing digital tube by using the up and down plus and minus keys.	Note: When changing the value, it is only valid for data with flashing.
▼	Down	1. Select the sub menus of each mode backwards under the root menu Scroll back or down under the submenu.	
◀	Left	1. Select the sub menus for each mode under the root menu 2. Scroll forward or add numbers under the submenu.	

7.2 Menu Description

There are a total of 3 operating modes, which can be changed by pressing the M key.

- ◆ **Status monitoring mode:** Display the current status of the servo, such as input and

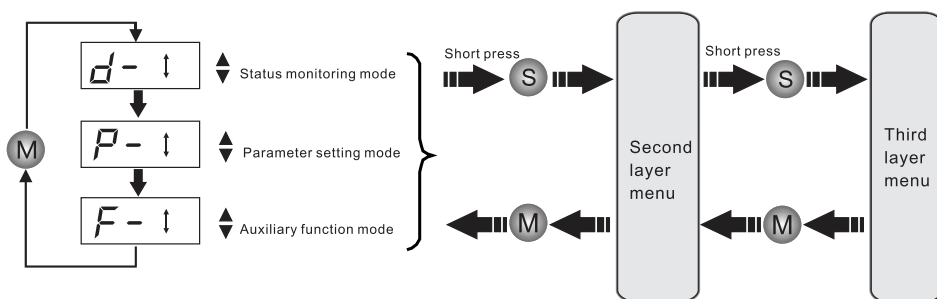
output signal status display, error codes, historical records, etc.

◆ **Parameter setting mode:** Set servo parameters.

◆ **Auxiliary function mode:** jog function, restore factory settings, clear alarms, etc.

The first layer is the main menu. Press the S key to enter the second layer menu. After completing the specific operation, press the S key to confirm the operation and exit from the second layer menu, returning to the first layer menu. When the menu is deeply embedded, the operation is similar. The structure of each mode is as follows:

< **Remarks** > Before entering the third level menu in F and D modes, long press.



For example, modify parameter Settings, M→P→F-EEP.

1) Press the "M" key to go to the "P" interface. At this time, the number "0" will always shine, indicating that the parameter group can be selected at this time.

2) Press the up or down button to select the corresponding parameter group. There are 13 groups of parameters, and the next 10 groups are represented by letters:

10--a, 11--b, 12--c, 13--d, 15--f, select the corresponding parameter group and press "S" to confirm. For example, if you select group 11 (Pb) and press S, the panel displays PB.000.

3) Select the corresponding parameter in the parameter group, press S after modifying the parameter, press M to return to the F-EEP screen, and press S frequently until donE is displayed, indicating that the data is successfully written and saved.

7.3 Operation Mode Description

When the A6N driver is powered on for the first time, the LED display shows . The parameter PB.006 (default display setting on the panel) can be set to select the initial display content on the LED when the power is turned on. Please refer to the following instructions for the specific operation of each control mode.

Note: If the control mode is 402 mode (i.e. P2.002=7), setting parameter PB.006 (default display setting of the panel) is invalid, and the initial display content cannot be set. The panel can only display the system status.

7.3.1 Status Monitoring Mode

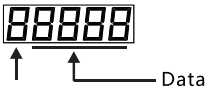
Press M, select Status monitoring mode “ ” from the main menu, press up or down to select the items that need to be displayed, and press S to enter the specific display state.

No.	Mode	Description	Display Style	Describe	Notes
0.		motor velocity		2000r/min	Note 1
1.		Output Torque		Output Torque: 80%	Note 1
2.		Position deviation		Position deviation: 2	Note 1
3.		control mode		External position control mode	Note 2
4.		DI state		Input signal 0 is invalid	Note 3
5.		DO state		Output signal 0 is invalid	Note 3
6.		Historical fault		No errors	Note 4
7.		Driver scheme		Display drive scheme, each product scheme is different	Note 5
8.		Load rate of braking resistor		Load rate of braking resistor: 30%	Note 6
9.		Load inertia ratio		Load inertia ratio: 100%	Note 7
10.		Feedback pulse count		Feedback pulse count: 50	Note 8
11.		Number of instruction pulses		Number of instruction pulses: 10	Note 8

12.	d-FEr	External device deviation counter	FE 5	Deviation counter: 5 pulses	Note 9
13.	d-FPS	Total number of feedback pulses from external devices	500.	External feedback pulses: 500	Note 8
14.	d-Rud	Motor automatic recognition function	- Rud -	Motor automatic identification function is effective	Note 10
15.	d-Rin	analog input	--	--	Reserve
16.	d-CH	The reason for the motor not rotating	CP 0.	No servo enable signal input	Note 11
17.	d-SYS	system state	rdy	Servo ready	Note 12

Note 1 Details

[Position deviation, motor velocity and output torque display]



- P

Position deviation

All decimal points in the data are on: generating rotational torque in the CW direction at the axis

Data decimal point not displayed: generates rotational torque in the CCW direction at the axis
- r

Motor speed, unit: r/min

All decimal points in the data are on: CW

Data decimal point not displayed: CCW
- t

Torque command, unit:% (rated torque 100.0)

All decimal points in the data are on: CW

Data decimal point not displayed: CCW

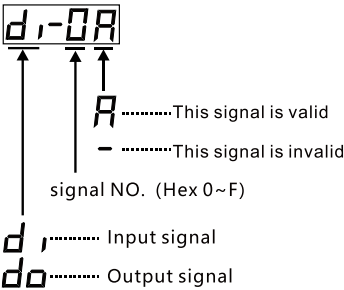
Note 2 Details

[Control mode expression]

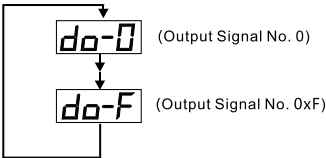
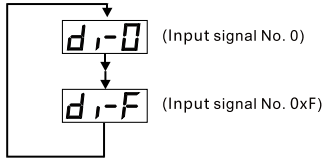
Panel display	Mode
-P05-	Position control mode
-5Pd-	Velocity control mode
-tr9-	Torque control mode

Note 3 Details

【Input/output signal status display】

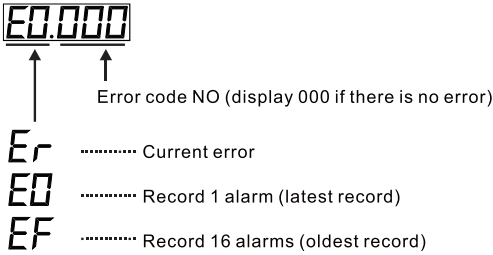


NO.Select the signal NO that needs to be monitored by pressing ▲ ▼



Note 4 Details

【Reason for errors and historical records】



You can view the reasons for errors that occurred 16 times (including the current record).

Press to select the history record you want to view.

When a historical error occurs, the current error and record 1 are displayed with the same error code.

The display flashes when an error occurs.

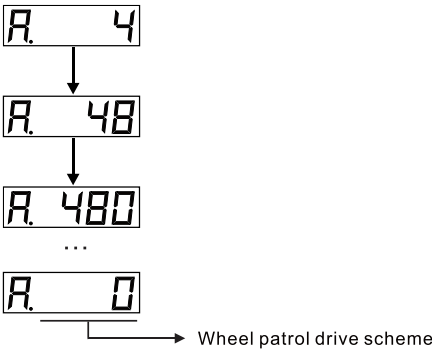
For specific alarm fault codes, please refer to Chapter 9 [Fault Description \(V9 version\)](#)

Note 5 Details

【Driver scheme】

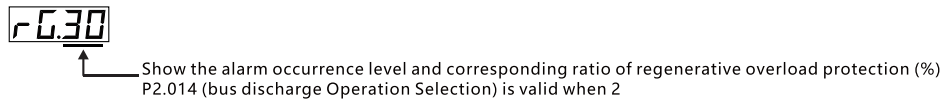
Display driver scheme, each product's scheme is different.

For example, if the drive scheme is 48000600, the panel will rotate 48000600 from right to left.



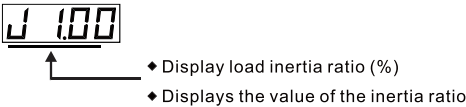
Note 6 Details

【Load rate of braking resistor】



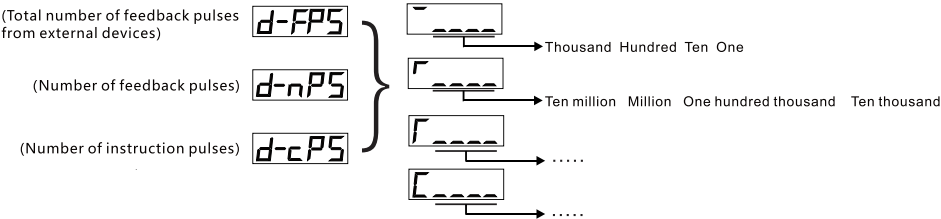
Note 7 Details

【Load inertia ratio】

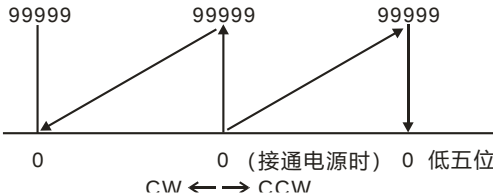


Note 8 Details

【Display the number of external device feedback pulses, feedback pulses, and command pulses】



Control the total sum of pulses after the power is turned off. If overflow occurs, it will be as shown in the following figure:



Note 9 Details

【 External device deviation counter 】

This feature is reserved

Note 10 Details

【 Motor automatic recognition function 】

This feature is reserved

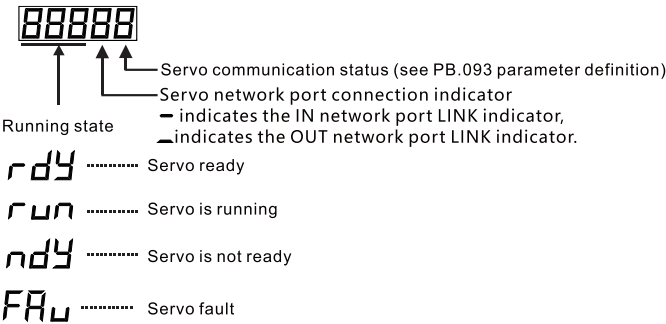
Note 11 Details

【 Reason for motor not rotating 】

This feature is reserved

Note 12 Details

【 Servo status 】



7.3.2 Parameter Setting Mode

Select operation

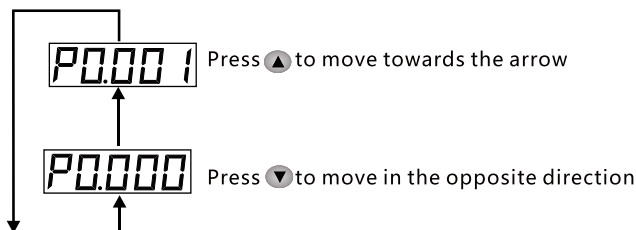
Starting from the initial state of the LED, press the M key until it displays as parameter setting mode:

Parameter number (decimal)

Group number (hexadecimal)

Perform operations

Press the key to select the parameters for viewing or editing.



Press the SET key to enter the operation

The number of decimal places can be change

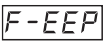
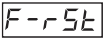
Parameter value

Press to move the decimal point to the desired number of digits, and press to set the parameter value (increase value, decrease value)

Note

After changing the parameter value, press the SET key, and its content will be reflected in the control. When changing parameter values that have a significant impact on the motor (especially speed loop gain, position loop gain, etc.), do not modify too large values at once, try to modify them in stages as much as possible.

7.3.3 Auxiliary Function Mode

Display	Mode	Specific operation instructions
	Save parameters	Starting from the initial state of the LED, press the M key until the F parameter array is displayed, and press the up and down keys until  is displayed. After resetting the changed content, in order to make the set content effective, long press the S key. After the writing ends and displays 'done', it indicates that A6N has successfully saved the parameters. Notes: 1) Write error, please rewrite. If the error persists after repeated attempts, the drive may be faulty. 2) Do not turn off the power when writing to EEPROM. Otherwise, it will result in writing incorrect data. If such a situation occurs, reset all parameters and rewrite them after confirmation.
	Factory restoration	Restore the factory settings and reset the servo parameters to the factory default settings. It is recommended to restart the servo drive after restoring the factory default settings. Starting from the initial state of the LED, press the M key to display the F parameter group, and press the up and down keys until it displays as . Press and hold the S key to start the factory reset process, and once the reset is complete, it will display 'done'. Notes: 1) Write error, please rewrite. If the error persists after repeated attempts, the drive may be faulty. 2) Do not turn off the power when writing to EEPROM. Otherwise, it will result in writing incorrect data. If such a situation occurs, reset all parameters and rewrite them after confirmation.
	Jog	In jog operation mode, the driver does not need an external enable signal, and the motor can rotate according to the JOG speed setting value. Starting from the initial state of the LED, press the M key until the F

Display	Mode	Specific operation instructions
		parameter group is displayed, press the up and down keys until it is displayed as F-JoG, press the S key for jog operation, and then press the up and down keys to perform motor rotation. Press the up key to rotate the motor forward and the down key to rotate the motor in reverse. The motor stops running without pressing the up and down keys. (r represents positive, r. represents negative) The command speed of the servo is parameter P4.012 (jog speed command). Note: 1) Before jog operation, it is recommended to use the factory default parameters, especially the servo gain parameters. 2) Before trial operation, please remove the motor load and disconnect the servo control signal terminal X2.
F-RcL	Clear alarm	Release the alarm, the motor is in a stopped state. Starting from the initial state of the LED, press the M key until the F parameter group is displayed, press the up and down keys until it is displayed as F-RcL, press the S key to clear the alarm, display done after clearing, and then the panel will jump back to the initial display state (PB. 006). If the alarm clearing is not completed, an error will be displayed. After powering on again, continue clearing the alarm.
F-Rbc	Clear encoder multi turn values	When used as a multi-turn bus type absolute encoder, the motor encoder may lose multi-turn pulses due to various reasons such as a low battery, and the servo driver will prompt the Err.330 alarm, which can be cleared with this function. From the initial state of the LED, press the M key until F-Rbc appears, and then press the SET key to execute the operation. If clearing is not completed and Error is displayed, it is necessary to reopen the operation, and if there is still an error after reopening the operation, it is necessary to restart the driver. CAUTION: 1) Do not disconnect the controller from the drive while in donE.

Display	Mode	Specific operation instructions
		mode. If the connector is disconnected, plug in the connector and restart operation. 2) When the alarm is cleared, the user coordinate values will be cleared to zero at the same time.
F-J-E	Inertia recognition	Identify the ratio of inertia, ratio of inertia = the ratio of the total inertia of the mechanical load / the inertia of the motor itself x 100%. Starting from the initial state of the LED, press the M key until F-J-E appears, then press the S key to execute the operation. Press the upper key again, and then after identifying the inertia, press the S key to execute the write operation, and after success, the display will show SAVE.
F-PAL	Panel test	Reserved



Communication



8 Communication

8.1 Modbus RTU communication

The A6N servo driver is embedded with the standard Modbus RTU communication protocol, supporting Modbus RTU master station reading and writing of single or multiple parameters. After the controller with Modbus protocol is successfully connected to the servo drive, the controller can directly set the parameters and read the status of the servo drive. In the communication control mode, the controller can modify the operating command parameters in real time, change the motor's operating position, velocity, etc.

The Modbus RTU protocol has multiple bus commands, and the A6N series servo drive supports the three most commonly used commands, which can meet the controller's all-round control of the servo drive. The specific function codes are shown in the table below:

Function Code (CMD)	Meaning of Function Code
16#03	Read single or multiple drive parameter registers
16#06	Write a single drive parameter register
16#10	Write multiple driver parameter registers

For the convenience of controller reading and writing driver parameters, the parameter numbers of A6N series drivers correspond to the corresponding device Modbus address. The parameter number 0 of the driver corresponds to the device Modbus address 40001, and the rest are postponed accordingly. The Modbus address corresponding to the servo parameters is $40001 + \text{servo group number} * 256 + \text{parameter number}$.

For example, if parameter P4.002 is the given velocity command for communication velocity control mode, then this parameter corresponds to the Modbus address of the device $= 40001 + 4 * 256 + 2 = 41027$, which means that the operation result on the data with Modbus address 41027 corresponds to parameter value P4.002.

1. Read parameter (16 # 03)

The following request frame represents reading 2 words of data starting with parameter PD.050 (user velocity feedback) from the driver with communication address 01.

Request frame format:

Format	Slave Adr	CMD	Start Adr H	Start Adr L	No. of Regs H	No. of Regs L	CRC	
	1Byte	1Byte	2Bytes		2Bytes		2Bytes	
Example	16#01	16#03	16#0D	16#32	16#00	16#02	XXXX	XXXX

Slave Adr-Drive communication address, which is the PB.020 (communication slave address) parameter setting value. The slave address value needs to be converted to hexadecimal.

CMD-Function code, 16 # 03 refers to the operation of reading the function code.

Start Adr H/L-The high/low bits of the starting address of the parameter. The starting address needs to be converted to hexadecimal. In this example, parameter PD.050 is converted to hexadecimal as 16 # 0D32, so the high bit is 16 # 0D and the low bit is 16 # 32.

No.of Regs H/L-The high/low order of the number of read parameters, and the starting address needs to be converted to a hexadecimal number. For example, in this example, there are two parameters (i.e. 16 # 0002), so the high order is 16 # 00 and the low order is 16 # 02.

CRC-CRC checkword

If read successfully, reply frame format:

Format	Slave Adr	CMD	Data Length	Data 0	Data1	...	Data n×2-2	Data n×2-1	CRC	
	1Byte	1Byte	1Byte	2Bytes		...	2Bytes		2Bytes	
Example	16#01	16#03	16#04	16#00	16#00	/	16#00	16#00	XXXX	XXXX

Slave Adr-Drive communication address.

CMD-Function code, 16 # 03 is the read operation.

Data Length-The length of data bytes, equal to the number of read parameters (No. of Regs) × 2.

Data0/Data1/.../Data n × 2-1-Read the starting parameter value by 8 bits high/starting parameter value by 8 bits low/.../read the last parameter value by 8 bits low.

CRC-CRC checkword.

2. Write a single parameter (16 # 06)

The following request frame represents writing a new value of 500 to a single parameter P5.001 (digital torque command) of the drive with communication address 01.

Request frame format:

Form at	Slave Adr	CMD	Reg Adr H	Reg Adr L	Preset Data H	Preset Data L	CRC	
	1Byte	1Byte	2Bytes		2Bytes		2Bytes	
Exa mple	16#01	16#06	16#05	16#01	16#01	16#F4	XXXX	XXXX

Slave Adr-The communication address of the drive, which is the set value of PB.020 (communication slave address) parameter. The slave address needs to be converted to a hexadecimal number.

CMD-Function code, 16 # 06 is for writing a single parameter operation.

Reg Adr H/L-The parameter number needs to be written with the starting address high/low, and the starting address needs to be converted to a hexadecimal number. For example, in this example, the P5.001 parameter is converted to hexadecimal 16 # 0501, so the high bit is 16 # 05 and the low bit is 16 # 01.

Preset Data H/L-High/low bytes of written data, which is converted to a hexadecimal number, and decimal 500 is converted to hexadecimal, which is equal to 16#01F4.

CRC-CRC checkword.

If a single write is successful, the response frame format is:

Format	Slave Adr	CMD CMD	Reg Adr H	Reg Adr L	Preset Data H	Preset Data L	CRC	
	1Byte	1Byte	2Bytes		2Bytes		2Bytes	
Examp le	16#01	16#06	16#04	16#02	16#01	16#F4	XXXX	XXXX

Slave Adr-Drive communication address.

CMD-Function code, 16 # 06 is for writing a single parameter operation.

Reg Adr H/L: Parameter number High/low of the start address.

Preset Data H/L: High/low bytes of data to be written.

CRC-CRC checkword.

3. Write multiple parameters (16 # 10)

The following request frame represents-continuously writing new values of 200 and 300 to two parameters P4.008/P4.009 (acceleration and deceleration time) of drive with communication address 01.

Request frame format:

Forma t	Slave Adr	CMD	Start Adr H	Start Adr L	No. of Regs H	No. of Regs L	Data Length	Data 0	Data 1	...	Data n×2-2	Data n×2-1	CRC	
	1Byte	1Byte	2Bytes		2Bytes		1Byte	2Bytes		...	2Bytes		2Bytes	
Exam ple	16#01	16#10	16#04	16#08	16#00	16#02	16#04	16#00	16#C8	/	16#01	16#2C	XXXX	XXXX

Slave Adr-Drive communication address, which is the parameter setting value of PB.020 (communication slave address). The slave address needs to be converted to a hexadecimal number.

CMD-Function code, 16 # 10 refers to writing multiple parameter operations.

Start Adr H/L-Write the high and low values of the start address of the parameter number. The start address must be converted to a hexadecimal number. For example, in this example, P4.008 is converted to 16#0408.

No. of Regs H/L-indicates the high and low values of the number of parameters to be written. The number of parameters must be converted to a hexadecimal number. For example, in this example, there are two parameters (16#0002), so the high and low values are 16#00 and 16#02.

Data Length-The byte length of the data, equal to the number of parameters written (No. of Points) ×2, and the starting address needs to be converted to a hexadecimal number.

Data0/Data1/.../Data n×2-1: Write the higher 8 bits of the start parameter value/the lower 8 bits of the start parameter value /... / Writes the lower 8 bits of the last parameter value.

CRC-CRC checksum.

If multiple successful writes are made, the response frame format is:

Format	Slave Adr	CMD	Start Adr H	Start Adr L	No. of Regs H	No. of Regs L	CRC	
	1Byte	1Byte	2Bytes		2Bytes		2Bytes	
Example	16#01	16#10	16#04	16#08	16#00	16#02	XXXX	XXXX

Slave Adr-Drive communication address.

CMD-Function code, 16 # 10 refers to writing multiple parameter operations.

Start Adr H/L: Parameter number High/low of the start address.

No. of Regs H/L: The high/low number of parameters to be written.

CRC-CRC checksum.

4. Error code

The driver receives Modbus communication messages from the master station without any transmission errors, but the slave station is unable to execute master commands correctly or respond correctly. The slave station will respond with an abnormal response message.

The following request frame represents the abnormal response of the slave station when the master station reads the parameter P2.030 of the driver with address 01.

Abnormal response frame format:

Format	Slave Adr	CMD	Error	CRC	
	1Byte	1Byte	1Byte	2Bytes	
Example	16#01	16#86	16#02	XXXX	XXXX

Slave Adr-Drive communication address.

CMD: 功能码，异常响应帧中将主站功能码最高位（第 7 位）置 1，例如此例中主站请求帧功能码下写入单个参数为 16#06，异常响应帧将主站功能码最高位置 1 后，即为 16#86。

CMD-Function code. In the abnormal response frame, the highest bit (7th bit) of the master function code is set to 1. For example, in this example, a single parameter is

written under the main station request frame function code as 16 # 06. In the abnormal response frame, the highest position of the main station function code is set to 1, which is 16 # 86.

Error-Error code, specific error code names and descriptions are shown in the table below:

Error code	Explain
0	No connection
1	Slave station busy
2	Normal
3	The total word length of accessing consecutive parameters exceeds the limit
4	Access parameter address out of bounds
5	Access parameter address error
6	Access parameters can only be stopped for writing
7	Access parameter R
8	Accessing a single parameter with incorrect length
9	Accessing multiple consecutive parameters with an incorrect total length
10	Accessing parameter write data out of bounds
11	Access parameters without permission
12	The request command is not supported
13	The byte length of the received message is incorrect
14	Received message CRC error

CRC-CRC checkword.

8.2 EtherCAT communication

8.2.1 Summary

EtherCAT, short for Ethernet for Control Automation Technology, is an open network communication between the master and slave stations of real-time Ethernet.

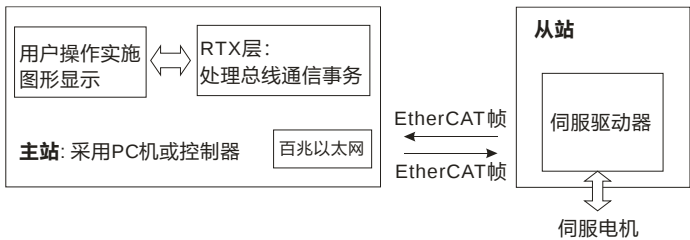
The A6N servo supports EtherCAT communication and is used as a slave in the EtherCAT Ethernet system, allowing the EtherCAT controller to set servo parameters, read servo

status, and write registers to the A6N.

1、EtherCAT communication parameters

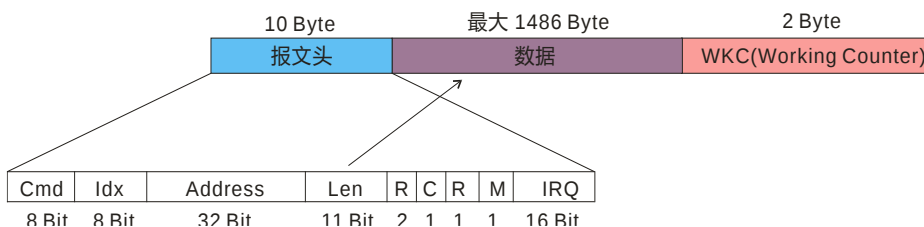
Project	Specifications
Communication standards	IEC61158、IEC61800、IEC61784
physical layer	100BASE-TX(IEEE802.3)
Connector	2 RJ45 communication ports
Transmission medium	Recommend using Category 5 Ethernet (100BASE-TX) twisted pair cables or higher
Communication distance	Supports up to 100 meters in length
Process data	Configurable PDO mapping
Mailbox (CoE)	SDO request, SDO response, SDO information
Distributed Clock (DC)	DC-Synchronous

The EtherCAT based servo controller system adopts a master-slave structure, and its overall structure is shown in the following figure:



The master station initiates communication to monitor the slave station equipment (servo drive) and the driven device (servo motor). The slave station (servo drive) receives control commands from the master station and sends the status of the driven device (servo motor) to the master station.

2. Definition of EtherCAT Transmission Messages

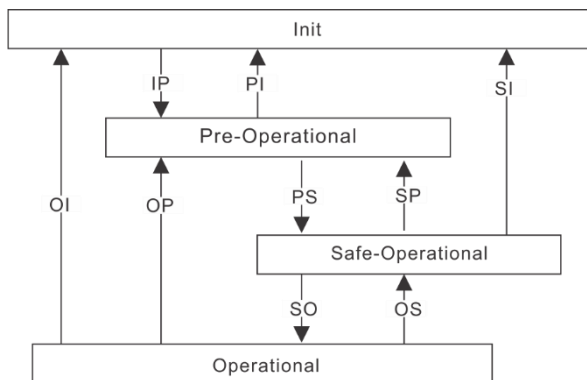


3、EtherCAT State Machine (ESM)

EtherCAT 状态机构建于数据链路层，定义 EtherCAT 从站设备的一般信息状态，指定对 EtherCAT 从站设备启用网络时初始化和错误处理。

The EtherCAT state mechanism is built at the data link layer, defining the general information state of EtherCAT slave devices and specifying initialization and error handling for EtherCAT slave devices when enabling the network.

A total of four states have been defined-Initialize, Pre Operational, Safe Operational, and Operational. Please refer to the following diagram for the description of status management:



Status Name	Describe
Init	◆There is no data interaction in the application layer ◆The master has a pathway for registering data transmission information.
Pre-Operational	◆Email communication at the application layer ◆No process data interaction
Safe-Operational	◆Email communication at the application layer ◆Process data communication, but only the input is evaluated and the output is placed in a safe state

Operational	◆Both input and output are valid
-------------	----------------------------------

State transition

State transition	Local management service	Value
IP	Activate email communication	0x02
PI	Stop email communication	0x01
PS	Start inputting update	0x04
SP	Stop input updates	0x02
SO	Start output update	0x08
OS	Stop outputting updates	0x04
OP	Stop output updates and stop input updates	0x02
SI	Stop inputting updates, stop email communication	0x01
OI	Stop inputting updates, stop inputting updates, stop email communication	0x01

6000h axis parameter table

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
603Fh	0	Error code	TPDO	Uint16	-	0~65535	0	Cannot be changed
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real-time changes
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
605Ah	0	Quick Stop option code	RPDO	Uint16	-	0~4	0	Shutdown Change
605Ch	0	Disable operation option code	RPDO	Uint16	-	0~6	0	Shutdown Change
605Dh	0	Halt option code	RPDO	Uint16	-	0~2	0	Shutdown Change
605Eh	0	Fault	RPDO	Uint16	-	0~10	0	Shutdown

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
		reaction option code						n Change
6060h	0	Modes of operation	RPDO	Uint16	-	0~10	0	Real-time changes
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
6062h	0	Position demand value	TPDO	Dint32	Instruction unit	-2147483648~2147483647	0	Cannot be changed
6063h	0	Position actual value	TPDO	Dint32	Encoder unit	-2147483648 ~ 2147483647	0	Cannot be changed
6064h	0	Position actual value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
6065h	0	Following error window	RPDO	UDint32	Instruction unit	0~4294967295	0	Real-time changes
6066h	0	Following error time out	RPDO	Uint16	ms	0~65535	0	Real-time changes
6067h	0	Position window	RPDO	UDint32	Instruction unit	0~4294967295	0	Real-time changes
6068h	0	Position window time	RPDO	Uint16	ms	0~65535	0	Real-time changes
606Ch	0	Velocity actual value	TPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Cannot be changed
606Dh	0	Velocity window	RPDO	Uint16	Instruction unit/s	0~65535	0	Real-time changes
606Eh	0	Velocity window time	RPDO	Uint16	ms	0~65535	0	Real-time changes
606Fh	0	Velocity threshold	RPDO	Uint16	rpm	0~65535	10	Real-time

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
								changes
6070h	0	Velocity threshold time	RPDO	Uint16	ms	0~65535	10	Real-time changes
6071h	0	Target torque	RPDO	int16	0.001	-3000~3000	0	Real-time changes
6072h	0	Max. Torque	RPDO	Uint16	0.001	0~3000	0	Shutdown Change
6074h	0	Torque Demand Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
6077h	0	Torque Actual Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
607Ah	0	Target position	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real-time changes
607Dh	0	number of elements	NO	Uint8	-	-	0	Cannot be changed
	1	Min position limit	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real-time changes
	2	Max position limit	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real-time changes
607Ch	0	home offset	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real-time changes
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real-time changes
607Fh	0	Max profile velocity	RPDO	UDint32	Instruction unit/s	0~4294967295	6553600	Real-time changes
6081h	0	Profile velocity	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real-time changes

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
6083h	0	Profile acceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real-time changes
6084h	0	Profile deceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real-time changes
6085h	0	quick stop deceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real-time changes
6091h	0	Number of gear ratio sub-indexes	NO	Uint8	-	-	-	Cannot be changed
	1	Motor revolutions	RPDO	UDint32	-	1~4294967295	1	Shutdown Change
	2	Shaft revolutions	RPDO	UDint32	-	1~4294967295	1	Shutdown Change
6098h	0	Homing method	RPDO	Uint16	-	1~37	37	Shutdown Change
6099h	0	Number of homing velocity sub-indexes	NO	Uint8	-	-	-	Cannot be changed
	1	velocity during search for switch	RPDO	UDint32	Instruction unit/s ²	1~4294967295	1092267	Real-time changes
	2	velocity during search for zero	RPDO	UDint32	Instruction unit/s ²	1~4294967295	218454	Real-time changes
609Ah	0	Homing acceleration	RPDO	UDint32	Instruction unit/s ²	1~4294967295	2184533	Real-time changes
60B0h	0	Position Offset	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real-time changes
60B1h	0	Velocity Offset	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real-time changes

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
60B2h	0	Torque Offset	RPDO	int16	0.001	-3000~3000	0	Real-time changes
60B8h	0	Touch probe function	RPDO	Uint16	-	0~65535	0	Real-time changes
60B9h	0	Touch probe status	TPDO	Uint16	-	0~65535	0	Cannot be changed
60BAh	0	Touch Probe Pos1 Pos Value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
60BBh	0	Touch Probe Pos1 Neg Value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
60BCh	0	Touch Probe Pos2 Pos Value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
60BDh	0	Touch Probe Pos2Neg Value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
60C5h	0	Max acceleration	RPDO	UDint32	Instruction unit/s ²	1~4294967295	4294967295	Real-time changes
60C6h	0	Max deceleration	RPDO	UDint32	Instruction unit/s ²	1~4294967295	4294967295	Real-time changes
60E0h	0	Forward Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real-time changes
60E1h	0	Reverse Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real-time changes
60F4h	0	Following error actual value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
60FCh	0	Position demand value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed

Index (hex)	Sub index (hex)	Name	PDO mapping	Datatype	Unit	Data Range	Default	Change method
60FDh	0	Digital Input	TPDO	UDint32	-	0~4294967295	0	Cannot be changed
60FFh	0	Target velocity	RPDO	Dint32	Instruction unit/s	-2147483648~2147483647	0	Real-time changes

8.2.2 Cyclic Synchronous Position Mode (CSP)

Cyclic Synchronous Position Mode (CSP) is a motion control mode in which the upper controller plans position commands and periodically sends the planned target position 607Ah and control commands to the servo drive. The servo drive completes position, velocity, and torque control internally.

Configuration diagram

Periodic synchronization position mode (6060h=8)



List of Relevant Parameters

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes
	Defines the control command							
	bit	name			describe			
	0	switch on			1- Valid, 0- Invalid			
	1	enable voltage			1- Valid, 0- Invalid			

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	2	quick stop			0-valid, 1-invalid			
	3	enable operation			1- Valid, 0- Invalid			
	The CSP mode only supports absolute position references.							
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name		describe				
	0	ready to switch on		1-valid, 0-invalid				
	1	switch on		1-valid, 0-invalid				
	2	operation enabled		1-valid, 0-invalid				
	3	fault		1-valid, 0-invalid				
	4	voltage enabled		1 valid, 0-invalid				
	5	quick stop		0-valid, 1-invalid				
	6	switch on disabled		1-valid, 0-invalid				
	7	warning		1- Effective,				
	8	Halt		0-Keep the current running state 1-Pause				
	9	remote		1- Effective, control word takes effect 0- Invalid				
	10	Target Reach		0-Positioning not completed 1-Positioning completed				
	11	Internal limit actice		0-The position command has not exceeded the limit 1-Position instruction exceeds the limit				
	12	drive follow the command Value		Not supported, always set to 1				
	13	Following error		0-No significant positional deviation fault 1-There is a malfunction where the position deviation is too large				
	14	Home Find		0-Origin return to zero incomplete 1-Zero return to origin completed				
	15	Brake output		0-Invalid 1-Effective				
	6060h	0	Modes of operation	RPDO	Uint16	-	0~10	0
Select servo operation mode: 0-Reserved 1-Profile position (PP) mode								

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
6061h	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6064h	0	position actual value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
	Display absolute position feedback (command unit). For absolute value encoders, when using the rotation mode function, 6064h reflects the mechanical load single turn position feedback (command unit).							
6065h	0	Threshold for excessive positional deviation	RPDO	UDint32	Instruction unit	0~4294967295	0	Real time changes
	Set a threshold (instruction unit) for excessive positional deviation. When the set value of 6065h is too large, the alarm value for the fault of excessive position deviation will be processed according to the encoder unit of 2147483647.							
6066h	0	Following error time out	RPDO	Uint16	ms	0~65535	0	Real time changes

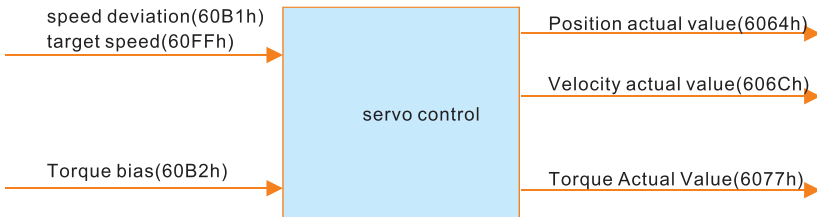
Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	Excessive position deviation timeout. If the position deviation exceeds the alarm value for the fault of excessive position deviation and the time exceeds the set value of 6066h, Er.531 (fault of excessive position deviation) will occur.							
606Ch	0	Velocity actual value	TPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Cannot be changed
	Display the actual velocity feedback value (command unit/s).							
6077h	0	Torque Actual Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display servo internal torque feedback (unit-0.1%). 100.0% corresponds to 1 times the rated torque of the motor.							
607Ah	0	Target position	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real time changes
	Set the servo target position in profile position mode and cycle synchronization position mode. In the periodic synchronous position mode, 607Ah always represents the absolute target position In profile position mode, 607Ah can be set as an incremental or absolute position through the control word.							
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real time changes
	Set the polarity of position command, velocity command, and torque command. Position instruction polarity. Bit7=0, maintain the current value. Bit7=1, instruction x (-1). PP-Reverse the target position of 607Ah. CSP-Reverse the position command (607Ah+60B0h).							
60B0h	0	Position Offset	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real time changes
	Set the servo position command bias in the periodic synchronous position mode. The sum of 607Ah and 60B0h determines the servo target position-servo target position=607Ah+60B0h.							
60B1h	0	Position Offset	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real time changes

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		Setting the EtherCAT external velocity feedforward signal in the periodic synchronous position mode (effective at 2 hours on October 2, 2003) can reduce the position deviation during the positioning process. However, after the positioning is completed, it is necessary to set the velocity bias to 0, otherwise the bias will cause the positioning target position to deviate from the position There is a deviation between the feedback settings. This object can simultaneously set the velocity instruction bias in the periodic synchronous velocity mode.						
60B2h	0	Torque bias	RPDO	int16	0.001	-3000~3000	0	Real time changes
		Set the EtherCAT external torque feedforward signal under the cycle synchronization position mode and cycle synchronization velocity (effective at 2004.1Bh=2). This object can be used simultaneously to set the torque command bias in the periodic synchronous torque mode.						
60F4h	0	Position deviation	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
		Display position deviation (instruction unit).						

8.2.3 Cyclic Synchronous Velocity Mode (CSV)

Cyclic Synchronous Velocity Mode (CSV), where the upper controller plans velocity commands and periodically sends the planned target velocity of 60FFh and control commands to the servo drive, which completes velocity and torque control internally.

Periodic synchronous velocity mode (6060h=9)



Description of relevant parameters

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes
	Set control instructions							
	bit		name		describe			
	0		switch on		1- Valid, 0- Invalid			
	1		enable voltage		1- Valid, 0- Invalid			
	2		quick stop		0-valid, 1-invalid			
	3		enable operation		1- Valid, 0- Invalid			
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name		describe				
	0	ready to switch on		1-valid, 0-invalid				
	1	switch on		1-valid, 0-invalid				
	2	operation enabled		1-valid, 0-invalid				
	3	fault		1-valid, 0-invalid				
	4	voltage enabled		1-valid, 0-invalid				
	5	quick stop		0-valid, 1-invalid				
	6	switch on disabled		1-valid, 0-invalid				
	7	warning		1-Effective,				
	8	Halt		0-Keep the current running state 1-Pause				
	9	remote		1- Effective, control word takes effect 0- Invalid				
	10	Target Reach		0-Positioning not completed 1-Positioning completed				
	11	Internal limit actice		0-The position command has not exceeded the limit 1-Position instruction exceeds the limit				
	12	drive follow the command Value		Not supported, always set to 1				
	13	-		-				
	14	Home Find		0-Origin return to zero incomplete 1-Zero return to origin completed				

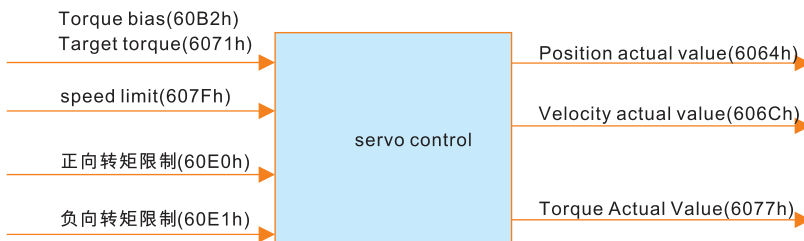
Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	15	Brake output		0-Invalid 1-Effective				
6060h	0	Modes of operation	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6064h	0	Position actual value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
	Display absolute position feedback (command unit). For absolute value encoders, when using the rotation mode function, 6064h reflects the mechanical load single turn position feedback (command unit).							
606Ch	0	Velocity actual value	TPDO	Dint32	Instruction	-2147483648 ~ 2147483647	0	Cannot be

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
					unit/s			changed
	Display the actual velocity feedback value (command unit/s).							
6077h	0	Torque Actual Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display servo internal torque feedback (unit-0.1%). 100.0% corresponds to 1 times the rated torque of the motor.							
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real time changes
	Velocity command polarity. Bit6=0, keep the current value. Bit6=1, instruction x (-1).							
60B1h	0	Velocity Offset	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real time changes
	Set the servo velocity command bias in the cycle synchronous velocity mode, and after setting-servo target velocity=60FFh+60B1h.							
60B2h	0	Torque Offset	RPDO	int16	0.001	-3000~3000	0	Real time changes
	Set the EtherCAT external torque feedforward signal in periodic synchronous velocity mode (effective at 2006.0Ch=2).							
60FFh	0	Target velocity	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real time changes
	Set the target velocity in profile velocity mode and cycle synchronization velocity mode. In the periodic synchronous velocity mode, the maximum velocity at which the motor can operate is determined by the maximum velocity of the motor.							

8.2.4 Cyclic Synchronous Torque Mode (CST)

Cyclic Synchronous Torque Mode (CST), where the upper computer plans torque commands and periodically sends the planned target torque 6071h and control commands to the servo drive, which completes torque control internally.

Periodic synchronous torque mode (6060h=10)



Description of relevant parameters

Index (hex)	Sub index (hex)	Name	PDO mappi ng	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes
	Set control instructions							
	bit	name		describe				
	0	switch on		1- Valid, 0- Invalid				
	1	enable voltage		1- Valid, 0- Invalid				
	2	quick stop		0-valid, 1-invalid				
6041h	3	enable operation		1- Valid, 0- Invalid				
	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name		describe				
	0	ready to switch on		1-valid, 0-invalid				
	1	switch on		1-valid, 0-invalid				
	2	operation enabled		1-valid, 0-invalid				
	3	fault		1-valid, 0-invalid				
	4	voltage enabled		1-valid, 0-invalid				
	5	quick stop		0-valid, 1-invalid				
	6	switch on disabled		1-valid, 0-invalid				
	7	warning		1- Effective,				
	8	Halt		0-Keep the current running state 1-Pause				
	9	remote		1- Effective, control word takes effect 0- Invalid				
	10	Target Reach		0-Positioning not completed 1-Positioning completed				

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	11	Internal limit actice		0-The position command has not exceeded the limit 1-Position instruction exceeds the limit				
	12	drive follow the command Value		Not supported, always set to 1				
	13	--		--				
	14	Home Find		0-Origin return to zero incomplete 1-Zero return to origin completed				
	15	Brake output		0-Invalid 1-Effective				
6060h	0	Modes of operation	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV)							

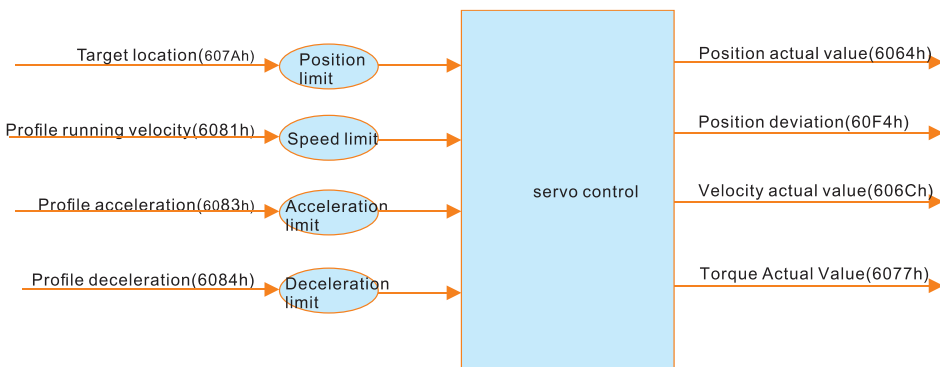
Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	10-Cyclic synchronous torque (CST) mode							
6071h	0	Target torque	RPDO	int16	0.001	-3000~3000	0	Real time changes
	Set the servo target torque in profile torque mode and periodic synchronous torque mode. 100.0% corresponds to 1 times the rated torque of the motor.							
6072h	0	Max. Torque	RPDO	Uint16	0.001	0~3000	0	Shutdown Change
	Set the maximum forward and reverse torque limit values for the servo drive.							
6074h	0	Torque Demand Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display the torque command output value under servo operation status. 100.0% corresponds to 1 times the rated torque of the motor.							
6077h	0	Torque Actual Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display the actual output torque of the servo. 100.0% corresponds to 1 times the rated torque of the motor.							
60B2h	0	Torque Offset	RPDO	int16	0.001	-3000~3000	0	Real time changes
	Set the servo torque command bias in the periodic synchronous torque mode. After bias: Servo target torque=6071h+60B2h.							
60E0h	0	Forward Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real time changes
	Set the maximum forward torque limit value for the servo.							
60E1h	0	Reverse Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real time changes
	Set the maximum negative torque limit value for the servo.							
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real time changes

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		Set the polarity of position command, velocity command, and torque command. Polarity of torque command. Bit5=0, maintain the current value. Bit5=1, instruction x (-1). PT-Reverse the target torque of 6071h. CSP, CSV-Reverse the torque bias of 60B2. CST-Reverse the torque command (6071h+60B2h).						
607Fh	0	Max profile velocity	RPDO	UDint32	Instruction unit/s	0~4294967295	6553600	Real time changes
		Set the velocity limit values for profile position mode, profile velocity mode, profile torque mode, and periodic synchronous torque mode.						

8.2.5 Profile Position Mode (PP)

The Profile Position Mode is mainly used for point-to-point positioning applications. In this mode, the upper computer sets the target position, operating velocity, acceleration and deceleration. The position Track generator inside the servo will generate position curve instructions based on the settings, and the driver will complete position control, velocity control, and torque control internally.

Profile position mode (6060h=1)



In profile position mode, the triggering and effectiveness of the target position are determined by the timing of bit4 (New set point) in the control word and bit12 (Set point acknowledgement) in the status word.

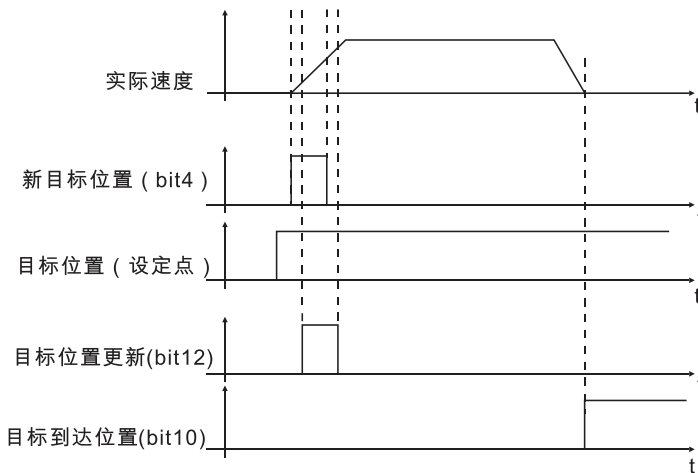
The controller informs the driver of a new target position by setting the New set point (bit 4 of the control word) from 0 to 1. After the driver receives the new target position, it sets the Set point acknowledgement (bit 12 of the status word) to 1. The controller sets the New set point (bit 4 of the control word) to 0. If the driver can currently receive the new target position, it sets the Set point acknowledgement (bit 12 of the status word) to 0. Otherwise, it remains at 1.

The bit5 of the control word (immediately update Change set immediately) determines the connection method of the position instruction. When the bit is 1, the sequential connection between position instructions is called sequential mode. On the contrary, when the bit is 0, the zero crossing connection between position instructions is called single point mode.

Sequential mode:

The current target position is in the process of positioning. After the controller prepares the new target position, it sets the New set point from 0 to 1, and the driver immediately locates to the new target position.

In sequential mode, the timing sequence of bit 4 of the control word (New set point) and bit 12 of the status word (Set point acknowledgement) is shown in the following figure.



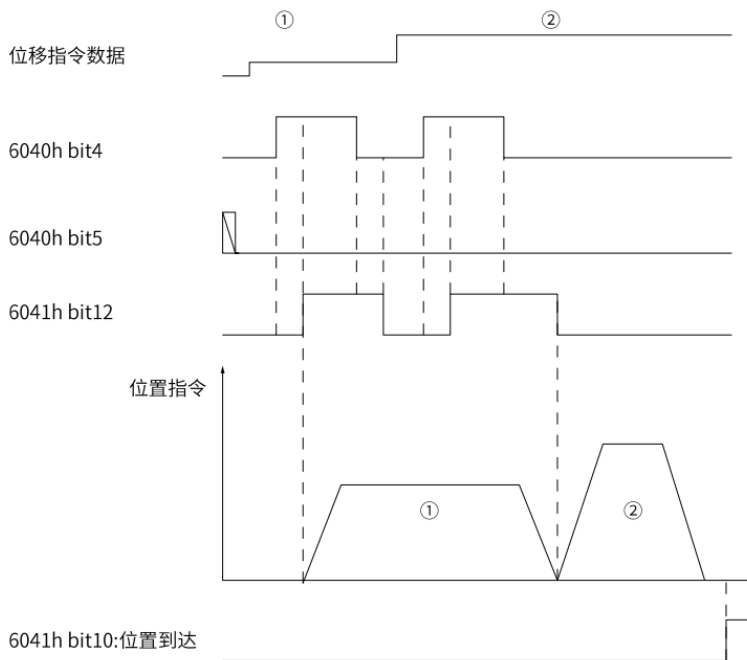
Single point mode:

The current target position is in the process of positioning. After the controller prepares the new target position, it sets the New set point bit from 0 to 1. After the driver completes

sending the current position instruction, it locates to the new target position.

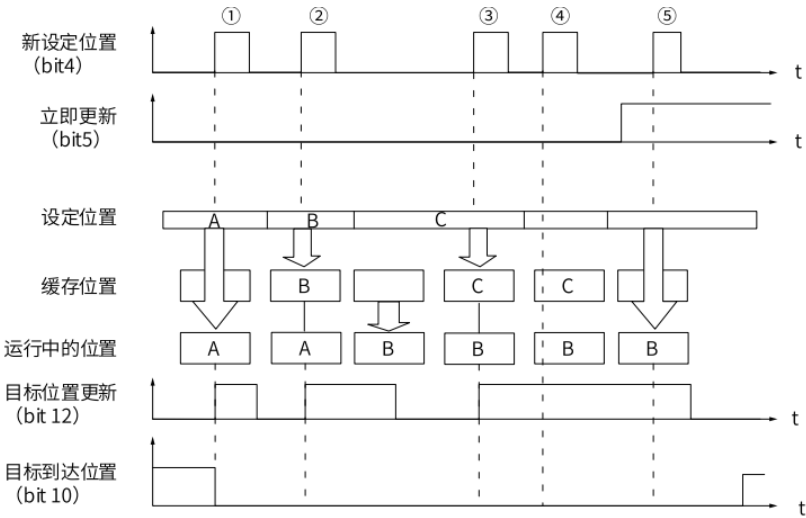
Bit4 for the control word (New set point) and bit12 for the status word (Set point for updating the target position)

The timing sequence of acknowledgement is shown in the following figure.



注意：如需更改位移指令的任一参数，均需重新发送触发信号

For single point mode, the servo drive supports one target position cache, which means that if the current target position is running, a new target position can be cached. The timing sequence is shown in the following figure.



- ① If the cache location is empty, the set location will run immediately.
- ② If a position instruction is running, the new set position will be stored in the cache. When the previous instruction is sent, the cache value will start running. After the cache is cleared, new settings can be received.
- ④ When the cache is full, no new set values will be received. Unless the attribute bit 'Change immediate' of the set value is set to 1, the set value will start running immediately.

List of Relevant Parameters

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	Set control instructions							
	bit	name	describe					
	0	switch on	1- Valid, 0- Invalid					
	1	enable voltage	1- Valid, 0- Invalid					
	2	quick stop	0-valid, 1-invalid					
	3	enable operation	1- Valid, 0- Invalid					
	4	New set-point	0 → 1-Trigger a new target position 1 → 0-Bit12 of the reset status word					
	5	Change set immediately	0-he target location is not an immediate update type 1-he target location is an immediate update type					
	6	abs/rel	0-he target position is an absolute position instruction 1-he target position is a relative position instruction					
	8	Halt	0-Keep the current running state 1-Pause					
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name	describe					
	0	ready to switch on	1- Valid, 0- Invalid					
	1	switch on	1- Valid, 0- Invalid					
	2	operation enabled	1- Valid, 0- Invalid					
	3	fault	1- Valid, 0- Invalid					
	4	voltage enabled	1- Valid, 0- Invalid					
	5	quick stop	0-alid, 1-nvalid					
	6	switch on disabled	1- Valid, 0- Invalid					
	7	warning	1- Effective,					
	8	Halt	0-Keep the current running state 1-Pause					
	9	remote	1- Effective, control word takes effect 0- Invalid					
	10	Target Reach	0-ositioning not completed 1-ositioning completed					
	11	Internal limit actice	0-The position command has not exceeded the limit 1-Position instruction exceeds the limit					

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	12	Set-point acknowledge	0-Can update target location 1-Cannot update target location					
	13	Following error	0-No significant positional deviation fault 1-There is a malfunction where the position deviation is too large					
	14	Home Find	0-Origin return to zero incomplete 1-Zero return to origin completed					
	15	Brake output	0-Invalid 1-Effective					
6060h	0	Servo mode selection	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Operation mode display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6064h	0	Position	TPDO	Dint32	Instructi	-2147483648 ~	0	Cannot

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		feedback			on unit	2147483647		be changed
	Display absolute position feedback (command unit). For absolute value encoders, when using the rotation mode function, 6064h reflects the mechanical load single turn position feedback (command unit).							
6065h	0	Threshold for excessive positional deviation	RPDO	UDint32	Instruction unit	0~4294967295	0	Real time changes
	Set a threshold (instruction unit) for excessive positional deviation. When the set value of 6065h is too large, the alarm value for the fault of excessive position deviation will be processed according to the encoder unit of 2147483647.							
6066h	0	Excessive position deviation timeout	RPDO	Uint16	ms	0~65535	0	Real time changes
6067h	0	Location reaches threshold	RPDO	UDint32	Instruction unit	0~4294967295	0	Real time changes
	Set the threshold for reaching the location. When the position instruction is sent and the position deviation is within $\pm 6067h$, and the time reaches 6068h, it is considered that the position has been reached, and the status word is displayed The target of 6041h has reached bit 10=1. When the servo enable is effective in profile position mode, this flag is meaningful Otherwise, it's meaningless.							
6068h	0	Location arrival window time	RPDO	Uint16	ms	0~65535	0	Real time changes
	Set a time window for determining the arrival of a valid location.							
607Ah	0	Target location	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real time changes
	Set the profile position mode servo target position. In profile position mode, the target position can be specified as a relative or absolute target position by controlling the bit 6 of the word 6040h.							

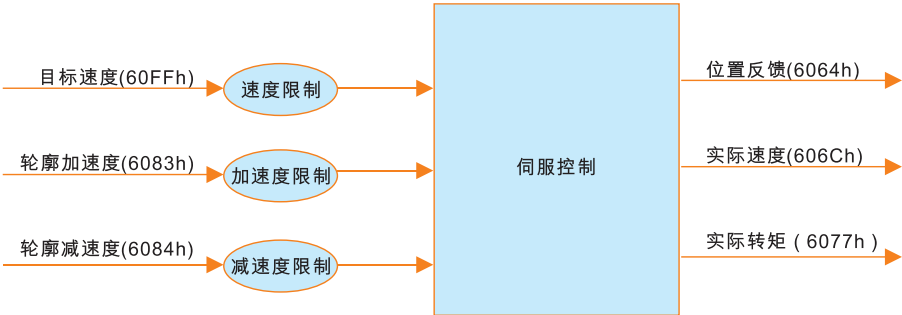
Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
607Eh	0	Directive polarity	RPDO	Uint16	-	0~65535	0	Real time changes
	Set the polarity of position command, velocity command, and torque command. By setting the polarity of the position command, the direction of the position command can be changed. Bit7=0-Maintain the current value Bit7=1-instruction x (-1) PP-Reverse the target position of 607Ah							
607Fh	0	Maximum profile velocity	RPDO	UDint32	Instruction unit/s	0~4294967295	six million five hundred and fifty-three thousand and six hundred	Real time changes
	Set the velocity limit values for profile position mode, profile velocity mode, profile torque mode, and periodic synchronous torque mode.							
6081h	0	Profile running velocity	RPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Real time changes
	电机转速(rpm)= $\frac{6081h \times \text{齿轮比}}{\text{编码器分辨率}} \times 60$ in profile position mode.							
6083h	0	Profile acceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real time changes
	Set the profile position mode and position command acceleration. In profile position mode, if the acceleration exceeds 60C5h after 6083h, it will be limited to 60C5h. Setting the parameter value to 0 will be forcibly converted to 1.							
6084h	0	Profile	RPDO	UDint32	Instruction	0~4294967295	24845333	Real

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		deceleration			on unit/s [^] ₂			time changes
	Set the profile position mode and position command to decelerate. In profile position mode, if the deceleration exceeds 60C6h after 6084h, it will be limited to 60C6h. Setting the parameter value to 0 will be forcibly converted to 1.							
60C5h	0	Maximum acceleration	RPDO	UDint32	Instructi on unit/s [^] ₂	1~4294967295	4294967295	Real time changes
	Set the maximum limit value for acceleration. In profile position mode, if the acceleration exceeds 60C5h after 6083h, it will be limited to 60C5h. The setting value of 60C5h is 0 and will be forced to 1.							
60C6h	0	Maximum deceleration	RPDO	UDint32	Instructi on unit/s [^] ₂	1~4294967295	4294967295	Real time changes
	Set the maximum limit value for deceleration. In profile position mode, if the deceleration exceeds 60C6h after 6084h, it will be limited to 60C6h. The setting value of 60C6h is 0 and will be forced to 1.							

8.2.6 Profile Velocity Mode (PV)

In the Profile Velocity Mode, the upper controller sends the target velocity, acceleration, and deceleration to the servo drive, which plans the velocity command curve and adjusts the velocity and torque internally.

Profile velocity mode (6060h=3)



Index (hex)	Sub index (hex)	Name	PDO mappi ng	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes
	Set control instructions							
	bit	name		describe				
	0	switch on		1- Valid, 0- Invalid				
	1	enable voltage		1- Valid, 0- Invalid				
	2	quick stop		0-valid, 1-invalid				
	3	enable operation		1- Valid, 0- Invalid				
	8	Halt		0-Keep the current running state 1-Pause				
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name		describe				
	0	ready to switch on		1-valid, 0-invalid				
	1	switch on		1-valid, 0-invalid				
	2	operation enabled		1-valid, 0-invalid				
	3	fault		1-valid, 0-invalid				
	4	voltage enabled		1-valid, 0-invalid				
	5	quick stop		0-valid, 1-invalid				
	6	switch on disabled		1-valid, 0-invalid				
	7	warning		1- Effective,				

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	8	Halt	0-Keep the current running state 1-Pause					
	9	remote	1- Effective, control word takes effect 0- Invalid					
	10	Target Reach	0-Positioning not completed 1-Positioning completed					
	11	Internal limit actice	0-The position command has not exceeded the limit 1-Position instruction exceeds the limit					
	12	velocity	0-The velocity is not 0 1-Velocity is 0					
	13	Following error	0-No significant positional deviation fault 1-There is a malfunction where the position deviation is too large					
	14	Home Find	0-Origin return to zero incomplete 1-Zero return to origin completed					
	15	Brake output	0-Invalid 1-Effective					
6060h	0	Modes of operation	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved							

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
606Ch	0	Velocity actual value	TPDO	Dint32	Instruction unit/s	-2147483648 ~ 2147483647	0	Cannot be changed
	Display the actual velocity feedback value (command unit/s).							
606Dh	0	Velocity window	RPDO	Uint16	Instruction unit/s	0~65535	0	Real time changes
	606Dh is used to set the threshold for reaching velocity When the difference between the velocity command and the velocity feedback is within $\pm 606D$ and the time reaches 606E, it is considered that the velocity has arrived, and the target arrival bit bit10 of the status word 6041h is set to 1. When the servo enable is effective in profile velocity mode, this flag is meaningful Otherwise, it's meaningless.							
606Eh	0	Velocity window time	RPDO	Uint16	ms	0~65535	0	Real time changes
	606Eh is used to set the velocity arrival time window.							
606Fh	0	Velocity threshold	RPDO	Uint16	rpm	0~3000	0	Real time changes
	When the velocity feedback is within $\pm 606F$ and the time reaches 6070, the motor velocity is considered to be 0, and the status word 6041-bit12=1. In profile velocity mode, this flag is meaningful Otherwise, it's meaningless.							
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real time changes
	Set the polarity of position command, velocity command, and torque command. By setting the polarity of the velocity command, the direction of the velocity command can be changed. Bit6=0, keep the current value. Bit6=1, instruction $\times (-1)$. PV-Reverse the target velocity of 60FFh.							

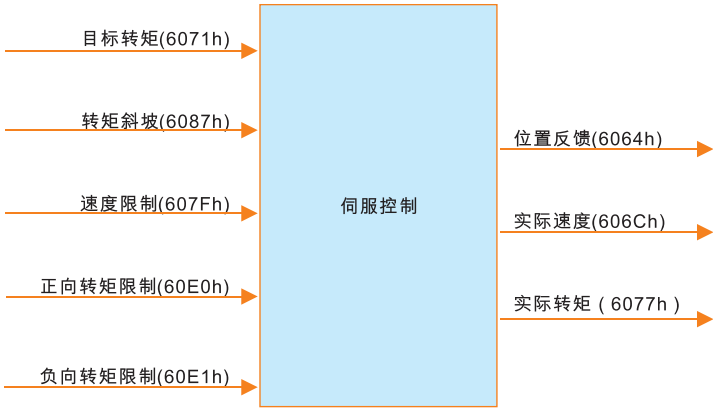
Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6070h	0	Velocity threshold time	RPDO	Uint16	ms	0~65535	10	Real time changes
607Fh	0	Max profile velocity	RPDO	UDint32	Instruction unit/s	0~4294967295	6553600	Real time changes
	Set the velocity limit values for profile position mode, profile velocity mode, profile torque mode, synchronous periodic torque mode, and origin regression mode. In profile velocity mode, the maximum velocity for forward and reverse operation can be limited by setting the maximum profile velocity to 607Fh. But it always does not exceed the maximum operating velocity allowed by the motor.							
6083h	0	Profile acceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real time changes
	Set the profile velocity mode and profile position mode velocity command acceleration. Setting the parameter value to 0 will be forcibly converted to 1.							
6084h	0	Profile deceleration	RPDO	UDint32	Instruction unit/s ²	0~4294967295	24845333	Real time changes
	Set the profile velocity mode and profile position mode velocity command deceleration. Setting the parameter value to 0 will be forcibly converted to 1.							
60C5h	0	Max acceleration	RPDO	UDint32	Instruction unit/s ²	1~4294967295	4294967295	Real time changes
	Set the maximum limit value for acceleration. In profile velocity mode, if the acceleration exceeds 60C5h after 6083h, it will be limited to 60C5h. The setting value of 60C5h is 0 and will be forced to 1.							
60C6h	0	Max deceleration	RPDO	UDint32	Instruction unit/s ²	1~4294967295	4294967295	Real time changes
	Set the maximum limit value for deceleration. In profile velocity mode, if the deceleration exceeds 60C6h after 6084h, it will be limited to 60C6. The setting value of 60C6h is 0 and will be forced to 1.							
60FFh	0	Target velocity	RPDO	Dint32	Instruction	-2147483648~2147483647	0	Real time

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
					unit/s			changes
Set the target velocity in profile velocity mode and cycle synchronization velocity mode.								

8.2.7 Profile torque mode (PT)

In the Profile torque mode, the upper controller sends the target torque 6071h and torque ramp constant 6087h to the servo driver, which plans the torque command curve and performs torque adjustment internally.

Profile torque mode (6060h=4)



List of Relevant Parameters

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes

Index (hex)	Sub index (hex)	Name	PDO mappi ng	Data type	Unit	Data Range	Default	Change method
	Set control instructions							
	bit	name	describe					
	0	switch on	1- Valid, 0- Invalid					
	1	enable voltage	1- Valid, 0- Invalid					
	2	quick stop	0-valid, 1-invalid					
	3	enable operation	1- Valid, 0- Invalid					
	8	Halt	0-Keep the current running state 1-Pause					
6041h	0	Status word	TPDO	Uint16	-	0~65535	0	Cannot be changed
	Reflecting servo status:							
	bit	name	describe					
	0	ready to switch on	1-valid, 0-invalid					
	1	switch on	1-valid, 0-invalid					
	2	operation enabled	1-valid, 0-invalid					
	3	fault	1-valid, 0-invalid					
	4	voltage enabled	1-valid, 0-invalid					
	5	quick stop	0-valid, 1-invalid					
	6	switch on disabled	1-valid, 0-invalid					
	7	warning	1- Effective,					
	8	Halt	0-Keep the current running state 1-Pause					
	9	remote	1- Effective, control word takes effect 0- Invalid					
	10	Target Reach	0-Positioning not completed 1-Positioning completed					
	11	Internal limit actice	0-The position command has not exceeded the limit 1-Position instruction exceeds the limit					
	12~13	NA	Meaningless, always 0					
	14	Home Find	0-Origin return to zero incomplete 1-Zero return to origin completed					
	15	Brake output	0-Invalid 1-Effective					

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6060h	0	Servo mode selection	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6071h	0	Target torque	RPDO	int16	0.001	-3000~3000	0	Real time changes
	Set the servo target torque in profile torque mode and periodic synchronous torque mode. 100.0% corresponds to 1 times the rated torque of the motor.							
6072h	0	Max Torque	RPDO	Uint16	0.001	0~3000	0	Shutdown Change
	Set the maximum forward and reverse torque limit values for the servo drive. For the purpose of protecting mechanical devices, the maximum torque of 6072h, forward torque limit of 60E0h,							

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		and reverse torque limit of 60E1h can be set to limit the torque command of the drive in various position, velocity, and torque control modes, but it always does not exceed the maximum torque allowed by the drive.						
6074h	0	Torque Demand Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display the torque command output value under servo operation status. 100.0% corresponds to 1 times the rated torque of the motor.							
6077h	0	Torque Actual Value	TPDO	int16	0.001	-3000~3000	0	Cannot be changed
	Display the actual output torque of the servo. 100.0% corresponds to 1 times the rated torque of the motor.							
607Eh	0	Polarity	RPDO	Uint16	-	0~65535	0	Real time changes
	Polarity of torque command: Bit=0-Keep the current value. Bit=1-instruction x (-1). CSP CSV-Reverse the torque bias of 60B2. CST-Reverse the torque command (6071h+60B2h).							
607Fh	0	Max profile velocity	RPDO	UDint32	Instruction	0~4294967295	6553600	Real time

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
					unit/s			changes
		Set the velocity limit values for profile position mode, profile velocity mode, profile torque mode, and periodic synchronous torque mode. In torque mode, the maximum velocity for forward and reverse operation can be limited by setting the maximum profile velocity to 607Fh. But it always does not exceed the maximum operating velocity allowed by the motor.						
6087h	0	Torque slope	RPDO	32-bit		-	-	-
		Set the torque command acceleration in profile torque mode/periodic synchronous torque mode, which means-incremental torque command per second. Setting the parameter value to 0 will be forcibly converted to 1.						
60E0h	0	Forward Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real time changes
		Set the maximum forward torque limit value for the servo.						
60E1h	0	Reverse Direction Torque Limit Value	RPDO	int16	0.001	-3000~3000	3000	Real time changes
		Set the maximum negative torque limit value for the servo.						

8.2.8 Homing Mode (hm)

[Function Overview]

The homing mode is used to search for the mechanical home and determine the position relation between the mechanical home and mechanical zero.

- Mechanical home: a fixed position on the machine, which corresponds to a certain home switch or the motor Z signal.
- Mechanical zero: absolute zero point on the machine.

After homing is done, the motor stops at the mechanical home. The relation between the mechanical home and mechanical zero can be set in 607Ch. Mechanical home = Mechanical zero + 607Ch (Home offset) When 607Ch = 0, the mechanical home coincide with the mechanical zero.

[Related Parameters]

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
6040h	0	Control word	RPDO	Uint16	-	0~65535	0	Real time changes
	Set control instructions							
	bit		name		describe			
	0		switch on		1- Valid, 0- Invalid			
	1		enable voltage		1- Valid, 0- Invalid			
	2		quick stop		0-valid, 1-invalid			
	3		enable operation		1- Valid, 0- Invalid			
	4		enable homing		1- Start back to original, 0- Interrupt back to original			
	8		Halt		0-Keep the current running state 1-Pause			
	6041h	0	Status word	TPDO	Uint16	-	0~65535	0
Reflecting servo status:								
bit		name		describe				
0		ready to switch on		1-valid, 0-invalid				
1		switch on		1-valid, 0-invalid				
2		operation enabled		1-valid, 0-invalid				
3		fault		1-valid, 0-invalid				
4		voltage enabled		1-valid, 0-invalid				
5		quick stop		0-valid, 1-invalid				
6		switch on disabled		1-valid, 0-invalid				
7		warning		1-valid, 0-invalid				
8		Halt		0-Keep the current running state 1-Pause				
9		remote		1- Effective, control word takes effect 0- Invalid				
10		Target Reach		0-Positioning not completed 1-Positioning completed				
12		Homing attained		0-Origin signal not found 1-Find the origin signal				
13		Homing error		0-No error occurred when returning to zero 1-Error occurred during the zeroing process				
14		Home Find		0-Origin return to zero incomplete 1-Zero return to origin completed				

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	15	Brake output		0-Invalid 1-Effective				
6060h	0	Servo mode selection	RPDO	Uint16	-	0~10	0	Real time changes
	Select servo operation mode: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6061h	0	Modes of operation display	TPDO	Uint16	-	0~10	0	Cannot be changed
	Display the current operating mode of the servo: 0-Reserved 1-Profile position (PP) mode 2-Reserved 3-Profile velocity (PV) mode 4-Profile torque (PT) mode 5-Reserved 6-Homing (HM) mode 7-Reserved 8-Cyclic synchronous position (CSP) mode 9-Cyclic synchronous velocity (CSV) 10-Cyclic synchronous torque (CST) mode							
6064h	0	position actual value	TPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Cannot be changed
	Display absolute position feedback (command unit). For absolute value encoders, when using the rotation mode function, 6064h reflects the mechanical load single turn position feedback (command unit).							
6065h	0	Following	RPDO	UDint32	Instruc	0~4294967295	0	Real time

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
		error window			tion unit			changes
	Set a threshold (instruction unit) for excessive positional deviation. When the set value of 6065h is too large, the alarm value for the fault of excessive position deviation will be processed according to the encoder unit of 2147483647.							
6066h	0	Following error time out	RPDO	Uint16	ms	0~65535	0	Real time changes
	Excessive position deviation timeout. If the position deviation exceeds the alarm value for the fault of excessive position deviation and the time exceeds the set value of 6066h, Er.531 (fault of excessive position deviation) will occur.							
6067h	0	Position window	RPDO	UDint32	Instruction unit	0~4294967295	0	Real time changes
	Set the threshold for reaching the location. When the position instruction is sent and the position deviation is within $\pm$ 6067h, and the time reaches 6068h, it is considered that the position has been reached. The target arrival bit bit10 of the status word 6041h is set to 1. When the servo enable is effective in profile position mode, this flag is meaningful Otherwise, it's meaningless.							
607Ch	0	Home offset	RPDO	Dint32	Instruction unit	-2147483648 ~ 2147483647	0	Real time changes
	Set the origin back to the physical position where the mechanical zero point deviates from the motor origin. Condition for origin bias to take effect-During this power on operation, the origin reset operation has been completed, and the status word 6041_bit15=1. The function of origin bias: If 607Ch is mistakenly set outside 607Dh (software absolute position limit), an origin offset setting error will occur.							
6098h	0	Homing method	RPDO	Uint16	-	1~41	37	Shutdown Change
	The specific method of returning to the original mode is described in the following text							
6099h	1	velocity during search for switch	RPDO	Uint32	Instruction unit/s ^ 2	1~4294967295	1092267	Real time changes
	Set the search deceleration point signal velocity, which can be set to a higher value to prevent the return to zero time from being too long.							

Index (hex)	Sub index (hex)	Name	PDO mapping	Data type	Unit	Data Range	Default	Change method
	Attention-After finding the deceleration point from the station, slow down the operation. During the deceleration process, shield the changes in the origin signal from the station. To avoid touching the origin signal during the deceleration process, the switch position of the deceleration point signal should be set reasonably, leaving enough deceleration distance or increasing the acceleration to zero to shorten the deceleration time.							
	2	velocity during search for zero	RPDO	Uint32	Instruction unit/s [^] 2	1~4294967295	218454	Real time changes
	It is suggested that this velocity should be set to low velocity to prevent overshoot during servo high-velocity parking, which may cause excessive deviation between the stopping position and the set mechanical origin.							
609Ah	0	Homing acceleration	RPDO	Uint32	Instruction unit/s [^] 2	1~4294967295	2184533	Real time changes
	Set the acceleration in zero return mode. After the zero point reset is initiated, the set value takes effect. In the original mode, when the pause mode is 605Dh=2, the deceleration stop will also be set at 609Ah. The meaning of this object dictionary is that the incremental parameter value of the position instruction per second (instruction unit) set to 0 will be forcibly converted to 1.							
60C5h	0	Max acceleration	RPDO	UDint32	Instruction unit/s [^] 2	1~4294967295	4294967295	Real time changes
	Set the maximum limit value for acceleration. In the origin regression mode, if the acceleration of 609Ah exceeds 60C5h, it will be limited to 60C5h. The setting value of 60C5h is 0 and will be forced to 1.							

Mode	Description
6098H	
0	N/A
1	Reverse, Negative limit switch as deceleration point and Z signal as home, falling edge of the negative limit switch signal must be reached before Z signal
2	Forward, Positive limit switch as deceleration point and Z signal as home, falling edge of positive limit switch signal must be reached before Z signal.
3	Forward, Home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.

4	Reverse, Home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
5	Reverse, Home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
6	Forward, Home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
7	Forward, Forward, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
8	Forward, Forward, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
9	Forward, home switch as deceleration point and Z signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.
10	Forward, home switch as deceleration point and Z signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.
11	Reverse, home switch as deceleration point and Z signal as home, falling edge on the same side of the home switch signal must be reached before Z signal.
12	Reverse, home switch as deceleration point and Z signal as home, rising edge on the same side of the home switch signal must be reached before Z signal.
13	Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, rising edge on the other side of the home switch signal must be reached before Z signal.
14	Reverse, home switch as deceleration point and Z signal on the other side of the home switch signal as home, falling edge on the other side of the home switch signal must be reached before Z signal.
15~16	N/A
17~32	Similar to setpoints 1...14 except that the deceleration point coincide with the home.
33	Reverse, Z signal as home.
34	Forward, Z signal as home.
35	Current position as home.
36	N/A
37	Similar to 35
38	Negative limit triggering torque limit as reference
39	Referring to the forward limit triggering torque limit
40	Negative limit triggering torque limit and Z-phase signal as reference
41	Based on the forward limit triggering torque limit and Z-phase signal as reference
Note-(Except for the 35 and 37 modes, all other home modes can home offset function by configuring P3.104)	

Regardless of the initial position of the machine, when the equipment (origin switch, positive travel limit switch, negative travel limit switch) is installed properly, the origin of the equipment searched by the servo is always unique. The vertical lines in the following schematic diagrams represent the initial position of the machine, the red thick Track line represents high velocity, which is the return velocity, and the black thin Track line represents low velocity, which is the crawling velocity. The circle  represents the origin position.

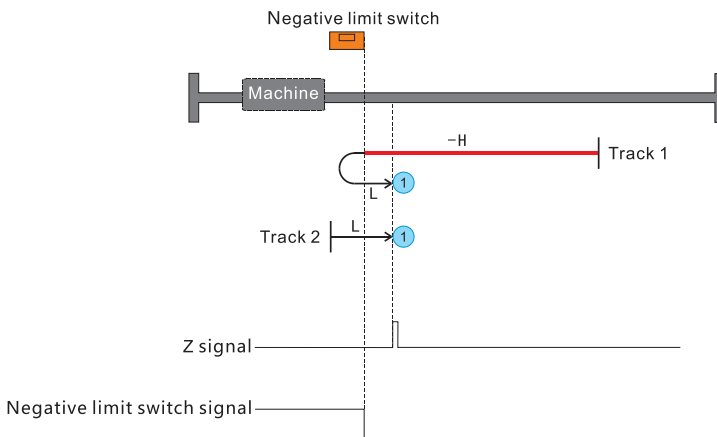
6098H=1

Home: Z signal

Deceleration point: negative limit switch (N-OT)

Track 1: The N-OT signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the N-OT signal, the motor decelerates and changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the falling edge of the N-OT signal.

Track 2: The N-OT signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the N-OT signal, the motor decelerates and changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the falling edge of the N-OT signal.



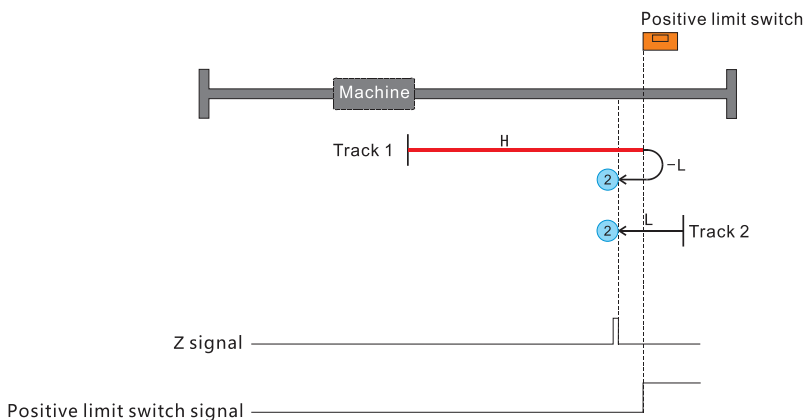
6098H=2

Home: Z signal

Deceleration point: negative limit switch (N-OT)

Track 1: The P-OT signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the P-OT signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the falling edge of the P-OT signal.

Track 2: The P-OT signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the P-OT signal, the motor stops at the first Z signal.

**6098H=3**

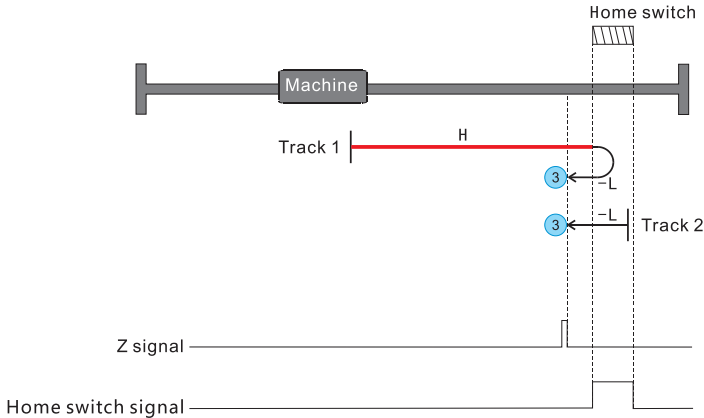
Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor stops

at the first Z signal.



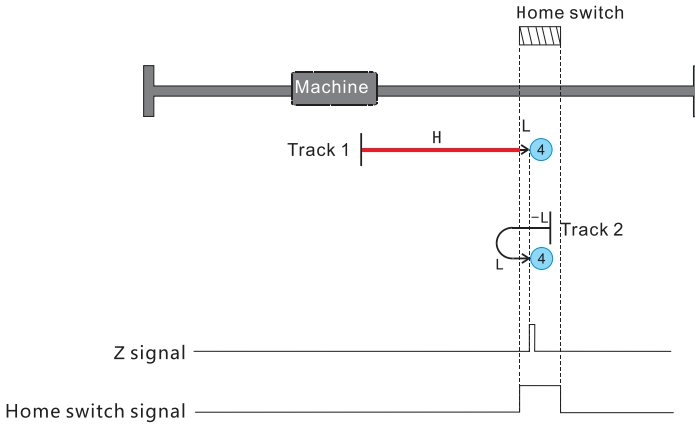
6098H=4

Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and run in the forward direction until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor decelerates and changes to run in the forward direction until it stops at the first Z signal after reaching the rising edge of the HW signal.



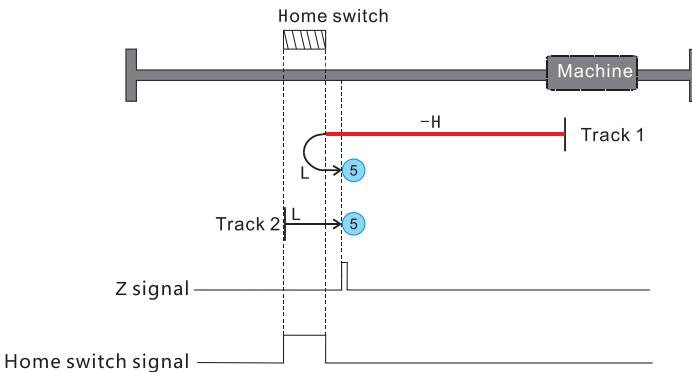
6098H=5

Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor stops at the first Z signal.



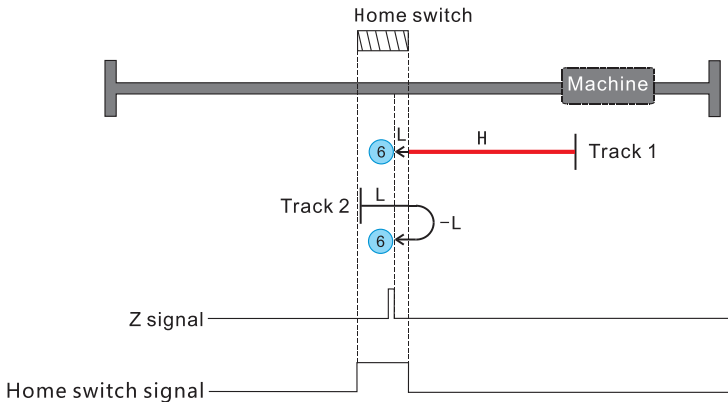
6098H=6

Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the rising edge of HW signal.

**6098H=7**

Home: Z signal

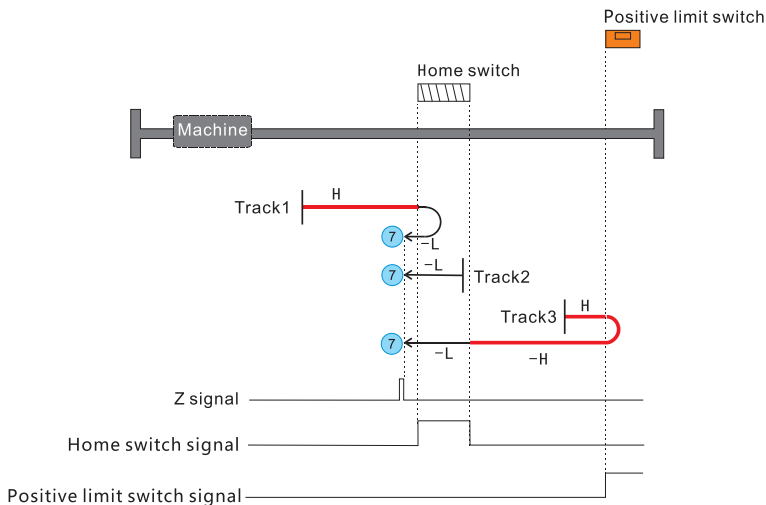
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor stops at the first Z signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse

direction at low speed. After reaching the falling edge of the HW signal, the motor stops at the first Z signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and runs in the reverse direction at low speed. Finally, the motor stops at the first Z signal after reaching the falling edge of the HW signal.



6098H=8

Home: Z signal

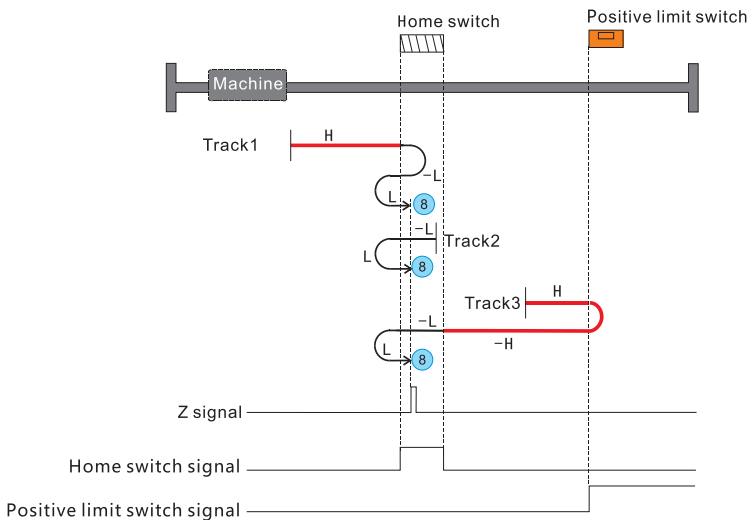
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of HW signal, the motor changes to

run in the forward direction at low speed until it stops at the first Z signal after reaching the rising edge of HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction at high speed. After reaching the rising edge of HW signal, the motor decelerates and continues running in the reverse direction at low speed. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops at the first motor Z signal after reaching the rising edge of the HW signal.



6098H=9

Home: Z signal

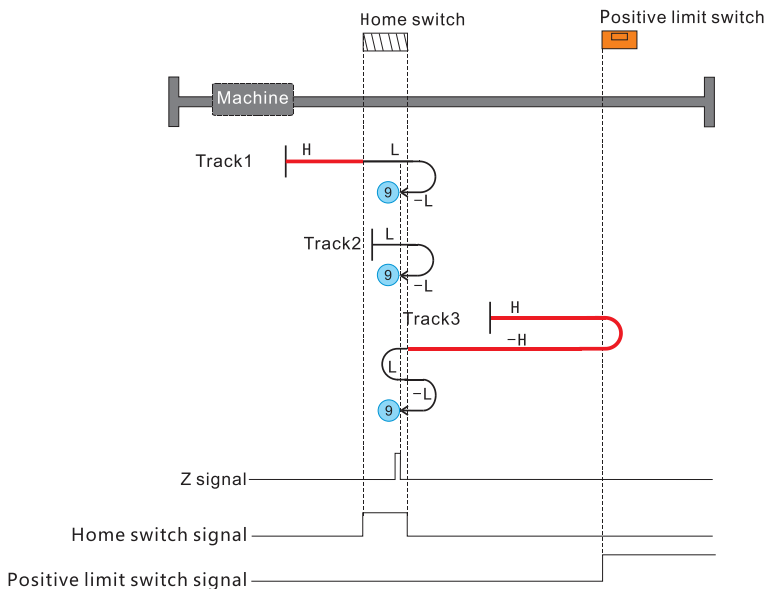
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and runs in the forward direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the reverse direction until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed. Then after reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed. Finally, the motor stops at the first Z signal after reaching the rising edge of HW signal.



6098H=10

Home: Z signal

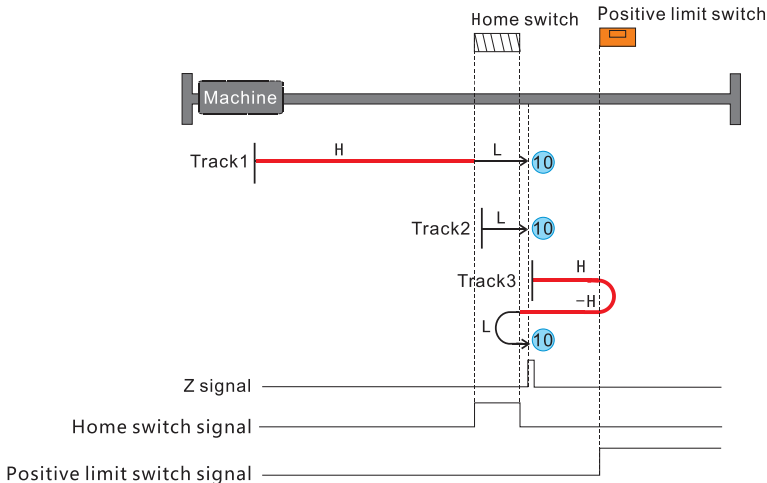
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and

runs in the forward direction at low speed after reaching the rising edge of HW signal. Finally, it stops at the first Z signal after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of HW signal, the motor stops at the first Z signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the falling edge of the HW signal.



6098H=11

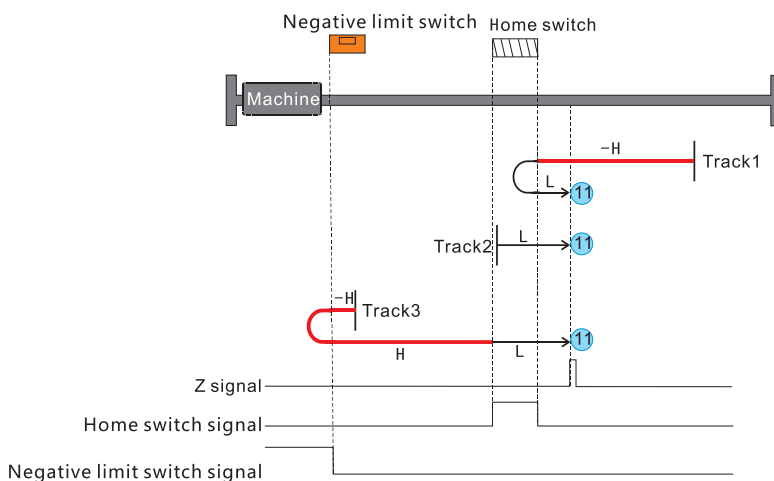
Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the forward direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor stops at the first Z signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor stops at the first Z signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction, After reaching the rising edge of the HW signal, the motor decelerates and runs in the forward direction at low speed. Then, after reaching the falling edge of the HW signal, the motor stops at the first Z signal after reaching the falling edge of the HW signal.



6098H=12

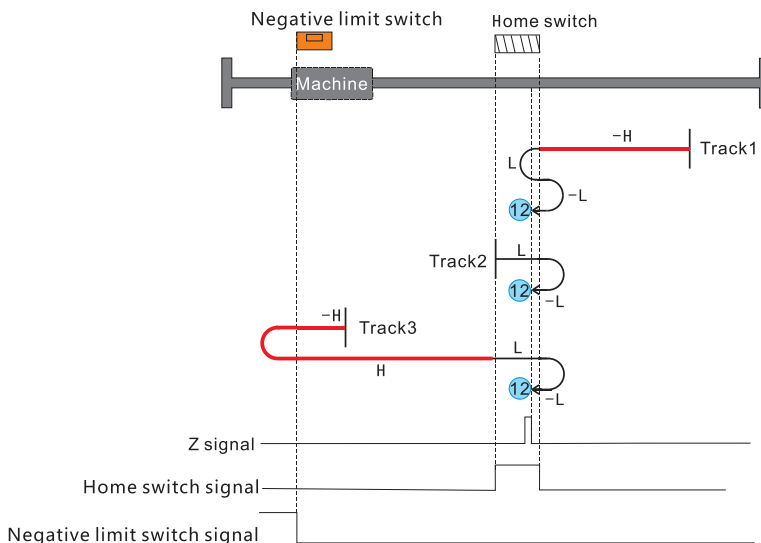
Home: Z signal

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the forward direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of HW signal, the motor changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed. After reaching the rising edge of HW signal, the motor decelerates and runs in the forward direction at low speed. Then, after reaching the falling edge of HW signal, the motor changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.



6098H=13

Home: Z signal

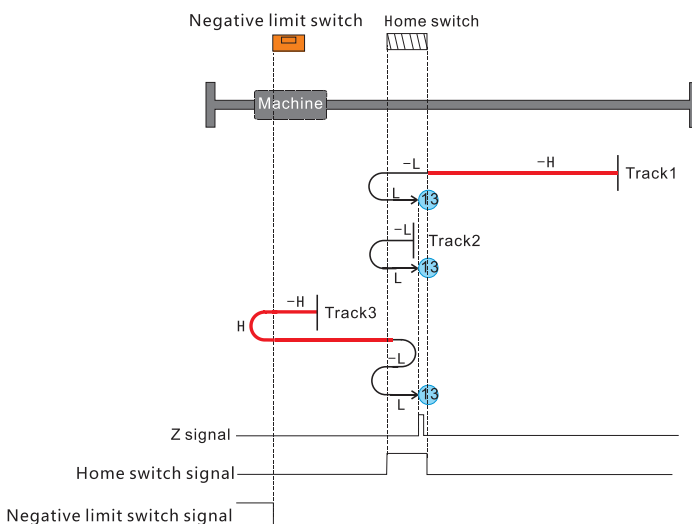
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to

run in the forward direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops at the first Z signal after reaching the rising edge of the HW signal.



6098H=14

Home: Z signal

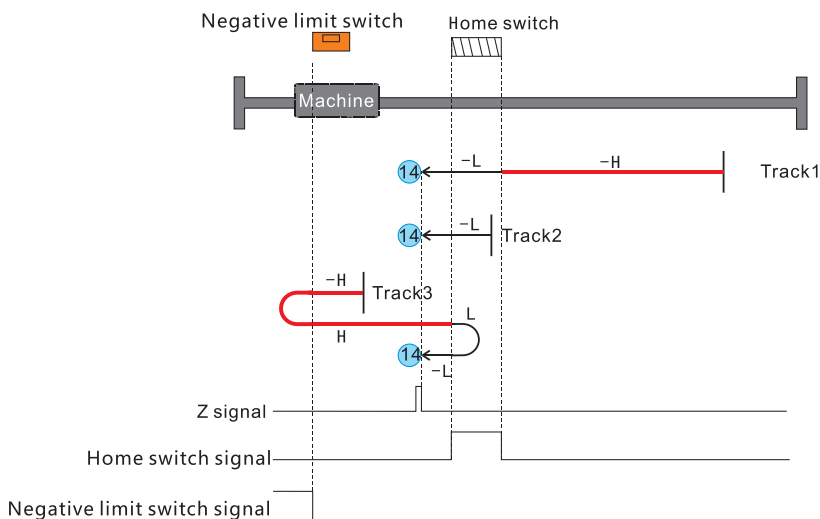
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and

runs at low speed after reaching the rising edge of HW signal. Finally, the motor stops at the first Z signal after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor stops at the first Z signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops at the first Z signal after reaching the falling edge of the HW signal.



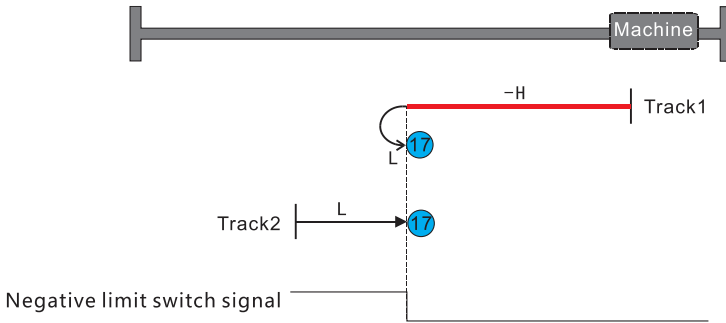
6098H=17

Home: Z signal

Deceleration point: negative limit switch (N-OT)

Track 1: The N-OT signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the N-OT signal, the motor decelerates and changes to run in the forward direction at low speed until it stops after reaching the falling edge of the N-OT signal.

Track 2: The N-OT signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the N-OT signal, the motor stops.



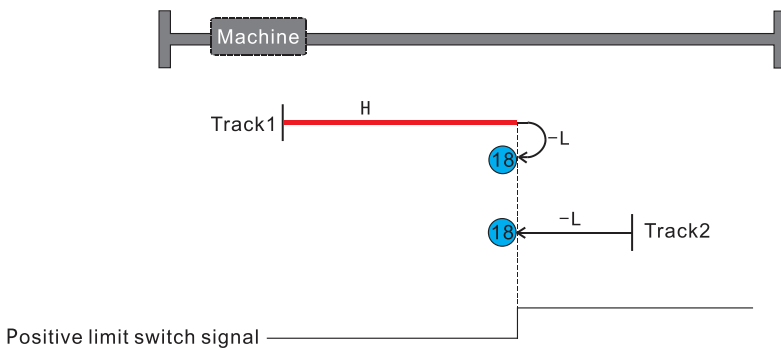
6098H=18

Home: positive limit switch

Deceleration point: positive limit switch (P-OT)

Track 1: The P-OT signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the P-OT signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops after reaching the falling edge of the P-OT signal.

Track 2: The P-OT signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the P-OT signal, the motor stops.



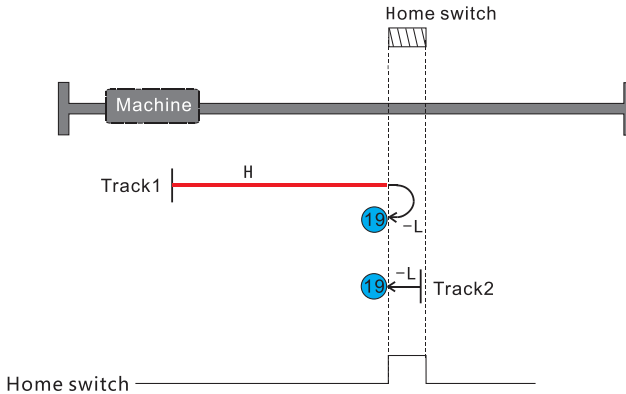
6098H=19

Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor stops.

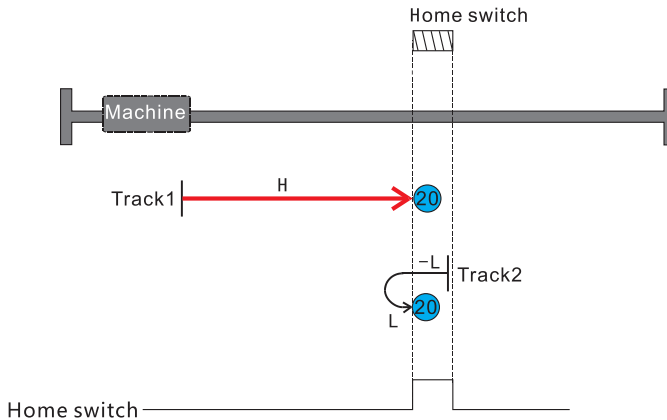
**6098H=20**

Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor stops.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed until it stops after reaching the rising edge of the HW signal.



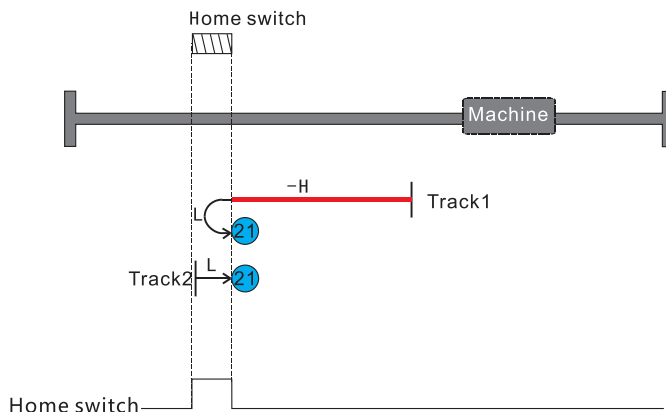
6098H=21

Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed until it stops after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor stops.



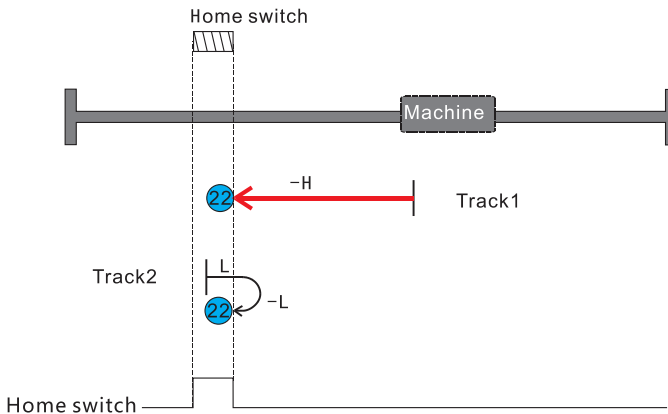
6098H=22

Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor stops.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops after reaching the rising edge of the HW signal.

**6098H=23**

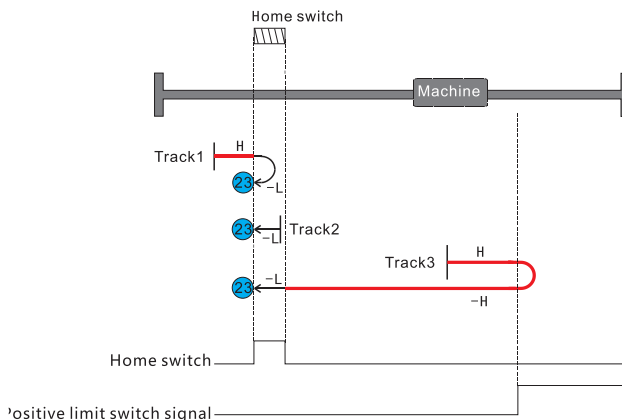
Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor stops.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed until it stops after reaching the falling edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction at high speed until it reaches the rising edge of the HW signal, where it decelerates at low speed. Finally, the motor stops after reaching the falling edge of the HW signal.



6098H=24

Home: home switch

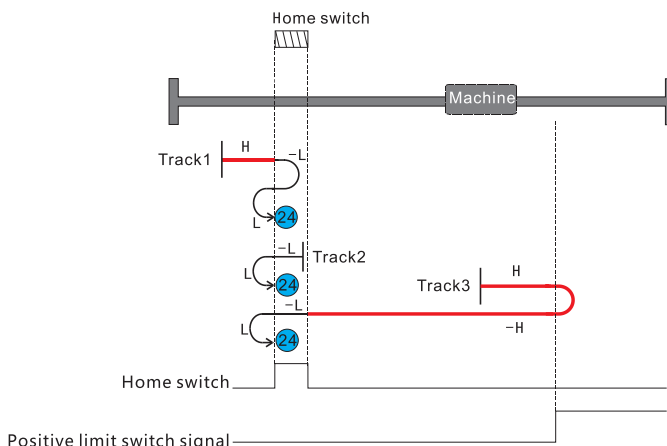
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the

reverse direction at high speed until it decelerates after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed. Finally, the motor stops after reaching the rising edge of the HW signal.



6098H=25

Home: home switch

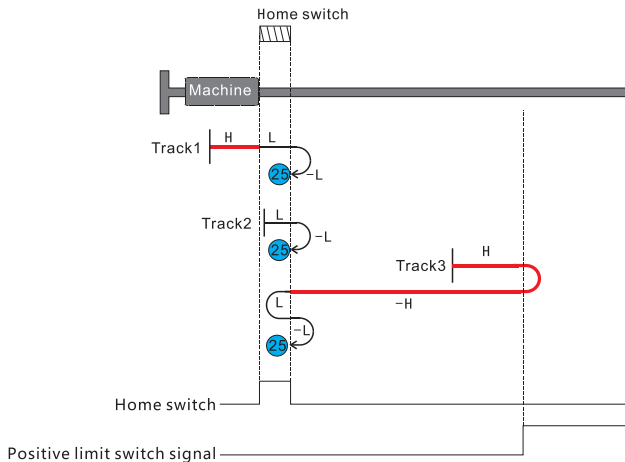
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates and runs in the forward direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor

decelerates and changes to run in the forward direction at low speed until reaching the falling edge of the HW signal where it changes to run in the reverse direction at low speed. Finally, the motor stops after reaching the rising edge of the HW signal.



6098H=26

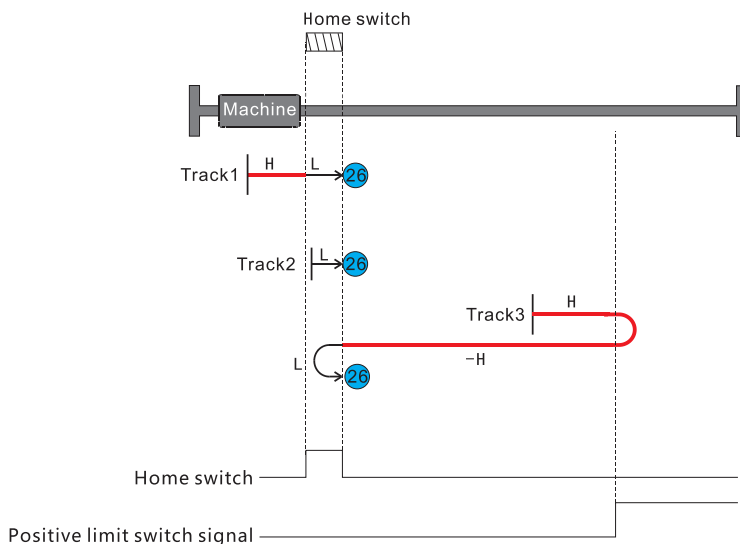
Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis does not hit the limit switch, the motor decelerates at low speed. Finally, the motor stops after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor stops.

Track 3: The HW signal is inactive at start, and the motor starts homing in the forward direction at high speed. If the axis hits the limit switch, the motor changes to run in the reverse direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the forward direction at low speed until it stops after reaching the falling edge of the HW signal.



6098H=27

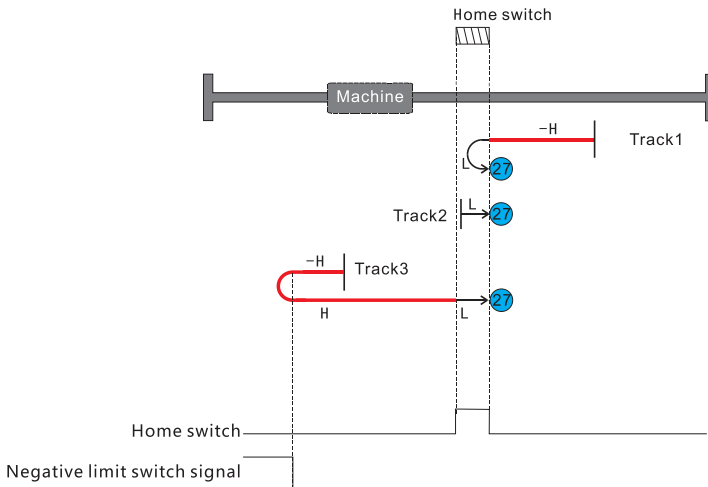
Home: home switch

Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start. The motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the forward direction at low speed after reaching the rising edge of the HW signal. Then, the motor stops after reaching the falling edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the HW signal, the motor stops.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at low speed. After reaching the rising edge of the HW signal, the motor decelerates and keeps running in the forward direction at low speed until it stops after reaching the falling edge of the HW signal.



6098H=28

Home: home switch

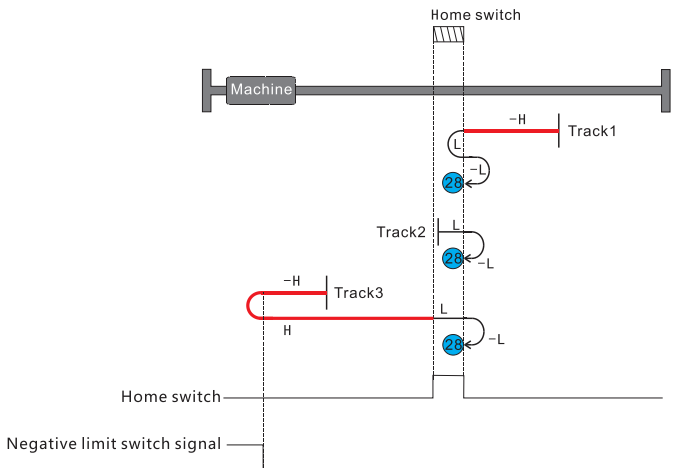
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and changes to run in the forward direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the reverse direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 2: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed until it decelerates after reaching the rising edge of the HW signal. Then, after reaching the falling edge of HW signal, the motor decelerates and changes to run in the reverse direction at low speed. Finally, the motor stops after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed until it decelerates after reaching the rising edge of the

HW signal. Then, after reaching the falling edge of HW signal, the motor decelerates and changes to run in the reverse direction at low speed. Finally, the motor stops after reaching the rising edge of the HW signal.



6098H=29

Home: home switch

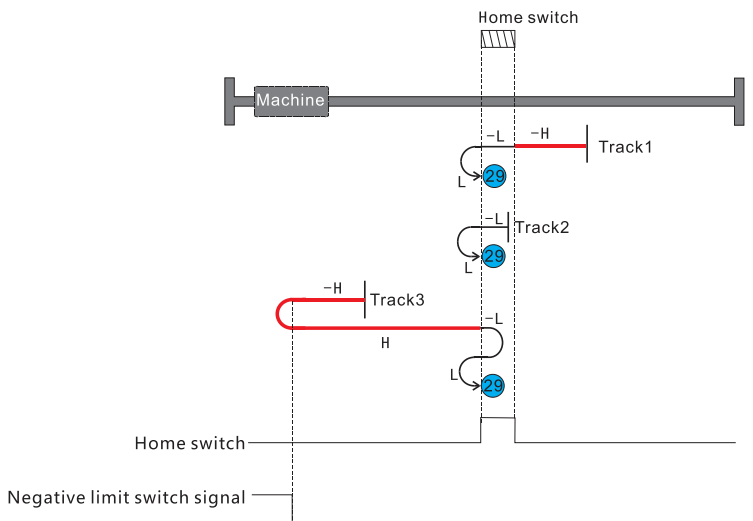
Deceleration point: home switch (HW)

Track 1: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and runs in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 2: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the HW signal, the motor changes to run in the forward direction at low speed until it stops after reaching the rising edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor

decelerates and changes to run in the reverse direction at low speed until it reaches the falling edge of the HW signal, where it changes to run in the forward direction at low speed. Finally, the motor stops after reaching the rising edge of the HW signal.



6098H=30

Home: home switch

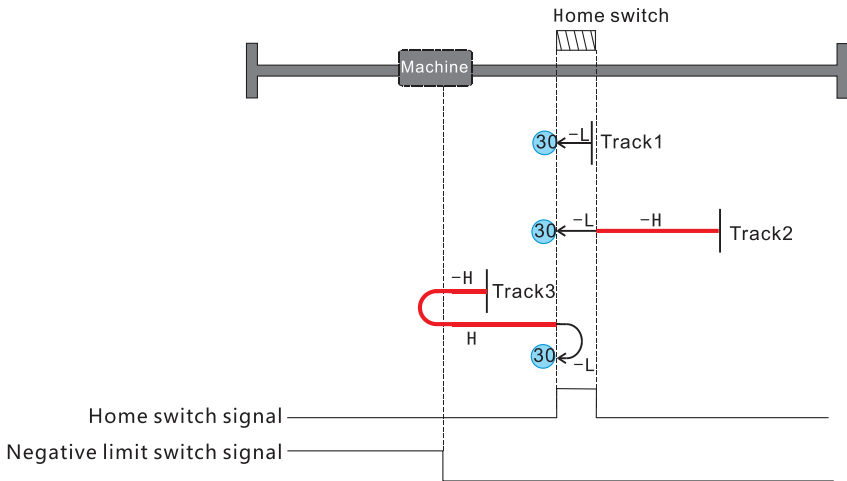
Deceleration point: home switch (HW)

Track 1: The HW signal is active at start, and the motor starts homing in the reverse direction at low speed and stops after reaching the falling edge of the HW signal.

Track 2: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis hits the limit switch, the motor changes to run in the forward direction at high speed. After reaching the rising edge of the HW signal, the motor decelerates and changes to run in the reverse direction at low speed until it stops after reaching the falling edge of the HW signal.

Track 3: The HW signal is inactive at start, and the motor starts homing in the reverse direction at high speed. If the axis does not hit the limit switch, the motor decelerates and keeps running in the reverse direction at low speed after reaching the rising edge of the HW signal. Then, after reaching the falling edge of the HW signal, the motor decelerates

and changes to run in the forward direction at low speed until reaching the rising edge of the HW signal where it changes to run in the reverse direction at low speed. Finally, the motor stops after reaching the falling edge of the HW signal.



6098H=33-Reference reverse Z-phase signal

The motor runs in reverse at low speed, until it stops at the first Z signal.

6098H=34-Reference forward Z-phase signal

The motor runs forward at low speed to find the first Z-phase signal and the motor immediately stops.

6098H=35-Set the current position as home

The motor stops at the current position and completes the return to the home signal given.

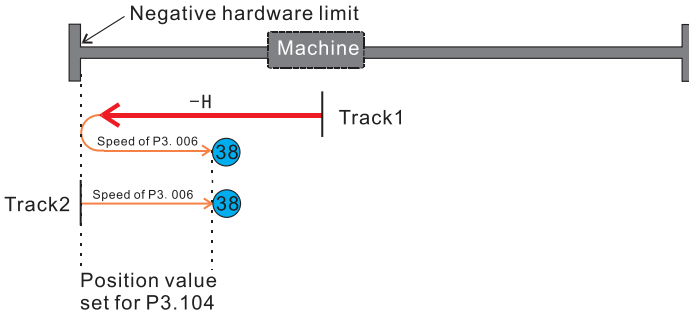
6098H=37 is consistent with 6098H=35

6098H=38-Negative limit triggering torque limit as reference

Track 1: When the motor is not in the reverse hardware limit position, the motor starts homing in the reverse direction to the hardware limit position. After the torque reaches the torque limit set in P3.101, it runs in the forward direction. The position at which the P3.104 (home offset) set value is reached is the home.

Track 2: When the motor is in the reverse hardware limit position, the motor starts homing

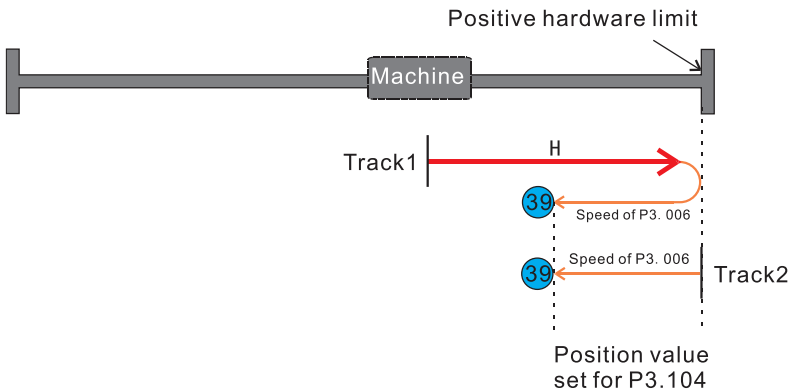
and when the torque reaches the torque limit value, run in the forward direction at low speed, go through the fixed length P3.104 (home offset) set value that is the home.



6098H=39-Referring to the forward limit triggering torque limit

Track 1: When the motor is not in the forward hardware limit position, the motor starts homing in the forward direction to the hardware limit position. After the torque reaches the torque limit set in P3.101, it runs in the reverse direction. The position at which the P3.104 (home offset) set value is reached is the home.

Track 2: When the motor is in the forward hardware limit position, the motor starts homing and when the torque reaches the torque limit value, run in the reverse direction at low speed, go through the fixed length P3.104 (home offset) set value that is the home.

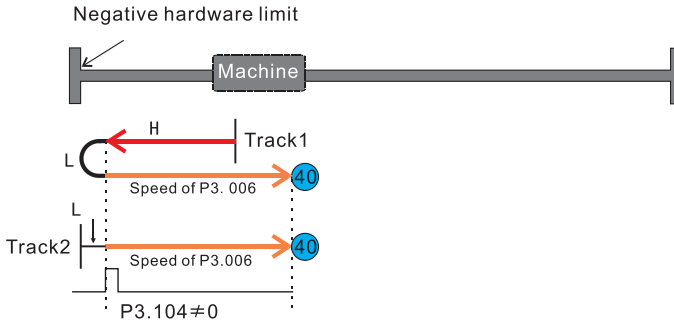


6098H=40-Negative limit triggering torque limit and Z-phase signal as reference

Track 1: When the motor is not in the reverse hardware limit position, the motor starts homing in the reverse direction to the hardware limit position. After the torque reaches the

torque limit set in P3.101, it runs in the forward direction at low speed. The position at which the P3.104 (home offset) set value is reached is the home.

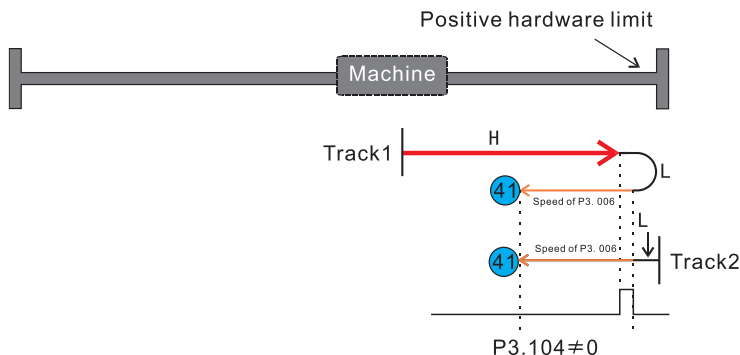
Track 2: When the motor is in the reverse hardware limit position, the motor starts homing and when the torque reaches the torque limit value, run in the forward direction at low speed, go through the fixed length P3.104 (home offset) set value that is the home.



6098H=41-Based on the forward limit triggering torque limit and Z signal as reference

Track 1: When the motor is not in the forward hardware limit position, the motor starts homing in the forward direction to the hardware limit position at high speed. After the torque reaches the torque limit set in P3.101, it runs in the reverse direction at low speed. When reaching the Z signal, run P3.104 ((home offset)) at the speed set at P3.006 to set the position then stop.

Track 2: When the motor is in the forward hardware limit position, the motor starts homing in the reverse direction at low speed, and when the torque reaches the torque limit value, run at low speed. After reaching the Z signal, run P3.104 ((home offset)) at the speed set at P3.006 to set the position then stop.



[Application Example]

The following two examples introduce the home in the communication position mode and the external position mode. With this section, you can better understand and apply the restore function.

Example 1) The steps and operations for the home function in the communication position control mode are as follows:

Step 1-Select Return to Original Mode

In this example, P3.100=1, which means selecting home mode 1 (referring to negative limit+Z-phase signal return to original mode).

Step 2-Control mode selection and control command source selection

P2.002=1 (control mode is position mode), P3.000=0 (position command source selection, set to 0 to indicate position command source from P3.002), P2.004=0 (control command source selection communication control)

Step 3-Set the home velocity

P3.102-Velocity before returning to the original point switch (return to original velocity)

P3.103-Velocity after returning to the original origin switch (crawling velocity)

Note: To ensure a successful return to the original, please set lower regression and crawling velocities.

Step 4-Enable and start back to the original state

P2.030=12 (bit2=1, bit3=1, servo enabled). P2.032=2 (bit1=1. Return to original startup)

Note: To ensure successful homing, set lower regression and crawl speeds.

Step 5-Return to original action

(1) When the negative limit signal is valid at the start of the homing, homing is started directly, the 1st Z signal position after the negative limit falling edge signal is found and recorded as the home position, and the motor stops.

(2) When the negative limit signal is invalid at the start of the homing, the homing is started, the reverse limit signal is given manually, the motor searches for the Z signal position in reverse and records it as the home position, and the motor stops.

Step 6-Check if the homing is valid

When homing is valid, home command bit P2.047

Step 7-Check if the homing is complete

After the home state is completed, the P2.040-bit14 status will be set to 1.

Step 8-Output homing completion signal

Set 8.036 to 15 and select the DO0 terminal function as 'home Completion' (or any configuration of DO0, DO1, DO2 can be set to 15). After returning to original completion, check that D.005bit0 will set to 1 and output the 'Return to Original Completion' signal.

Example 2) Application example of returning to the original function in external position control mode, specific steps and operations are shown in the table below:

Step 1-Select home Mode

In this example, P3.100=7 (refer to positive limit+origin signal+Z-phase signal return to original mode)

Step 2-Control Command Source Selection

P2.002=1 (position mode), P3.000=1 (position command source selection, set to 1 to indicate position command source from external pulse), P2.004=1 (control command source selection terminal control)

Step 3-Configure the return to original command signal and origin switch signal

Configure EDI0 as "Enable Command", EDI1 as "Forward Limit", EDI2 as "Reverse Limit", EDI3 as "Return to Origin", and EDI4 as "Return to Origin Start" in the "Virtual IO&External IO" window.



Step 4-Configure the output signal back to its original state

Configure EDO0 as "Fault State", EDO1 as "Return to Original Completion Signal", and EDO2 as "Brake Output Signal" in the "Virtual IO&External IO Window".



Step 5-Enable and start back to the original state

Activate DI0 and DI4 will start back to its original state.

The **备注** (Note) revert command only takes effect after the servo is enabled. Please enable the servo before executing the revert command.

Step 6-Return to original action

Write the positive limit signal first through "virtual IO&external IO", and then write it back to the original signal. After receiving the command, the servo slows down and slides back until it detects the rising edge of the first Z-phase signal and stops.

Step 7-Check if the return to original is valid

When the return command is valid, return to the original command bit P2.047.

Step 8-Check if the return to original is complete

After returning to the original state, the status bit P2.040_Sit14 will be set to 1.

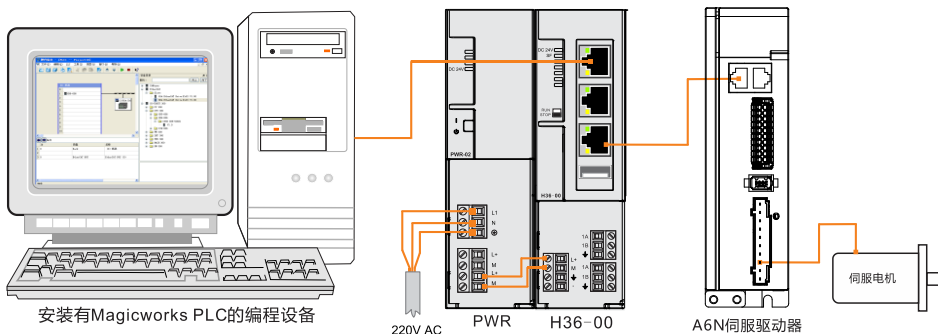
Step 9-Output back to the original completion signal

After returning to the original, check that D.005-bit1 will set to 1 and output the return to original completion signal

8.2.9 Example of COTRUST CPU controlling A6N communication

Example 1 Implementing EtherCAT Communication through MagicWorks PLC

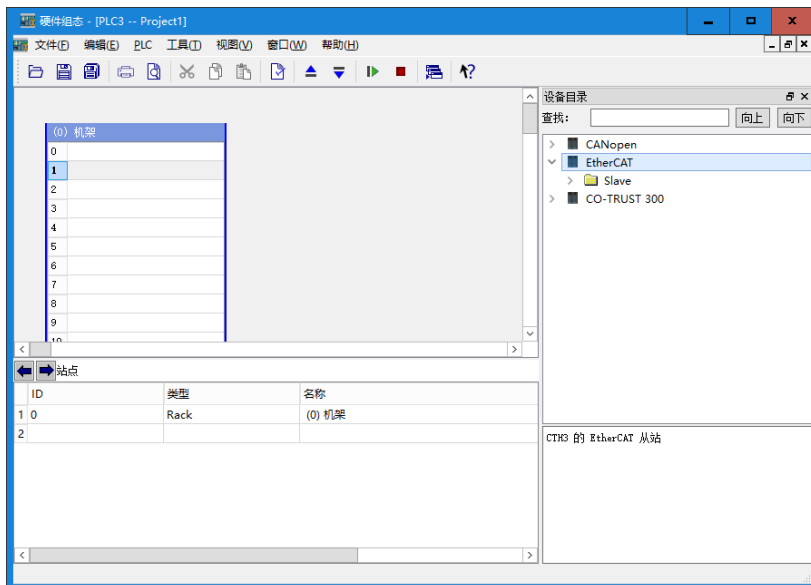
This example introduces the process of EtherCAT communication between A6N servo and COTRUSTCPU H36-00. The schematic diagram of the communication system connection is as follows:



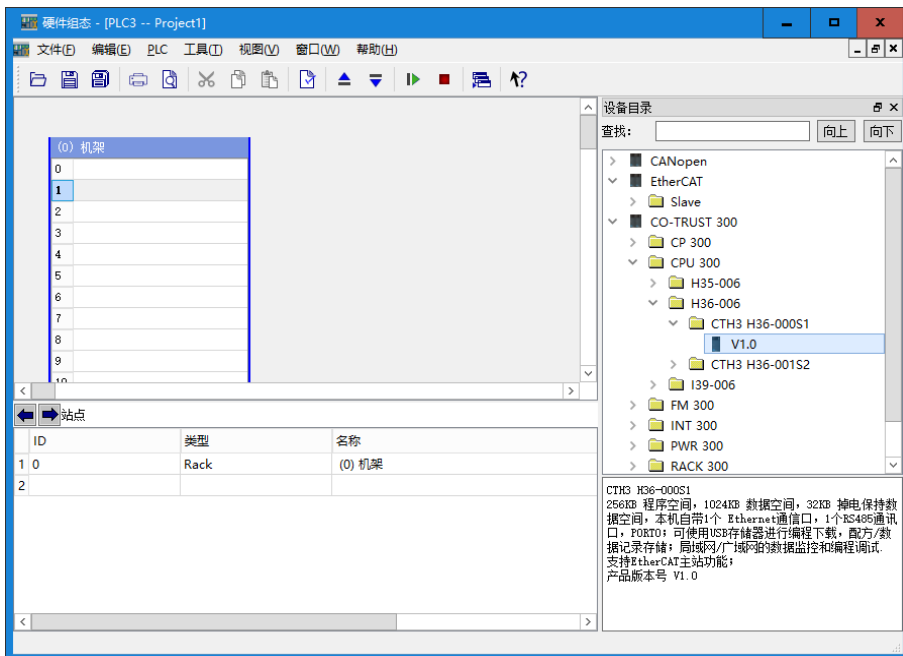
Please follow the steps below to configure EtherCAT in MagicWorks PLC software:

For more detailed instructions on using MagicWorks PLC programming software, please refer to the MagicWorks PLC User Manual. The download link for the manual is: <http://www.co-trust.com/Download/index.html>

1) Open MagicWorks PLC software and enter the EtherCAT configuration interface under hardware configuration, as shown in the following figure:

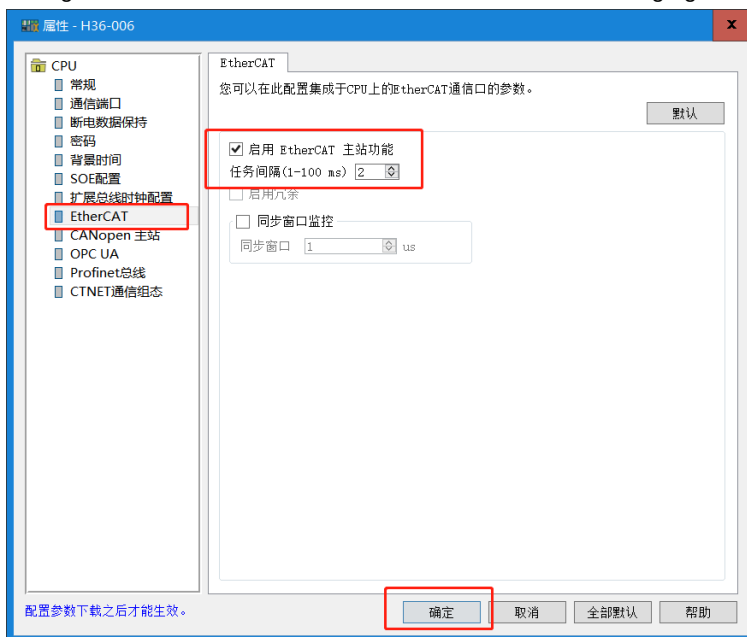


2) Expand the CPU 300 node under CO-TTRUST 300 node in the device directory, select H36-006, and drag and drop it to slot 1. As shown in the following figure:

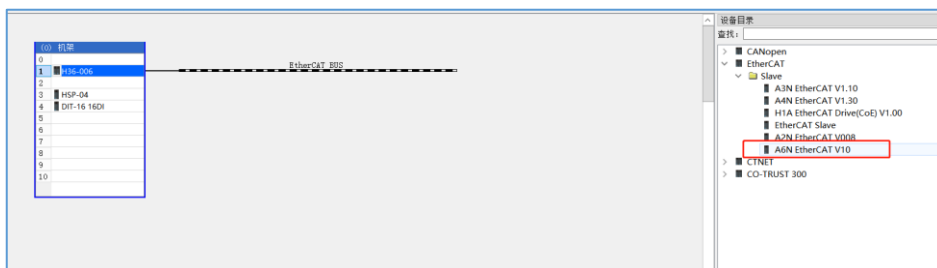


3) Double click H36-006 in slot 1 to configure its communication parameters. Select

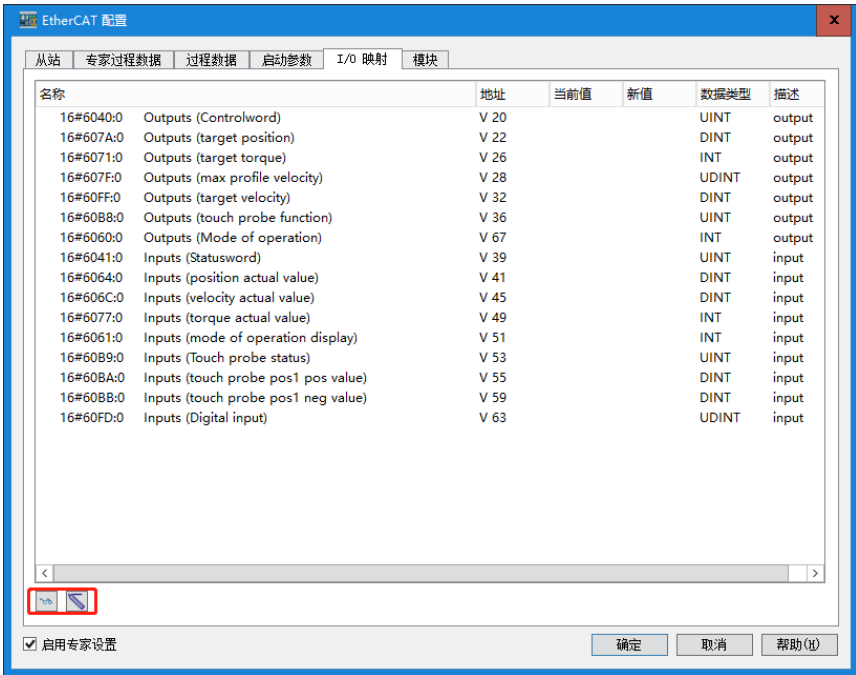
EtherCAT from the left directory bar, check "Enable EtherCAT Master Station Function" in the right function item, and click OK, as shown in the following figure:



4) Expand the slave node in the device directory, select A6N as the slave and drag it onto the EtherCAT bus, as shown in the following figure:



5) Double click the A6N slave icon on the bus and configure its parameters as needed:



By writing values to the mapping addresses corresponding to the parameters, relevant operations can be performed. For example, by setting the V memory address VW0 mapped to P2.030 to 12, the servo can be enabled through EtherCAT communication.

By reading the mapping address corresponding to the parameter, the parameter status can be read. For example, by reading the mapping address VW16 of parameter PC.024, one can view the type of servo alarm error.

6) Diagnose the EtherCAT master-slave network through the front panel of A6N and the SMB status word of MagicWorks PLC.

H36-00 Special Storage Area SMB400~SMB499 Diagnostic Function

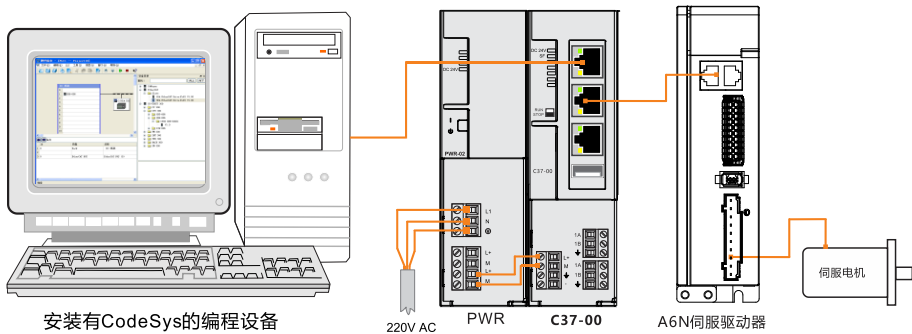
SMB	Error description
SMB400	The number of EtherCAT slave stations found
SMB401	EtherCAT error: 0-No errors 1-Configuration parameter error 2-No sub station found 3-State switching error

	4-An error occurred while writing the configuration 5-Wrong number of stations
SMB402~SMB499	The status of the first slave station: 0-No connection 1-Initialization status 2-Pre operation status 4-Safe operation 8-Operation status

Example 2-Implementing motion control based on EtherCAT communication using CODESYS software

In this example, the CTH300-C series motion controller C37 is used as the EtherCAT master station, and the A6N servo drive is used as the EtherCAT slave station. EtherCAT communication is achieved through CODESYS software to achieve motion control functions.

The schematic diagram of the EtherCAT communication connection between A6N servo drive and C37-00 is as follows:



备注 [The station number is automatically assigned by the main station, and the physical connection determines the position of the servo.](#)

Please refer to the following steps to configure EtherCAT in CODESYS software:

1) Add EtherCAT Master Station

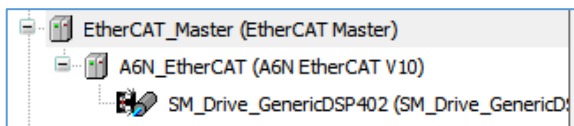
Select "Device (CODESYS control from Co trust)" in the device view and right-click to choose "Add Device" to select "Add EtherCAT Master Station" in the pop-up dialog box.

2) Add EtherCAT slave

Select the successfully added EtherCAT master station in the device view and right-click to select "Add Device" to add the slave station (A6N) connected to the EtherCAT master station below it.

3) Add EtherCAT slave driver

Select the EtherCAT slave (A6N) in the device view and right-click, then select "Add softmotion DSP402 axis" from the pop-up menu to indicate successful driver addition.



4) Configure EtherCAT master station

Set the source address (MAC) in the "Main Station" tab-Click the "Browse" button to the right of "Source Address (MAC)", and then select the corresponding MAC address in the pop-up dialog box. Alternatively, select 'Select Network by Name' and enter the corresponding network name.

主站 | EtherCAT I/O映射 | 状态 | 信息

☒ 自动配置主站/从站

EtherCAT NIC 设置

目的地址 (MAC) | FF-FF-FF-FF-FF-FF | ☒ 广播 | ☐ 激活冗余

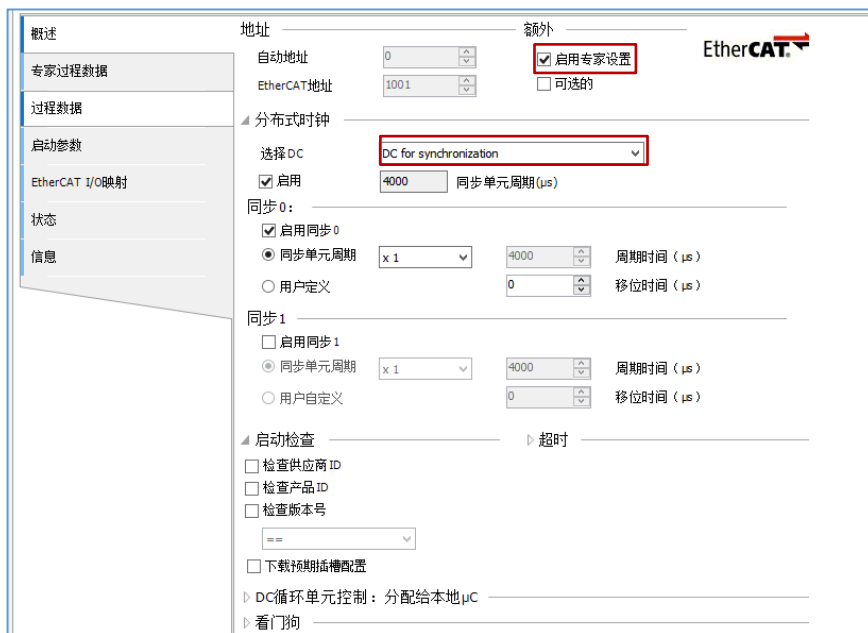
源地址 (MAC) | 2C-6B-7D-54-68-C5 | 浏览...

网络名称 | eth1

☐ 根据MAC选择网络 | ☒ 根据名称选择网络

5) Configure EtherCAT Slave (A6N)

Select "Enable Expert Settings" in the "Slave" tab, and then choose "DC for synchronization" from the drop-down menu of "Select DC".



6) Configure A6N driver (SM_Sriver_GenericDSP402)

The "Softmotion Driver-Basic" tab of SM-Driver_GenericDSP402 is set as follows:



SoftMotor驱动: 基本的 ☐ 比例缩放 ☐ 反转方向

SoftMotor驱动: 缩放/映射 增量 <=> 电机转

SoftMotor驱动器: 调试 电机转动 <=> 齿轮输出转

SM_Drive_ETC_GenericDSP402: I/O 映射 减速机输出 <=> 应用的单元

状态

信息

映射

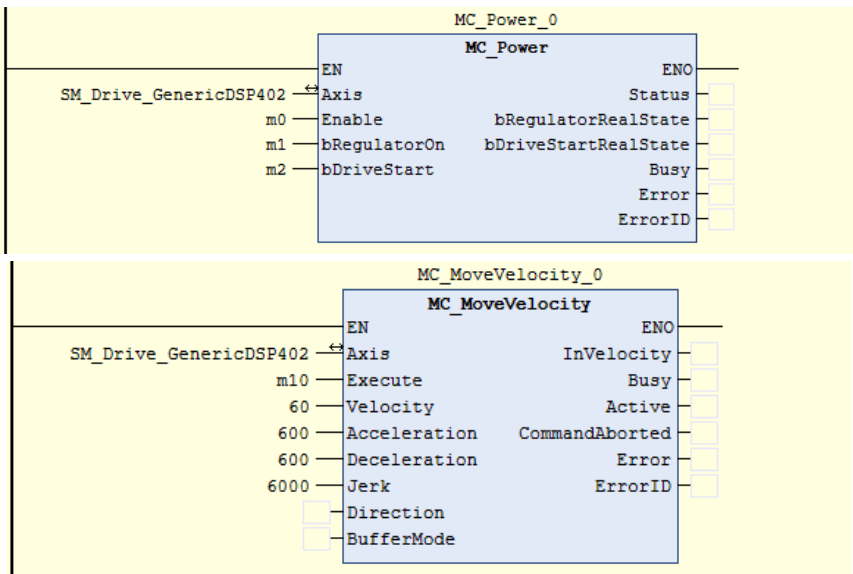
☒ 自动映射

输入:

循环对象	对象数	地址	类型
status word (in.wStatusWord)	16#6041:16#00	'%GIW0'	'UINT'
actual position (diActPosition)	16#6064:16#00	'%ID1'	'DINT'
actual velocity (diActVelocity)	16#606C:16#00	'%ID2'	'DINT'

The running Track is selected as "limited", the velocity ramp type is selected as trapezoidal, and the scaling is set according to the above figure.

7) Expand "PLC" → "Application" in the device view, then double-click to open PLC-PRG for programming:



8) Double click on "Device (CoDessys Control from Co Trust)" in the device view to open the device dialog box, and then set up communication settings in the "Communication Settings" tab to connect C37-00 to the upper computer for communication.

9) Set servo mode P2.002 to mode 7 and save EEPROM

10) Run and debug

Select the menu item "Online" → "Login..." to establish a connection between the application and C37-00 and enter online mode Then select the menu item 'Debug' → 'Start' to start the application program in C37-00.

Double click "PLC-PRG (PRG)" in the device view to open the program table, trigger and download each instruction in sequence.

备注 For detailed usage of the CTH300-C series motion control, please refer to the "CTH300-C Series Motion Controller Manual". The manual can be downloaded from- <https://www.co-trust.com/Download/index.html>.

5. Diagnosis

If an abnormal situation occurs during EtherCAT communication, please check parameter PB.093 on the front panel of the A6N servo driver to diagnose the current EtherCAT network. The function description of PB.093 is shown in the table below:

Parameter number	name	Function Description
B.093	EtherCAT Application Layer Status	Bit0~3- slave station actual status, 1- initialization status 2- Pre operational status 3- Bootstrap state 4- Safe operating status 8- Running status Bit4 AL error prompt-0- The slave station is in the requested state or the flag has been cleared, 1- After local operation, the device has not entered the requested state or changed state Bit5-15- reserved.

Please refer to the following table for the causes of EtherCAT communication failures:

Alarm	Alarm type	Reason for malfunction
-------	------------	------------------------

code		
Er.536	EtherCAT communication exception	This fault occurs when EtherCAT communication is abnormal, and the cause of the fault is described as follows: 1. The main station stops sending messages. 2. The communication physical connection is disconnected. 3 . Communication errors are caused by environmental interference



9

Fault Description (V9 version)



9 Fault Description (V9 version)

9.1 Severe faults

20 Severe Faults

Code	Alarm content	Reasons	Measures
Er.001: Soft start relay failure	Deteriorated or damaged soft start relay		
Er.101: Hardware protection detected overcurrent	Hardware overcurrent protection circuit detects overcurrent	1. Current exceeds servo unit peak current 2. External noise interference 3. Servo unit failure	1. Replace the faulty component 2. Optimize the servo unit working environment wiring, considering the use of input filters 3. Replace the servo unit
Er.102: Software protection detection of overcurrent	Software detects overcurrent		
Er.103: Output short-circuit to ground	Output short to ground detected in power-on self-test	1. Motor power line short circuit to ground 2. Inter turn short circuit or ground short circuit of motor winding 3. Servo failure	1. Check the cable connection or replace the power cable of the motor 2. Replace the motor 3. Replace the servo unit
Er.104: U-phase overcurrent	U-phase output overcurrent is detected		
Er.105: V-phase overcurrent	V-phase output overcurrent is detected		
Er.106: P-phase overcurrent	P-phase output overcurrent is detected		
Er.107: N-phase overcurrent	N-phase output overcurrent is detected		
Er.201: Motor UVW phase sequence abnormal	Motor wiring phase sequence error detected during angle recognition	1. Wrong phase sequence connection of motor power line	1. Switch U and W phase lines and then re-angle identification
Er.202: Motor phase failure	Motor output phase loss	Motor power cable not connected	1. Connect the UVW three-phase power cable between the driver and motor

Code	Alarm content	Reasons	Measures
Er.301: Encoder communication interference	The encoder communication is severely disrupted, resulting in communication failure or abnormal data		
Er.302: Encoder R/W data exception (reserved)	The R/W parameter data of the encoder is abnormal		
Er.401: Internal parameter verification exception (reserved)	Abnormal verification of servo internal parameter data		
Er.402: Logic programme load failure	Logic programme load failure	Logic program initialisation failure	
Er.403: EEPROM parameter R/W is abnormal	The R/W parameter is abnormal	The EEPROM R/W is abnormal	
Er.404: Drive scheme change requires factory restoration	Restore factory parameters after changing the drive scheme	Updated firmware and firmware solution	Restore servo to factory settings
Er.405: After restoring the factory settings, it is necessary to power on and restart	After restoring the parameters to factory values, the servo needs to be powered on again to ensure correct operation		Servo control power supply power off and power on again
Er.406: Firmware voltage level change	Newly loaded firmware has a different voltage level than the previous loaded firmware	1. Wrote the wrong firmware 2. Develop proactive changes	1. For reason 1, it is necessary to reload the correct firmware. If action 2 is followed at this time, if the resistance braking function is enabled, it may cause the brake pipe to burn out 2. For reason 2, restore the servo execution to factory settings, disconnect the servo control power supply, and then power it back on

9.2 General faults

50 general faults

Code	Alarm content	Reasons	Measures
Er.030: Main circuit overvoltage	Main circuit DC bus voltage exceeds set overvoltage thresholds	1. Main power input voltage exceeds the specification 2. The main power input is unstable, fluctuates seriously or suffers from lightning strikes. 3. Discharge resistor resistance value is large 4. Large load inertia or mass but short acceleration and deceleration times. 5. Failure of servo unit	1. Adjust the mains input voltage to within specification 2. Improve the power supply conditions and set surge suppressors or filters in the main power input circuit. 3. Re-wire and replace the discharge resistor with appropriate resistance value. 4. Increase the acceleration and deceleration time or reduce the load. 5. Replace the servo unit
Er.031: Main circuit undervoltage	Main circuit DC bus voltage below set undervoltage threshold	1. The bus voltage of the main loop is lower than the undervoltage threshold during operation	
Er.032: Control electrical overvoltage	Control the DC bus voltage to exceed the set overvoltage threshold	1. Control the input voltage of the power supply to exceed the specifications 2. Unstable control power input, severe fluctuations, or encountering lightning strikes 3. Servo unit malfunction	1. Adjust the input voltage of the control power supply to within specifications 2. Replace the servo
Er.033: Control electrical undervoltage	Control the power supply voltage below the set undervoltage threshold		
Er.034: DC bus discharge resistance overload	Overload of discharge resistor	1. Input main power voltage exceeds specifications 2. Poor or disconnected wiring of busbar discharge circuit	1. Adjust the input voltage value within the specifications 2. Reconnect the wires

Code	Alarm content	Reasons	Measures
		3. Insufficient discharge resistance capacity 4. The machinery is in a continuous braking and power generation state 5. Incorrect setting of discharge resistor resistance or capacity parameters 6. The selected discharge resistor has a high resistance value 7. Driver malfunction	3. Choose a discharge resistor with appropriate capacity 4. Adjust the operating conditions appropriately or choose a discharge resistor with a larger capacity according to the actual situation 5. Modify the corresponding parameters to their actual values 6. Choose a discharge resistor with an appropriate resistance value 7. Replace the servo unit
Er.130: Main inverter bridge overheating	The temperature of the main inverter bridge is higher than the protection threshold	1. The ambient temperature of the servo unit is too high 2. Abnormal cooling fan of servo unit 3. Overload operation of servo unit	1. Adjust the servo motor environment to a temperature below 40 °C 2. Replace the cooling fan 3. Reduce the load of the servo unit to within the rated load
Er.131: Continuous overload of the main inverter bridge	Operate continuously beyond the rated limit		
Er.132: Instantaneous overload of the main inverter bridge	Operated significantly beyond the rated range for several seconds to tens of seconds		
Er.230: Flying car	1. In torque mode, the direction of torque command is opposite to the direction of speed feedback 2. In position or speed mode, the speed feedback is in the	1. Wrong phase sequence connection of motor power line When the control power is turned on, strong interference signals cause significant deviation in the initial phase detection of the motor 3. Encoder abnormality	1. Connect the power line reliably in the correct phase sequence 2. Power on again 3. Select the matching motor and encoder and set the parameters correctly

Code	Alarm content	Reasons	Measures
	opposite direction of the speed command 3. In position or speed mode, the speed feedback exceeds the rated speed and the difference from the speed command exceeds the set threshold	4. There is an external force driving the motor at the load end, causing the motor to run in the opposite direction to the commanded direction 5. Motor loss of control or external driving force far exceeding the motor output capacity at the load end	4. Do not drive the motor through external force at the load end 5. Consider replacing the motor with a larger output capacity or reducing the load
Er.231: Motor overspeed	电机转速超过故障设定阈值	1. Wrong phase sequence connection of motor power line 2. The overspeed threshold is set too low 3. The input command exceeds the overspeed threshold 4. Inappropriate loop gain leads to speed overshoot 5. Servo malfunction	1. Connect the power line reliably in the correct phase sequence 2. Set an appropriate overspeed threshold 3. Set appropriate electronic gear ratios and provide reasonable speed commands 4. Adjust the loop gain 5. Replace the servo
Er.232: Continuous overload of motor	电机以超过额定值的转矩进行了持续运行，且持续时间超过设定阈值		
Er.233: Instantaneous overload of motor	电机以超过额定值的转矩进行了持续运行，且持续时间超过设定阈值		
Er.235: Motor overheating (reserved)	The internal temperature of the motor is too high	1. The ambient temperature of the servo motor is too high 2. The effective heat dissipation area of the servo motor installation surface is too small 3. Overload operation of servo motor	1. Adjust the ambient temperature of the servo motor to below 40°C. 2. Using a larger mounting surface or using forced air cooling. 3. Reduce the servo motor load to within the rated load.
Er.236: When enabled, the motor speed is too fast	Detected motor speed too fast when enabled		

Code	Alarm content	Reasons	Measures
Er.237: Abnormal motor vibration			
Er.330: Encoder battery failure	The encoder battery voltage is below the set threshold		
Er.331: Encoder single loop calculation error	Encoder single loop calculation error		
Er.332: Encoder multi cycle count overflow	Encoder multi cycle count overflow		
Er.334: Encoder overspeed	When the servo is ON, the encoder velocity is too high	When the servo unit control power is turned on, the motor speed exceeds the set value 2. Encoder malfunction 3. Servo malfunction	Before connecting the servo control power supply, reduce the motor speed to below the set value 2. When the servo control power supply is reconnected and the alarm still persists, it may be a fault with the encoder. Consider replacing the encoder or servo motor 3. When the servo control power supply is reconnected and the alarm still persists, it may be a servo failure. Consider replacing the servo
Er.335: Encoder multi turn value abnormality	The encoder multi-turn value is abnormal	During the power on period of the main power supply, if there is a jump in the count value of multiple cycles, this alarm will be triggered. During the main power outage, this error is not detected.	Return the device to its home position and reset the alarm

Code	Alarm content	Reasons	Measures
Er.336: Encoder working mode not supported	Encoder working mode not supported	Single cycle absolute value encoder configured for multi cycle absolute position mode	If you need to work in multi turn absolute position mode, you need to replace the motor of the multi turn absolute position encoder 2. Configure the encoder to work in single loop absolute position mode
Er.530: EDI function setting error	External DI function settings are incorrect or conflicting	External DI function setting error or multiple terminals with the same function set	Cancel duplicate terminal functions
Er.531: Excessive positional deviation	In position mode, the position deviation is greater than the set threshold	1. Abnormal operation of the motor 2. The position instruction differs too much from the current position or the increment is too large 3. The gain parameters of the servo unit loop are not suitable and need to be readjusted 4. If the position deviation is too large, the alarm value will be too small for the current working condition 5. Servo malfunction	1. Confirm that the motor and servo wiring are in good condition 2. Try to reduce the incremental position command and set the electronic gear ratio reasonably 3. Adjust the gain parameters of each loop to an appropriate state 4. Increase the alarm value appropriately 5. If the trial run cannot operate normally, consider replacing the servo
Er.533: Electronic gear ratio setting range exceeds the limit	The electronic gear ratio exceeds the set range	Setting or parameter setting sequence causes the electronic gear ratio to exceed the limit value: $(0.001 * \text{encoder resolution}/10000, 4000 * \text{encoder resolution}/10000)$	Set the DS402 application, first electronic gear ratio, or second electronic gear ratio to a limited range
Er.535: 485 communication disconnected	After establishing a Modbus connection, communication disconnection timed out	1. The main station stops sending messages 2. Communication physical connection disconnected 3. Communication errors caused by environmental interference	
Er.536: CAN/EtherCAT	After establishing a connection with	1. The main station stops sending messages	

Code	Alarm content	Reasons	Measures
communication disconnected	CANopen, communication disconnection timed out	2. Communication physical connection disconnected 3. Communication errors caused by environmental interference	
Er.537: The runtime limit has been reached	The startup running time has reached the set limit time	The startup running time has reached the set limit time	
Er.538: Profinet communication disconnected	After establishing a connection with Profinet, communication disconnection timed out	1. PROFINET connection interruption 2. Controller shutdown 3. Set the controller to STOP state	
Er.539: VDI function setting error	Virtual DI function setting error or conflict	The virtual DI function is set incorrectly or multiple terminals have the same function set	Cancel duplicate terminal functions
Er.540: Parameter self-tuning failed	Parameter self-tuning failed		
Er.541: Control board overheating	The temperature in the core area of the control board exceeds 85 degrees Celsius		
Er.542: Speed limit leads to excessive position deviation	Alarm for excessive position deviation due to small speed limit during activation		
Er.543: Position instruction data is too large	The position command data exceeds the processing range		
Er.544: The increment of the position instruction is too large	The increment of position instructions within a single cycle exceeds the limit		
Er.545: Bus synchronization signal loss	Communication bus synchronization signal loss		

Code	Alarm content	Reasons	Measures
Er.546: Abnormal switching of bus network status	Abnormal switching of communication bus network status		
Er.547: Bus network connection is unreliable	Unreliable communication bus connection		
Er.548: Digital limit position setting error	Conflict in setting forward and reverse limit points for numbers		
Er.549: Home position setting error	Home position setting error		
Er.550: EtherCAT synchronization cycle setting error	EtherCAT synchronisation cycle setup error		
Er.551: EtherCAT synchronization cycle error is too large	EtherCAT synchronization cycle error is too large		
Er.552: Missing PLC control	After Profinet establishes the connection, the PLC is set to stop	Check PLC control status	
Er.630: Illegal speed command (4-axis frequency converter)	The speed command is not within the set range	1. The speed command is less than the starting speed.	
Er.631: ADJ range exceeded (4-axis frequency converter)	ADJ is out of range	When open-loop, the speed command is greater than the maximum synchronous speed.	
Er.632: Abnormal speed		When closed loop, the speed command is greater than the maximum motor speed.	

Code	Alarm content	Reasons	Measures
deviation (4-axis frequency converter)			

9.3 Warning

27 Warnings

Code	Alarm content	Reasons	Measures
AL.080: DC bus discharge resistance overload warning	Discharge resistor overload warning (warning before becoming overload alarm)	1. The short-time power of busbar discharge resistance is too large, and the continuous working condition will lead to high temperature of the discharge resistance. 2. Failure of discharge control circuit 3. Drain resistor parameter setting is not consistent with the actual parameter. 4. Input voltage of main power supply exceeds the specification range. 5. Load inertia is too large 6. Insufficient capacity of the driver or discharge resistor.	
AL.081: Main circuit undervoltage	Main circuit voltage is below set threshold		
AL.082: Abnormal main circuit power input	Abnormal main power input	1. Input main power supply is not consistent with the specification. 2. When three-phase input is selected, input abnormality or phase loss is detected during operation.	1. Set the parameters according to the actual input 2. Make sure the wiring is correct
A.180: Inverter overload warning		The motor ran for several seconds to tens of seconds beyond the rated torque	

A.280: Motor overload warning		The motor ran for several seconds to tens of seconds beyond the rated torque	
A.380: The absolute encoder battery is insufficient	The absolute encoder's battery voltage is less than 3V		
AL.381: Encoder overheating	Encoder temperature exceeds threshold		
AL.580: Return to original action timeout	Return to original incomplete within set time		
AL.581: ESC startup failed	EtherCAT slave startup failure	1. ESC chip does not burn configuration files 2. Circuit malfunction	1. After burning the ESC chip configuration file, restart 2. Confirm that the relevant hardware circuits are normal
AL.582: Parameters saved frequently	Parameters saved frequently	Power-on restart takes effect parameters, power-down save parameters or program internal processing parameters save EEPROM frequently.	
AL.583: Forward overtravel warning	Positive overtravel signal takes effect		
AL.584: Reverse overtravel warning	Reverse overtravel signal takes effect		
AL.585: Speed output range exceeds the limit (4-axis frequency converter)	The velocity output is greater than the maximum synchronous velocity		
AL.586: Driver power not supported	P0.014 Driver power level selection not supported	The power level related parameters of the driver are not pre-set within the program	

AL.587: Motor type not supported	P1.002/P1.050 Motor Selection Not Supported	This motor parameter is not configured within the programme.	
AL.588: EEPROM data read overrun	Data read from EEPROM at power-up exceeds the data allowable range	1. Parameter table has changed 2. Hardware failure leads to abnormal parameter R/W.	1. The software automatically restores the parameters to their factory default values. If this warning is triggered by a change in parameter address, the alarm can be manually cleared. If it is caused by hardware, the parameter save EEPROM function will not be available.
AL.589: FLASH access error	FLASH R/W error		
AL.590: Misconfiguration of external discharge resistor parameters	Incorrect external discharge resistor resistance or power configuration		
AL.591: PLC loses control	After establishing a connection with Profinet, the PLC stops	Check the PLC control status	
AL.592: Control board overheat	Temperature exceeding 85°C in the core area of the control board	1. The servo environment temperature is too high 2. Abnormal servo cooling fan 3. Servo overload operation	1. Adjust the ambient temperature of the servo motor to below 40 °C 2. Replace the cooling fan 3. Reduce the load of the servo unit to within the rated load
AL.593: Change the restart effect parameters	The restart effective parameters have been changed		
AL.594: CANOPEN PDO mapping overruns	Canopen master station configuration number of Pdos exceeds limit		

AL.595: Pulse input overspeed	The input pulse signal velocity is too fast		
AL.596: Torque fluctuation compensation failure	Torque fluctuation compensation failed		
AL.680: ADJ range exceeds limit (4-axis frequency converter)	ADJ is out of range	During the winding process, the difference between the velocity command value and the velocity detection value is greater than the velocity determined by ADJ within the ADJ judgment time	
AL.681: Abnormal velocity detection (4-axis frequency converter)		The deviation of the velocity detection value exceeds the set value.	
AL.682: Abnormal velocity deviation (4-axis frequency converter)		The state in which the difference between the rotation velocity setting value and the velocity detection value exceeds the velocity deviation abnormality level continues until the velocity deviation abnormality judgement time is exceeded.	

9.4 Other Anomalies

Other anomalies

Code	Alarm content	Reasons	Measures
Ft.900: Parameter table error		The number of parameters in the parameter table does not match the number of parameter attributes	Check whether parameters correspond to properties

Ft.901: Main loop running too long		Too many interrupts or too many main loop tasks, causing the main loop tasks to take too long to execute	Reduce the number of tasks, or update to a higher performance processor
Ft.902: Interrupt A programme runs too long		Interrupt A too many tasks, resulting in long execution times	
Ft.903: Interrupt B programme runs too long		Interrupt A or Interrupt B has too many tasks, resulting in long execution times	

- Severe fault type alarms cannot be cleared by the control word. Please clear the alarm by switching off the power and restarting the servo after troubleshooting.
- Warning alarms can be set directly from the control word, and other internal warning alarms can be cleared directly without affecting the normal operation of the servo.
- After an alarm occurs, the servo drive will record the last 16 alarms and automatically store the alarm record in EEPROM.
- When an alarm occurs, the servo drive enters the shutdown state according to the shutdown mode set for the fault or alarm (see shutdown mode description in parameters PC.000 to PC.002) and outputs the servo alarm DO in the control signal.



10

Adjustments



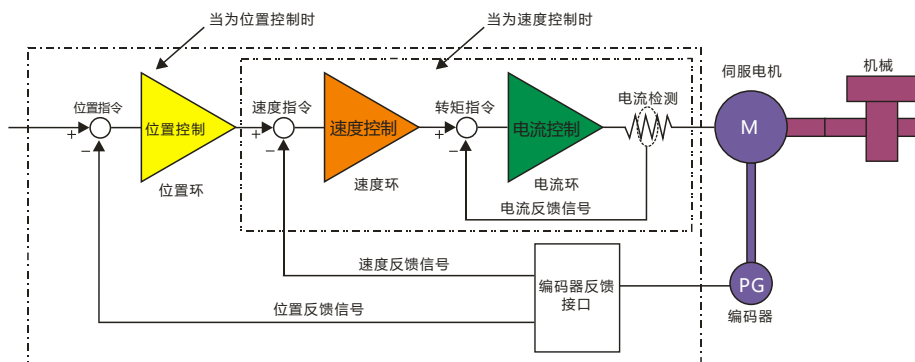
10 Adjustments

Gain parameter adjustment

The servo gain parameters affect the performance of the system, so it is necessary to adjust the servo gain parameters during the system debugging. When the servo leaves the factory, the gain parameter has been set to a relatively stable value, and the user adjusts the servo gain parameter according to the needs of the field mechanical system to further improve the performance of the system.

The gain parameters of the servo affect each other, so it is recommended that engineers with professional knowledge adjust the gain parameters to ensure that the servo motor maintains high performance.

10.1 A6N servo drive system control block diagram



10.2 Setting of servo related gain parameters

1. Position loop proportional gain 0 (P3.012), position loop proportional gain 1 (P3.013)

The larger the position gain value, the higher the gain, and the greater the stiffness. Under the same frequency command pulse conditions, the tracking characteristics of the position command are better, the response speed is increased, the time required for positioning is shortened, and the lag error is correspondingly reduced. However, oscillation is prone to

occur when positioning is completed.

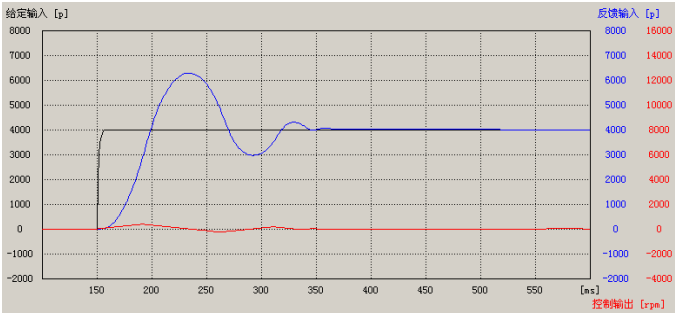


Figure 12-1 Position Loop Curve with Position Loop Gain Set Too Large

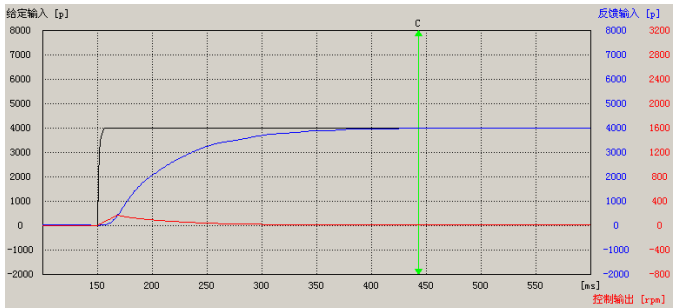


Figure 12-2 Position Loop Curve with Position Loop Gain Set Too Small

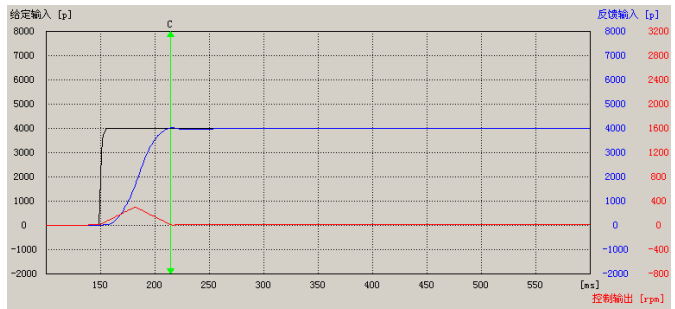


Figure 12-3 Position loop curve for optimum position loop gain value

As can be seen from the above figure, too large a position loop gain will result in overshoot and oscillation, too small a gain will result in a longer positioning time, and a suitable position loop gain will result in a shorter positioning time without overshoot and oscillation.

2. Velocity command filter time constant (P4.014)

Set the time constant of velocity command filter 1. The larger the setting value, the stronger the filtering effect and the more hysteresis.

3. Velocity loop proportional gain 0 (P4.018), speed loop proportional gain 1 (P4.021)

The larger the velocity loop gain setting value, the higher the gain and the greater the stiffness. Set larger values as much as possible without oscillation. In general, the larger the load inertia, the larger the set value of speed gain should be.

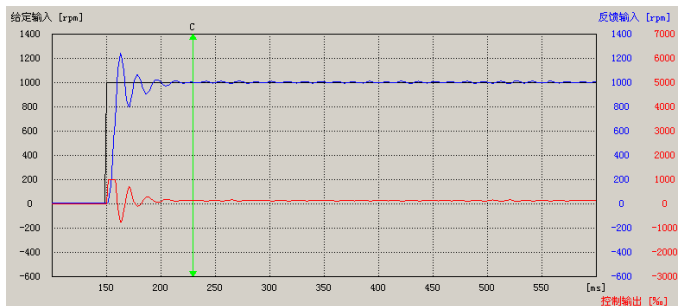


Figure 12-4 Velocity Loop Curve with Excessive Speed Loop Gain

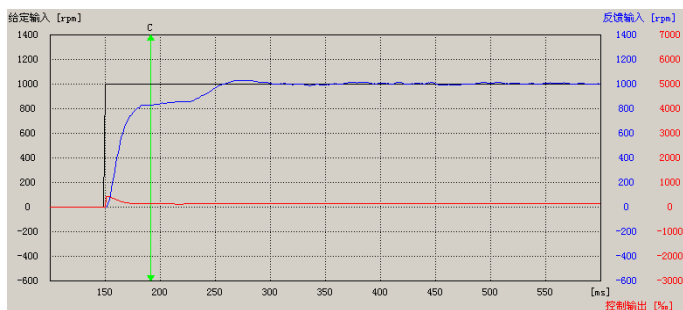


Figure 12-5 Velocity Loop Curve with Too Small Gain

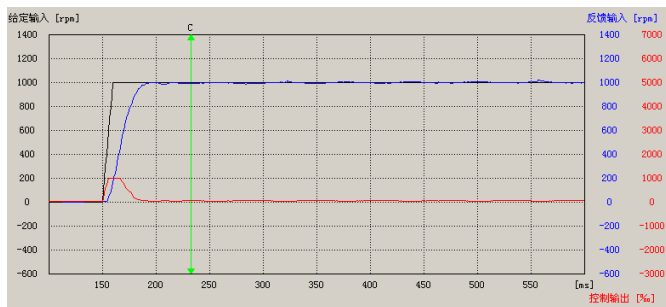


Figure 12-6 Velocity loop curve with appropriate speed loop gain values

From the above figure, it can be seen that a speed loop gain that is too large can lead to overshoot and oscillation, while a gain that is too small can result in a long speed arrival time and poor system responsiveness. A suitable speed loop gain has a shorter positioning time and will not cause overshoot and oscillation.

4. Velocity loop integration time constant 0 (P4.019), Velocity loop integration time constant 1 (P4.022)

The smaller this setting value, the faster the integration velocity. According to the given conditions, smaller values should be set as much as possible to improve response velocity, but at the same time, oscillation is also prone to occur. So, under the condition of no oscillation, try to set a smaller value as much as possible. In general, the larger the load inertia, the larger the set value of the velocity integral should be.

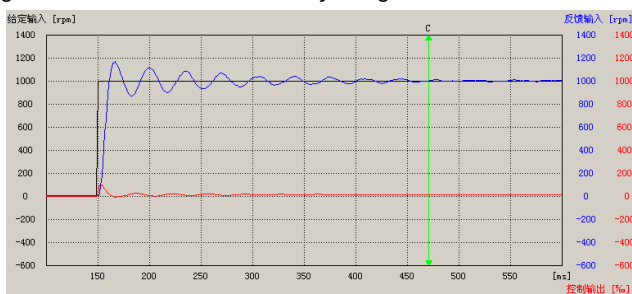


Figure 12-7 Speed loop curve with integral set too small

5. Speed feedback filtering time constant 0 (P4.020), speed feedback filtering time constant 1 (P4.023)

This parameter allows you to choose the type of speed detection filter. The higher the value, the stronger the noise suppression ability, but the response will also slow down accordingly.

6. Torque feedforward (P4.026, P4.027, P4.028)

1) Function

Torque feedforward can improve the following characteristics during speed acceleration and deceleration phases

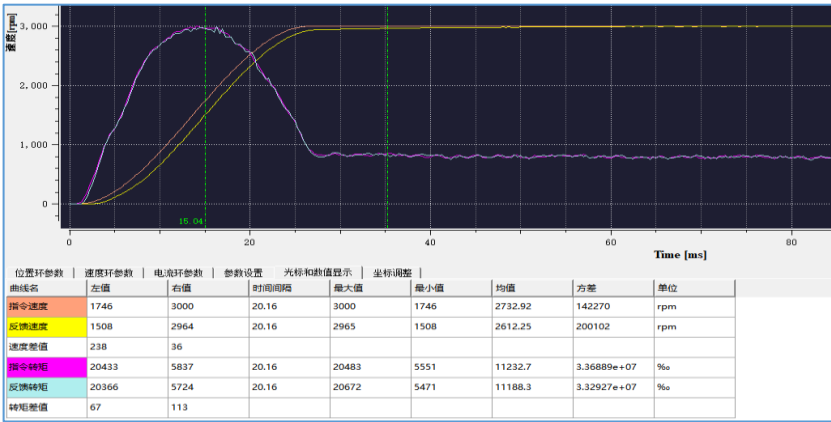


Figure 12-8 No torque feedforward

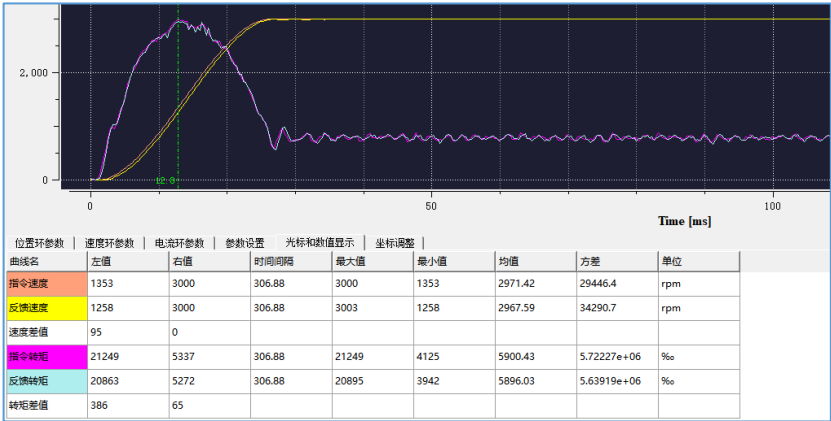


Figure 12-9 With torque feedforward

2) Range

Control mode: Non torque mode

3) Usage method

Address	Name	Description	
		Parameter function	Adjustment method
P4.027	Torque feedforward gain	The larger the gain, the stronger the torque feedforward, the louder the noise, and the faster the speed	Adjust from 0 to large until better results are achieved.

		response.	
P4.028	Time constant of torque feedforward filtering	Set the time constant for torque feedforward filter 1. The larger the setting value, the stronger the filtering effect and the more lag.	When significant noise appears when increasing P4.027, noise can be reduced by increasing P4.028.

- Firstly, set the torque feedforward filtering time constant (P4.028) to the factory value
- Then slowly increase the torque feedforward gain (P4.027) to achieve the desired effect
- Repeatedly adjust and find the setting with the best balance (torque feedforward that best matches the command position and feedback position)
- Increasing the torque feedforward gain can improve response, but overshoot may occur during acceleration and deceleration. Increasing the time constant of torque feedforward filtering can suppress noise.

7. Torque feedback filtering time constant 0 (P5.016), torque feedback filtering time constant 1 (P5.017)

In certain application scenarios, torque resonance may occur, generating vibration noise. Increasing the time constant of the primary delay filter after torque command can suppress such vibrations.

8. Inertia ratio (P4.038, P4.039)

Set the ratio of the total moment of inertia of the mechanical load to the moment of inertia of the motor itself: (total moment of inertia of the mechanical load/moment of inertia of the motor itself) x 100%. Increasing the inertia ratio parameter value is equivalent to increasing the gain of the system, and an excessively large inertia ratio can also cause oscillation. When the load inertia increases, if there are vibration factors in the mechanical system, if the speed integration time is not increased to some extent, it may also lead to mechanical vibration.

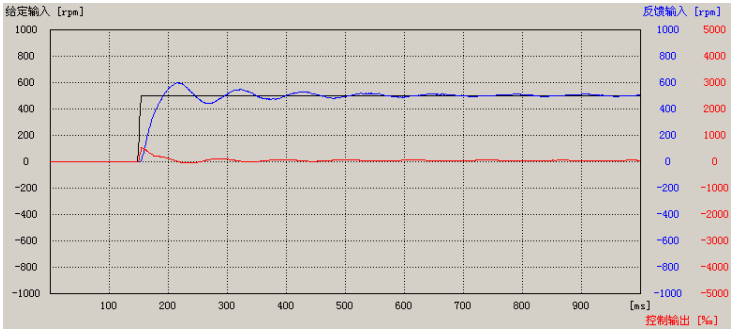
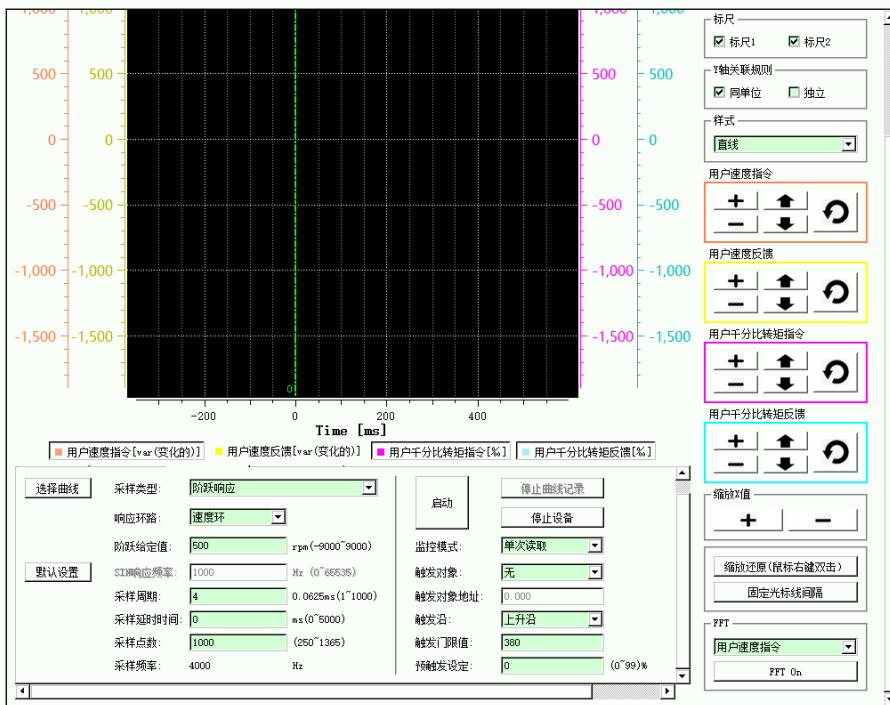


Figure 12-10 Velocity Loop Curve with Insufficient Integration Time for Increasing Inertia Ratio Parameter

10.3 MagicWorks Tuner Curve Chart Function

Users can use the curve graph function to debug servo performance and more intuitively view the sampling value curves of the current loop, speed loop, or position loop. The curve chart includes three curves for the given input, feedback input, and control output of the current loop/velocity loop/position loop. Each curve is sampled at 1000 points based on the sampling period, and then plotted as a curve based on the sampled 1000 points. The interface is shown in the following figure:



The current loop, speed loop, or position loop can be viewed through the drop-down menu of "Curve Loop". The "Monitoring Mode" drop-down menu can also be used to select continuous monitoring or single reading. Click the "Start" button to start the motor, start sampling data, and draw the curve. Click the 'Stop Curve Recording' button to stop curve recording without stopping the motor, or click the 'Stop Equipment' button to stop the motor.

The instruction given for the third ring:

The given value of the current loop step is in ‰, and the speed is limited by the fourth internal speed. The output is a position command (unit: number of pulses).

The unit of the given value for the speed loop step is rpm, the unit of the sinusoidal response frequency of the speed loop is Hz, and the output is the torque command (unit: ‰). Because the speed loop is related to the acceleration and deceleration time parameters, these two parameters should be taken into account when debugging the performance of the speed loop. The longer the acceleration and deceleration time, the slower the response of the speed loop will correspondingly decrease.

The unit for the given value of the position loop step is the number of pulses, and the

output is the velocity command (unit: rpm) 。 This given value is the number of pulses before the gear ratio. If the gear ratio is 1:1 and the step given value is 10000, the motor will be positioned once after starting. Due to the fact that this given value is not controlled by acceleration and deceleration time, if the gear ratio is too large or the given number of pulses is too many, it will cause a large instantaneous position deviation of the servo, which may lead to an overspeed alarm in the servo.

10.4 Inertia Identification

Function

The inertia identification function is used to identify the inertia ratio (P4.038~P4.039)

Ratio of inertia = (Ratio of total inertia of mechanical load/inertia of motor itself) x 100%.

Online inertia identification: online identification is carried out in real time during the normal operation of the servo motor, online identification is suitable for occasions that require real-time adjustment and optimisation of system performance.

Offline inertia identification: Offline identification requires system downtime or non-production time.

10.4.1 Online inertia identification

1) Function

The load inertia ratio can be inferred online in real time.

2) Range

Control mode: Unlimited

3) Description

The initial value of inertia identification is P4.038 or P4.039. The closer P4.038 or P4.039 is to the real inertia ratio, the faster the identification speed can be improved. Under the conditions allowed by the working conditions, increasing the loop gain can improve the accuracy of inertia recognition.

For inertia recognition, please make sure that the motor parameters (motor rated torque P1.009/P1.057, motor body inertia P1.006/P1.064, etc.) are configured correctly, and that

the system needs to satisfy the following conditions when running:

- The motor running speed is above 150r/min.
- The minimum acceleration during acceleration and deceleration is 800rpm/s, the acceleration and deceleration torque is 20% or more of the rated torque, and the torque command must not be in saturation.
- The load inertia ratio is 150 times or less.
- The rigidity of the system must not be too low.
- The load torque should be constant or slowly changing.

4) Usage

Online inertia recognition is enabled by writing 1 to P7.030.

Address	Name	Parameter effects
P7.030	Online Inertia Recognition Enable Switch	Enable online inertia recognition, 1: enabled. 0: not enabled
P7.031	Online Inertia Recognition Ratio	Ratio of inertia recognised by online inertia recognition, in %.
P7.032	Online Inertia Recognition Error Code	--

10.4.2 Offline inertia identification

1) Range

Control mode: Unlimited



Note

When identifying inertia, the velocity PI parameters should be appropriate to ensure that the feedback velocity follows the given velocity.

1) Pre-execution instructions

- Confirm that the servo is not alarmed, i.e., P2.040_bit7=0. If there is an alarm, please disarm and clear the alarm.
- Confirm the servo is not enabled, i.e. P2.030_bit3=0. If the servo is enabled, please set the value of P2.030_bit3 to 0 and write it.
- Select offline load inertia recognition, i.e. P2.001=4.

2) Usage

- Open the upper computer software MagicWorksTuner.
- Function menu select inertia recognition.

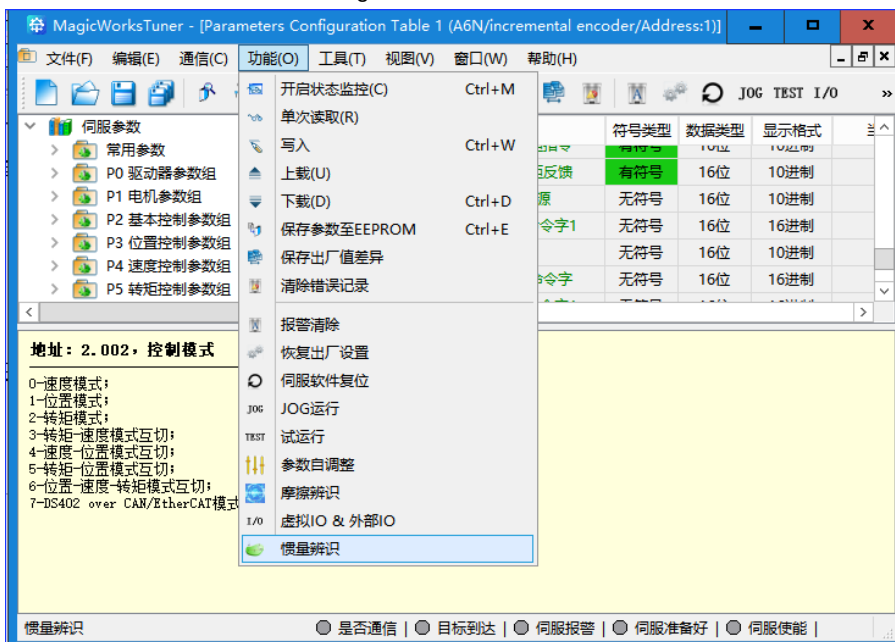


Figure 12-11 Offline Inertia Recognition Menu

- Parameter Settings

It is recommended to set the speed and deceleration travel to the permissible range of the device. The larger the settings of these two parameters, the more accurate the inertia recognition results. Speed gain and speed integration constant are recommended to be set by default. The deceleration ratio should be filled in according to whether the motor is equipped with a gearbox or not, and if it is not equipped, it should be filled in 1. (Generally, the default parameter is selected.)

After the parameter setting is finished, click Write, and click Next after the display of 100%.



Figure 12-12 Offline Inertia Recognition Settings

- 惯量比测试
- Inertia Ratio Test

Click forward to test the ratio of inertia, click Reverse to test the ratio of inertia.



Figure 12-13 Inertia Ratio Test

If an error is reported, click Previous to modify the reported parameter according to the

error message. For example, in the following figure, the error message shows that the rigidity level is incorrect, so click on the previous step to return to modify the rigidity level.

Note: Generally, the error will be reported only when the rigidity level is too small.



Figure 12-14 Inertia Recognition Error Tip

Click forward and reverse again to test the inertia ratio, the writing progress bar shows 100% indicating that the inertia recognition is complete, click write again.

10.5 Vibration Suppression

Servo vibration suppression technology solves vibration problems in servo systems to improve system performance and stability. There are two types of vibration suppression, one is mechanical resonance suppression and the other is low frequency vibration suppression.

10.5.1 Mechanical Resonance Suppression

1. Mechanical resonance: servo system in the working process, if there is flexibility or gap in the mechanical components, it may produce resonance. This resonance is usually related to the intrinsic frequency of the system, when this frequency is excited, it will produce noise, and in serious cases, it may also lead to hardware damage.

There are two ways of mechanical resonance suppression:

1) Torque command filtering

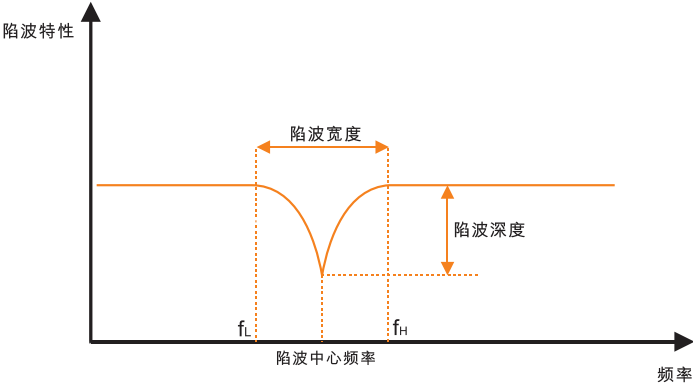
2) Wave Trap

2. Torque command filtering

By setting the torque filtering time constant P4.028, the torque command is attenuated in the high-frequency band above the cut-off frequency to achieve the purpose of suppressing mechanical resonance.

3. Traps: traps reduce the gain of a specific frequency, thus suppressing the system mechanical resonance.

A6N servo drive has four sets of traps, of which traps 0 and 1 belong to the automatic traps (can also be set manually), traps 2 and 3 belong to the manual traps, each set of traps include three parameters, respectively, frequency, width, depth. Vibration suppression is achieved by setting the frequency, width, and depth of the trap filters. After setting the three parameters of the traps, you need to set P5.120 to turn on the corresponding traps to take effect.



Related parameters

Parameter	Name	Description
P5.120	Mechanical resonance suppression trap selection	Bit0- notch filter 0 switch (0-OFF, 1-ON) Bit1- notch filter 1 switch Bit2- notch filter 2 switch Bit3- notch filter 3 switch
P5.121	Frequency of	Set the vibration frequency of notch filter 0, unit: Hz. Range:

	Notch filter 0 (Hz)	50~4000.
P5.122	Width of Notch filter 0	Set the width of notch filter 0, the larger the width, the better the effect, but the response will decrease, ranging from 10 to 2000, default 70.
P5.123	Depth of notch filter 0	Set the depth of notch filter 0, the smaller the depth, the better the effect. If the depth is too small, it may intensify vibration, with a range of 0-1000. Default 1000 is invalid.
P5.124	Frequency of Notch filter 1 (Hz)	Set the vibration frequency of notch filter 1, unit: Hz. Range: 50~4000.
P5.125	Width of Notch filter 1	Set the width of notch filter 1, the larger the width, the better the effect, but the response will decrease, ranging from 10 to 2000, default 70.
P5.126	Depth of notch filter 1	Set the depth of notch filter 1, the smaller the depth, the better the effect. If the depth is too small, it may intensify vibration, with a range of 0-1000. Default 1000 is invalid.
P5.127	Frequency of Notch filter 2 (Hz)	Set the vibration frequency of notch filter 2, unit: Hz. Range: 50~4000.
P5.128	Width of Notch filter 2	Set the width of notch filter 2, the larger the width, the better the effect, but the response will decrease, ranging from 10 to 2000, default 70.
P5.129	Depth of notch filter 2	Set the depth of notch filter 2, the smaller the depth, the better the effect. If the depth is too small, it may intensify vibration, with a range of 0-1000. Default 1000 is invalid.
P5.130	Frequency of Notch filter 3 (Hz)	Set the vibration frequency of notch filter 3, unit: Hz. Range: 50~4000.
P5.131	Width of Notch filter 3	Set the width of notch filter 3, the larger the width, the better the effect, but the response will decrease, ranging from 10 to 2000, default 70.
P5.132	Depth of notch filter 3	Set the depth of notch filter 3, the smaller the depth, the better the effect. If the depth is too small, it may intensify vibration, with a range of 0-1000. Default 1000 is invalid.

4. Get vibration frequency

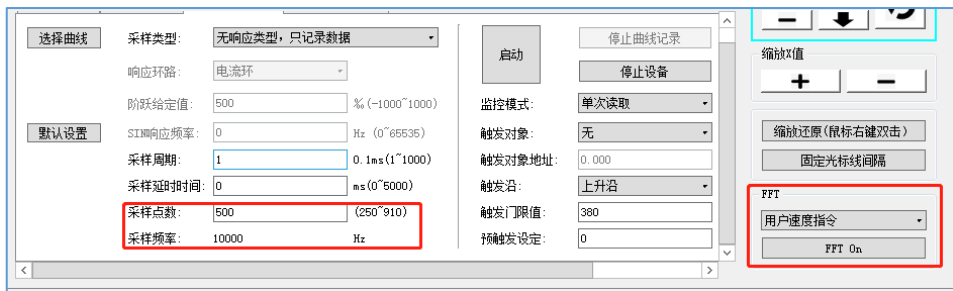
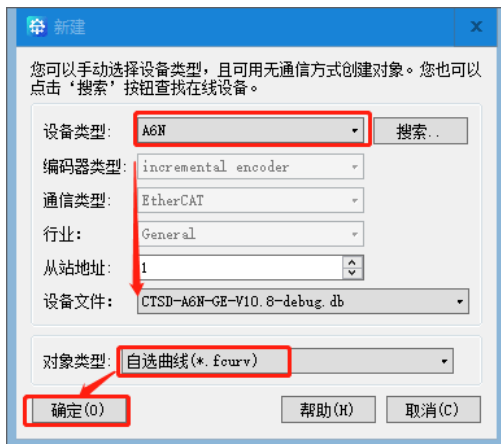
The vibration frequency can be obtained by the host computer or the automatic notch function, as follows:

- ① Detect the vibration frequency through the FFT function of the upper computer.

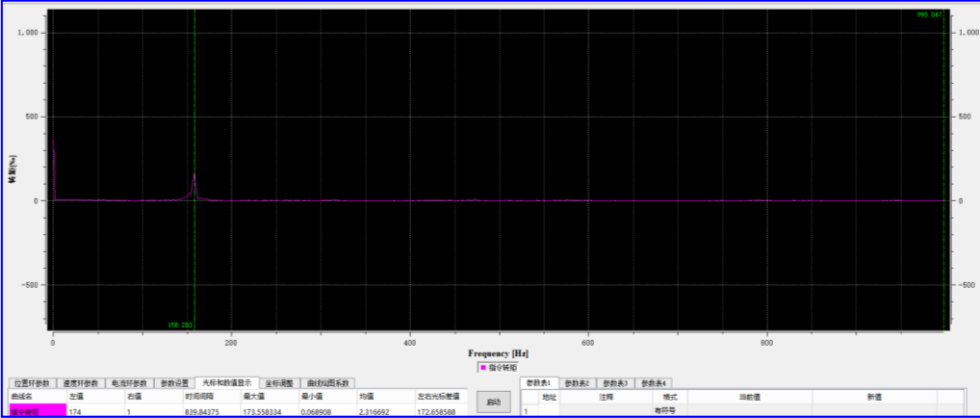
Turn on the FFT function after collecting the torque command data, if the data collected

is more than one group, the FFT will be turned on after selecting the torque command.

Pay attention to the sampling frequency and sampling points, the sampling frequency set here must be greater than twice the highest frequency detected by FFT, otherwise the vibration frequency may not be in the spectrum.



It can be seen from the FFT that the vibration frequency is 153Hz.



② Automatic notch to obtain vibration frequency

Related parameters

Parameter	Name	Description
P5.133	vibration threshold	Threshold value for judging vibration during vibration detection. Unit: ‰ (parts per thousand)
P5.134	Adaptive Trap	0-No operation. 1-Automatic trap setting (up to two). 2-Restore trap 0 and trap 1 parameters to before automatic setting. 3-Frequency detection only. 4-Restore trap 0 and trap 1 parameters to default values.
P5.135	Adaptive Trap Vibration Detection Frequency0	Vibration frequency detection frequency 0. Unit: Hz
P5.136	Adaptive Trap Vibration Detection Amplitude 0	Vibration frequency detection amplitude 0. Unit: ‰ (parts per thousand)
P5.137	Adaptive Trap Vibration Detection Frequency 1	Vibration frequency detection frequency 1 Unit: Hz
P5.138	Adaptive Trap Vibration Detection Amplitude1	Vibration frequency detection amplitude 1. unit: ‰ (parts per thousand)

Set P5.134=3 Turn on the detection vibration frequency. When there is vibration, the vibration frequency and amplitude of P5.135, P5.136, P5.137 and P5.138 will be displayed.

5. Automatic notch filter

Set P5.134 to 1 to enable automatic notch filtering. When the device vibration amplitude is detected to be greater than the vibration detection threshold P5.133, the driver will

automatically update the relevant parameters of notch filters 0 and 1. After a period of undetected vibration, the automatic trap will automatically shut down, and the parameters of trap 0 and 1 will no longer be automatically updated. Note: When there are more than two vibration frequencies, please manually set notch filters 2 and 3.

10.5.2 Low frequency vibration suppression

1) Function

To suppress low-frequency vibrations caused by the flexibility of the device end during positioning, up to two vibration frequencies can be set.

2) Scope

Control mode: Position mode

3) Instructions for use

- The low-frequency vibration suppression function can achieve vibration suppression at two frequencies, corresponding to P3.202~P3.205 and P3.206~P3.209, respectively. When the vibration suppression frequency is set to 1-9, low-frequency vibration suppression is ineffective.
- The higher the width level, the better the vibration suppression effect, and the slower the response of the motor. The lower the depth level, the better the vibration suppression effect, and at the same time, the motor response will be slower. Increasing the correction factor can improve motor response, but may increase vibration (usually the default value is 10).
- Setting of vibration frequency: When the vibration is not fed back to the motor end, please use a vibration detection device to detect the end vibration frequency before setting. When the vibration is fed back to the motor end (limited to a single vibration frequency), the upper computer can be used to read the position command feedback curve and calculate the vibration frequency (vibration frequency $f=1/t$) from the curve graph. Alternatively, the low-frequency vibration suppression mode can be set to 2 to run the equipment for multiple position command cycles, and the driver will automatically detect and set the first set of vibration suppression parameters. When the effect of using automatic mode is not ideal, it can be changed to manual mode for fine-tuning.
- When using automatic identification, the detection of vibration is based on P3.201 *

P3.094 (positioning completion range)/100. When the system vibration amplitude is greater than this value, it is considered that vibration has occurred. P3.201 and P3.094 can be modified to change the vibration detection amplitude.

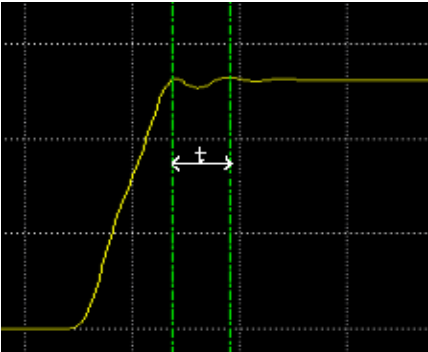


Figure 12-20 Position Feedback Curve

 Note
The following situations cannot be suppressed for vibration: 1. Vibration caused by external forces 2. The vibration frequency is not within the range of 1-100Hz.

4) Operation method

Set vibration suppression related parameters and set low-frequency vibration suppression mode

P3.200	Selection of low-frequency vibration suppression mode	0-Off. 1-Enable (manual parameterisation). 2-Automatic recognition.
P3.201	Low frequency vibration detection amplitude	Setting the vibration detection amplitude (relative to the positioning completion range). Unit: % (per cent)
P3.202	Low frequency vibration suppression frequency 0	Low-frequency vibration frequency 0,1-1000 (0.1Hz) (the trap is invalid when the frequency is 1-9) Unit: 0.1Hz
P3.203	Low frequency vibration suppression frequency ratio0	Set notch correction coefficient 0
P3.204	Low-frequency vibration suppression trap width class 0	Set notch width 0
P3.205	Low frequency vibration	Set notch depth 0

	suppression trap depth level 0	
P3.206	Low frequency vibration suppression frequency1	Low-frequency vibration frequency 1,1-1000 (0.1Hz) (the trap is invalid when the frequency is 1~9). Unit: 0.1Hz
P3.207	Low frequency vibration suppression frequency ratio1	Set notch correction coefficient 1
P3.208	Low frequency vibration suppression trap width class 1	Set notch width 1
P3.209	Low frequency vibration suppression trap depth class 1	Set notch depth 1

10.6 Gain Adjustment

10.6.1 Principle of servo parameter gain adjustment

The adjustment of servo gain parameters should follow a control principle, and the more inner the loop, the more it needs to improve its responsiveness. If this principle is not followed, it may lead to poor responsiveness or vibration. The current loop is the innermost loop, and due to the factory default parameters ensuring its full responsiveness, the servo current loop parameters have been locked and protected. Users only need to adjust the position loop parameters and velocity loop parameters.

The gain parameters of the servo are mutually constrained. For example, in order to improve the responsiveness of the position loop, if only the gain of the position loop is increased, the velocity command output by the position loop may become unstable, which may lead to unstable performance of the entire servo system. Because only the response of the position loop is increased, the response of the position loop is greater than that of the velocity loop. The acceleration and deceleration operations that were originally required for the velocity command output by the position loop will not follow due to the poor response of the velocity loop, resulting in an accumulation of position deviations. The servo will increase the acceleration command, which will cause the servo motor velocity to become too fast, and the position loop will begin to reduce the velocity command. Repeating this process will make the motor unable to adapt and cause vibration. So in order to ensure that the velocity loop response is greater than the position loop response, increasing the position loop gain also requires a corresponding increase

in the velocity loop gain.



Notes

- Before tuning the gain, pay attention to its applicable range and precautions to ensure that there is no danger in changing the load position during the gain adjustment process.
- Please ensure that relevant safety measures have been taken, such as setting P3.097 (threshold for excessive positional deviation), etc.

10.6.2 Manual Adjustment

Manually adjust servo gain parameters

1. The servo gain parameters are usually adjusted according to the following steps, and if necessary, the curve function of MagicWorks Tuner software can be used to assist in adjustment:

- 1) Set the position loop gain to a lower value first, and then gradually increase the gain of the velocity loop to the maximum value without generating abnormal noise and vibration.
- 2) Gradually adjust and reduce the velocity loop gain value, while increasing the position loop gain. Under the premise of no overshoot or vibration in the entire response, set the position loop gain to the maximum.
- 3) The integration time constant of the velocity loop depends on the length of the positioning time, and this value should be minimized as much as possible without vibration in the mechanical system.
- 4) Subsequently, fine tune the position loop gain, velocity loop gain, and integration time constant to find the optimal values.

2. When manually adjusting parameters, after setting the correct inertia ratio P4.038, the position loop gains P3.012, P3.013, velocity loop gains P4.018, P4.021, velocity loop integration time constant P4.019, torque feedforward filtering time constant P4.028, and velocity command filter time constant P4.014 should be set to satisfy the following relationship as much as possible (the same for gain 1):

- 1) Position loop proportional gain P3.012 (0.1Hz) and velocity loop proportional gain P4.018 (0.1Hz).

The maximum proportional gain of position loop P3.012 cannot be greater than $P4.018 * 2\pi$, that is, $P3.012 < P4.018 * 2\pi$.

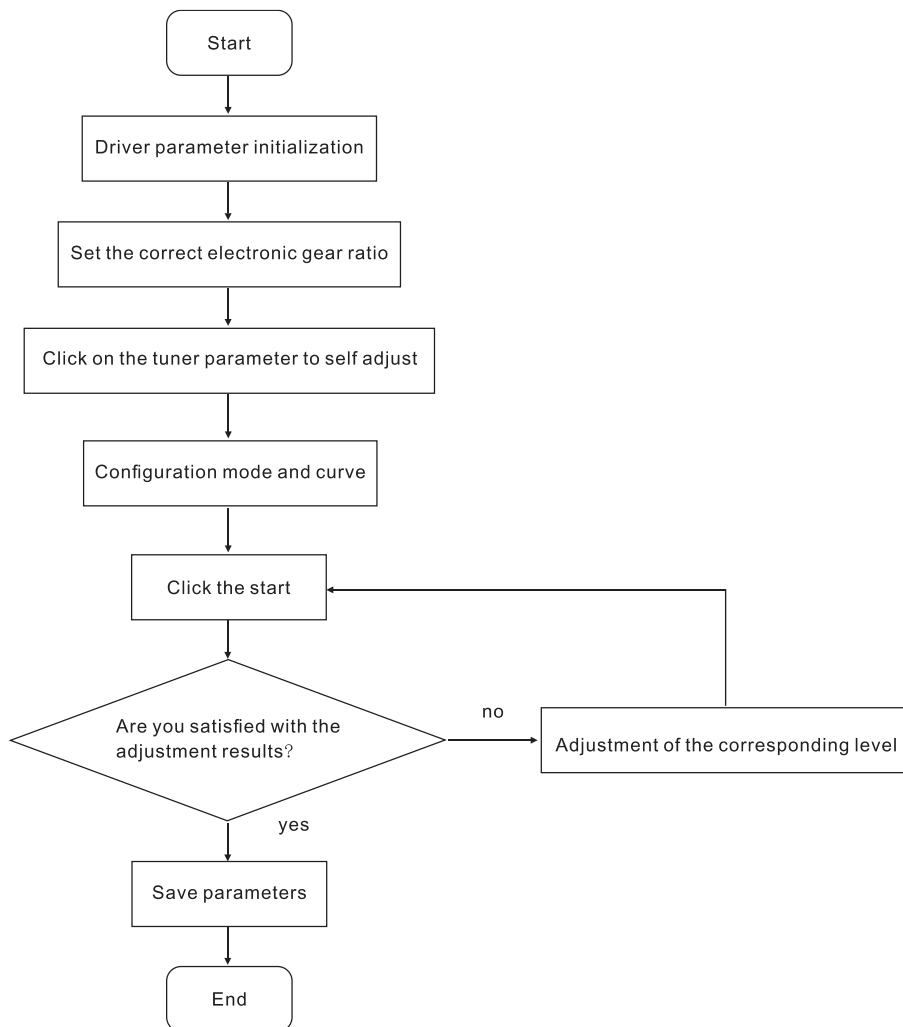
Suggested value: $P4.018 * 2\pi/5 \leq P3.012 \leq P4.018 * 2\pi/3$.
2) Proportional gain of velocity loop P4.018 (0.1Hz) and integral time constant of velocity loop P4.019 (0.01ms). The integration time constant of the velocity loop should be at least greater than $1000000 / (P4.018 * 2\pi)$, that is, $P4.019 > 1000000 / (P4.018 * 2\pi)$. Suggested value: $2000000 / (P4.018 * 2\pi) \leq P4.019 \leq 6000000 / (P4.018 * 2\pi)$.
3) Velocity loop proportional gain P4.018 (0.1Hz) and torque command filtering time constant P4.028 (0.01ms). The maximum torque command filtering time constant P4.028 cannot exceed $1000000 / (P4.018 * 2\pi)$, that is, $P4.028 < 1000000 / (P4.018 * 2\pi)$. Suggested value: It is recommended to ensure that the cut-off frequency of the filter is at least 4 times the maximum velocity following frequency ($P4.018 * 2\pi$), that is, $P4.028 \leq 1000000 / (P4.018 * 4 * 2\pi)$.
4) Velocity proportional loop gain P4.018 (0.1Hz) and velocity command filter time constant P4.014 (0.01ms). The time constant P4.014 of the velocity command filter cannot be greater than $1000000 / (P4.018 * 2\pi)$, that is, $P4.014 \leq 1000000 / (P4.018 * 2\pi)$. Suggested value: $P4.014 \leq 1000000 / (P4.018 * 4 * 2\pi)$.

10.6.3 Self- tuning

The parameter self adjustment function sets the corresponding curve Track and response demand parameters through a guide, and the servo will automatically run and adjust the optimal gain parameters. After the adjustment is completed, save the gain parameters.

The recommended application scenario for this feature is in situations where the load inertia changes little.

1. Operation steps

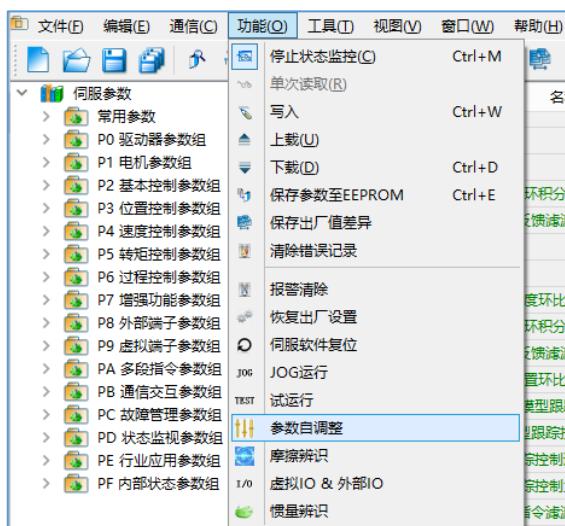


2. Detailed description

1) Connect the MagicWorks Tuner software to the servo drive.



2) Click Menu bar → Function → Parameter Self-adjustment.



3) Enter the parameter self adjustment page

3. Parameter self- tuning instruction setting

- Internal instruction: P2.002 Control mode can be set to any value. Automatically plan internal position commands and adjust parameters based on the set displacement, maximum speed, acceleration and deceleration time, and waiting time.
- External command: Only applicable when P2.002 control mode=1 (position mode) and

P3.000 position command source=1 (external pulse). The parameters are self-tuning according to the external pulse command received by the servo driver. (The time between the end of positioning and the start of the next instruction needs to be greater than 200ms).

- CIA402 instruction: Only P2.002 control mode =7-DS402 over CAN/EtherCAT mode, according to the CAN/EtherCAT motion control instruction received by the servo drive, the parameters are self-adjusted. (Need more than 200ms between the end of positioning and the start of the next instruction).

4. Inertia ratio setting

- Inertia identification: Only applicable when the self-tuning command is an internal command, and inertia identification is performed first based on the set curve. After identification is completed, it will automatically enter the gain adjustment stage.
- Manual setting of inertia ratio: Adjust the gain directly after startup.

5. Rigid level setting

Self-adjustment of the initial gain when using inertia discrimination.

- Turning off the rigidity level: the following gain parameters are set manually.

P4.018 Velocity loop proportional gain 0, P4.019 Velocity loop integration time constant 0, 3.012 Position loop proportional gain 0, P5.005 Torque command filter time constant 0.

- Enable Rigidity Level: Set the appropriate rigidity level according to the rigidity level table.

Click "Next" when the setting is complete.

参数自适应

指令设置

☒ 内部指令

☐ 外部指令

☐ CIA402指令

惯量比设置

小提示: 如果惯量辨识失败, 需修改刚性等级

☒ 使用惯量辨识

☐ 手动设置惯量比

惯量比(%): (100 ~ 65535)

100

刚性等级设置

☒ 关闭刚性等级

☐ 启用刚性等级

刚性等级: (0 ~ 31)

12

< 上一步(P) 下一步(N) >

6. Internal command parameter setting

- Motor displacement: number of motor axis rotations, unit 0.01r.
- Maximum speed: maximum rotation speed of motor axis, unit rpm.
- Acceleration time: acceleration time per 1000rpm in ms.
- Deceleration time: deceleration time per 1000rpm in ms.
- Waiting time: the interval between the end of positioning and the start of the next command, in ms.

7. Operation mode setting

- Forward and reverse reciprocating motion: The motor will reciprocate within the set displacement at the motor.
- Unidirectional operation: The motor will maintain unidirectional operation with the set displacement of the motor end as the maximum distance for a single action.

8. Internal instruction start direction

- Forward rotation start: selected according to P2.007 rotating positive direction, self-adjustment starts from positive direction rotation when clicking start.

- Reverse Start: Selected according to P2.007 rotating positive direction, and start self-adjustment from reverse direction rotation when clicking start.

参数自适应

内部指令参数设置

小提示: 如果惯量大于20倍时, 可以适当调整加/减速时间以及等待时间

电机端位移量 (0.01r) 500 最大速度 (rpm) 500
 (50~65535) (10~3000)

加速时间 (ms) 100 减速时间 (ms) 100
 (1~32767) (1~32767)

等待时间 (ms) 300
 (200~2000)

运行模式设定

☒ 往复正反 ☐ 单向运行

内部指令启动方向

☒ 正转启动 ☐ 反转启动

< 上一步 (P) 下一步 (N) >

9. Tuning parameters

- Self tuning gain coefficient: The final adjusted gain parameter is the result of multiplying by this coefficient.
- Starting adjustment with default value: When checked, the default gain parameter will be used for self adjustment. Uncheck and adjust based on the current gain parameter.

10. Self response mode

- The self response mode is divided into low response, medium response, and high response, which can be set according to the needs.

11. Self tuning mode

- Standard mode: Perform standard gain adjustment, in addition to gain adjustment, automatically adjust the notch filter.
- Positioning mode (with emphasis on overshoot): Special adjustments are made for positioning purposes. In addition to gain adjustment, the notch filter and model loop tracking control are automatically adjusted, with the P7.104 self-tuning overshoot

allowable value as the reference for self adjustment.

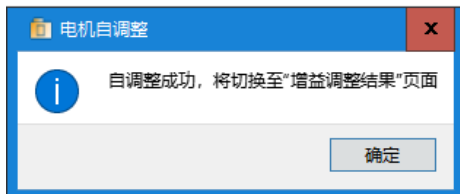
- Positioning mode (focusing on positioning time): Special adjustments are made for positioning purposes. In addition to gain adjustment, the notch filter and model loop tracking control are automatically adjusted to self adjust based on the shortest positioning time.
- Track mode: Standard gain adjustment, in addition to gain adjustment, automatically adjust notch filter and velocity feedforward gain.

12. Self adjustment results

- Positioning time: Real time display of the time from the end of the current command to the location feedback meeting the positioning requirements, measured in 0.1ms.
- Overshoot (pulse): Real time display of the overshoot at the end of the current instruction positioning, in units of 1 pulse.

After setting up, click on start to start parameter self adjustment. Click Stop to stop the parameter self adjustment midway.

After the self adjustment is completed, click OK to jump to the "Gain Adjustment Results" page.

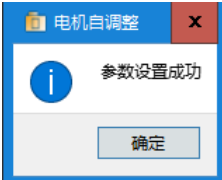


13. Parameter settings

- Save the set of parameters to EEPROM: Save the adjusted gain parameters to EEPROM, and the parameters can be saved when powered off.
- Restore parameters to pre adjustment: Restore the gain parameters to their pre self adjustment values.
- Exit but not save to EEPROM: The adjusted gain parameters are currently in effect but not saved to EEPROM. Re powering on will restore them to the values before self adjustment.



After selection, click on 'Set Parameters'. The parameter setting is successful. Click OK to end the self adjustment function and close the page.

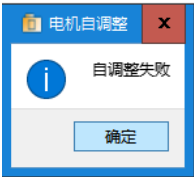


14. Note

- The maximum speed and acceleration/deceleration time of the running curve can be set according to the actual needs of the site, and the acceleration/deceleration time can also be increased appropriately to meet the faster positioning completion after learning.
- If the acceleration/deceleration setting is too small, an overload condition may occur, in which case the acceleration/deceleration time needs to be increased.
- For vertical axes, take precautionary measures against falling and select zero-speed stop for the fail-safe stop before executing the movement.
- For screw drive, if the adjustment time is too long, shorten the stroke.

15. Common fault handling

During the self adjustment process, if an exception occurs, a pop-up window will appear indicating that the self adjustment has failed. Please refer to the table below for the reasons and corresponding solutions.



自调整结果

定位时间(0.1ms)	超调量(脉冲)
2500	572

自调整失败：自调整过程中断开了使能

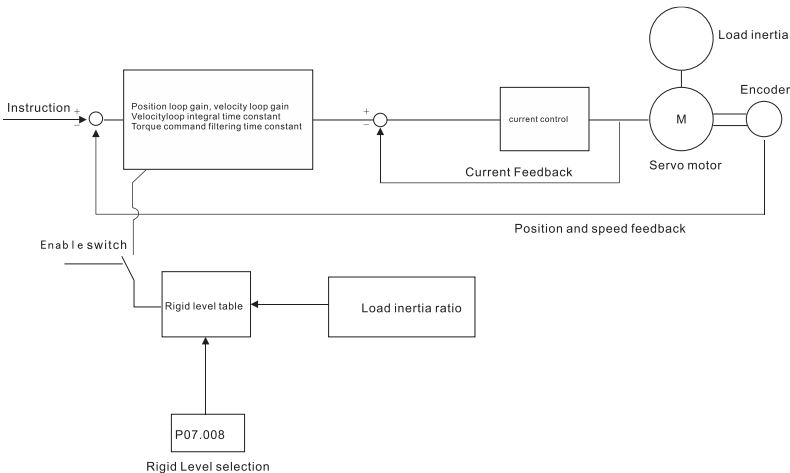
P7.106 Automatic adjustment status	Reason	Measure
------------------------------------	--------	---------

7: Self adjustment process interrupt enable	Manually turn off self adjustment or servo alarm.	Refer to the servo alarm handling measures.
8: Control mode error	Not in position control mode when self-tuning with user instructions.	Set the correct position control mode.
9: Minimum gain detected vibration	Vibration suppression failed.	Manually turn on vibration suppression to eliminate vibration first, then set P7.108bit0 =0 to turn off automatic notch when self-tuning.
10-11: inertia identification failed	The discrimination value fluctuates too much.	Increase the maximum operating speed and reduce the acceleration and deceleration time.
	The load mechanical connection is loose and the mechanism is eccentric.	Please check the mechanical fault.
	Vibration cannot be suppressed in inertia identification.	The vibration suppression function can be manually turned on to eliminate vibration and then self-adjust.

10.6.4 Rigid level

1) Function

There are 32 rigidity levels inside the servo system, and setting the rigidity level (P7.008) can achieve rapid adjustment of position loop gain, velocity loop gain, velocity loop integration time constant, and torque command filtering time constant. The functional block diagram is shown below:



Note: For fast adjustment, set the correct load inertia ratio P4.038~P4.039, otherwise jitter, overshoot or even instability may occur.

Set the overall responsiveness of the system by setting P7.008 (Rigidity Level). The higher the rigidity level, the better the tracking performance of the system and the shorter the adjustment time, but the higher the rigidity level setting, the more vibration it may cause.

When changing the rigidity level during operation, gradually increase the rigidity level from low to high to avoid vibration.

Rigidity level	Type of load mechanism
4-9	Some large machines
9-15	Mechanisms with low rigidity such as belt mechanism
15-22	Higher rigidity mechanisms such as ballscrew mechanisms or direct links

Table 12-1 Rigidity Levels

parameters		P4.018 Velocity loop gain 0	P4.019 Velocity loop integral time constant 0	P3.012 Position loop gain 0	P5.005 Torque instruction filter time constant 0	P4.021 Velocity loop gain 1	P4.022 Velocity loop integral time constant 1	P3.013 Position loop gain 1	P5.006 Torque instruction filter time constant 1
Rigidity class	0	15	50000	24	1326	15	51200	40	1326
	1	20	39789	32	995	20	51200	48	995
	2	25	31831	40	796	25	51200	56	796
	3	30	26526	48	663	30	51200	72	663
	4	35	22736	56	568	35	51200	96	568
	5	45	17684	72	442	45	51200	120	442
	6	60	13263	96	332	60	51200	144	332
	7	75	10610	120	265	75	51200	176	265
	8	90	8842	144	221	90	51200	224	221
	9	110	7234	176	181	110	51200	288	181
	10	140	5684	224	142	140	51200	400	142
	11	180	4421	288	111	180	51200	480	111
	12	250	3183	400	80	250	51200	560	80

13	300	2653	480	66	300	51200	640	66
14	350	2274	560	57	350	51200	800	57
15	400	1989	640	50	400	51200	960	50
16	500	1592	800	40	500	51200	1200	40
17	600	1326	960	33	600	51200	1440	33
18	750	1061	1200	27	750	51200	1840	27
19	900	884	1440	22	900	51200	2240	22
20	1150	692	1840	17	1150	51200	2720	17
21	1400	568	2240	14	1400	51200	3360	14
22	1700	468	2720	12	1700	51200	4000	12
23	2100	379	3360	9	2100	52100	4480	9
24	2500	318	4000	8	2500	51200	4960	8
25	2800	284	4480	7	2800	51200	5440	7
26	3100	257	4960	6	3100	51200	5920	6
27	3400	234	5440	6	3400	51200	6400	6
28	3700	215	5920	5	3700	51200	7200	5
29	4000	199	6400	5	4000	51200	8000	5
30	4500	177	7200	5	4500	51200	8000	5
31	5000	159	8000	5	5000	51200	8000	5

parameters	P4.018 Velocity loop gain 0	P4.019 Velocity loop integral time constant 0	P3.012 Position loop gain 0	P5.005 Torque instruction filter time constant 0	P4.021 Velocity loop gain 1	P4.022 Velocity loop integral time constant 1	P3.013 Position loop gain 1	P5.006 Torque instruction filter time constant 1
Default	250	3183	400	80	250	51200	560	80
Unit	0.1Hz	0.01ms	0.1Hz	0.01ms	0.1Hz	0.01ms	0.1Hz	0.01ms
Range	1~ 20000	15~ 51200	1~ 20000	0~ 3000	1~ 20000	15~ 51200	1~ 20000	0~ 3000
R/W	RW							
Data type	Uint16							

10.7 Gain Switch

The servo has two sets of gain parameters, setting the servo internal parameters (P2.031_bit3) or gain switching the external signal terminal (Function Selection - 20 Loop Gain Selection) can switch two sets of parameters, the default is gain 0.

The gain switching operation can be switched to a lower gain in the motor stop state to suppress vibration or noise. The gain switching operation can be switched to a higher gain in the motor stop state to increase the servo rigidity. It can be switched to higher gain in motor running state to get better position following performance. It is also possible to switch to different gain settings to achieve optimum performance according to the different loads on site, such as mechanical equipment.

Gain switching related parameters:

P02.031 Gain 0 when bit3=0		P02.031 Gain 1 when bit3=1
Position loop proportional gain 0		Position loop proportional gain 1
Velocity loop proportional gain 0		Velocity loop proportional gain 1
Velocity loop integral time constant 0		Velocity loop integral time constant 1
Speed feedback filter time constant 0		Speed feedback filter time constant 1
Q-axis current command filter time 0		Q-axis current command filter time 1



11

Warranty

* Guarantee clauses and maintenance list

11 Warranty

Guarantee clauses and maintenance list

For consumers being assured and satisfied to use the products, we will strictly in accordance with the relevant laws and regulations issued by country to make reasonable after-sales service system.

11.1 Warranty Period

COTRUST provides warranty service in certain time (calculated from the date of first delivery) for products, please use as followed by regulations. Any non-human fault during the warranty period is free to be maintained.

Equipment damaged due to one of the following reasons during the warranty period, it will be charged for maintenance

- 1) Failure and damage caused by human factors and abnormal working environment, or not using according to the user manual provided by our company;
- 2) Users disassemble, repair or modify products without the consent of COTRUST.
- 3) Failure or damage due to falling or poor transportation after purchasing the product.
- 4) Failure or damage due to natural causes (such as flood, lightning, earthquake, abnormal voltage, other secondary disasters)
- 5) Failure or damage due to external device.
- 6) Abrasion or fracture by normally use.
- 7) No valid shopping credentials or the fuselage serial number was damaged

11.2 Warranty Information

- ◆ In case of product failure or damage, please fill in the " maintenance list" correctly and send it to us (see the mailing address on the next page).
- ◆ The charge of maintenance fee is subject to the price list of COTRUST.
- ◆ If your problem is not properly solved, please call or email our customer service department (see the contact information on the back cover), we will help you solve the problem in the shortest time.

◆ COTRUST reserves the right to interpret these clauses.

11.3 Maintenance List

Company that sends product to repair: _____

Company address: _____

Name: _____ Tel: _____ Fax: _____

No.	Type	Serial No.	Fault	Note
1				Repair (√) Detect () Upgrade ()
2				Repair (√) Detect () Upgrade ()
3				Repair (√) Detect () Upgrade ()
4				Repair (√) Detect () Upgrade ()
5				Repair (√) Detect () Upgrade ()
6				Repair (√) Detect () Upgrade ()
7				Repair (√) Detect () Upgrade ()
8				Repair (√) Detect () Upgrade ()
9				Repair (√) Detect () Upgrade ()
10				Repair (√) Detect () Upgrade ()
11				Repair (√) Detect () Upgrade ()
12				Repair (√) Detect () Upgrade ()
13				Repair (√) Detect () Upgrade ()
14				Repair (√) Detect () Upgrade ()
15				Repair (√) Detect () Upgrade ()

Agent seal:

(Seal to be valid)



Delivery info

Address: 268 New road, Yangyong village, Dalang town, Dongguan, CHINA
Addressee: Maintenance department
Tel: 0796-82220668
Postcode: 523770



Service Hotline
+86 400-700-4858

Address: 9/F, block a, building 6, international innovation Valley, Nanshan District, Shenzhen

Tel: 0755-86226822

Fax: 0755-86226922

E-mail: sales@co-trust.com

Website: <http://www.co-trust.com>

Version: V1.00

Release date: 12/2024

Order number: CTM1-A6N2024

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