

Preface

First of all, thank you for purchasing the SD500 series spindle servo drive from VEICH!!

The SD500 series spindle driver adopts high-performance closed-loop vector control, with the characteristics of wide speed range, fast response, accurate positioning, etc., and can easily achieve spindle accurate stop, C-axis, rigid tapping, indexing positioning and other requirements with the CNC system. The SD500 series spindle driver can be widely used in machining centers, CNC machine tools, CNC milling machines, inclined lathes and other equipment, as well as flying shears, tracking cutting and other fields. It is the preferred drive product for various machine tool power axes.

spindle servo EtherCAT communication user manual V1.0, which provides product safety information, mechanical and electrical installation instructions, and EtherCAT communication introduction . To ensure the correct installation and operation of the SD500 spindle servo drive and its superior performance, please read this manual in detail before installation. If you have any questions about some functions and performance, please consult our company's technical support staff for help.

Our company is committed to the continuous improvement of our products. The product functions will be continuously upgraded. The information provided is subject to change without prior notice. If you have any other questions during use, please contact our regional agents or customer service center.

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1. Overview

1.1 Safety precautions

To ensure safe and reasonable use of this product, please use the product only after fully understanding the safety precautions described in this manual.

Warning signs and their meanings

The following marks are used in this manual to indicate important safety-related contents. Failure to observe these precautions may result in personal injury, death, or damage to the product and related systems.

 危險	Danger: Improper operation may result in death or serious safety accidents.
 注意	CAUTION: Minor injury may occur if handled incorrectly.

Operation Qualification

This product must be operated by trained professionals. In addition, operators must receive professional skills training, be familiar with the installation, wiring, operation and maintenance of the equipment, and correctly respond to various emergencies that occur during use.

Safety Guide

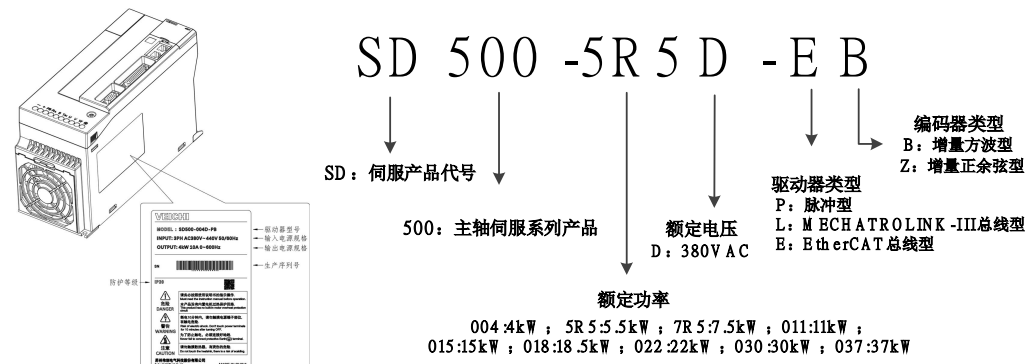
Warning signs are provided for your safety and are measures taken to prevent operators from being injured and the product and related systems from being damaged. Please read this manual carefully before use and operate in strict accordance with the safety rules and warning signs in this manual.

- Correct transportation, storage, installation, and careful operation and maintenance are crucial to the safe operation of the spindle drive. During transportation and storage, the spindle drive must be protected from shock and vibration, and must be stored in a dry place without corrosive gases, conductive dust, and an ambient temperature below 60 °C .
- This product contains dangerous voltages and controls a potentially dangerous motion mechanism. Failure to comply with regulations or operate in accordance with the requirements of this manual may result in personal injury or death, or damage to the product and related systems.
- Do not perform wiring work when the power is on, otherwise there is a risk of electric shock and death; when performing wiring, inspection, maintenance and other operations, please cut off the power supply of all related equipment, and confirm that the DC voltage of the main circuit has dropped to a safe level, and wait for 5 minutes before performing related operations.
- The power line, motor line, and control line must be firmly connected, the grounding terminal must be reliably grounded, and the grounding resistance must be less than 10Ω.
- Static electricity from the human body can seriously damage internal sensitive devices. Before performing related operations, please comply with the measures and methods specified in the electrostatic discharge prevention measures (ESD), otherwise the spindle drive may be damaged.
- Since the output voltage of the spindle driver is a pulse waveform, if capacitors to improve the power factor or varistors for lightning protection are installed on the output side, be sure to remove or modify them on the input side of the spindle driver.
- of the spindle driver (if a switching device must be connected on the output side, the control must ensure that the output current of the spindle driver is zero when the switch is actuated).
- No matter where the fault occurs in the control equipment, it may cause production stoppage and serious accidents. Therefore, please take necessary external protection measures or backup devices.
- This product can only be used in accordance with the purpose specified by the manufacturer and must not be used in special fields such as emergency, rescue, shipping, medical treatment, aviation, nuclear facilities, etc. without permission.
- The maintenance of this product can only be performed by our company or professionals authorized by our company. Unauthorized modification and use of accessories not approved by our company may cause product failure. During maintenance, any defective components must be replaced in a timely manner.
- Our company is not responsible for any injury or equipment damage caused by your company or your customers' failure to comply with the contents of this instruction manual.

Precautions before use

After receiving the product you ordered, please check whether the outer packaging is damaged. After confirming that it is intact, open the outer packaging and confirm whether the spindle drive is damaged, scratched or dirty (damage caused during product transportation is not covered by our company's "three guarantees"). If the product you received is damaged during transportation, please contact our company or the transportation company immediately. After confirming that the received product is intact, please confirm whether the model of the spindle drive you received is the same as the product you ordered.

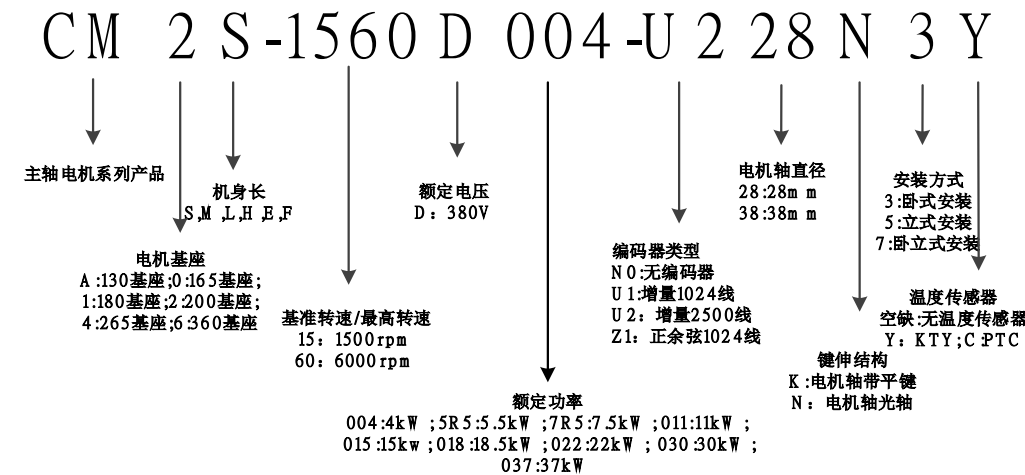
1.2.1 Spindle servo drive model and nameplate description



Rated output current of spindle servo drive

Input voltage	380V		
Spindle drive model	Rated input	Rated output	Adaptive motor
SD500-004D-E*	12.0	10	4.0
SD500-5R5D-E*	14.6	13	5.5
SD500-7R5D-E*	21.5	17	7.5
SD500-011D-E*	27.0	25	11.0
SD500-015DE*	35.2	32.0	15.0
SD500-018DE*	45.3	38.0	18.0
SD500-022DE*	50.0	45.0	22.0
SD500-030DE*	67.7	60.0	30.0
SD500-037DE*	83.4	75.0	37.0

1.2.2 Motor naming rules



1.3 Technical specifications

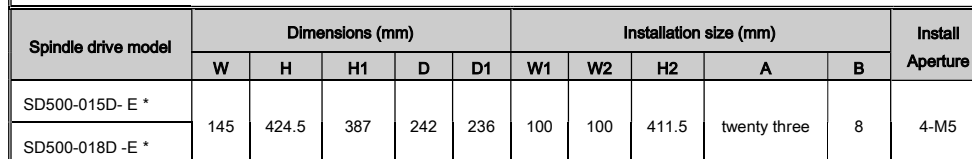
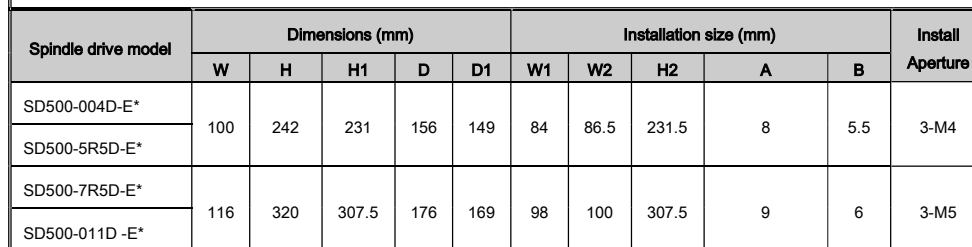
project	describe
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power supply enter	Voltage	Three-phase: 380V ~ 440V, 50/60Hz
	Allow	Voltage unbalance rate: <3%; Frequency: ±5%; Distortion rate meets
	Closing	Less than rated current
	Power	≥0.94(with DC reactor)
	Spindle	≥96%
Output	The output	Output under rated conditions: three-phase 380~440V, error less than 5%
	Output	4-pole motor 0 ~ 4 5000rpm; 0 ~ 1500Hz
Main control performance	Motor	Sine wave PWM modulation, full closed loop vector control
	Speed	1:1000
	Steady-state	≤0.05% rated synchronous speed
	Starting	200% rated torque at 0Hz
	Torque	< 10ms
	Speed	±0.2%
	Position	±1pulse
	Overload	200% rated current 20S
Input and output interface	Digital input	4-way optocoupler isolated input, input mode NPN, PNP optional.
	Digital	2-way optocoupler isolation output
	Encoder	2 channels: 1 motor encoder; 1 spindle encoder
	Encoder	1 channel: frequency division output
	Temperature	2-way: K TY84 , PT100
Protective function		Overvoltage, undervoltage, current limiting, overcurrent, overload, electronic thermal relay, overheating, overvoltage stall, data protection,
ring territory	Installation location	The altitude is lower than 1000 meters. Above 1000 meters, the rating is derated by 1% for every 100 meters increase.
	temperature humidity	-10 ~ +50 °C , derating can be used above 40 °C , maximum temperature 60 °C (no-load operation)
	vibration	9 ~ 200Hz, 5.9m/s2(0.6g)
	Storage	-30 ~ +60 °C
	Installation	Wall-mounted, cabinet-type
	Protection	IP20
	cooling	Forced air cooling

2 Mechanical and electrical installation

To ensure that users use this product safely, maximize the performance of the spindle drive, and ensure the reliable operation of the spindle drive, please use this product strictly in accordance with the environment, wiring, ventilation and other requirements described in this chapter.

2.1.1 Spindle drive dimensions



SD500-022D- E *											
SD500-030D- E *											
SD500-037D- E *	185	471	433	242	236	140	140	457	twenty two	8.75	4-M6

2.1.2 Installation environment and precautions:

Ambient temperature: The ambient temperature has a great impact on the life of the spindle servo drive. The operating temperature of the spindle servo drive is not allowed to exceed the allowable temperature range (-10 °C ~ 50 °C). If the ambient temperature exceeds 40 °C , external forced heat dissipation is required and the drive needs to be used at a reduced rating.

The humidity of the installation site should be lower than 95%, without condensation. Avoid direct sunlight, oily, dusty or metal dusty environments.

When the altitude exceeds 1000m, the heat dissipation effect will be poor due to the thin air, so please use it at a reduced rating. The rated output will decrease by 1% for every 100m increase in altitude.

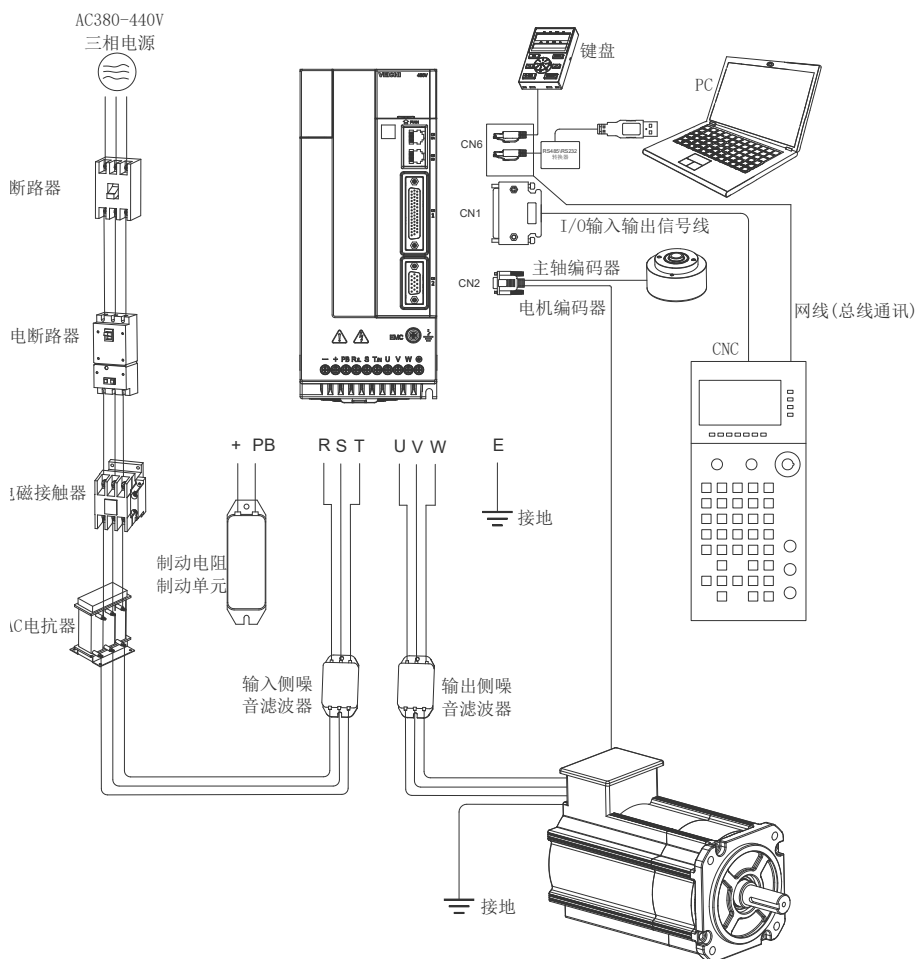
The spindle drive must be installed on a flame retardant surface to ensure sufficient heat dissipation space. The mounting surface must be able to reliably bear the weight of the spindle servo drive, otherwise it may fall and cause personal injury or equipment damage.

When the spindle drive is installed near the vibration source, please install vibration-proof equipment on the installation surface of the servo unit to prevent the vibration from being transmitted to the servo unit.

Install the spindle servo drive in a place away from electromagnetic interference sources.

2.2 Electrical installation

2.2.1 Peripheral electrical components and connections



Note: When only a single encoder is connected, the spindle encoder signal terminal is invalid and the encoder signal must be connected to the motor encoder signal terminal.

2.2.2 Instructions for use of peripheral electrical components

Parts Name	Installation location	Function Description
air circuit breaker	Input circuit front end	Contact and disconnect the circuit, and can promptly protect the downstream equipment when short circuit or severe overload occurs. The rated current of the air switch can be selected according to 150% of the rated current of the driver.
Electromagnetic contactor	Between the circuit breaker and the spindle servo drive	Driver power-on control. Select the model based on 150% of the driver rated current.
AC Reactor	Spindle servo drive input side	Improve the power factor on the input side; improve the overall efficiency and thermal stability of the spindle drive;

		Effectively eliminate the impact of high-order harmonics on the spindle drive at the input side and reduce external conduction and radiation interference. Select according to 100% of the drive's rated current.
Braking resistor	Models with power of 11kW or below	For models with power of 11kW and below, please use a brake resistor. For matching resistors, please refer to the brake resistor matching table. The motor consumes regenerative energy through the braking resistor when decelerating.

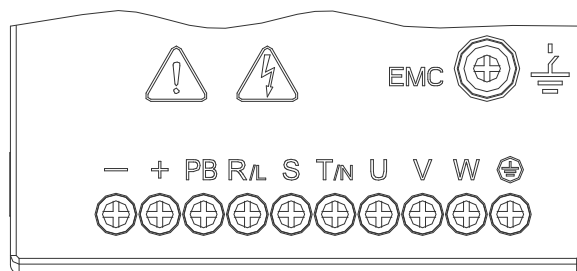
● Braking resistor selection

When the spindle drive is decelerating with a large inertia load or requires rapid deceleration, the motor will work in a discharge state, transferring the load energy to the DC link of the spindle drive through the inverter bridge, causing the spindle drive bus voltage to rise. When it exceeds a certain limit, the drive will report an overvoltage fault. To prevent this phenomenon from happening, an external brake component is required. The following table shows typical reference values for external brake resistor specifications:

Spindle drive model	Minimum allowable braking resistance	Braking resistor power
SD500-004D-*	50Ω	1.0kw
SD500-5R5D-*	50Ω	1.0kw
SD500-7R5D-*	45Ω	1.5kw
SD500-011D-*	35Ω	2.0kw
SD500-01 5D- *	30Ω	3.0 k W
SD500-01 8D- *	30Ω	3.0 k W
SD500-0 22 D- *	25Ω	4.0 kW
SD500-0 30 D- *	18Ω	6.0 k W
SD500-0 37 D- *	18Ω	7.0 k W

The table shows typical reference data. The selection of brake resistors needs to be determined based on the power generated by the motor in the actual application system (but the brake resistance value cannot be less than the limit in the table above), and is related to the system inertia, deceleration time, and energy of potential load. The greater the inertia of the system, the shorter the required deceleration time, and the more frequent the braking, the greater the power and the smaller the resistance of the brake resistor. Users can choose different resistance values and powers according to actual conditions. For detailed calculations, please consult our technical support.

2.2.3 Main circuit terminal description



Terminal name screen printing	Terminal name	Function Description
R, S, T	Three-phase AC power input terminal, 380~440V, 50/60Hz	AC input three-phase power connection point.
(+), (-)	DC bus positive and negative terminals	Common DC bus input point or external braking unit.
(+), PB	Braking resistor connection terminals	Reserved terminals for external braking resistor.
U, V, W	Spindle servo drive output terminal	Three-phase AC output connects to the motor.
PE	Ground terminal	Power supply and motor grounding terminal.

● Recommended main circuit connection cable size:

Servo spindle drive model	Recommended cable size (mm ²)		Terminal screw specifications	Recommended tightening torque (Nm)
	R/S/T/U/V/W	PE		
SD500-004D-E *	4.0	4.0	M4	1.2 ~ 1.5
SD500-5R5D-E *	6.0	6.0	M4	1.2 ~ 1.5
SD500-7R5D-E *	6.0	6.0	M5	2 ~ 2.5
SD500-011D-E *	10.0	10.0	M5	2 ~ 2.5
SD500-01 5DE *	10.0	10.0	M6	4-6
SD500-01 8DE *	16.0	16.0	M6	4-6
SD500-0 22 DE *	16.0	16.0	M6	4-6
SD500-0 30 DE *	25.0	25.0	M8	8-10
SD500-0 37DE *	25.0	25.0	M8	8-10

Main circuit precautions

The input side wiring of the spindle servo driver has no phase sequence requirements, so you need to pay attention to the power input electrical specifications.

The specifications and installation methods of external power wiring must comply with local regulations and relevant IEC standards.

The brake resistor selection refers to the recommended value and the wiring distance is less than 5m.

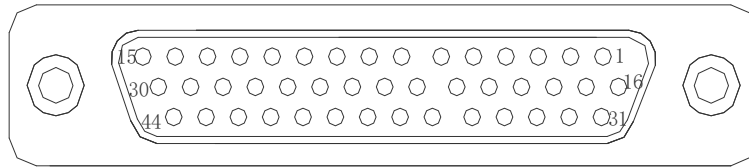
The output side of the spindle servo drive must not be connected to a capacitor or surge absorber, otherwise the spindle servo drive will be frequently protected or even damaged.

Route the motor cables, input power cables, and control cables separately.

The grounding wire should be of the wire diameter specified in the technical standards for electrical equipment, and should be as short as possible to the grounding point, with a grounding resistance of less than 4Ω. Do not share the grounding wire with an electric welder or power equipment.

2.2.4 Terminal block pin definition

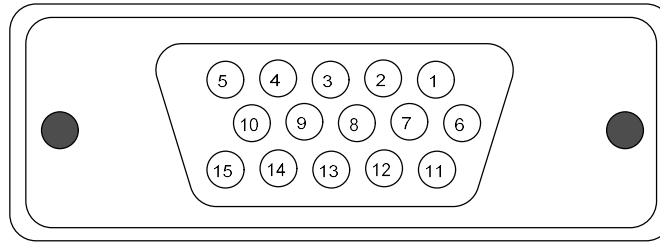
- CN1 multi-function control terminal pin definition:



CN1 interface					
Needle No.	Signal name	Function	Needle No.	Signal name	Function
1	GND	Reference ground GND	twenty three		
2	+10V	10V power supply	twenty four		
3	GND	Reference ground GND	25		
4			26	X2	Multi-function contact input 2
5			27	SC	I/O Common +
6			28	Y2+	Y2+
7			29		
8			30		
9			31		
10	X4	Multi-function contact input 4	32	GND	Reference ground GND
11	X1	Multi-function contact input 1	33	GND	Reference ground GND
12	24V+	24V power supply	34	GND	Reference ground GND
13	Y 1+	Y 1+	35		
14	Y 1-	Y 1-	36		
15			37		
16			38		
17			39		
18	GND	Reference ground GND	40		
19			41	X3	Multi-function contact input 3
20			42	COM	C O M

twenty one			43	Y 2-	Y 2-
twenty two			44		

- CN2 encoder terminal pin definition:



CN2 encoder interface					
Needle No.	Signal name	Function	Needle No.	Signal name	Function
1	U-	Spindle encoder signal A-	8	A+	Motor encoder signal A+
2	W-	Spindle encoder signal Z-	9	B+	Motor encoder signal B+
3	A-	Motor encoder signal A-	10	V+	Spindle encoder signal B+
4	B-	Motor encoder signal B-	11	T1	Motor overheating
5	V-	Spindle encoder signal B-	12	5V	Motor encoder power supply 5V
6	U+	Spindle encoder signal A+	13	0V	Motor encoder power supply 0V
7	W+	Spindle encoder signal Z+	14	Z-	Motor encoder signal Z-
case	shield	-	15	Z+	Motor encoder signal Z+

Note: When only one encoder is connected , the spindle encoder signal terminal is invalid and the encoder signal must be connected to the motor encoder signal terminal.

3 . EtherCAT Communication

3.1 Communication specifications

Table 3-1 Description of performance parameters

	name	illustrate
EtherCAT Communication function		
	Physical Layer	100BASE-TX
	Communication connector	RJ45×2
	Network Architecture	Concatenation
	transfer speed	2×100Mbps (full duplex)
	Maximum data length	1484 bytes
	SyncManager	SM0: MailBox Output SM1: MailBox Input SM2: Periodic output output SM3: Periodic data input
	FMMU (Bus Memory Management Unit)	FMMU0: Periodic data input area FMMU1: Periodic data output area FMMU2: MailBox Status Area
	Application layer protocols	COE: CANOpen Over EtherCAT
	Synchronous Mode	DC Sync Mode (SYNC0)
	Communication object	SDO: Service Data Object (acyclic data) PDO: Process Data Object (cyclic data) EMCY: Emergency
	Application layer specifications	IEC61800-7 CIA402 Driver Profile
Supported CIA402 operation modes		Contour Position Mode Profile Speed Mode Contour torque mode Cycle Synchronous Position Mode Cycle Synchronous Speed Mode Cycle Synchronous Torque Mode Zero return mode

3.2 Wiring

3.2.1 Interface Information

SD 500 spindle servo drive uses dual RJ45 terminals as EtherCAT protocol communication ports. The terminal interface is shown in the figure below. Interface A (the upper interface) is the input interface, and interface B (the lower interface) is the output interface.

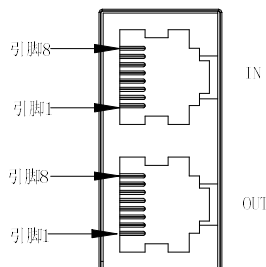


Figure 3.1 CN 6 terminal pin definition

Table 3-2 Communication connector pin definition

Pin Number	name	Function
1	TX+	Receiver signal
2	TX-	Receiver signal
3	RX+	Sending a signal
4	--	--
5	--	--
6	RX-	Sending a signal
7	485-	485 Data -
8	485+	485 Data+
	shell	shield

Note: For EtherCAT bus type, only CN6B port supports RS485 .

3.2.2 Topological Connection

The servo drive topology communication connection is flexible and has basically no restrictions. Its connection topology is shown below.

Linear connection:

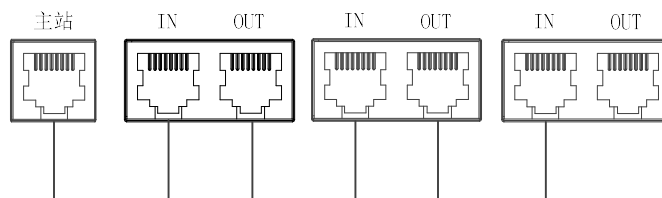


Figure 3.2 Schematic diagram of linear connection

Ring redundant connection:

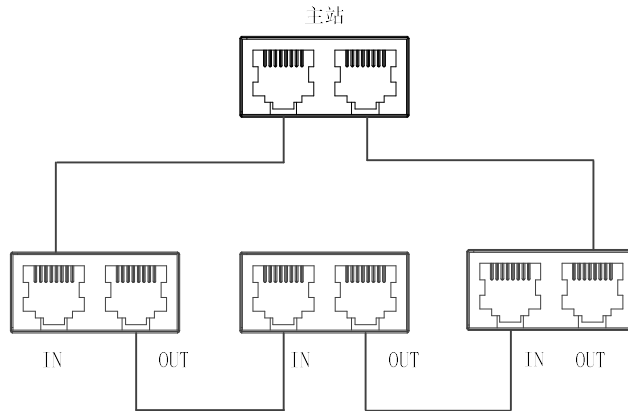


Figure 3.3 Schematic diagram of ring redundant connection

3.2.3 Communication cables

The EtherCAT communication cable uses Ethernet Category 5 (100BASE-TX) network cable or high-strength shielded network cable. When using the SD500-EtherCAT spindle servo drive, you also need to use a shielded network cable to enhance anti-interference capabilities.

3.2.4 EMC standards

SD500-EtherCAT spindle servo drive complies with IEC/EN61800-3:2004 (Adjustable speed electrical power drive systems-part3:EMC requirements and specific test methods) standard and GB/t12668.3 national standard.

3.3 Communication network settings

The steps for setting up the EtherCAT communication network are as follows:

1. Import XML file; (refer to the main site of the field application to determine the import method)
2. EtherCAT mode parameter setting; (refer to Section 10.3.3.1)
3. EtherCAT communication parameter settings; (refer to Section 10.3.4.4)
4. Start the remote node. (Observe Section 10.3.2 to determine the current status)

3.3.1 Parameter settings

In order to enable the servo drive to access the EthrCAT fieldbus network, the relevant function codes of the servo drive need to be set.

Table 3-3 Communication parameter settings

F01.01	Run command channel			■	Communication address: 0x0101
Factory 0003	value:	Setting range: 0000 ~ 0004	Unit: N/A	Control PST	mode:

Feature Selection	
0	Keyboard Control
1	Terminal control
2	RS485 communication control
3	EtherCAT bus control
4	Terminal switching command given

F01.02	Given command channel			■	Communication address: 0x0102
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Factory value:	Setting range: 0000 ~ 0011	Unit: N/A	Control mode:
0010			PST

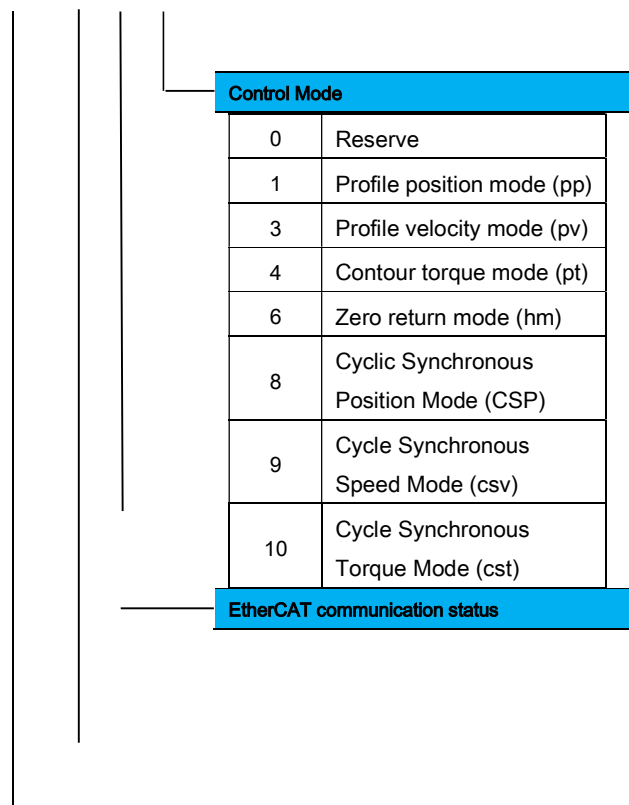
Feature Selection	
0	Keyboard digital given frequency
1	Keyboard analog potentiometer setting
2	Voltage analog AI1 given
3	Current/voltage analog AI2 given
4	reserve
5	Terminal pulse PUL given
6	RS485 communication setting
7	Terminal UP/DW control
8	PID control given
9	Program control (PLC) given
10	EtherCAT bus given
11	Multi-speed setting

Precautions



- After setting to EtherCAT model, the control mode selection is invalid and the control mode is selected by the master station .

3.3.2 Status Monitoring



1	Initialization state (I)
2	Pre-operation status
4	Safe operation status
8	Operating status

Port connection status



Port 1 (In)
connection status

Port 2 (Out)
connection status

state	significance	state	significance
	Lights up when the control power is on and goes out when it is off		Lights up when the main circuit power is on, and turns off when it is off
	Speed control: Lights up when the speed is consistent (V-CMP) output		Lights up when the rotation detection (/ TGON) output is on
	Position control: Lights up when positioning is completed (/ COIN) output Torque control: always on		Speed control: Lights up when speed command is being input Position control: Lights up when position command is being input
	Lights up when the servo is OFF, and turns off when the servo is ON		Torque control: Lights up when torque command is being input Position control: Lights up when pulse clear signal is input

3. 4 Communication Basics

3.4.1 Communication specifications

Table 3-4 Communication Specifications

project		Specification
letter of agreement		IEC61158 Type12, IEC61800-7 CiA 402 Drive Profile
Application Layer	SDO	SDO request, SDO response
	PDO	Variable PDO mapping
	CiA402	Profile Position Mode (PP)
		Profile Velocity Mode (PV)
		Contour Torque Mode (PT)
Physical Layer	Home Return Mode (HM)	
	Synchronous Cyclic Position Mode (CSP)	
	Synchronous Cycle Speed Mode (CSV)	
	Synchronous Cyclic Torque Mode (CST)	
Physical Layer	Transfer Protocol	100BASE-TX (IEEE802.3)
	Maximum distance	100m
	interface	RJ45×2 (1 INT, 1 OUT)

3.4.2 Communication Structure

There are many application layer protocols for EtherCAT communication, but the servo drive described in this manual uses the IEC 61800-7 (CiA402)-CANopen motion control subprotocol. The following figure is a communication structure based on EtherCAT application.

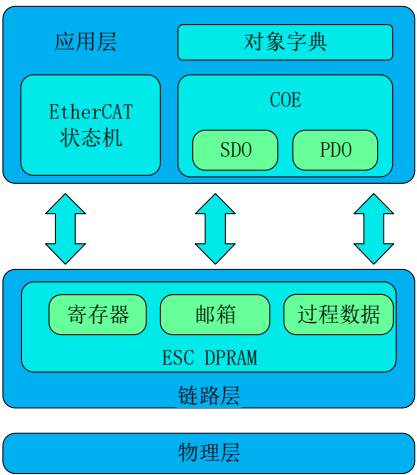


Figure 3.4 EtherCAT communication structure

In the structure diagram, the application layer object dictionary contains communication parameters, service data objects (SDO), and process data objects (PDO). The PDO process data object contains real-time data in servo operation and is read and written periodically. SDO mailbox communication configures and accesses and modifies some communication parameter objects aperiodically.

3.4.3 state machine

The following is the EtherCAT state transition block diagram:

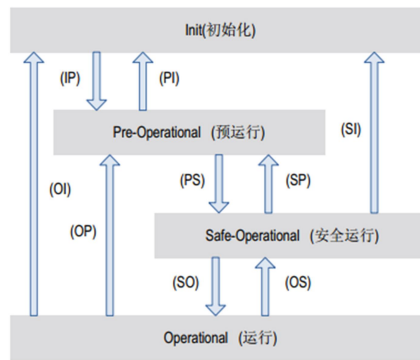


Figure 3.5 State transition diagram

SD 500 -EtherCAT spindle servo drive supports 4 state switching, responsible for coordinating the state transition from initialization to operation between the master and slave. The following table shows the relevant operations performed inside the servo from initialization state to operation state.

Table 3- 5 State Transition Table

State or state transition	Internal related operations
Initialization (I)	There is no communication on the application side, the master can only read and write the ESC register
Initialization to pre-operation conversion Init to Pre-Op(IP)	Master station configuration slave station register Configuring Mailbox Channel Parameters Configure distributed clock (DC) related registers The master writes the status control register to request the pre-operational status
Pre-run (P)	Application layer mailbox data communication
Transformation from pre-operation to safe operation Pre-Op to Safe-Op (PS)	The master station uses the mailbox to initialize the process data mapping The master station configures the SM channel used for process data communication Master station configuration FMMU The master writes the status control register to request the safe operation status
Safe operation (S)	The application layer supports mailbox data communication There is process data communication, but only input data can be read and no output signal is generated.
Transformation from safe operation to operation Safe-Op to Op(SO)	The master sends valid output data The master station writes the status control register to request the operating status

Operation status (O)	All inputs and outputs are valid Email communication is still available
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3.4.4 Process Data (PDO)

Real-time process data (PDO) follows the producer-consumer model. PDO can be divided into RPDO (receive PDO) and TPDO (send PDO). The slave receives the master's instructions through RPDO and sends its own status information to the master through TPDO.

(1) PDO mapping parameters

PDO mapping is used to establish the mapping relationship between the object dictionary and PDO. In the SD 500-EtherCAT spindle servo drive, 1600h~1603h are RPDOs, and 1A00h~1A03h are TPDOs. The following table shows the information about PDO mapping and mapping objects of this product. The mapping objects can be changed.

Table 3- 6 PDO Mapping Table

PDO	index	Maximum number of mappings	Maximum mapping bytes	Default Mapping Object
RPDO	1600h	8	32	6040h (control word) 607Ah(target position) 60FFh (target speed) 6071h (target torque) 6060h (operating mode)
	1601h	8	32	6040h (control word) 607Ah(target position)
	1602h	8	32	6040h (control word) 60FFh (target speed)
	1603h	8	32	6040h (control word) 6071h (target torque)
TPDO	1A00h	8	32	6041h (status word) 6064h (actual position) 606Ch(actual speed) 6077h (actual torque)
	1A01h	8	32	6041h (status word) 6064h (actual position)
	1A02h	8	32	6041h (status word) 6064h (actual position) 606Ch(actual speed)
	1A03h	8	32	6041h (status word) 6064h (actual position) 6077h (actual torque)

(2) PDO synchronization management allocation settings

In periodic data communication, process data can contain multiple PDO mapping objects. The CoE protocol uses data objects 0x1C10~0x1C2F to define the PDO mapping object list of the corresponding synchronization management channel. Multiple PDOs can be mapped in different sub-indexes of 0x1C10~0x1C2F. In the SD 500 -EtherCAT spindle servo drive, only 1 RPDO and 1 TPDO are supported, as shown in the following table:

Table 3- 7 Synchronous management allocation table

index	Sub-index	Mapping Allocation	Default Mapping Assignments
0x1C12	01h	Select one of 1600h~1603h as RPDO application	1600h
0x1C13	01h	Select one of 1A00h~1A03h as TPDO application	1A00h

(3) PDO configuration

The PDO mapping parameter (such as 1600h) contains a pointer to the process data of the PDO that the PDO needs to send or receive, including the index, sub-index and length of the mapping object. Among them, the mapping parameter sub-index 0 records the number N of specific mapping objects of the PDO (such as the maximum value of N for SD500-EtherCAT servo is 8), and one or more objects can be mapped at the same time. Sub-indexes 1~8 are mapping contents (mapping objects). The mapping parameter content is defined as follows.

Table 3- 8 Mapping parameter content definition table

Number of digits	31	...	16	15	...	8	7	...	0
meaning	index			Sub-index			Object length		

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

Table 3- 9 Object dictionary bit length description table

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

For example, the mapping parameter of object 6040h-00 is 60400010h.

The configuration process of PDO is as follows:

1. Cancel PDO. Write 0 to the 00h sub-index of 1C12h (or 1C13h);
2. Clear the original mapping content. Write 0 to the 00h sub-index of the mapping parameter (such as 1600h-00) to clear the original mapping content;
3. Write PDO mapping content. Write mapping parameter sub-indexes 1 to N (N is up to 8) according to the above definition.
4. Write the total number of PDO mapping objects. Write the mapping number N in step 3 into the mapping parameter sub-index 0 (e.g. 1600h-00 is written into N);
5. Enable PDO. Write 1 to the 00h sub-index of 1C12h (or 1C13h).

3. 4 . 5 Mailbox Data (SDO)

Mailbox data SDO is used to transmit non-periodic data, such as the configuration of communication parameters, the configuration of servo drive operating parameters, etc. In the SD 500 -EtherCAT spindle servo drive, SDO requests and SDO responses are currently supported.

3.4.6 Distributed Clocks

Distributed clocks can enable different servo devices to use the same system clock, ensuring that different servos receive instructions at the same time and execute instructions at the same time, and can achieve absolute time synchronization. The slave device can generate a synchronization signal based on the synchronization system time. The servo drive only supports DC synchronization mode, and the synchronization period is controlled by SYNC0, which is an integer multiple of 125us or 250us.

3. 5 Control Mode

SD500-EtherCAT spindle servo drive selects the supported mode according to the setting of F01.00 (motor control mode). The corresponding situations are shown in the following table.

Table 3- 10 Support mode definition table

F01.00: Motor control mode	6052h: Support servo operation mode		
00: Asynchronous motor VF control 10: Synchronous motor VF control	The servo operation mode supported by the drive, 0 means not supported, 1 means supported.		
	Bit	describe	value
	0	Contour Position Mode	0
	1	Variable frequency speed regulation mode	0
	2	Profile Speed Mode	1
	3	Contour torque mode	0
	4	NA	0
	5	Home return mode	0
	6	Interpolation position mode	0
	7	Cyclic Synchronous Position Mode (CSP)	0
	8	Cycle Synchronous Speed Mode (csv)	0
	9	Cycle Synchronous Torque Mode (cst)	0
	10~31	Factory customized	Reserve
01: Asynchronous motor open loop vector control 11: Synchronous motor open loop vector control	Bit	describe	value
	0	Contour Position Mode	0
	1	Variable frequency speed regulation mode	1
	2	Profile Speed Mode	1
	3	Contour torque mode	1
	4	NA	0
	5	Home return mode	0
	6	Interpolation position mode	0
	7	Cyclic Synchronous Position Mode (CSP)	0
	8	Cycle Synchronous Speed Mode (csv)	1
	9	Cycle Synchronous Torque Mode (cst)	1
	10~31	Factory customized	Reserve
	02: Asynchronous motor closed-loop vector control 12: Synchronous motor closed loop vector control	Bit	describe
0		Contour Position Mode	1
1		Variable frequency speed regulation mode	0
2		Profile Speed Mode	1
3		Contour torque mode	1
4		NA	0
5		Home return mode	1
6		Interpolation position mode	0
7		Cyclic Synchronous Position Mode (CSP)	1
8		Cycle Synchronous Speed Mode (csv)	1
9		Cycle Synchronous Torque Mode (cst)	1
10~31		Factory customized	Reserve

3.5.1 Profile Position Mode (PP)

In the profile position mode, the master sends the required target position (absolute or relative), speed, acceleration and deceleration of the position curve and other related object dictionaries to the servo drive, and the servo drive generates the target curve instruction based on the received related data and commands.

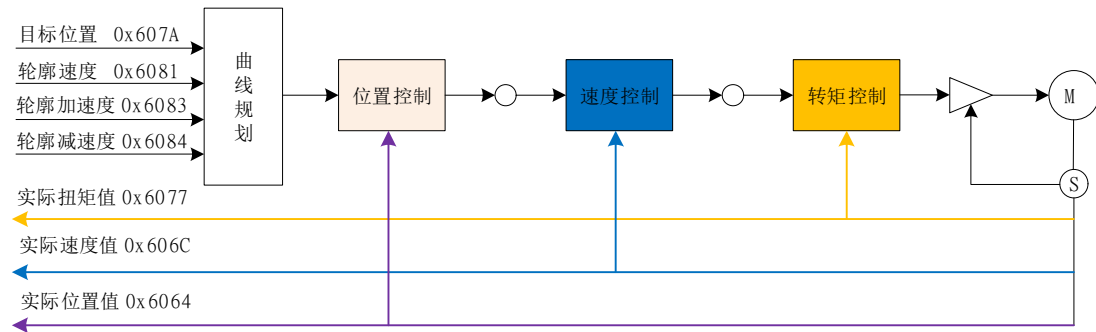


Figure 3.6 Contour position control block diagram

(1) Related Object Dictionary

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
4	New Set-Point	A rising edge triggers a new target position
5	Change Set Immediately	0: not updated immediately; 1: updated immediately
6	Absolute position command/Relative position command (Abs/Rel)	0: The target position is an absolute position command 1: The target position is a relative position instruction
Status word 6041h		
Bit	name	describe
10	Target Reached	0: The target position has not been reached 1: Target location reached
12	Target position update (Set Point)	0: The target position can be updated

	Acknowledge)	1: The target position cannot be updated
13	Following error	0: No position deviation fault 1: A fault occurs when the position deviation is too large
15	Home Find completed	0: Origin return is not completed 1: Return to zero completed

Index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	00	error code	RO	UINT16	-	0~65535
0x6040	00	Control Word	R W	UINT16	-	0~65535
0x6041	00	Status word	RO	UINT16	-	0~65535
0x6060	00	Operation Mode	R W	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x6062	00	Position instructions	RO	DINT32	Command unit	-
0x6063	00	Position feedback	RO	INT32	Encoder unit	-
0x6064	00	Position feedback	RO	INT32	Command unit	-
0x606C	00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x607A	00	target location	R W	INT32	Command unit	$-2^{31} \sim (2^{31} - 1)$
0x6081	00	Profile speed	R W	UINT32	Instruction unit/s	$0 \sim (2^{32} - 1)$
0x6083	00	Acceleration	R W	UINT32	Command unit/S ₂	$0 \sim (2^{32} - 1)$
0x6084	00	deceleration	R W	UINT32	Command unit/S ₂	$0 \sim (2^{32} - 1)$

(2) Non-immediate update of curve planning

① The master station sends the relevant information of the position command to the slave station as needed (acceleration time 6083h, deceleration time 6084h, profile speed 6081h, target displacement 607A);

② The master station sets bit 4 of 6040h to 1, and after the slave station detects the rising edge signal of bit 4 of 6040h, it processes the new displacement instruction received.

First, the slave determines whether bit 5 of 6040h is 0. If it is not 0, the slave does not process the relevant instruction information.

Secondly, the slave determines that bit 5 of 6040h is 0 and bit 12 of 6041h is 0, then the slave sets bit 12 of 6041h to 1 and executes the relevant instruction information of ①. At this time, the slave is in a state where it cannot continue to receive new displacement instructions.

③ After the master station detects that bit 12 of the status word 6041h is set to 1, the master station can release the relevant data of the displacement instruction and set bit 4 of the control word 6040h from 1 to 0.

④ The slave detects that bit 4 of control word 6040h is 0. After the current segment positioning is completed, bit 12 of 6041h is set to 0, indicating that the slave can receive new displacement instructions.

In non-immediate update mode, the servo does not process new displacement instructions while the current segment is running. The servo can receive and process new displacement instructions only after the current segment positioning is completed.

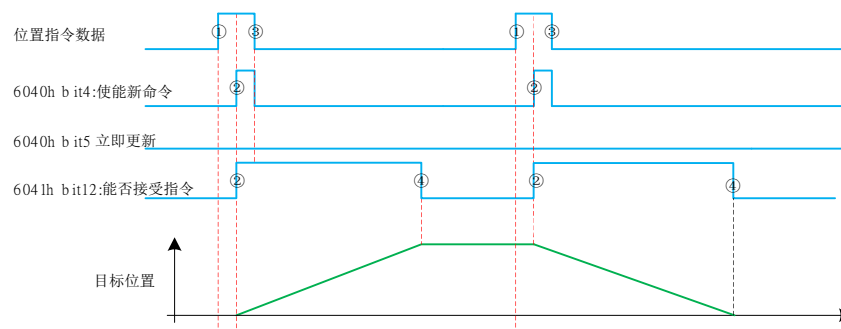


Figure 3.7 Non-immediate update timing diagram

When bit 6 of control word 6040h is 0, it is an absolute position, and when bit 6 of control word 6040h is 1, it is a relative position.

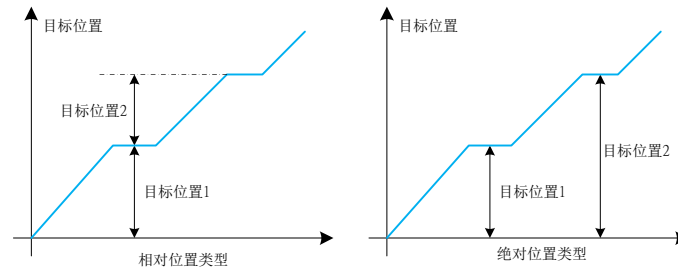


Figure 3.8 Difference between absolute position and relative position

(3) Immediate update of curve planning

① The master station sends the relevant information of the position command to the slave station as needed (acceleration time 6083h, deceleration time 6084h, profile speed 6081h, target displacement 607A) ;

② The master station sets bit 4 of 6040h to 1, and after the slave station detects the rising edge signal of bit 4 of 6040h, it processes the new displacement instruction received.

First, the slave determines whether bit 5 of 6040h is 1. If it is not 1, the slave does not process the relevant instruction information.

Secondly, the slave determines that bit 5 of 6040h is 1 and bit 12 of 6041h is 0, then the slave sets bit 12 of 6041h to 1 and executes the relevant instruction information of ① . At this time, the slave is in a state where it cannot continue to receive new displacement instructions.

③ After the master station detects that bit 12 of status word 6041h is set to 1, the master station can release the relevant data of the displacement instruction and set bit 4 of control word 6040h from 1 to 0.

④ When the slave detects that bit 4 of 6040h is set from 1 to 0, it sets bit 12 of 6041h to 0, indicating that the slave can receive new displacement instructions.

In the immediate update mode, while the current segment is running, the slave detects the rising edge of bit 4 of 6040h and bit 12 of 604h is 0, and the servo can receive and process new displacement instructions.

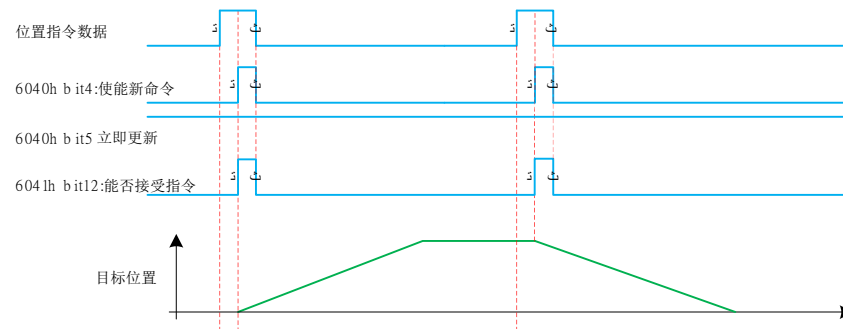


Figure 3.9 Immediate update timing diagram

3.5.2 Profile Velocity Mode (PV)

In profile speed mode, the master transmits the required target speed, acceleration time, and deceleration time to the servo drive, and the servo drive performs speed and torque regulation.

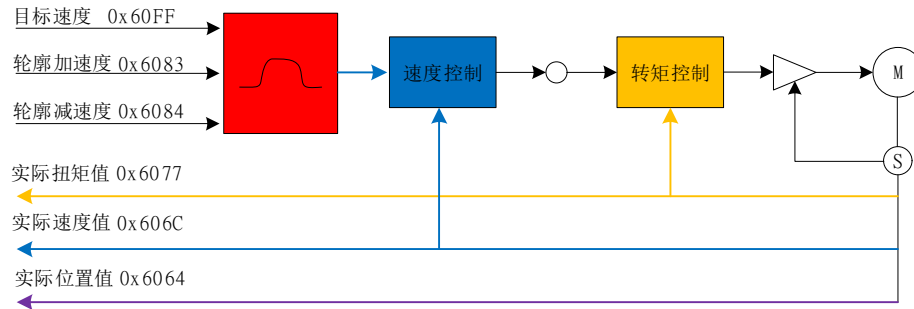


Figure 3.10 Contour speed control block diagram

Related object dictionary:

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
8	Halt	0: invalid; 1 : press 0x 605D to set pause

Status word 6041h		
Bit	name	describe
10	Target Reached	0: Target speed not reached 1: Target speed reached
15	Home Find completed	0: Origin return is not completed 1: Return to zero completed

index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	00	error code	RO	UINT16	-	0~65535
0x6040	00	Control Word	R W	UINT16	-	0~65535
0x6041	00	Status word	RO	UINT16	-	0~65535
0x6060	00	Operation Mode	R W	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x606C	00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x607F	00	Maximum contour speed	R W	UINT32	0.1rpm	0~(2 ³² -1)
0x6083	00	Acceleration	R W	UINT32	Command unit/S ₂	0~(2 ³² -1)
0x6084	00	deceleration	R W	UINT32	Command unit/S ₂	0~(2 ³² -1)
0x60FF	00	Target speed	R W	INT32	Command unit/S	-2 ³¹ ~(2 ³¹ -1)

Precautions



- The speed limit value is determined by the smaller value between 0x607F and the maximum motor speed .

3.5.3 Contour torque mode (PT) (not available yet)

In the profile torque mode, the master sends the target torque command 6071h, the torque ramp constant 6087h, and the

speed limit value 607Fh to the servo drive, and the torque regulator is executed internally by the servo drive. When the speed reaches the limit value 607Fh, it will enter the speed regulation stage.

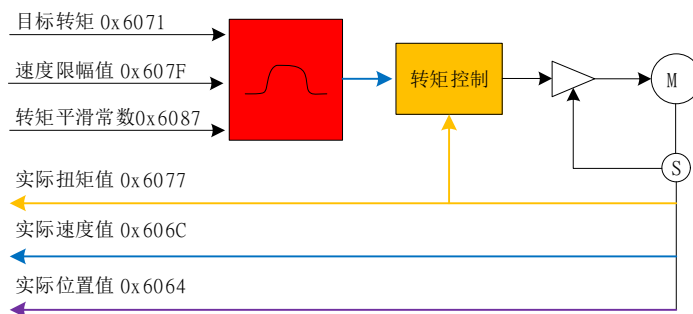


Figure 3.11 Contour torque control block diagram

Related object dictionary:

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
8	Halt	0: invalid; 1 : press 0x 605D to set pause

Status word 6041h		
Bit	name	describe
10	Target Reached	0: Target torque not reached 1: Target torque reached
15	Home Find completed	0: Origin return is not completed 1: Return to zero completed

index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	0x00	error code	RO	UINT16	-	0~65535
0x6040	0x00	Control Word	R W	UINT16	-	0~65535
0x6041	0x00	Status word	RO	UINT16	-	0~65535
0x6060	0x00	Operation Mode	R W	INT8	-	0~10
0x6061	0x00	Mode Display	RO	INT8	-	0~10
0x606C	0x00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x6071	0x00	Target torque	R W	INT16	0.1%	-3000~3000
0x6072	0x00	Maximum torque	R W	UINT16	0.1%	0~3000
0x6074	0x00	Torque command	RO	INT16	0.1%	-
0x6077	0x00	Actual torque	RO	UINT16	1%	-
0x607F	0x00	Maximum contour speed	R W	UINT32	0.1rpm	0-50000
0x6087	0x00	Torque ramp time	R W	UINT32	ms	0-(2 ³² -1)

3.5.4 Synchronous Position Pattern (CSP)

In the periodic synchronous position mode, the master sends the planned target position 607Ah to the servo drive in a periodic synchronous manner according to the value of the target speed 60FFh. The servo drive performs position, speed and torque control internally.

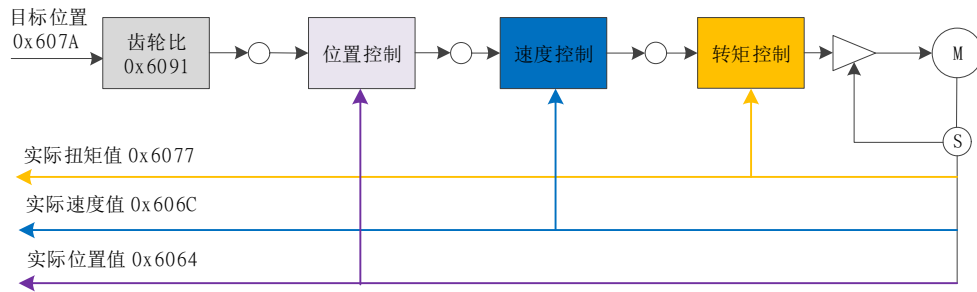


Figure 3.12 Cycle Synchronous Position Control Block Diagram

Related object dictionary:

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
8	Halt	0: invalid; 1: press 0x 605D to set pause

Status word 6041h		
Bit	name	describe
10	Target Reached	0: The target position has not been reached 1: Target location reached
13	Following error	0: No position deviation fault 1: A fault occurs when the position deviation is too large
15	Home Find completed	0: Origin return is not completed 1: Return to zero completed

index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	00	error code	RO	UINT16	-	0~65535
0x6040	00	Control Word	R W	UINT16	-	0~65535
0x6041	00	Status word	RO	UINT16	-	0~65535
0x6060	00	Operation Mode	R W	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x6063	00	Position feedback	RO	INT32	Encoder unit	-
0x6064	00	Actual position feedback	RO	INT32	Command unit	-
0x606C	00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x607A	00	target location	R W	INT32	Command unit	$-2^{31} \sim (2^{31}-1)$
0x6091	01	Motor resolution	R W	UINT32	-	$0 \sim (2^{32}-1)$
	02	Axis resolution	R W	UINT32	-	$1 \sim (2^{32}-1)$
0x60B0	00	Position offset	R W	INT32	Command unit	$-2^{31} \sim (2^{31}-1)$

3.5.5 Synchronous speed mode (CSV)

In the periodic synchronous speed mode, the master station will periodically and synchronously send the calculated target speed 60FFh to the servo drive, and the speed and torque regulation will be adjusted internally by the servo.

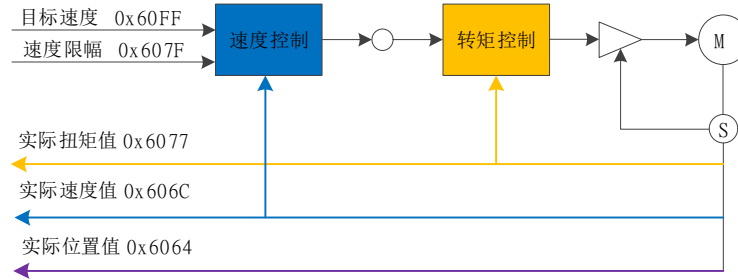


Figure 3.13 Cycle synchronous speed control block diagram

Related object dictionary:

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
8	Halt	0: invalid; 1 : press 0x 605D to set pause

Status word 6041h		
Bit	name	describe
10	Target Reached	0: Target speed not reached 1: Target speed reached
15	Home Find completed	0: Origin return is not completed 1: Return to zero completed

Index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	00	error code	RO	UINT16	-	0~65535
0x6040	00	Control Word	R W	UINT16	-	0~65535
0x6041	00	Status word	RO	UINT16	-	0~65535
0x6060	00	Operation Mode	R W	INT8	-	0~10
0x6061	00	Mode Display	RO	INT8	-	0~10
0x6063	00	Position feedback	RO	INT32	Encoder unit	-
0x6064	00	Actual position feedback	RO	INT32	Command unit	
0x606C	00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x6077	00	Actual torque	RO	INT16	1%	-
0x607F	00	Maximum speed	R W	UINT32	0.1r/min	0~50000
0x6083	00	Acceleration	R W	UINT32	Instruction unit/s	0~(2 ³² -1)
0x6084	00	deceleration	R W	UINT32	Instruction unit/s	0~(2 ³² -1)
0x6091	01	Motor resolution	R W	UINT32	-	0~(2 ³² -1)
	02	Axis resolution	R W	UINT32	-	1~(2 ³² -1)
0x60FF	00	Target speed	R W	INT32	Instruction unit/s	-2 ³¹ ~(2 ³¹ -1)

Precautions



- The speed limit value is determined by the smaller value between 0x607F and the maximum motor speed .

3.5.6 Synchronous torque mode (CST) (not available yet)

In the periodic synchronous torque mode, the master station sends the calculated target torque 6071h to the servo drive periodically and synchronously, and the torque regulation is performed internally by the servo. When the speed reaches the limit value, it enters the speed regulation stage.

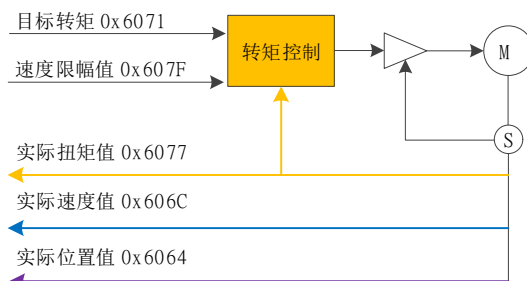


Figure 3.14 Cycle synchronous torque control block diagram

Related object dictionary:

Control word 6040h		
Bit	name	describe
0	Servo ready (Switch On)	0: invalid; 1: valid
1	Connect the main circuit power (Enable Voltage)	0: invalid; 1: valid
2	Quick Stop	0: valid; 1: invalid
3	Servo Operation (Enable Operation)	0: invalid; 1: valid
8	Halt	0: invalid; 1: press 0x605D to set pause

Status word 6041h		
Bit	name	describe
10	Target Reached	0: The target position has not been reached 1: Target location reached
11	Software internal position exceeded the limit (internal limit actice)	0: Position feedback is within the limit 1: Position feedback exceeds limit
12	Homing attained	0: Return to zero failed 1: Return to zero successfully
13	Homing error	0: No error occurred during zero return 1: Zero return error (position deviation is too large)
15	Home find completed	0: Return to zero is not completed 1: Return to zero completed

index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x603F	00	error code	RO	UINT16	-	0~65535
0x6040	00	Control Word	R W	UINT16	-	0~65535
0x6041	00	Status word	RO	UINT16	-	0~65535
0x6060	00	Operation Mode	R W	INT8	-	0~10

0x6061	00	Mode Display	RO	INT8	-	0~10
0x6064	00	Actual position feedback	RO	INT32	Command unit	-
0x606C	00	Actual speed feedback	RO	INT32	Instruction unit/s	-
0x6071	00	Target torque	R W	INT16	0.1%	-3000~3000
0x6072	0x00	Maximum torque	R W	UINT16	0.1%	0~3000
0x6077	00	Actual torque	RO	INT16	1%	-
0x607F	00	Maximum speed	R W	UINT32	0.1r/min	0~(2 ³² -1)

Precautions



- The speed limit value is determined by the smaller value between 0x607F and the maximum motor speed .

3.5.7 Home Return Mode (HM)

The origin return mode is used to find the mechanical origin and locate the positional relationship between the mechanical origin and the mechanical zero point.

Mechanical origin: A fixed position on the machine that corresponds to a certain origin signal switch.

Mechanical origin = mechanical zero point + 607C (origin offset)

Mechanical zero point: The absolute 0 position on the machine.

After the servo drive completes the origin return, the motor will stop at the mechanical origin. By setting the value of the object dictionary 0x607C, the position relationship between the mechanical origin and the mechanical zero point can be adjusted.

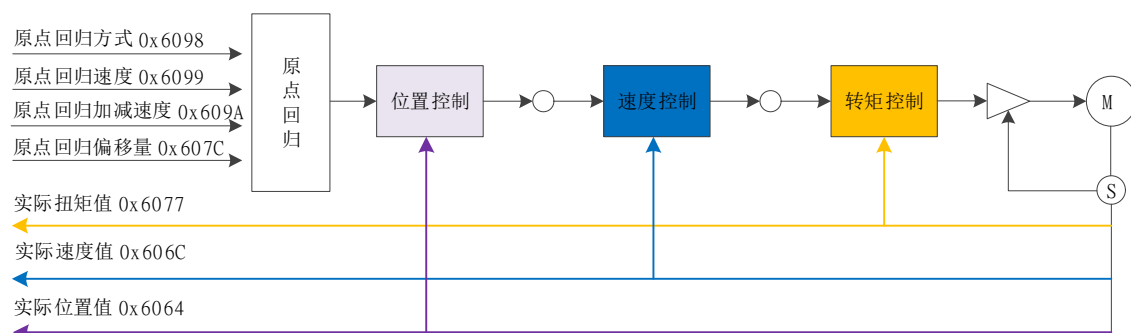


Figure 3.15 Zero return mode control block diagram

Introduction to origin return method:

Origin return mode 1 (6098 00h=1)

The Z pulse can be used as the zero point for accurate stop positioning.

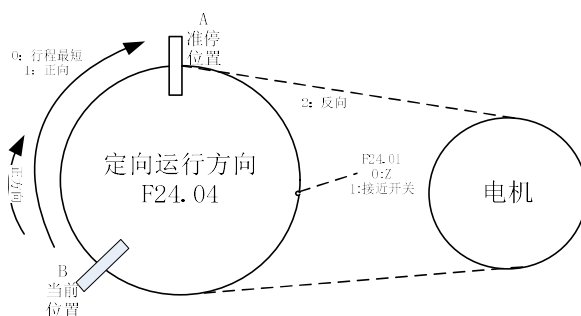


Figure 3.16 Origin return method 1

3.5.8 Probe function

The probe function is the position latch function, which can latch the position information (user command unit) when the external DI signal or the motor Z signal changes.

This servo supports two probe functions, which can latch 4 position information. Probe 1 can select DI or Z signal as the probe signal, and probe 2 can select DI or Z signal as the probe signal.

(1) Related object dictionary

Table 3- 11 Probe object dictionary table

index	Sub-index	name	Read and Write	type of data	unit	Predetermined area
0x60B8	00	Probe function	R W	UINT16	-	0~65535
0x60B9	00	Probe Status	RO	UINT16	-	-
0x60BA	00	Probe 1 rising edge latch position	RO	INT32	Command unit	-
0x60BB	00	Probe 1 falling edge latch position	RO	INT32	Command unit	-
0x60BC	00	Probe 2 rising edge latch position	RO	INT32	Command unit	-
0x60BD	00	Probe 2 falling edge latch position	RO	INT32	Command unit	-

(2) Usage steps

This product supports X5 and X6 as external trigger signals in the probe function. The software internally forces X5 and X6 to be used as probe functions. After turning on the probe function, in order to prevent malfunction of the programmable functions assigned to the X5 and X6 terminals, please set the relevant pin functions to the probe function .

When the probe signal needs to be filtered, the corresponding filtering time can be set for probe 1 and probe 2 respectively through the relevant function code.

(3) Set the probe function (60B8h)

The relevant definitions are as follows:

Table 3- 12 Probe function definition table

Bit	illustrate	Bit	illustrate
0	Probe 1 enable: 0: Disable; 1: Enable	8	Probe 2 enable: 0: Disable; 1: Enable
1	Probe 1 trigger mode: 0: single trigger, 1: continuous trigger	9	Probe 2 trigger mode: 0: single trigger, 1: continuous trigger
2	Probe 1 trigger signal selection: 0: X terminal , 1: Z signal	10	Probe 2 trigger signal selection: 0: X terminal , 1: Z signal
3	NA	11	NA
4	Probe 1 rising edge enable: 0: No latching on the rising edge; 1: Latching on the rising edge	12	Probe 2 rising edge enable: 0: No latching on the rising edge; 1: Latching on the rising edge
5	Probe 1 falling edge enable: 0: No latching on the falling edge; 1: Latching on the falling edge	13	Probe 2 falling edge enable: 0: No latching on the falling edge; 1: Latching on the falling edge
6 ~ 7	NA	14 ~15	NA

Note: Once the enable bit of probe 1 (rising edge of bit 0 of 60B8h) is valid, the function settings of probe 1 (trigger mode, valid latch edge) cannot be changed, and during the operation of probe 1, bit 0 of 60B8h must remain valid.

Probe 2 is the same as Probe 1.

(4) Read probe status (60B9h)

The relevant bits are defined as follows:

Table 3- 13 Probe Status Monitoring Table

Bit	illustrate	Bit	illustrate
0	Probe 1 enable status: 0: Disabled; 1: Enabled	8	Probe 2 enable status: 0: Disabled; 1: Enabled
1	Probe 1 rising edge latch execution: 0: Not executed, 1: Executed	9	Probe 2 rising edge latch execution: 0: Not executed, 1: Executed
2	Probe 1 falling edge latch execution: 0: Not executed, 1: Executed	10	Probe 2 falling edge latch execution: 0: Not executed, 1: Executed
3~5	NA	11~13	NA
6	Probe 1 selects monitoring 0: X input signal ; 1: Z signal	14	Probe 2 selects monitoring 0: X input signal ; 1: Z signal
7	Probe 1 signal monitoring 0: low level; 1: high level	15	Probe 2 signal monitoring 0: low level; 1: high level

For example, when using probe 1 as the position trigger latch function, you can determine whether the rising edge position latch or the falling edge position latch is executed by judging Bit1 or Bit2 of the object dictionary [60B9h]. At the same time, you can read the value of Bit3~Bit7 of the object dictionary, which records the probe selection signal and the current level of the probe.

(5) Probe latch position

The latch position information of probe 1 and probe 2 are recorded in the object dictionary 60BAh, 60BBh, B06Ch, and 60BDh respectively. The user can read the corresponding position information value according to the actual situation.

For example: Use the rising edge position of probe 1 to continuously trigger the latch position function.

- (1) Configure probe 1 to trigger continuously, and set Bit 1 of object dictionary 60B8h to 1;
- (2) Configure the rising edge position latch of probe 1 and set Bit4 of object dictionary 60B8h to 1;
- (3) Enable the probe 1 latch position function and set Bit 0 of the object dictionary 60B8h to 1.

After enabling probe 1, the driver detects the valid probe latch edge and latches the position information value corresponding to the edge.

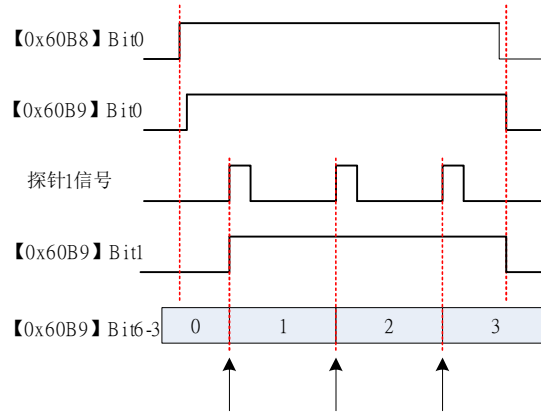


Figure 3.17 Probe function timing logic diagram

3. 6 Object Dictionary

The glossary is explained as follows

"Index": specifies the position of each object in the object dictionary, expressed in hexadecimal (h).

"Sub-index": The same index contains multiple objects, and each object has an offset under the class.

Data Type: For details, see Table 3-14.

"Read/Write Type": For details, please refer to Table 3-15 .

"Object structure": Please see Table 3-16 for details .

Table 3- 14 Data Type Description Table

type of data	Numerical range	Data length	DS301 Value
Int8	-128 ~ 127	1 byte	2
UInt8	0 ~ 255	1 byte	5
Int16	-32768 ~ +32767	2 bytes	3
UInt16	0 ~ 65535	2 bytes	6
Int32	-2147483648 ~ +2147483647	4 bytes	4
UInt32	0 ~ 4294967295	4 bytes	7
String	ASCII	-	9

Table 3- 15 Read and write type description table

Read and write types	illustrate
R W	Read and write
WO	just write
RO	Read-only
CONST	Constant, read-only

Table 3- 16 Object structure description table

Object Structure	illustrate
VAR	A single simple value, including the data types in Table 3-1
ARR	Multiple data field objects, the variables in the fields are all in the same data form
REC	Multiple data field objects, the variables in the fields are all in different data formats

3.6.1 1000h Group Object List

index	Sub-index	name	Accessability	PDO Mapping	type of data	unit	scope	Factory default
1000h	00	Drive type	RO	NO	UINT32	-	-	0x00020192
1001h	00	mistake register	RO	NO	UINT8	-	-	-
1008h	00	Driver Name	RO	NO	-	-	-	SD500 Spindle Servo Drive
100Ah	00	Software version	RO	NO	-	-	-	6621
1018h	00	Maximum sub-link Citation Number	RO	NO	UINT8	-	-	4
	01	Manufacturer ID	RO	NO	UINT32	-	-	0x00000D81
	02	Device Code	RO	NO	UINT32	-	-	0x03000500

	03	Revisions	RO	NO	UINT32	-	-	0x02040608
	04	serial number	RO	NO	UINT32	-	-	0x20230910
1 600 h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	4
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60400010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x607A0020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60600008
	04	Mapping Object 4	R W	NO	UINT32		$0 \sim (2^{32} - 1)$	0x60 B 80010
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1 601 h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	2
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60400010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x607A0020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1 602 h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	2
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60400010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60FF0020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1 603 h	00	Mapping Objects	R W	NO	UINT8	-	0~8	2

		Number						
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60400010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60710010
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1A00h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	5
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60410010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60640020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60B90010
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60BA0020
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60FD0020
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1A01h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	2
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60410010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60640020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1A02h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	3
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60410010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60640020

	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x606C0020
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1 A03h	00	Mapping Objects Number	R W	NO	UINT8	-	0~8	3
	01	Mapping object 1	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60410010
	02	Mapping object 2	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60640020
	03	Mapping object 3	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0x60770010
	04	Mapping Object 4	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	05	Mapping Object 5	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	06	Mapping Object 6	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	07	Mapping Object 7	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
	08	Mapping Object 8	R W	NO	UINT32	-	$0 \sim (2^{32} - 1)$	0
1 C00h	00	Maximum sub-index	RO	NO	UINT8	-	-	4
	01	SM0 Type	RO	NO	UINT8	-	-	1
	02	SM1 Type	RO	NO	UINT8	-	-	2
	03	SM2 Type	RO	NO	UINT8	-	-	3
	04	SM3 Type	RO	NO	UINT8	-	-	4
1 C12 h	00	RPDO Allocation Maximum sub-index	R W	NO	UINT8	-	0~1	1
	01	RPDO Allocation Object index	R W	YES	UINT16	-	0~65535	0x1601
1 C13 h	00	TPDO allocation Maximum sub-index	R W	NO	UINT8	-	0~1	1
	01	TPDO allocation Object index	R W	YES	UINT16	-	0~65535	0x1A0 1
1 C32 h	00	Synchronous output The largest child Number of indexes	RO	NO	UINT8	-	-	32
	01	Synchronization Type	R W	NO	UINT16	-	-	2
	02	Cycle Time	RO	NO	UINT32	ns	-	0

	04	Supported synchroniz ation type	RO	NO	UINT16	-	-	4
	05	Minimum cycle	RO	NO	UINT32	ns	-	125000
	06	Compute and Replicate time	RO	NO	UINT32	ns	-	0
	08	Get loop time	R W	NO	UINT16	-	-	0
	09	delay	RO	NO	UINT32	ns	-	0
	0A	SYN0 time	R W	NO	UINT32	ns	-	-
	0B	Number of lost	RO	NO	UINT16	-	-	0
	0C	Cycle Exceeded count	RO	NO	UINT16	-	-	0
	20	Synchroniz ation Error	RO	NO	BOOL	-	-	FALSE
1 C33 h	00	Sync Input The largest child Number of indexes	RO	NO	UINT8	-	-	32
	01	Synchroniz ation Type	R W	NO	UINT16	-	-	2
	02	Cycle Time	RO	NO	UINT32	ns	-	0
	04	Supported synchroniz ation type	RO	NO	UINT16	-	-	4
	05	Minimum cycle	RO	NO	UINT32	ns	-	125000
	06	Compute and Replicate time	RO	NO	UINT32	ns	-	0
	08	Get loop time	R W	NO	UINT16	-	-	0
	09	delay	RO	NO	UINT32	ns	-	0
	0A	SYN0 time	R W	NO	UINT32	ns	-	-
	0B	Number of lost	RO	NO	UINT16	-	-	0
	0C	Cycle Exceeded count	RO	NO	UINT16	-	-	0
	20	Synchroniz ation Error	RO	NO	BOOL	-	-	0

3.6.2 2000h Group Object List

The SD500 function code is mapped as an object dictionary , which is divided into two parts: index and sub-index . The index indicates the group number of the function code , and the sub-index indicates the group number of the function parameter + 1 (sub-index 00h is the number of sub-indexes) , which needs to be converted into hexadecimal.

index	Sub-index	name	Accessibility	PDO Mapping	type of data	unit	scope	Factory default
2000h	00h ~ 32h	F00 Environmental Application Group	RO	NO	UINT16	-	-	32h
2001h	00h ~ 3Ch	F01 basic parameter group	RO	NO	UINT16	-	-	3Ch
2002h	00h ~ 67h	F02 Motor parameter group	RO	NO	UINT16	-	-	67h
2003h	00h ~ 64h	F03 vector control group	RO	NO	UINT16	-	-	64h
2004h	00h ~ 50h	F04V/F control group	RO	NO	UINT16	-	-	50h
2005h	00h ~ 5Ah	F05 input terminal group	RO	NO	UINT16	-	-	5Ah
2006h	00h ~ 50h	F06 output terminal group	RO	NO	UINT16	-	-	50h
2007h	00h ~ 38h	F07 Operation Control Group	RO	NO	UINT16	-	-	38h
2008h	00h ~ 32h	F08 Auxiliary Control Group	RO	NO	UINT16	-	-	32h
200Ah	00h ~ 54h	F10 protection parameter group	RO	NO	UINT16	-	-	54h
200Bh	00h ~ 28h	F11 operator parameter group	RO	NO	UINT16	-	-	28h
200Ch	00h ~ 42h	F12 Communication parameter group	RO	NO	UINT16	-	-	42h
200Fh	00h ~ 68h	F15 Position Control Group	RO	NO	UINT16	-	-	68h
2018h	00h ~ 33h	F24 Spindle Control Group	RO	NO	UINT16	-	-	33h
2030h	00h ~ 40h	C00 Basic Monitoring Group	RO	NO	UINT16	-	-	40h
2031h	00h ~ 18h	C01 Fault Monitoring Group	RO	NO	UINT16	-	-	18h
2032h	00h ~ 40h	C02 Application Monitoring Group	RO	NO	UINT16	-	-	40h
2033h	00h ~ 40h	C03 Maintenance Monitoring Group	RO	NO	UINT16	-	-	40h
2034h	00h ~ 40h	C04 Spindle Monitoring Group	RO	NO	UINT16	-	-	40h
2035h	00h ~ 40h	C05 Position Monitoring Group	RO	NO	UINT16	-	-	40h
2036h	00h ~ 49h	C06 bus monitoring group	RO	NO	UINT16	-	-	49h

3.6.3 6000h Group Object List

index	Sub-index	name	Accessability	PDO Mapping	type of data	unit	scope	Factory default
603Fh	00	error code	RO	TPDO	UINT16	-	0~65535	0
6040h	00	Control Word	R W	RPDO	UINT16	-	0~65535	0
6041h	00	Status word	RO	TPDO	UINT16	-	0~65535	0
6060h	00	Control Mode	RO	RPDO	INT8	-	0~10	8
6061h	00	Mode Display	RO	TPDO	INT8	-	0~10	-
6062h	00	Position instructions	RO	TPDO	INT32	Command unit	-	-
6063h	00	Position feedback	RO	TPDO	INT32	Encoder unit	-	-
6064h	00	Position feedback	RO	TPDO	INT32	Command unit	-	-
6065h	00	Position deviation Too large threshold	R W	RPDO	UINT32	Command unit	-	-
6067h	00	Location Arrival Threshold	R W	RPDO	UINT32	Command unit	0~(232-1)	100
6068h	00	Location Arrival Window time	R W	RPDO	UINT16	2ms	0~65535	0
606Bh	00	Actual speed instruction	RO	TPDO	UINT32	r/min	-	-
606Ch	00	Actual speed	RO	TPDO	INT32	Command unit /s	-	-
606Dh	00	Speed arrival Threshold	R W	RPDO	UINT16	r/min	0~65535	100
606Eh	00	Speed arrival Window time	R W	RPDO	UINT16	ms	0~65535	0
606Fh	00	0 speed threshold	R W	RPDO	UINT16	r/min	0~65535	10
6070h	00	0 speed time window	R W	RPDO	UINT16	ms	0~65535	0

6071h	00	Target torque	R W	RPD O	INT16	0.1%	-3000~3000	0
6074h	00	Torque command	RO	TPDO	INT16	0.1%	-300~300	0
6075h	00	Motor Rating Current	RO	TPDO	UINT32	mA	0~(232-1)	-
6076h	00	Motor Rating Torque	RO	TPDO	UINT32	mNm	0~(232-1)	-
6077h	00	Actual torque	RO	TPDO	UINT16	0.1%	-300~300	0
607Ah	00	target location	R W	RPD O	INT32	Com mand unit	-231~(231-1)	0
607Ch	00	Origin offset	R W	RPD O	INT32	Enco der unit	-231~(231-1)	0
607Dh	00	Sub-index number	RO	NO	UINT8	-	-	2
	01	Minimum position limit	R W	RPD O	INT32	Com mand unit	-231~(231-1)	-231
	02	Maximum position limit	R W	RPD O	INT32	Com mand unit	-231~(231-1)	231-1
607E	00	Instruction polarity	R W	RPD O	UINT8	-	0~255	0
607Fh	00	Maximum Profile speed	R W	RPD O	UINT32	0.1r/min	0~(232-1)	50000
6080h	00	Maximum motor speed	R W	RPD O	UINT32	1r/min	0~(232-1)	6000
6081h	00	Profile speed	R W	RPD O	UINT32	Com mand unit /s	0~(232-1)	1000000
6083h	00	Contour Acceleration Spend	R W	RPD O	UINT32	Com mand unit /s ²	0~(232-1)	200
6084h	00	Contour deceleration Spend	R W	RPD O	UINT32	Com mand unit /s ²	0~(232-1)	200
6086h	00	Running curve choose	R W	RPD O	INT16	-	-215~(215-1)	0
6087h	00	Torque ramp time	R W	RPD O	UINT32	ms	0~(232-1)	0
6091h	00	Sub-index Number	RO	NO	UINT8	-	-	2
	01	Motor Resolution	R W	RPD O	UINT32	-	1~(232-1)	1

	02	Load axis Resolution	R W	RPD O	UINT32	-	1~(232-1)	1
6098h	00	Return to origin Way	R W	RPD O	INT8	-	1~35	1
6099h	00	Sub-index Number	RO	NO	UINT8	-	-	2
	01	High-speed search Slowdown point	R W	RPD O	UINT32	Command unit /s	0~(232-1)	279620266
	02	Slow search origin	R W	RPD O	UINT32	Command unit /s	0~(232-1)	5592405
609Ah	00	Return to zero Acceleration	R W	RPD O	UINT32	Command unit /s ²	0~(232-1)	16000
60B0h	00	Position offset	R W	RPD O	INT32	Command unit	-231~(231-1)	0
60B8	00	Probe Mode	R W	RPD O	UINT16	-	0~65535	0
60B9h	00	Probe Status	RO	TPDO	UINT16	-	0~65535	0
60BAh	00	Probe 1 on Rising edge position	RO	TPDO	INT32	Command unit	-231~(231-1)	0
60BBh	00	Probe 1 down Falling edge position	RO	TPDO	INT32	Command unit	-231~(231-1)	0
60BCh	00	Probe 2 on Rising edge position	RO	TPDO	INT32	Command unit	-231~(231-1)	0
60BDh	00	Probe 2 down Falling edge position	RO	TPDO	INT32	Command unit	-231~(231-1)	0
60E0h	00	Forward torque limit	R W	RPD O	UINT16	0.1%	0~3000	3000
60E1h	00	Reverse torque limit	R W	RPD O	UINT16	0.1%	0~3000	3000
60F4h	00	Position deviation	RO	TPDO	INT32	Command unit	-	-
60FCh	00	Position instructions	RO	TPDO	INT32	Encoder unit	-	-
60FDh	00	DI Status	RO	TPDO	UNT32	-	-	-

60FEh	00	Number of sub-indexes	RO	NO	UINT8	-	-	2
	01	Physical Output	RO	TPDO	UINT32	-	0~(232-1)	0
	02	-	-	-	-	-	-	-
60FFh	00	Target speed	R W	RPDO	INT32	Command unit /s	-	-
6052h	00	Supported Drive Mode	RO	NO	UINT32	-	-	0x3AD

3.6.4 1000h group object detailed description

Object 1000h : Device Type					
index	1000h				
name	Equipment type				
Object Structure	VAR	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	0x00020192
Describe the CoE device type:					
	BIT	Name Description		describe	
	0~15	Device profile		402(0x192): Device sub-protocol	
	16~23	type		02: Servo drive	
	25~31	model		Factory customized	

Object 1001h : Error Register					
index	1001h				
name	Error register				
Object Structure	VAR	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	0
Bitwise error information included					
	BIT	meaning	BIT	meaning	
	0	conventional	4	Communications	

1	Current	5	Sub-protocol
2	Voltage	6	reserve
3	temperature	7	Manufacturer Definition

Object 1008h : Manufacturer Device Name					
index	1008h				
name	Manufacturer Equipment Name				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	SD500 Spindle Servo Drive
Description Manufacturer Equipment Name					

Object 1018h : Identity Object					
index	1018h				
name	ID Object				
Object Structure	REC	type of data	-	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	-

Sub-index	00h				
name	Number of sub-indexes (number of entries)				
Object Structure	-	type of data	Uint8	data range	4
Can it be mapped?	NO	Accessibility	RO	Factory settings	4

Sub-index	01h				
name	Vendor - ID				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	0x00000D81
Distributed uniformly by ETG manufacturers					

Sub-index	02h				
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name	Product Code										
Object Structure	-	type of data	Uint32	data range	-						
Can it be mapped?	NO	Accessibility	RO	Factory settings	0x03000500						
The device code corresponds to the product series and product model of the electronic tag.											
The corresponding relationship is as follows:											
<table><tr><td>Bit</td><td>0~15</td><td>16~31</td></tr><tr><td>meaning</td><td>Product number</td><td>Product Series</td></tr></table>						Bit	0~15	16~31	meaning	Product number	Product Series
Bit	0~15	16~31									
meaning	Product number	Product Series									

Sub-index	03h										
name	Revision Number										
Object Structure	-	type of data	Uint32	data range	-						
Can it be mapped?	NO	Accessibility	RO	Factory settings	0x02040608						
Indicates the upgrade record of the driver software											
<table><tr><td>Bit</td><td>0~15</td><td>16~31</td></tr><tr><td>meaning</td><td>Minor revision</td><td>Major revision</td></tr></table>						Bit	0~15	16~31	meaning	Minor revision	Major revision
Bit	0~15	16~31									
meaning	Minor revision	Major revision									

Sub-index	04h				
name	Serial number				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	0x20230910
Indicates software update time (defined by the manufacturer)					

Object 1600h : RPDO1 mapping object (1st Receive PDO Mapping)					
index	1600h				
name	RPDO1 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-

Function description: This object can only be modified when PDO is invalid.

Sub-index	00h				
name	RPDO1 Mapping Numbers				
Object Structure	-	type of data	UInt8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	4
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60400010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x607A0020

Sub-index	03h				
name	The third mapping object (Mapping entry (3))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60600008

Sub-index	04h				
name	The fourth mapping object (Mapping entry (4))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60B80020

Sub-index	05h~08h				
name	Mapping entry (5) to (8)				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	-

Object 1601h : RPDO2 mapping object (2nd Receive PDO Mapping)					
index	1601h				
name	RPDO1 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	RPDO2 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	2
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60400010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x607A0020

Sub-index	03h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object Structure	-	type of data	Uint32	data range	0~4294967295

Can it be mapped?	NO	Accessibility	R W	Factory settings	-
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Object 1602h : RPDO3 mapping object (3rd Receive PDO Mapping)

index	1602h				
name	RPDO1 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	RPDO3 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	2
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60400010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60FF0020

Sub-index	03h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	-

Object 1603h : RPDO4 mapping object (4th Receive PDO Mapping)

index	1603h				
name	RPDO4 mapping object				

Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	RPDO4 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	2
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60400010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60710020

Sub-index	03h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	-

Object 1A00h : TPDO1 mapping object (1st Transmit PDO Mapping)					
index	1A00h				
name	TPDO1 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	TPDO1 Mapping Numbers				
Object Structure	-	type of data	UInt8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	4
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60410010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60640020

Sub-index	03h				
name	The third mapping object (Mapping entry (3))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60B90010

Sub-index	04h				
name	The fourth mapping object (Mapping entry (4))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60BA0020
Sub-index	05h				
name	The fifth mapping object (Mapping entry (5))				
Object Structure	-	type of data	UInt32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60FD0020

Sub-index	06h~08h				
name	Mapping entry (6) to (8)				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	-

Object 1A01h : TPDO2 mapping object (2nd Transmit PDO Mapping)

index	1A01h				
name	TPDO2 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	TPDO2 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	2
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60410010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60640020

Sub-index	03h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory	-

mapped?				settings	
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Object 1A02h : TPDO3 mapping object (3rd Transmit PDO Mapping)

index	1A02h				
name	TPDO3 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	TPDO3 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	3
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60410010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60640020
Sub-index	03h				
name	The third mapping object (Mapping entry (3))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x606C0020

Sub-index	04h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object Structure	-	type of data	Uint32	data range	0~4294967295

Can it be mapped?	NO	Accessibility	R W	Factory settings	-
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Object 1A03h : TPDO4 mapping object (4th Transmit PDO Mapping)

index	1A03h				
name	TPDO4 mapping object				
Object Structure	REC	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Function description: This object can only be modified when PDO is invalid.					

Sub-index	00h				
name	TPDO3 Mapping Numbers				
Object Structure	-	type of data	Uint8	data range	0~8
Can it be mapped?	NO	Accessibility	R W	Factory settings	3
Function description: When writing 0 , other sub-index mapping objects are invalid					

Sub-index	01h				
name	The first mapping object (Mapping entry (1))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60410010

Sub-index	02h				
name	The second mapping object (Mapping entry (2))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60640020
Sub-index	03h				
name	The third mapping object (Mapping entry (3))				
Object Structure	-	type of data	Uint32	data range	0~4294967295
Can it be mapped?	NO	Accessibility	R W	Factory settings	0x60770020

Sub-index	04h~08h				
name	The 3rd to 8th mapping objects (Mapping entry (3) to (8))				
Object	-	type of data	Uint32	data range	0~4294967295

Structure					
Can it be mapped?	NO	Accessibility	R W	Factory settings	-

Object 1C00h : Sync manager type					
index	1C00h				
name	Synchronization management type				
Object Structure	REC	type of data	-	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	-

Sub-index	00h				
name	Maximum sub-index number for synchronous management				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	4

Sub-index	01h				
name	Communication Type SM0				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	1
SM0 communication type: receiving mailbox					

Sub-index	02h				
name	Communication Type SM1				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	2
SM1 communication type: send email					
Sub-index	03h				
name	Communication Type SM2				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	3
SM2 communication type: process data output					

Sub-index	04h				
name	Communication Type SM3				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	4
SM3 communication type: process data input					

Object 1C12h : Sync Manager 2 RPDO Assignment					
index	1C12h				
name	Synchronous Management 2_RPDO Allocation				
Object Structure	ARR	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Sets the object index of the RPDO allocation					

Sub-index	00h				
name	Synchronous management 2_The maximum sub-index number allocated by RPDO				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory settings	1

Sub-index	01h				
name	Index of RPDO Assignment				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory settings	1
Set the RPDO allocation index:					
1. Must be configured in pre-operation state					
2. If you use TwinCAT software to directly select the RPDO assignment, otherwise:					
a. 1C12-00h writes value 0					
b. 1C12-01h writes the pre-used RPDOx (1600h~1603h) and configures the RPDOx mapping object (for example, 1600h)					
c. 1C12-00h writes value 1					
Object 1C13h : Sync Manager 2 TPDO Assignment					
index	1C13h				

name	Synchronous management 2_TPDO allocation				
Object Structure	ARR	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory default	-
Set the assigned object index of the TPDO					

Sub-index	00h				
name	Synchronous management 2_TPDO assigned maximum sub-index number				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory settings	1

Sub-index	01h				
name	Index of TPDO Assignment				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	R W	Factory settings	1
Set the TPDO allocation index:					
1. Must be configured in pre-operation state					
2. If you use TwinCAT software to directly select the TPDO assignment, otherwise:					
a. 1C13-00h writes value 0					
b. 1C13-01h writes the pre-used TPDOx (1A00h~1A03h) and configures the TPDOx mapping object (for example, 1A00h)					
c. 1C13-00h writes value 1					

Object 1C32h : Sync Manager 2 output Parameter					
index	1C32h				
name	Synchronization Management 2_Synchronization Output Parameters				
Object Structure	REC	type of data	-	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	-
Describe the output parameters of SM2					

Sub-index	00h				
name	The maximum sub-index number of synchronization parameters of synchronization management 2				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory	32

mapped?				settings	
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Sub-index	01h				
name	Synchronization Type				
Object Structure	-	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	2
2 indicates that the synchronization type of SM2 is distributed clock synchronization 0 mode (DC SYNC0 Mode)					

Sub-index	02h				
name	Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	0
Reflects the period of DC SYNC0					

Sub-index	04h				
name	Synchronomization Types supported				
Object Structure	-	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	4
Indicates the type of distributed clock.					
4 indicates support for distributed clock 0 mode (DC SYNC0)					

Sub-index	05h				
name	Minimum Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	125000
Indicates the minimum synchronization period supported by the slave (ns)					

Sub-index	06h				
name	Calc and Copy Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Reflects the time it takes the microprocessor to copy data from the synchronization manager to					

the local device (ns)

Sub-index	08h				
name	Get Cycle Time				
Object Structure	-	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-

Sub-index	09h				
name	Delay Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Unit (ns)					

Sub-index	0Ah				
name	SYNC0 Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
In distributed clock mode, the value of ESC register 09A0h is set (ns)					

Sub-index	0B				
name	Number of synchronization events lost (SM-Event Missed)				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-

Sub-index	0Ch				
name	Cycle Time Too Small				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Setting the cycle too small will cause					

Sub-index	20h				
name	SYNC Error				
Object	-	type of data	BOOL	data range	-

Structure					
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
TRUE : Synchronous activation and no errors occurred					
FALSE : Synchronization is not active or no synchronization error has occurred.					

Object 1C33h : Sync Manager 2 input Parameters

index	1C33h				
name	Synchronization Management 2_Synchronization Input Parameters				
Object Structure	REC	type of data	-	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	-
Describe the input parameters of SM2					

Sub-index	00h				
name	The maximum sub-index number of synchronization parameters of synchronization management 2				
Object Structure	-	type of data	Uint8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	32

Sub-index	01h				
name	Synchronization Type				
Object Structure	-	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	2
2 indicates that the synchronization type of SM2 is distributed clock synchronization 0 mode (DC SYNC0 Mode)					

Sub-index	02h				
name	Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	0
Reflects the period of DC SYNC0					

Sub-index	04h				
name	Synchronomization Types supported				
Object	-	type of data	Uint16	data range	-

Structure					
Can it be mapped?	NO	Accessibility	RO	Factory settings	4
Indicates the type of distributed clock.					
4 indicates support for distributed clock 0 mode (DC SYNC0)					

Sub-index	05h				
name	Minimum Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	125000
Indicates the minimum synchronization period supported by the slave (ns)					

Sub-index	06h				
name	Calc and Copy Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Reflects the time it takes the microprocessor to copy data from the synchronization manager to the local device (ns)					

Sub-index	08h				
name	Get Cycle Time				
Object Structure	-	type of data	Uint16	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-

Sub-index	09h				
name	Delay Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Unit (ns)					

Sub-index	0Ah				
name	SYNC0 Cycle Time				
Object Structure	-	type of data	Uint32	data range	-
Can it be	NO	Accessibility	RO	Factory	-

mapped?				settings	
In distributed clock mode, the value of ESC register 09A0h is set (ns)					

Sub-index	0B				
name	Number of synchronization events lost (SM-Event Missed)				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-

Sub-index	0Ch				
name	Cycle Time Too Small				
Object Structure	-	type of data	Uint32	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
Setting the cycle too small will cause					

Sub-index	20h				
name	SYNC Error				
Object Structure	-	type of data	BOOL	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory settings	-
TRUE : Synchronous activation and no errors occurred					
FALSE : Synchronization is not active or no synchronization error has occurred.					

3.6.5 6000h group object detailed description

Object 603Fh : Error Code					
index	603Fh		Support Mode	HMI/CSP/PP/CSV/PV/CST/PT	
name	error code				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Fault code The most recent error that occurred in the driver. For details, see the fault code list and warning code list.					

Object 6040h : Control Word			
index	6040h	Support Mode	HM/CSP/PP/CSV/PV/CST/PT
name	Control Word		

Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0

Control word bit definition:

Bit	meaning	describe	
0	Servo ready	0- invalid; 1- valid	
1	Connect the main circuit	0- invalid; 1- valid	
2	Fast shutdown	0- valid; 1- invalid	
3	Servo operation	0- invalid; 1- valid	
4~6	Related to the pattern	PP	HM
	4	New position rising edge trigger	Zero return on
	5	0 : non-immediate update 1 : immediate update	reserve
	6	0 : Absolute position 1 : Relative position	reserve
	7	Fault reset	Bit7 rising edge is valid
		Bit7 remains at 1 , and other control instructions are invalid.	
8	pause		
9~10	NA	Reserve	
11~15	Factory customized	Factory customized	

Object 6041h : Status Word					
index	6041h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Status word				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be	TPDO	Accessibility	RO	Factory	0

mapped?				default	
Reflects the servo status:					
		Bit	name	Bit Definition	
		0	Servo no fault	1- valid; 0- invalid	
		1	Waiting for servo to be enabled	1- valid; 0- invalid	
		2	Servo operation	1- valid; 0- invalid	
		3	Fault	0 : No fault	
				1 : Faulty	
		4	Connect the main circuit	1- valid; 0- invalid	
		5	Fast shutdown	0- valid; 1- invalid	
		6	Servo not running	1- valid; 0- invalid	
		7	warn	0 : No warning; 1 : With warning	
		8	Factory customized	Reserve	
		9	remote control	0 - Invalid.	
				1- Effective, the control word takes effect.	
		10	Target reached	0- Target position or speed not reached.	
				1- Target position or speed reached.	
		11	Software internal position exceeded limit	0- The position command or feedback does not reach the software internal position limit.	
				1- Position command or feedback reaches the software internal position limit	
		12	Position Mode	0-allows receiving position commands; 1-does not allow receiving position commands.	
			Speed Mode	0-non-zero speed; 1-zero speed.	
			Origin return	0-Not completed; 1-Return to	

	mode	zero completed.
13	Origin return failure flag	0-no error occurred during zero return; 1-error occurred during zero return
14	Reserve	Reserve
15	Home return completion flag	0-origin return is not completed; 1-origin return is completed (this bit is set when the reference point is found).

Object 605Ah : Quick stop option code

index	605Ah		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Quick stop mode selection				
Object Structure	VAR	type of data	Int16	data range	0~7
Can it be mapped?	RPDO	Accessibility	R W	Factory default	1

PP :

Settings	Shutdown mode
0	Free stop, keep free running state
1	with 0x6084 ramp and keep free running state
2	with 0x6085 ramp and keep free running state
3	with 0x6072 and keep free running
4	NA
5	Ramp to stop with 0x6084 , keep position locked
6	Ramp to stop with 0x6085 , keep position locked
7	with 0x6072 and keep the position locked

CSP :

Settings	Shutdown mode
0	Free stop, keep free running
1 , 2 , 3	with the torque set at 0x6072 and keep running freely
4	NA
5 , 6 , 7	Stop with the torque set at 0x6072 and keep the position locked

CSV/PV/HM :

Settings	Shutdown mode
0	Free stop, keep free running

1	with 0x6084 (HM:0x609A) ramp and keep free running
2	Ramp down with 0x6085 , keep free running
3	Set the torque to stop at 6072 and keep running freely
4	NA
5	with 0x6084 (HM:0x609A) ramp, keep position locked
6	Ramp to stop with 0x6085 , keep position locked
7	with torque set at 6072 and keep position locked

CT/PT :

Settings	Shutdown mode
0	Free stop, keep free running
1	Ramp down with 0x6087 , keep free running
2	
3	Free stop, keep free running
4	NA
5	with 0x6087 ramp, keep position locked
6	
7	Free stop, keep position locked

Object 605Dh : Halt option code					
index	605Dh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Pause mode selection				
Object Structure	VAR	type of data	Int8	data range	1~3
Can it be mapped?	RPDO	Accessibility	R W	Factory default	1

PP :

Settings	Shutdown mode
1	Ramp to stop with 0x6084 , keep position locked
2	Ramp to stop with 0x6085 , keep position locked
3	Stop at the torque set by 0x6072 and keep free running

CSP :

Settings	Shutdown mode
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1	Stop at the torque set by 0x6072 and keep the position locked
2	
3	

PV/CSV/HM :

Settings	Shutdown mode
1	with 0x6084 (HM:0x609A) ramp, keep position locked
2	with 0x6085 ramp, keep position locked
3	at the torque set by 0x6072 and keep the position locked

PT/CST :

Settings	Shutdown mode
1	with 0x6087 ramp, keep position locked
2	
3	Stop at the torque set by 0x6072 and keep the position locked

Object 6060h : Modes of Operation					
index	6060h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Control Mode				
Object Structure	VAR	type of data	INT8	data range	0~10
Can it be mapped?	RPDO	Accessibility	R W	Factory default	8

Select the servo operation mode:

Settings	Character Identification	illustrate
0	NA	NA
1	PP	Contour Position Mode
2	NA	NA
3	PV	Profile Speed Mode
4	PT	Contour torque mode
5	NA	NA
6	HM	Zero return mode
7	NA	NA
8	CSP	Cycle Synchronous Position Mode
9	CSV	Cycle Synchronous Speed Mode
10	CST	Cycle Synchronous Torque

		Mode
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Object 6061h : Modes of Operation Display

index	6061h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Mode Display				
Object Structure	VAR	type of data	INT8	data range	0~10
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-

Select the servo operation mode:

Settings	Character Identification	illustrate
0	NA	NA
1	PP	Contour Position Mode
2	NA	NA
3	PV	Profile Speed Mode
4	PT	Contour torque mode
5	NA	NA
6	HM	Zero return mode
7	NA	NA
8	CSP	Cycle Synchronous Position Mode
9	CSV	Cycle Synchronous Speed Mode
10	CST	Cycle Synchronous Torque Mode

Object 6062h : Position Demand Value

index	6062h		Support Mode	CSP/PP	
name	Position instructions				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-

Reflects real-time position command (unit: command unit)

Object 6063h : Motor position feedback (Position Actual Value)

index	6063h	Support	HM/CSP/PP/CSV/PV/CST/PT		
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			Mode		
name	Position feedback				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Reflects real-time position feedback (unit: encoder unit)					

Object 6064h : Position feedback (Position Actual Value)

index	6064h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Position feedback				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Reflects real-time position feedback (unit: command unit)					

Object 6065h : Position deviation excessive threshold (Following error Window)

index	6065h		Support Mode	HM/CSP/PP	
name	Position deviation too large threshold				
Object Structure	VAR	type of data	UINT32	data range	-
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-
Set the position deviation excessive threshold (command unit) .					
When the position deviation exceeds ±6065h, a position deviation excessive fault occurs.					

Object 6067h : Position Window

index	6067h		Support Mode	HM/CSP/PP	
name	Position reaches threshold				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	100
Set the position arrival threshold (unit: command unit) . When the position deviation is within ±6067h and the time reaches 6068h, the position is considered to be reached. In the profile position mode, bit10 of status word 6041h=1.					

Object 6068h : Motor position arrival window time (Position Window Time)

index	6068h	Support Mode	CSP/PP		
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name	Position arrival window time				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
Set the time window for determining the valid position arrival (unit: 2ms).					

Object 606Bh : User actual velocity command (Velocity Demand Value)

index	606Bh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Actual speed command				
Object Structure	VAR	type of data	UINT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Reflects the actual speed command of the user (unit: 1rpm).					
In position mode, it reflects the speed command corresponding to the output of the position regulator. In speed mode, it reflects the input command of the speed regulator.					

Object 606Ch : User actual velocity feedback (Velocity Actual Value)

index	606Ch		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Actual speed				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Reflects the user's actual speed feedback value (unit: command unit / s).					

Object 606Dh : Velocity reaches threshold speed (Velocity Window)

index	606Dh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Speed reaches threshold				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	100
Set the threshold for speed arrival (unit: 1rpm). When the difference between the target speed 60FFh and the actual user speed 606Ch is within ±606Dh, and the time reaches 606Eh, the speed is considered to be reached. In the profile speed mode, bit10 of status word 6041h = 1. Otherwise, bit10 of status word 6061h = 0.					

Object 606Eh : Velocity Window Time

index	606Eh	Support	HM/CSP/PP/CSV/PV/CST/PT		
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			Mode		
name	Speed arrival window time				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
ms) for judging the effective speed arrival . When the difference between the target speed 60FFh and the user's actual speed 606Ch is within $\pm 606Dh$, and the time reaches 606Eh, the speed is considered to have arrived. In the profile speed mode, bit10 of status word 6041h = 1. Otherwise, bit10 of status word 6061h = 0.					

Object 606Fh : Velocity Threshold

index	606Fh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	0 speed threshold				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	10
the threshold used to determine whether the user speed is 0 (unit: 1rpm).					
Invalid					

Object 6070h : Zero Velocity Threshold Time

index	6070h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	0 speed time window				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
Set the time window used to determine whether the user's speed is 0 (unit: 2ms).					
Invalid					

Object 6071h : Target torque

index	6071h		Support Mode	CST/PT	
name	Target torque				
Object Structure	VAR	type of data	INT16	data range	-3000~3000
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
Only used in profile torque mode, torque command target value (unit: 0.1%).					

Object 6074h : Torque Demand Value

index	6074h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Torque command				
Object Structure	VAR	type of data	INT16	data range	-300~300
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Displays the current torque command (unit: 0.1 %).					

Object 6075h : Motor rated current					
index	6075h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Motor rated current				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Rated current on the motor nameplate (unit : mA). All current-related parameter values are related to this parameter.					

Object 6076h : Motor rated torque					
index	6076h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Motor rated torque				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Rated torque on the motor nameplate (unit : mNm). All torque-related parameter values are related to this parameter.					

Object 6077h : Motor feedback torque (Torque Actual Value)					
index	6077h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Actual torque				
Object Structure	VAR	type of data	UINT16	data range	-300~300
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Reflects the instantaneous torque output of the servo motor (unit: 1%).					

Object 607Ah : Target Position					
index	607Ah		Support Mode	CSP/PP	

name	target location				
Object Structure	VAR	type of data	INT32	data range	$-2^{31} \sim (2^{32}-1)$
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
Set the servo target position in the profile position mode and cycle synchronous position mode (unit: command unit).					

Object 607Ch : Origin offset (Hmoe Offset)

index	607Ch		Support Mode	HM	
name	Origin offset				
Object Structure	VAR	type of data	INT32	data range	-2^31~(2^31-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
In position control mode, the mechanical zero point deviates from the physical position of the motor origin (unit: encoder unit). Mechanical origin = mechanical zero point + 607Ch (origin offset). When set to 0, there is no origin offset.					

Object 607Dh : Software absolute position limit (Software position Limit)

index	607Dh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Software absolute position limit				
Object Structure	VAR	type of data	Int32	data range	-
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-

Set the minimum and maximum values of the software absolute position limit.

Minimum absolute position limit = (607D-1h). Maximum absolute position limit = (607D-2h).

Software absolute position limit setting: 1. When (607D-1h) and (607D-2h) are both set to the default value, the software limit does not take effect. 2. When the minimum absolute position limit (607D-1h) is greater than the maximum absolute position limit (607D-2h), a warning will occur. 3.

When the position command or position feedback reaches the software limit value, in position mode, the servo will run with the position limit as the target position, stop at the position limit, and prompt an overtravel warning. Entering a reverse command can make the motor exit the position overlimit state.

Sub-index	00h				
name	The number of sub-indexes limited by absolute position				
Object	VAR	type of data	UINT8	data range	-

Structure					
Can it be mapped?	NO	Accessibility	RO	Factory default	2

Sub-index	01h				
name	Minimum software absolute position limit (Min Position Limit)				
Object Structure	VAR	type of data	INT32	data range	-2 ³¹ ~(2 ³¹ -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-2 ³¹

Sub-index	02h				
name	Maximum software absolute position limit (Max Position Limit)				
Object Structure	VAR	type of data	INT32	data range	-2 ³¹ ~(2 ³¹ -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	2 ³¹ -1

Object 607Eh : Command polarity																				
index	607E		Support Mode	HM/CSP/PP/CSV/PV/CST/PT																
name	Instruction polarity																			
Object Structure	VAR	type of data	UINT8	data range	0~255															
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0															
Reflects the polarity of position command or speed command.																				
<table><tr><th>Bit</th><th>Function</th><th>describe</th></tr><tr><td>0~4</td><td>NA</td><td>NA</td></tr><tr><td>5</td><td>Torque command polarity</td><td>In torque mode, the torque command (6071h+60B2h) × (-1)</td></tr><tr><td>6</td><td>Speed command polarity</td><td>In speed mode, the speed command is (60FFh+60B1h)×(-1) and the motor rotates in the opposite direction.</td></tr><tr><td>7</td><td>Position command polarity</td><td>In standard position mode, the position command is multiplied by (-1) and the motor direction is reversed. In profile position mode and</td></tr></table>						Bit	Function	describe	0~4	NA	NA	5	Torque command polarity	In torque mode, the torque command (6071h+60B2h) × (-1)	6	Speed command polarity	In speed mode, the speed command is (60FFh+60B1h)×(-1) and the motor rotates in the opposite direction.	7	Position command polarity	In standard position mode, the position command is multiplied by (-1) and the motor direction is reversed. In profile position mode and
Bit	Function	describe																		
0~4	NA	NA																		
5	Torque command polarity	In torque mode, the torque command (6071h+60B2h) × (-1)																		
6	Speed command polarity	In speed mode, the speed command is (60FFh+60B1h)×(-1) and the motor rotates in the opposite direction.																		
7	Position command polarity	In standard position mode, the position command is multiplied by (-1) and the motor direction is reversed. In profile position mode and																		

		periodic synchronous position mode, the position command and target position are reversed.
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Object 607Fh : Max Profile Velocity					
index	607Fh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Maximum contour speed				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	50000
<p>User maximum running speed (unit: set the unit through Pn9A0 , Pn9A0 is 0 , the unit is 0.1r/min ; Pn9A0 is 1 , the unit is the command unit per second).</p> <p>Speed and torque modes are effective (and the torque mode is related to the Pn411 setting); in position mode, please limit the maximum speed through the motor parameters.</p>					

Object 6080h : Maximum Motor Velocity					
index	6080h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Maximum motor speed				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	6000
The maximum allowable operating speed of the motor can be obtained from the servo motor manual (unit: rpm)					

Object 6081h : Profile Velocity					
index	6081h		Support Mode	CSP/PP	
name	Profile speed				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	10000000
In the profile position mode , the running speed of the uniform speed section reached after completing the acceleration section (unit: command unit /s).					

Object 6083h : Profile Acceleration			
index	6083h	Support Mode	PP/PV
name	Contour acceleration		

Object Structure	VAR	type of data	UINT32	data range	0~(2 ³² -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	200
In profile mode, the acceleration of the motor from 0rpm to a given speed (unit: command /s ²). After the slave receives the displacement command, the set value takes effect.					

Object 6084h : Profile Deceleration

index	6084h		Support Mode	PP/PV	
name	Contour deceleration				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	200
In profile speed mode, the deceleration rate when the motor decelerates from the current speed to 0rpm (unit: command /s2).					
After the slave receives the displacement command, the set value takes effect.					

Object 6086h : Motor operation curve type (Motion Profile Type)

index	6086h		Support Mode	CSP/PP/CSV/PV	
name	Run curve selection				
Object Structure	VAR	type of data	INT16	data range	-2 ¹⁵ ~(2 ¹⁵ -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
The curve type of the motor position command or speed command. 0- Linear					

Object 6087h : Torque Slope

index	6087h		Support Mode	PT	
name	Torque ramp time				
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
the time (unit: ms) for the torque reference to rise from 0% rated torque to 100% .					

Object 6091h : Gear Ratio

index	6091h	Support Mode	HM/CSP/PP/CSV/PV/CST/PT
name	Gear Ratio		

Object Structure	VAR	type of data	UInt32	data range	-
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-
<p>The position factor is used to establish the proportional relationship between the user-specified load displacement and the motor displacement:</p> <p>Motor displacement (motor unit) = load displacement (user unit) × position factor</p> <p>The setting of the position factor is related to the mechanical reduction ratio, mechanical size-related parameters, and motor resolution. The calculation method is as follows:</p>					

Sub-index	00h				
name	Number of sub-indexes				
Object Structure	VAR	type of data	UINT8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	2

Sub-index	01h				
name	Motor revolutions				
Object Structure	VAR	type of data	UINT32	data range	1~(2 ³² -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	1

Sub-index	02h				
name	Shaft revolutions				
Object Structure	VAR	type of data	UINT32	data range	1~(2 ³² -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	1

Object 6098h : Homing method					
index	6098h		Support Mode	HM	
name	Origin return method				
Object Structure	VAR	type of data	INT8	data range	1~35
Can it be mapped?	RPDO	Accessibility	R W	Factory default	1
Select the origin return method:					
	value	illustrate			

1	Regression when encountering Z pulse signal
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Object 6099h : Homing Speeds

index	6099h		Support Mode	HM	
name	Zero return speed				
Object Structure	ARR	type of data	-	data range	-
Can it be mapped?	YES	Accessibility	R W	Factory default	-
In the zero return mode, there are two speed value settings: 6099-1h search for deceleration point signal speed (unit: command unit/s); 6099-2h search for origin signal speed (unit: command unit/s).					

Sub-index	00h				
name	Number of sub-indexes				
Object Structure	VAR	type of data	UINT8	data range	-
Can it be mapped?	NO	Accessibility	RO	Factory default	2

Sub-index	01h				
name	During Search for Switch				
Object Structure	VAR	type of data	UINT32	data range	0~(2 ³² -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	279620266

Sub-index	02h				
name	Speed During Search for Zero				
Object Structure	VAR	type of data	UINT32	data range	0~(2 ³² -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	5592405

Object 609Ah : Homing Acceleration

index	609Ah		Support Mode	HM	
name	Zero acceleration				
Object	VAR	type of data	UINT32	data range	0~(2^32-1)

Structure					
Can it be mapped?	RPDO	Accessibility	R W	Factory default	16000
<p>Set the acceleration in the origin return mode.</p> <p>The unit of this object dictionary is defined as the position command increment per second (command unit/s2).</p>					

Object 60B0h : Position offset

index	60B0h		Support Mode	CSP	
name	Position offset				
Object Structure	VAR	type of data	INT32	data range	-2 ³¹ ~(2 ³¹ -1)
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
Used for position command offset in synchronous periodic position mode, servo target position = 607Ah + 60B0h .					

Object 60B8h : Touch Probe Function

index	60B8	Support Mode		HM/CSP/PP/CSV/PV/CST/PT	
name	Probe Mode				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	RPDO	Accessibility	R W	Factory default	0
The probe function is the position latch function, which can latch the position information when the external DI signal or the motor Z signal changes. This servo supports two probe functions, which can latch 4 position information. Probe 1 can select DI44 or Z signal as the probe signal, and probe 2 can select DI45 or Z signal as the probe signal.					

Functions of Probe 1 and Probe 2 :

Bit	describe	scope
0	Probe 1 Enable	0--- Probe 1 is disabled 1--- Probe 1 is enabled
1	Probe 1 Trigger Mode	0--- single trigger 1--- continuous trigger
2	Probe 1 trigger signal selection	0---X terminal input signal 1---Z signal
3	NA	
4	Probe 1 rising edge enable	0--- No latching on the rising edge 1--- Latching on the rising

		edge
5	Probe 1 falling edge enable	0--- Do not latch on the falling edge 1--- Latch on the falling edge
6~7	NA	
8	Probe 2 Enable	0--- Probe 2 is disabled 1--- Probe 2 is enabled
9	Probe 2 Trigger Mode	0--- single trigger 1--- continuous trigger
10	Probe 2 trigger signal selection	0---X terminal input signal 1---Z signal
11	NA	
12	Probe 2 rising edge enable	0--- No latching on the rising edge 1--- Latching on the rising edge
13	Probe 2 falling edge enable	0--- Do not latch on the falling edge 1--- Latch on the falling edge
14~15	NA	

Object 60B9h : Touch Probe Status					
index	60B9h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Probe Status				
Object Structure	VAR	type of data	UINT16	data range	0~65535
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0

probe 1 and probe 2 .

Bit	describe	Remark
0	Probe 1 enable flag	0 : Disabled 1 : Enabled
1	Probe 1 rising edge latches the execution flag	0 : Probe 1 rising edge latch not executed 1 : Probe 1 rising edge latch executed
2	Probe 1	0 : Falling edge latch not

	falling edge latches the execution flag	executed 1 : Falling edge latch executed
3~5	NA	NA
6	Probe 1 latch selection monitor	0 : X terminal input signal 1 : Z signal
7	Probe 1 level monitoring	0 : low level 1 : high level
8	Probe 2 enable flag	0 : Disabled 1 : Enabled
9	Probe 2 rising edge latches the execution flag	0 : Rising edge latch not executed 1 : Rising edge latch executed
10	Probe 2 falling edge latches the execution flag	0 : Falling edge latch not executed 1 : Falling edge latch executed
11~13	NA	
14	Probe 2 latch selection monitor	0 : X terminal input signal 1 : Z signal
15	Probe 2 level monitoring	0 : low level 1 : high level

Object 60BAh : Touch Probe Pos1 Pos Value					
index	60BAh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Probe 1 rising edge position				
Object Structure	VAR	type of data	INT32	data range	-2^31~(2^31-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Displays the rising edge time of probe 1 signal and position feedback (command unit).					

Object 60BBh : Touch Probe Pos1 Neg Value					
index	60BBh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Probe 1 falling edge position				
Object Structure	VAR	type of data	INT32	data range	-2^31~(2^31-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Displays the falling edge time of probe 1 signal and position feedback (command unit).					

Object 60BCh : Probe 2 rising edge position feedback (Touch Probe Pos1 Pos Value)					
index	60BCh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Probe 2 rising edge position				
Object Structure	VAR	type of data	INT32	data range	-2^31~(2^31-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Displays the rising edge time of probe 2 signal and position feedback (command unit).					

Object 60BDh : Touch Probe Pos2 Neg Value					
index	60BDh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Probe 2 falling edge position				
Object Structure	VAR	type of data	INT32	data range	-2^31~(2^31-1)
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0
Displays the falling edge time of probe 2 signal and position feedback (command unit).					

Object 60E0h : Positive torque limit					
index	60E0h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Forward torque limit				
Object Structure	VAR	type of data	UINT16	data range	0~3000
Can it be mapped?	RPDO	Accessibility	R W	Factory default	3000
Limit the maximum value of the positive torque (unit: 0.1%).					

Object 60E1h : Negative torque limit			
index	60E1h		Support Mode
name	Reverse torque limit		

Object Structure	VAR	type of data	UINT16	data range	0~3000
Can it be mapped?	RPDO	Accessibility	R W	Factory default	3000
Limit the maximum negative torque (unit: 0.1%).					

Object 60F4h : Position error (Following Error Actual Value)

index	60F4h		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Position deviation				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Displays the position deviation (command unit).					

Object 60FCh : Position Demand Value

index	60FCh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Position instructions				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-
Motor real-time position command					
Position command (6062h) × electronic gear ratio (6091h) = motor position command (60FCh)					

Object 60FDh: Digital Input

index	60FDh	Support Mode		HM/CSP/PP/CSV/PV/CST/PT	
name	DI Status				
Object Structure	VAR	type of data	UNT32	data range	-
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-

The DI signals represented by each bit are as follows:

Bit	Numeric	describe
0	0x00000001	X1 terminal status
1	0x00000002	X2 terminal status
2	0x00000004	X3 terminal status
3	0x00000008	X4 terminal status
4	0x00000010	X5 terminal status (none)
5	0x00000020	X6 terminal status (none)

6	0x00000040	X7 terminal status (none)
7~31	-	reserve

Object 60FEh : Digital Output

index	60FEh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT																			
name	Digital Output																						
Object Structure	ARR	type of data	Uint32	data range	-																		
Can it be mapped?	TPDO	Accessibility	RO	Factory default	-																		
DO terminal logic of the driver , 0 means invalid, 1 means valid																							
Sub-index	00h																						
name	Number of sub-indexes																						
Object Structure	VAR	type of data	UINT8	data range	-																		
Can it be mapped?	NO	Accessibility	RO	Factory default	2																		
Sub-index	01h																						
name	Physical output monitoring																						
Object Structure	VAR	type of data	UINT32	data range	0~(2^32-1)																		
Can it be mapped?	TPDO	Accessibility	RO	Factory default	0																		
DO signals represented by each bit are as follows:																							
<table><tr><td>Bit</td><td>Numeric</td><td>describe</td></tr><tr><td>0</td><td>0x00000001</td><td>Y1 output status</td></tr><tr><td>1</td><td>0x00000002</td><td>Y2 output status</td></tr><tr><td>2</td><td>0x00000003</td><td>Y3 output status (none)</td></tr><tr><td>3</td><td>0x00000004</td><td>Y4 output status (none)</td></tr><tr><td>4~31</td><td>-</td><td>Factory customized</td></tr></table>						Bit	Numeric	describe	0	0x00000001	Y1 output status	1	0x00000002	Y2 output status	2	0x00000003	Y3 output status (none)	3	0x00000004	Y4 output status (none)	4~31	-	Factory customized
Bit	Numeric	describe																					
0	0x00000001	Y1 output status																					
1	0x00000002	Y2 output status																					
2	0x00000003	Y3 output status (none)																					
3	0x00000004	Y4 output status (none)																					
4~31	-	Factory customized																					
Sub-index	02h																						
name	Physical output enable (none)																						
Object Structure	VAR	type of data	-	data range	-																		

Can it be mapped?	-	Accessibility	-	Factory default	-
DO signals represented by each bit are as follows:					
	Bit	Numeric	describe		
	0	0x00000001	Y1 output enable		
	1	0x00000002	Y2 output enable		
	2	0x00000003	Y3 output enable (none)		
	3	0x00000004	Y4 output enable (none)		
	4~31	-	Factory customized		
Note: When using the terminal output enable, the corresponding terminal function of the drive needs to be selected as the ECAT bus control enable output.					

Object 60FFh : Target Velocity					
index	60FFh		Support Mode	CSV/PV	
name	Target speed				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-
(unit: command unit /s) in contour speed mode and synchronous cycle speed mode .					

Object 6052h : Supported Drive Modes					
index	60FFh		Support Mode	HM/CSP/PP/CSV/PV/CST/PT	
name	Target speed				
Object Structure	VAR	type of data	INT32	data range	-
Can it be mapped?	RPDO	Accessibility	R W	Factory default	-
The servo operation mode supported by the drive. 0 means not supported, 1 means supported.					
	Bit	describe	value		
	0	Contour Position Mode	1		
	1	Variable frequency speed regulation mode	0		
	2	Profile Speed Mode	1		
	3	Contour torque mode	1		
	4	NA	0		
	5	Zero return mode	1		
	6	Interpolation position mode	0		
	7	Cyclic Synchronous Position Mode (CSP)	1		
	8	Cycle Synchronous Speed Mode (csv)	1		

9	Cycle Synchronous Torque Mode (cst)	1
10~31	Factory customized	Reserve

3.7 Troubleshooting

3.7.1 Fault code list

Fault number	Fault display	Fault name	error code	Auxiliary code
1	E.SC1	Module failure during acceleration	0x6000	0x00000001
2	E.SC2	Module failure during deceleration	0x6001	0x00000002
3	E.SC3	Module failure during constant speed	0x6002	0x00000003
4	E.SC4	Shutdown module failure	0x6003	0x00000004
5	E.oC1	Overcurrent during acceleration	0x6004	0x00000005
6	E.oC2	Overcurrent during deceleration	0x6005	0x00000006
7	E.oC3	Constant speed medium current	0x6006	0x00000007
8	E.oC4	AC10 software overcurrent	0x6007	0x00000008
9	E.oU1	Overvoltage during acceleration	0x6008	0x00000009
10	E.oU2	Overvoltage during deceleration	0x6009	0x0000000A

11	E.oU3	Constant speed overvoltage	0x600A	0x0000000B
13	E.LU	Bus undervoltage	0x600C	0x0000000D
14	E.oL1	Motor overload	0x600D	0x0000000E
15	E.oL2	Inverter current overload	0x600E	0x0000000F
16	E.oL3	Inverter CBC overload	0x600F	0x00000010
17	E.oL4	Inverter overload 3	0x6010	0x00000011
18	E.ILF	Input phase loss	0x6011	0x00000012
19	E.oLF	Three-phase output phase loss	0x6012	0x00000013
20	E.oLF1	U phase output phase loss	0x6013	0x00000014
twenty one	E.oLF2	V phase output phase loss	0x6014	0x00000015
twenty two	E.oLF3	W phase output phase loss	0x6015	0x00000016
twenty three	E.oLF4	Three-phase current imbalance	0x6016	0x00000017
30	E.oH1	Rectifier overheating	0x601D	0x0000001E
31	E.OH2	Inverter overheating	0x601E	0x0000001F
32	E.oH3	Motor overheating	0x601F	0x00000020
33	E.EF	External fault	0x6020	0x00000021
34	E.CE	Communication failure	0x6021	0x00000022
35	E.HAL1	U phase zero drift large	0x6022	0x00000023
36	E.HAL2	V phase zero drift is large	0x6023	0x00000024
37	E.HAL	The sum of the three-phase current is not 0	0x6024	0x00000025

38	E.HAL3	W phase zero drift is large	0x6025	0x00000026
39	E.PoS	24V power supply short circuit	0x6026	0x00000027
40	E.SG	Short circuit to ground	0x6027	0x00000028
41	E.FSG	Fan short circuit to ground	0x6028	0x00000029
42	E.PID	PID disconnection fault	0x6029	0x0000002A
43	E.COP	Parameter copy exception	0x602A	0x0000002B
44	E.PGxx	Encoder failure	0x602B	0x0000002C
45	E.9B0	Ethercat synchronous communication abnormality	0x602C	0x0000002D
46	E.D00	Position deviation is too large	0x602D	0x0000002E
50	E.BRU	Braking unit failure	0x6031	0x00000032
51	E.E51	reserve	0x6032	0x00000033
52	E.TE1	Motor self-learning fault	0x6033	0x00000034
71	E.IAE1	Initial angle learning failed 1	0x6046	0x00000047
72	E.IAE2	Initial angle learning failed 2	0x6047	0x00000048
73	E.IAE3	Initial angle learning failed 3	0x6048	0x00000049
74	E.PST1	PM_ST	0x6049	0x0000004A
75	E.PST2	PM_ST	0x604A	0x0000004B
76	E.PST3	PM_ST	0x604B	0x0000004C
77	E.DEF	Speed deviation is too large	0x604C	0x0000004D

78	E.SPD	Speedy protection	0x604D	0x0000004E
79	E.LD1	Load protection 1	0x604E	0x0000004F
80	E.LD2	Load protection 2	0x604F	0x00000050
81	E.CPU	CPU timer timeout	0x6050	0x00000051

3.7.2 Warning code list

Warning Signs	Fault display	Fault name	Warning Codes	Auxiliary code
128	A.LU1	Shutdown undervoltage	0x0200	0x00000128
129	A.OU	Overpressure	0x0201	0x00000129
130	A.LIF	Input phase loss	0x0202	0x0000012A
131	A.PID	PID disconnection	0x0203	0x0000012B
132	A.EEP	Storage warning	0x0204	0x0000012C
133	A.DEF	Large speed deviation	0x0205	0x0000012D
134	A.SPD	Speedy protection	0x0206	0x0000012E
135	A.GPS1	Lock warning	0x0207	0x0000012F
136	A.GPS2	GPRS lock warning	0x0208	0x00000130
137	A.CE	485 Communication abnormality warning	0x0209	0x00000131
138	A.LD1	Load protection 1	0x020A	0x00000132
139	A.LD2	Load protection 2	0x020B	0x00000133
140	A.bUS	Expansion card disconnection warning	0x020C	0x00000134

141	A.OH1	Radiator overheat warning	0x020D	0x00000135
142	A.OH3	Motor overheat warning	0x020E	0x00000136
143	A.RUN	Warning during operation	0x020F	0x00000137
144	A.PA2	External keyboard disconnection warning	0x0210	0x00000138
145	A.COP	Parameter copy abnormal warning	0x0211	0x00000139
146	A.CP1	Comparator 1 warning	0x0212	0x00000130
147	A.CP2	Comparator 2 warning	0x0213	0x0000013A
158	A.9F0	EtherCAT synchronization cycle setting error	0x021E	0x00000144
159	A.9B0	EtherCAT synchronization interruption exception	0x021F	0x00000145

3.7.3 FAQ

For faults of the servo drive itself, please refer to the corresponding manual. This section only describes the processing method of the EtherCAT communication part.

(1) E.EB9: EtherCAT initialization error

Fault code: 0x602C	
Fault number	45
Fault name	Ethercat synchronous communication abnormality
Fault display	E.9B0
<div> <div>cause of issue:</div> <div> 1. During synchronous communication, the slave station receives abnormally; 2. During synchronous communication, the master station sends abnormally; </div> </div> <div> <div>Treatment measures:</div> <div> 1. (A) Use shielded twisted pair cables; (B) Check the wiring status through the keyboard digital display; 2. Replace the master station equipment. </div> </div>	

(2) A.9b0: SYNC0 synchronization frame lost

Fault code: 0x602C	
Fault number	45

Fault name	Ethercat synchronous communication abnormality	
Fault display	E.9B0	
cause of issue:		Treatment measures:
1. During synchronous communication, the slave station receives abnormally;		1. (A) Use shielded twisted pair cables; (B) Check the wiring status through the keyboard
2. During synchronous communication, the master station sends abnormally;		digital display;
		2. Replace the master station equipment.