



# **DP3C series closed loop stepping driver**

**User manual**

**Wuxi Xinje Electric Co., Ltd.**

Data No. D3C06 20201104 1.0

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## Basic description

- ◆ Thank you for purchasing Xinje DP3C series stepping driver. Please read this product manual carefully before operating.
- ◆ The manual mainly provides the user with relevant guidance and instructions for the correct use and maintenance of the step driver. The manual involves the function, use method, installation and maintenance of the step driver.
- ◆ The contents described in the manual are only applicable to Xinje's DP3C series stepping driver products.

## Notice to user

This manual is applicable to the following personnel:

- ◆ The installation personnel of stepper driver
- ◆ Engineering and technical personnel (electrical engineers, electrical operators, etc.)
- ◆ The designer

Before operating or debugging the stepper driver, the above personnel should carefully read the safety precautions section of this manual.

## Statement of responsibility

- ◆ Although the contents of the manual have been carefully checked, errors are inevitable and we can not guarantee that they are completely consistent.
- ◆ We will always check the contents of the manual and make corrections in subsequent versions. We welcome your comments.
- ◆ The contents described in the manual are subject to change without prior notice.

## Contact us

If you have any questions about the use of this product, please contact the agent and office that purchased the product, or contact Xinje company directly.

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# 1. Product introduction

## 1-1. Model naming rule

Take DP3C-705 as an example:

$$\frac{\text{DP3C}}{\text{①}} - \frac{70}{\text{②}} \frac{5}{\text{③}}$$

- ① : DP3C series bus stepping driver
- ② : Driver output maximum peak current 7A
- ③ : The maximum supply voltage of the driver is 50VDC

## 1-2. Performance

- Support COE (CANopen over EtherCAT) protocol, conform to CiA402 standard, support 32-axis, support master station with standard EtherCAT protocol, and the communication period between master and slave station can reach 32-axis 1ms.
- The network cable replaces the traditional pulse direction signal cable, and also has power cable and encoder cable, which is simple in wiring. It can reduce the cost of cable, labor and maintenance greatly.
- Relying on the low bus load of EtherCAT bus and the point-to-point physical layer, it can greatly suppress the generation of interference and clutter, and significantly improve the reliability and anti-interference ability of the system.
- EtherCAT bus technology combined with the latest control algorithm has greatly improved the performance.
- 7-channel signal input and 7-channel signal output, which can be used for probe input, positive and negative limit, origin input, alarm output, in place output, holding brake signal output and other functions to meet the needs of different customers.
- Using encoder as position feedback, the position deviation can be compensated in real time, which fundamentally solves the problem of step loss of traditional stepping motor.
- The current can be adjusted in real time according to the load and speed, which makes the operation more stable and the motor heating lower.

## 1-3. Application field

DP3C series bus drivers can be used for electronics, laser, and some equipment requiring multi-axis control, such as manipulator equipment, photovoltaic equipment, etc.

## 1-4. Electrical specification

Driver model		DP3C-305	DP3C-705	DP3C-808
Input power supply voltage (VDC)		20-50	20-50	20-80
Output peak current (A)		1-3	1-7	1-8
Matched motor (base)		42	57/60	86
Input signal		Probe input, origin input, positive and negative limit, emergency stop, user-defined input		
Output signal		Alarm output, in place output, holding brake signal output, custom output		
Alarm function		Overcurrent, overvoltage, out of tolerance, abnormal communication, etc		
Debugging software		Xinje stepper driver software		
Using environment	Application area	Try to avoid dust, oil mist and corrosive gas, places with high humidity and strong vibration, and combustible gas and conductive dust are prohibited		
	Environment temperature	0°C~50°C		
	Max working temperature	60°C		
	Humidity	40%~90% RH (No condensation or water droplets)		
	Vibration	5.9m/s <sup>2</sup> Max		
	Storage temperature	-20°C~65°C		

## 1-5. Safety caution

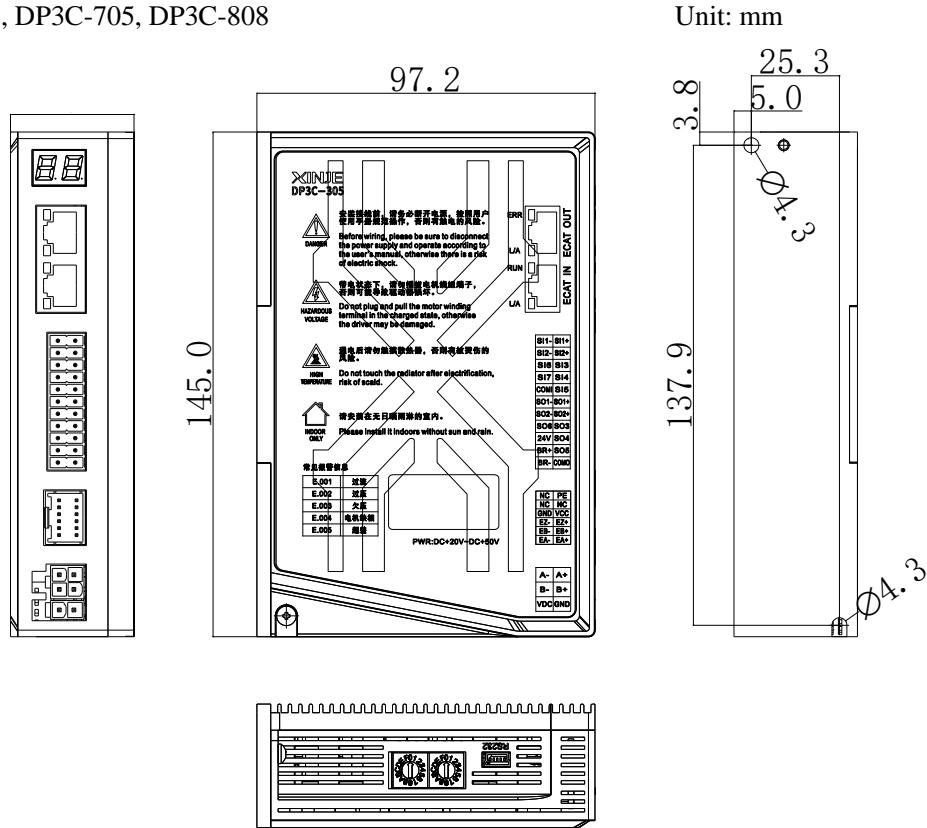
- (1) The driver must be installed and operated by professional technicians!
- (2) The input voltage of the driver must meet the technical requirements!
- (3) It is strictly forbidden to plug and unplug the power terminal of the driver with electricity. When the motor stops, there is still a large current flowing through the coil. Pulling and unplugging the power terminal will produce a huge instantaneous induction, and the electric potential will burn out the driver!
- (4) Before power on, please ensure the connection correctness and firmness of power cable, motor cable and signal cable!
- (5) Avoid electromagnetic interference!

## 2. Installation and wiring

### 2-1. Installation

#### 2-1-1. Dimension

- DP3C-305, DP3C-705, DP3C-808

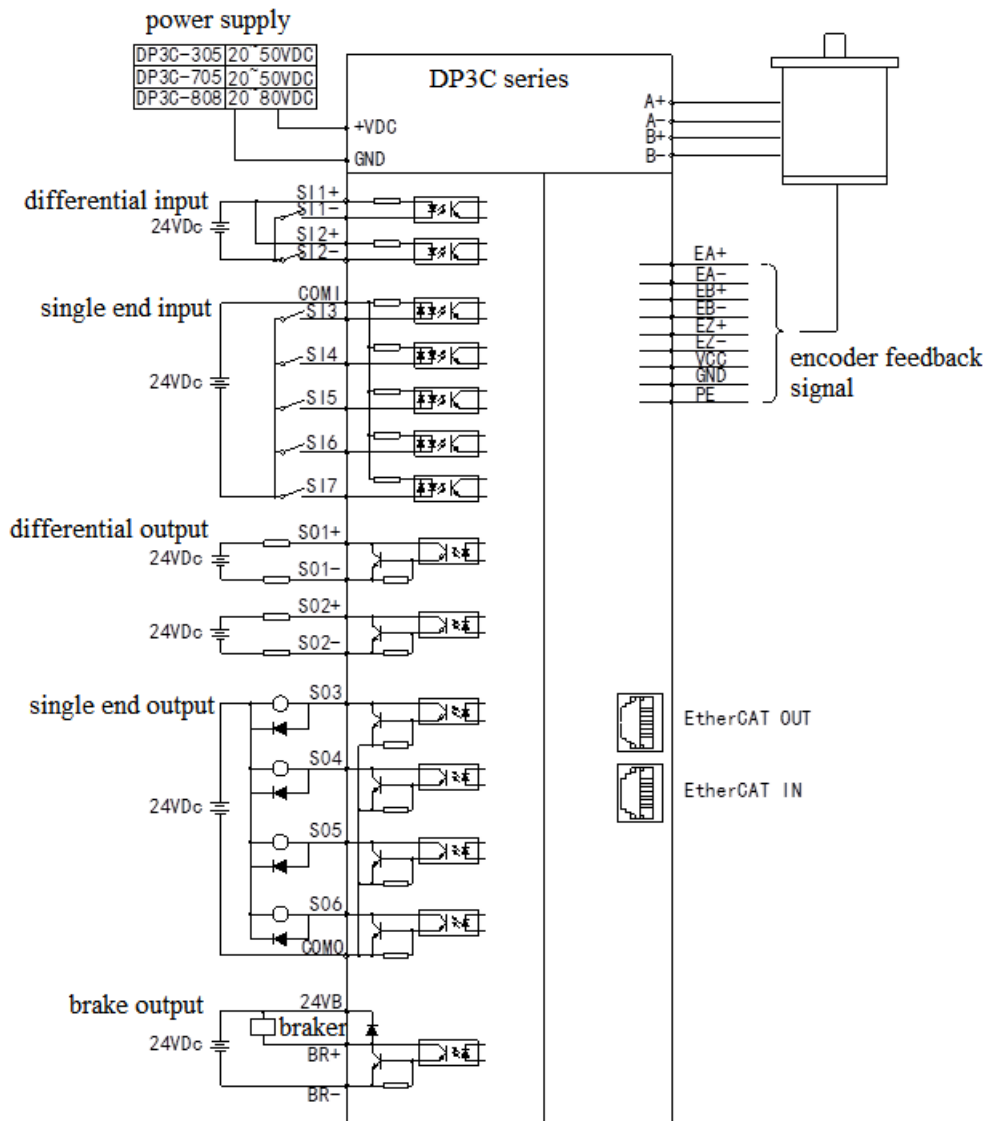


#### 2-1-2. Installation environment

The reliable working temperature of the driver is usually within 60°C, and the working temperature of the motor is within 80°C. To ensure that the driver works within the reliable working temperature range, the driver shall be installed in an electric cabinet with good ventilation and proper protection. If necessary, a fan shall be installed near the driver to dissipate heat forcibly, so as to avoid using in the occasions of dust, oil mist, corrosive gas, too high humidity and strong vibration.

## 2-2. Wiring

### 2-2-1. Typical wiring diagram

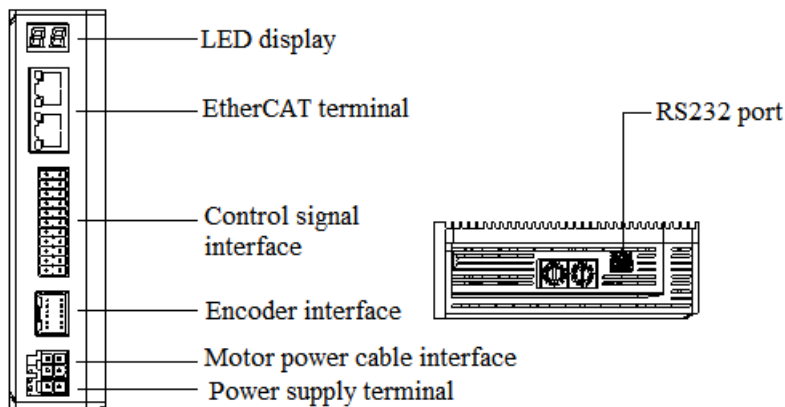


### 2-2-2. Wiring caution

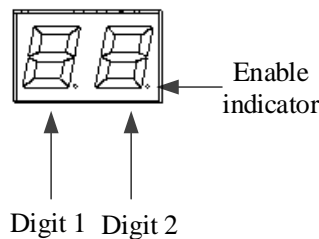
- (1) Please wiring according to the terminal voltage and polarity to prevent equipment damage and personal injury. The DC driver power supply cannot be reversed
- (2) If one power supply supplies multiple drives, parallel connection shall be adopted at the power supply side, and chain connection from one to another is not allowed.
- (3) It is strictly forbidden to connect the conductor head with tin to the wiring terminal, otherwise the terminal may be overheated and damaged due to the increase of contact resistance.
- (4) The terminal head shall not be exposed outside the terminal to prevent accidental short circuit from damaging the driver.



### 3. Driver interface



#### 3-1. LED display and fault solution



DP3C series displays running speed, state machine/operation mode, node address, alarm fault and other information through two-digit LED display.

Stage	Information
Power on	After the driver is powered on, digit 1 and 2 are on for 0.5s, the LED displays the actual node address of the current drive in hexadecimal. During this period, the LED node address flashes at an interval of 1s (0.5s on and 0.5s off). The time is 5s in total. After that, it enters the normal operation stage
Operation	Speed (r/s)
	Operation mode, state machine: display in hex format (default)
	Node address: always ON display

Note: during initialization and normal operation, if the node address is changed, the LED display flashes at an interval of 1s (0.5s on, 0.5s off), and continues to return to the original display state after 5s.

The specific display definition of operation mode and state machine is as follows:

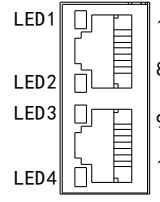
LED display digit 1	Operation mode
1	Position mode (PP)
3	Speed mode (PV)
6	Return to origin mode (HM)
8	Cyclic synchronous position mode (CSP)
LED display digit 2	State machine
1	Initialization
2	Pre-operation
4	Safe operation
8	Operation

Alarm and solution:

Alarm code	Fault	Solution
E.001	Over current	Check whether the power cable is short circuited
E.002	Over voltage	Check whether the power supply voltage is too high
E.003	Under voltage	Check whether the power supply voltage is too low
E.004	Motor phase loss	Check whether the power cable is installed well or broken
E.005	Overproof	Check whether the encoder cable is broken, whether the motor is blocked, and please extend the acceleration time
E.8xx	Bus error	Check the wiring or master station

Note: please refer to Chapter 9 for specific alarm information.

### 3-2. EtherCAT terminal

Graphic	Pin	Name	Explanation
	1, 9	E_TX+	EtherCAT data send +
	2, 10	E_TX-	EtherCAT data send -
	3, 11	E_RX+	EtherCAT data receive +
	4, 12	/	/
	5, 13	/	/
	6, 14	E_RX-	EtherCAT data receive -
	7, 15	/	/
	8, 16	/	/
<p>Note: LED1 and LED3 are "RUN" status lights. The yellow light is on during normal connection, but it is not on after connection failure;            LED2 is the "L/A OUT" status light;            LED4 is the "L/A IN" status light.</p>			

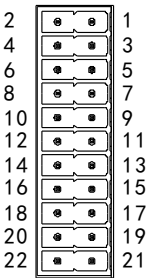
Note: the cable length between EtherCAT bus nodes is recommended to be no more than 50m. It is recommended to use CAT5E Ethernet cable with double-layer shielding or better.

#### Ethernet port light definition

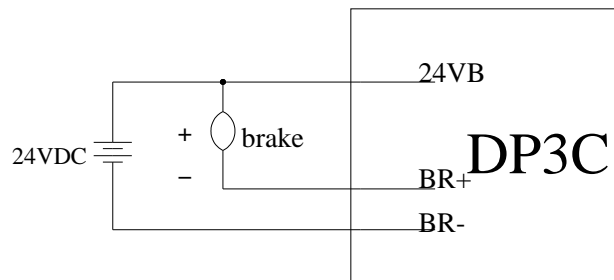
Name	Color	Status	Description
RUN	Yellow light	ON	Connection normal
		OFF	Connection abnormal
L/A OUT	Green light	ON	Physical layer link establishment
		OFF	Physical layer link not established
		Flash	Interactive data after link establishment
L/A IN	Green light	ON	Physical layer link establishment
		OFF	Physical layer link not established
		Flash	Interactive data after link establishment

### 3-3. Control signal interface

#### 3-3-1. Interface functions

Graphic	Pin	Name	I/O	Explanation
	1	SI1+	Input	Differential input signal SI1, 24V effective, maximum input frequency 200kHz, default probe input signal 1
	2	SI1-		
	3	SI2+	Input	Differential input signal SI2, 24V effective, maximum input frequency 200kHz, default probe input signal 2
	4	SI2-		
	5	SI3	Input	Single ended input signals SI3~SI7, 12~24V valid, maximum input frequency 10kHz, signal definition is configurable. I3 default is origin, I4 and I5 default is positive and negative limit, I6 and I7 default is in common use. COMI is the common end of single ended input signal, with common positive or negative
	6	SI6	Input	
	7	SI4	Input	
	8	SI7	Input	
	9	SI5	Input	
	10	COMI	Input	
	11	SO1+	Output	
	12	SO1-		
	13	SO2+	Output	Differential output signal OUT2, maximum output current 100mA, withstand voltage 30VDC, default in place signal
	14	SO2-		
	15	SO3	Output	Single ended output, common cathode, maximum current 100mA, withstand voltage 30VDC
	16	SO6	Output	Single ended output, common cathode, maximum current 100mA, withstand voltage 30VDC
	17	SO4	Output	Single ended output, common cathode, maximum current 100mA, withstand voltage 30VDC
	18	24V	Output	Used together with brake output
	19	SO5	Output	Single ended output, common cathode, maximum current 100mA, withstand voltage 30VDC
	20	BRK+	Output	Brake positive output, maximum 500mA, is displayed as SO7 in upper computer
	21	COM0	Output	Output common cathode common terminal
	22	BRK-	Output	Brake negative output, maximum 500mA, is displayed as SO7 in upper computer

DP3C series driver has a brake output and integrated freewheeling diode. The driving current is up to 500mA. It can directly drive the brake without relay. The circuit diagram of holding brake is as follows:



### 3-4. Encoder signal input port

Diagram	No.	Symbol	Name
	1	PE	Shielding ground
	2	NC	Reserved signal
	3	NC	Reserved signal
	4	NC	Reserved signal
	5	VCC	5V power output, provided by the driver, is only used for encoder power supply
	6	GND	
	7	EZ+	Encoder phase Z signal +
	8	EZ-	Encoder phase Z signal -
	9	EB+	Encoder phase B signal +
	10	EB-	Encoder phase B signal -
	11	EA+	Encoder phase A signal +
	12	EA-	Encoder phase A signal -

Note: the standard configuration is without Z signal. If Z-phase zeroing is required, the motor and encoder cable supporting Z signal shall be selected.

#### 3-4-1. Power supply requirements

The power supply voltage can work normally between the calibration range. It is best to use non-regulated DC power supply for the driver, or transformer step-down + bridge rectifier + capacitor filter. For DP3C-305 and DP3C-705, it is recommended to use 24V~48V DC power supply, and for DP3C-808, it is recommended to use 48V~72V DC power supply to avoid grid fluctuation exceeding the working range of driver voltage. If the regulated switching power supply is used, it shall be noted that the output current range of the switching power supply shall be set to the maximum.

**Note:**

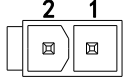
- (1) Do not reverse the power supply voltage!
- (2) Do not exceed the working range of the power supply to ensure the normal operation of the drive.
- (3) The power supply should be non-regulated DC power supply, and the power output capacity should be greater than 60% of the set current of the driver.
- (4) If the regulated switching power supply is used for power supply, the output current range of the power supply shall be greater than the working current of the motor.
- (5) In order to reduce the cost, two or three drives can share one power supply, but the power supply power should be large enough.

### 3-5. Motor winding terminal

Diagram	Pin	Name	Explanation
	1	A+	Motor winding phase A +
	2	B+	Motor winding phase B +
	3	A-	Motor winding phase A -
	4	B-	Motor winding phase B -

Note: the power cable diameter of Xinje standard is 0.75mm<sup>2</sup>.

### 3-6. Power supply terminal

Diagram	Pin	Name	Explanation
	1	GND	Power supply ground
	2	VDC	Power supply positive input

Note: the power cable diameter of Xinje standard is 0.75mm<sup>2</sup>.


DP3C-305 range 20~50VDC: recommended value is 24~36VDC.

DP3C-705 range 20~50VDC: 57 motor recommended value is 24~36VDC, 86 motor or high-speed application recommended value is 48V.

DP3C-808 range 20~80VDC: recommended value is above 48V.

### 3-7 Upper computer communication port

The definition of RS232 interface pin arrangement is shown in the following table:

Diagram	Pin	Function	Notes
	1	TXD	RS232 send
	2	RXD	RS232 receive
	3	GND	RS232 ground

Note: please use the cable supplied by Xinje company.

RS232 default communication parameters: baud rate 115200bps, 8 data bits, 1 stop bit, even parity, station no.1.

## 4. Parameter and setting

### 4-1. Parameter list

#### Group P0: basic function

Parameter	Address	Meaning	Range	Default	Note
P0-01	0x0001	Subdivision	200~51200	10000	Effective after restart
P0-02	0x0002	Filter time	0~50	0	Effective after restart, shut down the filter when setting to zero
P0-03	0x0003	Closed loop current percentage	1~100	100	Max closed loop current = closed loop current % $\times$ peak current
P0-04	0x0004	-	0~5	0	
P0-05	0x0005	Open loop current percentage	1~100	50	Max open loop current = open loop current % $\times$ peak current
P0-06	0x0006	Open/closed loop mode	0~1	1	0: open loop mode 1: closed loop mode
P0-07	0x0007	-	0~1	0	
P0-08	0x0008	-	0~1	1	
P0-09	0x0009	Closed loop holding current percentage	1~100	30	Closed loop holding current = closed loop holding current % $\times$ closed loop mode max current
P0-10	0x000A	Operation direction	0~1	1	
P0-11	0x000B	Operate panel display mode	0~2	0	0: mode 1: address 2: speed per second

#### Group P1: gain control

Parameter	Address	Meaning	Range	Default	Note
P1-00	0x0100	Auto tuning	0~1	1	0: OFF 1: ON
P1-01	0x0101	Current Kp	1~65535	1500	
P1-02	0x0102	Current Ki	1~65535	800	
P1-03	0x0103	Current kd	0~65535	0	
P1-04	0x0104	Current Kc	0~65535	0	
P1-05	0x0105	Speed Kp	1~65535	60	
P1-06	0x0106	Speed Ki	0~65535	0	
P1-07	0x0107	Position Kp	1~65535	2600	
P1-08	0x0108	Position Ki	0~65535	500	
P1-09	0x0109	Back EMF	1~300	55	
P1-10	0x010A	Weak magnetic coefficient	1~100	20	
P1-11	0x010B	Inductance	1~10000	1000	
P1-12	0x010C	Start delay	0~10	0	
P1-13	0x010D	In place delay	0~100	3	
P1-14	0x010E	In place error	0~100	4	

Group P2: IO configuration

Parameter	Address	Meaning	Range	Default	Note
P2-00	0x0200	-	0~65535	0	
P2-01	0x0201	Z phase output	0~65535	3	Bit0~3 output terminal Bit4 effective voltage
P2-02	0x0202	Alarm output	0~65535	1	Bit0~3 output terminal Bit4 effective voltage
P2-03	0x0203	Brake output	0~65535	7	Bit0~3 output terminal Bit4 effective voltage
P2-04	0x0204	In place output	0~65535	2	Bit0~3 output terminal Bit4 effective voltage
P2-05	0x0205	Alarm clear	0~65535	6	Bit0~3 output terminal Bit4 effective voltage
P2-06	0x0206	POT	0~65535	3	Bit0~3 output terminal Bit4 effective voltage
P2-07	0x0207	NOT	0~65535	4	Bit0~3 output terminal Bit4 effective voltage
P2-08	0x0208	Return to zero	0~65535	5	Bit0~3 output terminal Bit4 effective voltage
P2-09	0x0209	Probe 1	0~65535	1	Bit0~3 output terminal Bit4 effective voltage
P2-10	0x020A	Probe 2	0~65535	2	Bit0~3 output terminal Bit4 effective voltage

Group P3: protection function

Parameter	Address	Meaning	Range	Default	Note
P3-00	0x0300	Tracking error limit	1~65535	4000	For the current 1000ppr encoder, the default is 4000 = 1 turn
P3-01	0x0301	Fault detection selection	0~255	255	
P3-02	0x0302	Under voltage alarm threshold	0~20	0	Shield the alarm when it is 0 in default

Group P4: motor parameters

Parameter	Address	Meaning	Range	Default	Note
P4-00	0x0400	Peak current	305: 1~40 705: 1~70 808: 1~84	305: 25 705: 60 808: 70	Motor peak current (100mA)
P4-01	0x0401	Encoder resolution	200~20000	4000	Quadruple frequency, modification is not supported
P4-02	0x0402	-	0~1	0	

Group 5 to group 7 are reserved.

Group P8: curve collection

Parameter	Address	Meaning	Range	Default	Note
P8-00	0x0800	Sampling channel 1	0~65535	8001	
P8-01	0x0801	Sampling channel 2	0~65535	8003	
P8-02	0x0802	Sampling channel 3	0~65535	0	
P8-03	0x0803	Sampling channel 4	0~65535	0	
P8-04	0x0804	Sampling channel 5	0~65535	8002	
P8-05	0x0805	Sampling channel 6	0~65535	8004	
P8-06	0x0806	Sampling channel 7	0~65535	0	
P8-07	0x0807	Sampling channel 8	0~65535	0	
P8-08	0x0808	Sampling channel 9	0~65535	1008	
P8-09	0x0809	Sampling channel 10	0~65535	1009	
P8-10	0x080A	Sampling channel 11	0~65535	0	
P8-11	0x080B	Sampling channel 12	0~65535	0	
P8-12	0x080C	Sampling channel 13	0~65535	0	
P8-13	0x080D	Sampling channel 14	0~65535	0	
P8-14	0x080E	Sampling channel 15	0~65535	0	
P8-15	0x080F	Sampling channel 16	0~65535	0	
P8-16	0x0810	Sampling mode	0~8	1	
P8-17	0x0811	Sampling interval	1~65535	36	
P8-18	0x0812	Sampling time	0~65535	1024	
P8-19	0x0813	Trigger channel	0~65535	0	
P8-20	0x0814	Trigger threshold low bit	0~65535	0	
P8-21	0x0815	Trigger threshold high bit	0~65535	0	
P8-22	0x0816	Trigger slope	0~65535	0	
P8-23	0x0817	Sampling proportion	0~100	100	
P8-24	0x0818	-	0~1	0	
P8-25	0x0819	-	0~1	0	
P8-26	0x081A	-	0~1	0	

Group U0

Parameter	Address	Contents		Note
U0-00	0x1000	Feedback speed		rpm
U0-01	0x1001	Setting speed		rpm
U0-02	0x1002	Encoder numbers	0~15	Encoder pulse
U0-03	0x1003		16~31	
U0-04	0x1004		32~47	
U0-05	0x1005		48~62; 63: direction bit	
U0-06	0x1006	Feedback pulse numbers	0~15	Command pulse
U0-07	0x1007		16~31	
U0-08	0x1008		32~47	
U0-09	0x1009		48~62; 63: direction bit	
U0-10	0x100A	Pulse quantity	0~15	Command pulse
U0-11	0x100B		16~31	
U0-12	0x100C		32~47	



Parameter	Address	Contents		Note
U0-13	0x100D		48~62; 63: direction bit	
U0-14	0x100E	Position offset	0~15	Command pulse
U0-15	0x100F		16~31	
U0-16	0x1010	Single turn encoder counting	0~15	Encoder pulse
U0-17	0x1011		16~31	
U0-18	0x1012	Single turn pulse counting	0~15	Command pulse
U0-19	0x1013		16~31	
U0-20	0x1014	Pulse turns	0~15	
U0-21	0x1015		16~31	
U0-22	0x1016	Encoder turns	0~15	
U0-23	0x1017		16~31	
U0-24	0x1018	Feedback electric angle		
U0-25	0x1019	Setting electric angle		
U0-26	0x101A	Phase A feedback current		mA
U0-27	0x101B	Phase B feedback current		mA
U0-28	0x101C	Reference feedback current		mA
U0-29	0x101D	Phase A setting current		mA
U0-30	0x101E	Phase B setting current		mA
U0-31	0x101F	Reference setting current		mA
U0-32	0x1020	Bus voltage		V

### Group U1

Parameter	Address	Contents		Note
U1-00	0x1100	Current alarm code		
U1-01	0x1101	Phase A current when alarm occurs		
U1-02	0x1102	Phase B current when alarm occurs		
U1-03	0x1103	Reference current when alarm occurs		
U1-04	0x1104	Bus voltage when alarm occurs		
U1-05	0x1105	Position offset when alarm occurs		
U1-06	0x1106	Speed value when alarm occurs		
U1-07	0x1107	The time when alarm occurs		
U1-08	0x1108	The time when alarm occurs		
U1-09	0x1109	This time operation error code quantity		
U1-10	0x110A	Last second alarm code		
U1-11	0x110B	Last third alarm code		
U1-12	0x110C	Last fourth alarm code		
U1-13	0x110D	Last fifth alarm code		
U1-14	0x110E	Last sixth alarm code		
U1-15	0x110F	Reserved		
U1-16	0x1110	Reserved		
U1-17	0x1111	Reserved		
U1-18	0x1112	Reserved		
U1-19	0x1113	Reserved		
U1-20	0x1114	Reserved		
U1-21	0x1115	Reserved		

## Group U2

Parameter	Address	Contents	Note
U2-00	0x1200	Power on times	
U2-01	0x1201	Machine type	
U2-02	0x1202	Series	
U2-03	0x1203	Model	
U2-04	0x1204	Date of production	Year
U2-05	0x1205	Date of production	Month
U2-06	0x1206	Date of production	Day
U2-07	0x1207	Software version	
U2-08	0x1208	Hardware version	
U2-09	0x1209	Power on operation time	Hour
U2-10	0x120A	Power on operation time	Minute
U2-11	0x120B	Power on operation time	Second
U2-12	0x120C	Device serial no.	Low 16-bit
U2-13	0x120D	Device serial no.	High 16-bit
U2-14	0x120E	Firmware generation date: year	
U2-15	0x120F	Firmware generation date: month/day	
U2-16	0x1210	Firmware generation date: hour/minute	

## Group U3

Parameter	Address	Contents	Note
U3-00	0x1300	PDI period	
U3-01	0x1301	PDI time	
U3-02	0x1302	PDI period max time	
U3-03	0x1303	PDI period min time	
U3-04	0x1304	Sync0 period	
U3-05	0x1305	Sync0 time	
U3-06	0x1306	Sync0 period max time	
U3-07	0x1307	Sync0 period min time	
U3-08	0x1308	ECAT timer period	
U3-09	0x1309	PID2Sync0 time difference	
U3-10	0x130A	PID2Sync0 max time difference	
U3-11	0x130B	PID2Sync0 min time difference	

## Group F0

Parameter	Address	Contents	Note
F0-00	0x2000	Clear the alarm	
F0-01	0x2001	Restore factory settings	
F0-02	0x2002	Save the parameters	

## 5. EtherCAT communication specification

Physical layer	100BASE-TX
Communication interface	RJ45 × 2 (CN1 port)
Network architecture	Serial connection
Transmission speed	2 x 100 Mbps (full duplex)
Data frame length	Max 1484 bytes
SyncManager	SM0: Mailbox output SM1: Mailbox input SM2: Periodic data output SM3: Periodic data input
FMMU (Bus memory management unit)	FMMU0: periodic data output area FMMU1: periodic data output area FMMU2: Mailbox status
Application layer protocol	CoE: CANopen over EtherCAT
Synchronous mode	DC synchronous mode (SYNC0)
Communication object	SDO: aperiodic data object PDO: periodic data object
LED light (on the RJ45 port)	EtherCAT ERR(ER) × 1 EtherCAT Link / Activity(L / A) × 2 EtherCAT RUN(RN) × 1
Application layer specification	IEC61800-7 CiA402 Drive Profile
Support CIA402 operation mode	Homing Mode(HM): return to origin mode Cycle Synchronized Position Mode(CSP): periodic synchronous position control mode Profile Position Mode (PP): profile position control mode Profile Velocity Mode (PV): profile speed control mode

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## 6. EtherCAT operation mode

### 6-1. Homing Mode

#### 6-1-1. Overview

The user can use this mode to let the driver search the origin position, and set the way to return to the origin, the speed and acceleration of return.

#### 6-1-2. Operation steps

P2-06 corresponds to POT, P2-17 corresponds to NOT, and P2-08 corresponds to origin

1. set [control mode: 6060h] to homing mode (0x06).
2. set [homing mode: 6098h], setting range is 1~14, 17~30, 33, 34, 35, 37.
3. set [homing speed 6099h Sub-1], define the speed to find the origin switch (unit: command unit/s).
4. set [homing speed: 6099h Sub-2], define the speed to find the origin (unit: command unit/s).
5. set [homing acceleration: 609Ah], define the homing acceleration (unit: command unit/s<sup>2</sup>).
6. set [control word: 6040h] to (0x06 > 0x07 > 0x0F), enable the driver and make the motor to run.
7. set [control word: 6040h] to (0x0F > 0x1F), find the Home Switch and do the homing operation.
8. read [status word: 6041h] to know the driver status.

#### 6-1-3. Related object list

Index	Name	Unit	Read/write
6040h	Controlword	-	RW
6041h	Statusword	-	RO
6060h	Modes of operation	-	RW
6061h	Modes of operation display	-	RO
6098h	Homing method	-	RW
6099h	Homing speed	command unit/s	RW
609A	Homing acceleration	command unit/s <sup>2</sup>	RW

### 6-2. Cyclic synchronous position mode

#### 6-2-1. Overview

The upper computer plans the path in CSP mode and sends PDO according to the specified cycle. When transmitting each PDO, the data of target position and control word will be transmitted to the driver at the same time.

#### 6-2-2. Operation steps

1. set [control mode: 6060h] to cyclic synchronous position mode (0x08).
2. set [interpolation time period: 60C2h], the set value must be the same as SYNC0 cycle.  
60C2h Sub-1 can be set Interpolation time units, the range is 1ms~20ms.  
60C2h Sub-2 can be set Interpolation time index. The value is fixed at -3 which means the time is 10<sup>-3</sup> second.
3. Drive PDO Rx:  
607Ah can set the Target Pos Cmd (32-bit).  
6040h Sub-0 can set the controlword.

### 6-2-3. Related object list

Index	Name	Unit	Read/write
6040h	Control word	-	RW
6072h	Max torque	0.1%	RW
607Ah	Target Position	Command unit	RW
607Dh	Soft Position Limit	-	RW
	Number of entries	-	RW
607Bh	Position range limit	-	RW
	HighestSub-Index numbers	-	RW
60C5h	Max acceleration	Command unit /s <sup>2</sup>	RW
60C6h	Max deceleration	Command unit /s <sup>2</sup>	RW
60F2h	Positioning option code	-	RW

#### Csp control mode related detection types

Index	Name	Unit	Read/write
6041h	Statusword	-	RO
6062h	Position demand value	Command unit	RO
6063h	Position actual internal value	pulse	RO
6064h	Position actual value	Command unit	RO
6065h	Following error window	Command unit	RW
6066h	Following error timeout	1ms	RW
606Ch	Velocity actual value	Command unit /s	RO
6076h	Motor rated torque	mN·m	RO
6077h	Torque actual value	0.1%	RO
60F4h	Following error actual value	Command unit	RO
60FAh	Control effort	Command unit	RO
60FCh	Position deamnd internal value	Command unit	RO

## 6-3. Profile position mode

### 6-3-1. Overview

After receiving the position command from the upper computer controller, the servo driver controls the servo motor to reach the target position.

### 6-3-2. Operation steps

1. set [control mode: 6060h] to profile position mode (0x01).
2. set [target position: 607Ah] to target position (unit: command unit).
3. set [profile speed: 6081h] to profile velocity control (unit: command unit/s).
4. set [profile acceleration: 6083h], plan the acceleration slope (unit: command unit/s<sup>2</sup>).
5. set [profile deceleration: 6084h], plan the deceleration slope (unit: command unit/s<sup>2</sup>).
6. set [control word: 6040h] to (0x06 > 0x07 > 0x0F), make the driver start and the motor run.
7. read [position feedback: 6064h], get the present feedback position of motor
8. read [status word: 6041h], get the driver status, including following error, set-point acknowledge, target reached.

### 6-3-3. Related object list

Index	Name	Unit	Read/write
6040h	Controlword	UNSIGNED16	RW
6041h	Statusword	UNSIGNED16	RO
6060h	Mode of operation	INTEGER8	RW
6061h	Modes of operation display	INTEGER8	RO
6062h	Position demand value [PUU]	INTEGER32	RO
6063h	Position actual value [increment]	INTEGER32	RO
6064h	Position actual value	INTEGER32	RO
6065h	Following error window	UNSIGNED32	RW
6067h	Position window	UNSIGNED32	RW
6068h	Position window time	UNSIGNED16	RW
607Ah	Target position	INTEGER32	RW
6081h	Profile velocity	UNSIGNED32	RW
6083h	Profile acceleration	UNSIGNED32	RW
6084h	Profile deceleration	UNSIGNED32	RW
60F4h	Following error actual value	INTEGER32	RO
60FCh	Position demand value	INTEGER32	RO

## 6-4. Profile velocity mode

### 6-4-1. Overview

The driver can receive speed commands and plan acceleration and deceleration.

### 6-4-2. Operation steps

1. set [control mode: 6060h] to profile velocity mode (0x03).
2. set [control word: 6040h] to (0x06 > 0x07 > 0x0F), make the driver start and the motor to run.
3. set [profile acceleration: 6083h], plan acceleration slope (unit: command unit/s<sup>2</sup>).
4. set [profile deceleration: 6084h], plan deceleration slope (unit: command unit/s<sup>2</sup>).
5. set [target speed: 60FFh], target speed unit is 0.1 rpm.
6. read [status word: 6041h] to get the driver status.

### 6-4-3. Related object list

Index	Name	Unit	Read/write
6040h	Controlword	UNSIGNED16	RW
6041h	Statusword	UNSIGNED16	RO
6060h	Modes of operation	INTEGER8	RW
6061h	Modes of operation display	INTEGER8	RO
606Bh	Velocity demand value	INTEGER32	RO
606Ch	Velocity actual value	INTEGER32	RO
606Dh	Velocity window	UNSIGNED16	RW
606Eh	Velocity window time	UNSIGNED16	RW
606Fh	Velocity threshold	UNSIGNED16	RW
60FFh	Target velocity	INTEGER32	RW

## 7. Mode common function

### 7-1. Touch probe function

#### 7-1-1. Overview

The probe function can be triggered through the SI terminal of CN0 or encoder, and the feedback position can be fixed as the rising edge or falling edge by the input terminals of differential input signals SI1 and SI2. The fixed position time can be less than 5 $\mu$ s. This function can be used for high-speed measurement or packaging applications.

#### 7-1-2. Operation steps

P2-09 corresponds to probe 1 and P2-10 corresponds to probe 2 (it must be assigned to SI1 / SI2 and cannot be modified).

[probe function: 60B8h] disable the corresponding probe in 60B8h, set the input terminal in P5-62/P5-63, then enable the object word 60B8h.

When reading the probe value, you need to add the corresponding probe value object (60BAh-60BDh) to TxPDO.

#### 7-1-3. Related object list

Index	Name	Unit	Read/write
60B8h	Touch probe function	-	RW
60B9h	Touch probe status	-	RO
60BAh	Touch probe pos1 pos value	Command unit	RO
60BBh	Touch probe pos1 neg value	Command unit	RO
60BCh	Touch probe pos2 pos value	Command unit	RO
60BDh	Touch probe pos2 neg value	Command unit	RO

The user can obtain the current setting of the probe function from the object 60B8h. Under the same probe, do not set the rising edge and falling edge at the same time. The following is the bit description of 60B8h.

Bit	Value	Explanation	
0	0	switch off Touch probe 1	Stop/run Touch probe1
	1	enable Touch probe 1	
1	0	Trigger first event	Touch probe1 mode selection
	1	Continuous	
2	0	Trigger with Touch probe1 input	Touch probe1 trigger selection (external input/phase Z)
	1	Trigger with zero impulse signal of position encoder	
3	0	Reserved	Unuse
4	0	switch off sampling at positive edge of touch probe1	Touch probe1 rising edge selected
	1	enable sampling at positive edge of touch probe1	
5	0	switch off sampling at negative edge of touch probe1	Touch probe1 falling edge selected
	1	enable sampling at negative edge of touch probe1	
6-7	0	Reserved	

Bit	Value	Explanation	
8	0	switch off Touch probe 2	Stop/run Touch probe2
	1	enable Touch probe 2	
9	0	Trigger first event	Touch probe2 mode selection (single/continuous)
	1	Continuous	
10	0	Trigger with Touch probe2 input	Touch probe2 trigger selection (external input/phase Z)
	1	Trigger with zero impulse signal of position encoder	
11	0	Reserved	not used
12	0	switch off sampling at positive edge of touch probe2	Touch probe 2 rising edge selected
	1	enable sampling at positive edge of touch probe2	
13	0	switch off sampling at negative edge of touch probe2	Touch probe 2 falling edge selected
	1	enable sampling at negative edge of touch probe2	
14-15	0	Reserved	

The user can obtain the current state of the probe from the object 60B9h. The following is the description of bit corresponding to 60B9h.

Bit	Value	Explanation	
0	0	Touch probe1 is switch off	Probe 1 action stop
	1	Touch probe1 is enabled	Probe 1 in action
1	0	Touch probe1 no positive edge value stored	Rising edge probe 1 incomplete status
	1	Touch probe1 positive edge value stored	Rising edge probe 1 completion status
2	0	Touch probe1 no negative edge value stored	Falling edge probe 1 incomplete state
	1	Touch probe1 negative edge value stored	Falling edge probe 1 completion status
3-5	-	reserved	not used
6-7	-	Not supported	not used
8	0	Touch probe2 is switch off	Probe 2 action stop
	1	Touch probe2 is enabled	Probe 2 in action
9	0	Touch probe2 no positive edge value stored	Rising edge probe 2 incomplete status
	1	Touch probe2 positive edge value stored	Rising edge probe 2 completion status
10		Touch probe2 no negative edge value stored	Falling edge probe 2 incomplete state
		Touch probe2 negative edge value stored	Falling edge probe 2 completion status
11-13	-	Reserved	not used
14-15	-	Not supported	not used



## 8. EtherCAT parameter list (refer to XML file for details)

### 8-1. CoE object word

#### 8-1-1. Communication Profile area

Index		Name	Data type	Read/write
1000h	VAR	device type	UNSIGNED32	RO
1001h	VAR	error register	UNSIGNED8	RO
1600h~03h	RECORD	Receive PDO mapping	UNSIGNED32	RW
1A00h~03h	RECORD	Transmit PDO mapping	UNSIGNED32	RW

#### 8-1-2. Driver Profile area

Index		Name	Data type	Read/write
603Fh	VAR	Error Code	UNSIGNED16	RO
6040h	VAR	Controlword	UNSIGNED16	RW
6041h	VAR	Statusword	UNSIGNED16	RO
605Bh	VAR	Shutdown option code	INTEGER16	RW
605Eh	VAR	Fault reaction option code	INTEGER16	RW
6060h	VAR	Modes of operation	INTEGER8	RW
6061h	VAR	Modes of operation display	INTEGER8	RO
6063h	VAR	Position actual value[increment]	INTEGER32	RO
6064h	VAR	Position actual value	INTEGER32	RO
6065h	VAR	Following error window	UNSIGNED32	RW
6067h	VAR	Position windows	UNSIGNED32	RW
6068h	VAR	Position window time	UNSIGNED16	RW
606Bh	VAR	Velocity demand value	INTEGER32	RO
606Ch	VAR	Velocity actual value	INTEGER32	RO
606Dh	VAR	Velocity window	UNSIGNED16	RW
606Eh	VAR	Velocity window time	UNSIGNED16	RW
606Fh	VAR	Velocity threshold	UNSIGNED16	RW
6071h	VAR	Target torque	INTEGER16	RW
6072h	VAR	Max torque	UNSIGNED16	RW
6074h	VAR	Torque demand value	INTEGER16	RO
6075h	VAR	Motor rated current	UNSIGNED32	RO
6076h	VAR	Motor rated torque	UNSIGNED32	RO
6077h	VAR	Torque actual value	UNSIGNED16	RO
6078h	VAR	Current actual value	INTEGER16	RO
607Ah	VAR	Target position	INTEGER32	RW
607Ch	VAR	Home Offset	INTEGER32	RW
607Dh	ARRAY	Software position limit	INTEGER32	RW
607Eh	VAR	Polarity	UNSIGNED8	RW
607Fh	VAR	Max profile velocity	UNSIGNED32	RW
6080h	VAR	Max motor speed	UNSIGNED32	RW
6081h	VAR	Profile velocity	UNSIGNED32	RW
6083h	VAR	Profile acceleration	UNSIGNED32	RW

Index		Name	Data type	Read/write
6084h	VAR	Profile deceleration	UNSIGNED32	RW
6085h	VAR	Quick stop deceleration	UNSIGNED32	RW
6086h	VAR	Motion profile type	INTEGER16	RW
6087h	VAR	Torque slope	UNSIGNED32	RW
6093h	ARRAY	Position factor	UNSIGNED32	RW
6098h	VAR	Homing method	INTEGER8	RW
6099h	ARRAY	Homing speeds	UNSIGNED32	RW
609Ah	VAR	Homing acceleration	UNSIGNED32	RW
60B8h	VAR	Touch probe function	UNSIGNED16	RW
60B9h	VAR	Touch probe status	UNSIGNED16	RO
60BAh	VAR	Touch probe pos1 pos value	INTEGER32	RO
60BBh	VAR	Touch probe pos1 neg value	INTEGER32	RO
60BCh	VAR	Touch probe pos2 pos value	INTEGER32	RO
60BDh	VAR	Touch probe pos2 neg value	INTEGER32	RO
60C0h	VAR	Interpolation sub mode select	INTEGER16	RW
60C1h	ARRAY	Interpolation data record	UNSIGNED16/32	RW
60C2h	RECORD	Interpolation time period	SIGNED8	RW
60C5h	VAR	Max acceleration	UNSIGNED32	RW
60C6h	VAR	Max deceleration	UNSIGNED32	RW
60F2h	VAR	Positioning option code	UNSIGNED16	RW
60F4h	VAR	Following error actual value	INTEGER32	RO
60FCh	VAR	Position demand value	INTEGER32	RO
60FDh	VAR	Digital inputs	UNSIGNED32	RO
60FFh	VAR	Target velocity	INTEGER32	RW
6502h	VAR	Supported drive modes	UNSIGNED32	RO
Xinje user-defined area				
2000h~ 281Ah	VAR	Parameter Mapping	INTEGER16/32	RW

## 9. EtherCAT alarm information

Note: the stepper alarm can be cleared by setting SM2013+20\*(n-1) or the alarm can be cleared by upper computer F0-00 = 1.

Code	Explanation	Reason	Solution
E-800	Incorrect ESM requires fault protection	Accept state transition requests that cannot be converted from the current state: Init→Safeop Init→OP PreOP→OP ESM status after alarming: stop at the current status when the current status is Init, PreOP, convert to SafeOP when it is SafeOP. ESC register AL Status Code: 0011h	Confirm the status conversion requirements of the upper device
E-801	Undefined ESM requires fault protection	Accept state transition requests except the following: 1: Request Init State 2: Request Pre-Operational State 3: Request Bootstrap State 4: Reauest Safe-operational State 8: Request Operational State ESM status after alarming: stop at the current status when the current status is Init, PreOP, SafeOP. Convert to SafeOP when it is OP. ESC register AL Status Code: 0012h	Confirm the status conversion requirements of the upper device
E-802	Boot state requires abnormal protection	Accept the following state transition requests: 3: Request Bootstrap State ESM status after alarming: Init ESC register AL Status Code: 0013h	Confirm the status conversion requirements of the upper device
E-803	PLL incomplete abnormal protection	1s after synchronization, the phase combination (PLL locking) of communication and servo still cannot be completed ESM status after alarming: PreOP ESC register AL Status Code: 002Dh	Confirm the setting of DC and whether the propagation delay compensation and deviation compensation are correct
E-804	PDO watchdog abnormal protection	PDO communication (SafeOP or OP state), set the time through ESC register address 0400 (Watchdog Divider) and 0420 (Watchdog Time Process Data), 0220 (AL Event Request) bit10 is not ON. ESM status after alarming: Safe OP ESC register AL Status Code: 001Bh	Confirm whether the sending time of PDO from the upper device is fixed (interrupted). Confirm that the PDO watchdog detection delay value is too large. Confirm whether there is any problem with the wiring of EtherCAT communication cable and whether there is excessive noise on the cable.
E-806	PLL abnormal protection	ESM is in the state of SafeOP or OP, communication and servo phase (PLL locking) do	Confirm the setting of DC and whether the propagation delay

Code	Explanation	Reason	Solution
		not match ESM status after alarming: SafeOP ESC register AL Status Code: 0032h	compensation and deviation compensation are correct.
E-807	Synchronous signal abnormal protection	After the synchronization processing is completed, the interrupt processing occurs above the set threshold according to SYNC0 or IRQ ESM status after alarming: SafeOP ESC register AL Status Code: 002Ch	Confirm the setting of DC and whether the propagation delay compensation and deviation compensation are correct.
E-810	Synchronization cycle setting abnormal protection	Set unsupported synchronization cycle: The set value of synchronization cycle is beyond 500us, 1ms, 2ms and 4ms ESM status after alarming: PreOP ESC register AL Status Code: 0035h	Set the correct synchronization cycle
E-811	Mailbox setting abnormal protection	The mailbox setting value SM0/1 is error: The sending and receiving area of the mailbox overlaps with SM2/3, and the sending and receiving area address is odd. The mailbox starting address is at SyncManager0: 1000h~10FFh, SyncManager1: out the range of 1200h~12FFh. SyncManager0/1length (ESC register: 0802h, 0803h/080Ah, 080Bh) setting is error: SyncManager0: out the range of 32~256byte SyncManager1: out the range of 40~256byte SyncManager0/1 Control Register (ESC register 0804h/080Ch) setting is error: Set other than 100110b to 0804h: bit5-0 Set other than 100110b to 080Ch: bit5-0 ESM status after alarming: Init ESC register AL Status Code: 0016h	Set correct SyncManager according to ESI file description
E-814	PDO watchdog setting abnormal protection	PDO watchdog setting is error. PDO watchdog trigger is effective (SyncManager: register 0804h bit6 is 1), PDO watchdog detection timeout value (register 0400h, 0402h) is not meet "communication period *2" ESM status after alarming: PreOP ESC register AL Status Code: 001Fh	Set correct watchdog detection timeout value
E-815	DC setting abnormal protection	DC setting is error. ESC register 0981h (Activation) bit2-0 is set to the value other than the following: bit2-0=000b; bit2-0=011b. ESM status after alarming: PreOP ESC register AL Status Code: 0030h	Confirm the DC setting
E-816	SM event mode setting abnormal protection	Unsupported SM time mode is set, 1C32/1C33-01 set the value other than 00,01,02. ESC register 0981 bit2-0=000b and only SM2 of	Confirm that the settings of 1C32h-01h and 1C33h-01h are consistent and the values are at

Code	Explanation	Reason	Solution
		1C32h-01h and 1C33h-01h are set. ESM status after alarming: PreOP ESC register AL Status Code: 0028h	any one of 00h, 01h and 02h
E-817	SyncManager 2/3 setting abnormal protection	SM2/3 is set to error value. SM2/3 incorrect physical address setting (ESC register: 0810h/0818h), the receiving and transmitting area overlaps, overlaps with SM2/3, the starting address is odd, and the starting address and completion address are outside the range. SM2/3 length setting (ESC register: 0812h/081A) and RxPDO, TxPDO is different. SM2/3 control register (ESC register: 0814h/081Ch) setting is error. Set other than 100110b to bit5-0 ESM status after alarming: PreOP ESC register AL Status Code: 001Dh/001Eh	Set correct SyncManager2/3 according to ESI file description
E-850	TxPDO distribution abnormal protection	TxPDO mapping data size is over 24 bytes ESM status after alarming: PreOP ESC register AL Status Code: 0024h	Make sure the TxPDO mapping data size is in the range of 24 bytes
E-851	RxPDO distribution abnormal protection	RxPDO mapping data size is over 24 bytes ESM status after alarming: PreOP ESC register AL Status Code: 0025h	Make sure the RxPDO mapping data size is in the range of 24 bytes
E-881	Control mode setting abnormal protection	When the set value of 6060h is 0 and the set value of 6061h is 0, the PDS state is converted to "operation enabled". 6060h no corresponding control mode is set. When it is full closed loop control, 6060h is the mode other than position control and to be set. ESM status after alarming: stop at present ESM state ESC register AL Status Code: 0000h	Confirm the setting value of 6060h
E-882	ESM requires abnormal protection during operation	When the PDS status is "operation enabled" or "quick stop active", other ESM status conversion commands are received ESM status after alarming: based on the state transformation requirements from the host computer ESC register AL Status Code: 0000h	Confirm the state transformation requirements from the host computer

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## 10. Suitable motor and cable

### 10-1. Suitable motor

DP3C series driver can match Xinje MP3 series closed-loop stepping motor, covering 42/57/60/86 series base. The motor selection is shown in the table below:

Motor model	Base no.	Step angle (°)	Holding torque (N.m)	Phase current (A)	Motor shaft diameter (mm)	Matched driver
MP3-42T048	42	1.8	0.5	1.5	5	DP3C-305
MP3-42T060		1.8	0.8	1.5	5	
MP3-57T056	57	1.8	1.3	4	8	DP3F-705
MP3-57T076		1.8	2.3	5	8	
MP3-57T088		1.8	3	5	8	
MP3-60T088	60	1.8	3	5	8	
MP3-86T080	86	1.8	4.5	6	14	DP3F-808
MP3-86T118		1.8	8.5	6	14	
MP3-86T150		1.8	12	6	14	

### 10-2. Encoder cable

The models are as the following:

Model	Length (m)
CP-MD-2	2
CP-MD-3	3
CP-MD-5	5
CP-MD-8	8
CP-MD-10	10
CP-MD-12	12
CP-MD-16	16

### 10-3. Power cable

The models are as the following:

Model	Length (m)
CM-MP07-2	2
CM-MP07-3	3
CM-MP07-5	5
CM-MP07-8	8
CM-MP07-10	10
CM-MP07-12	12
CM-MP07-16	16

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#### 10-4. EtherCAT bus cable

Model	Length (m)
JC-CB-0P1	0.1
JC-CB-0P2	0.2
JC-CB-0P3	0.3
JC-CB-0P5	0.5
JC-CB-01	1
JC-CB-03	3
JC-CB-05	5
JC-CB-10	10
JC-CB-20	20

#### 10-5. Power supply cable

A power supply cable will be delivered free of charge when the driver leaves the factory. Please purchase it yourself if necessary.

Model	Length (m)
JC-PM-20	2

# XINJE



WECHAT ID

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