DS_C Bus-Type (CANopen) Low-Voltage Servo

User Manual

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Contents

Chapter I Product Introduction

1.1 Product Introduction

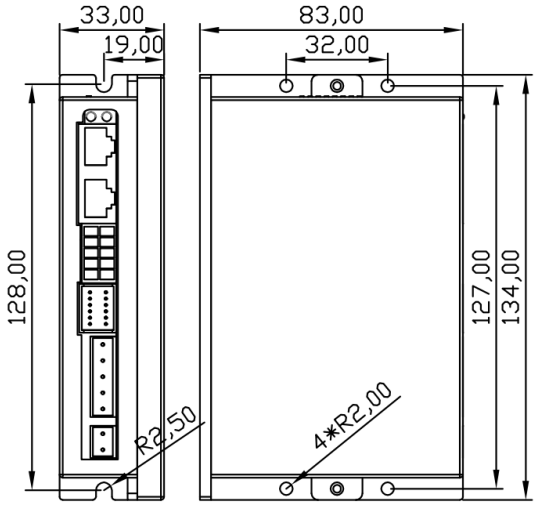
The low-voltage servo drives of DS series are low-voltage servo products developed based on the latest generation 32-bit DSP chips and combined with our company's years of experience in servo motion control, including pulse type, CANopen bus type and RS485 bus type products controlled with three kinds of modes, respectively. This manual mainly introduces CANopen bus type drives.

This drive can support specs from 100W to 750W. The encoder is a 2500-line incremental low-voltage servo motor powered by a low-voltage DC supply. External braking resistors can be connected. This CANopen bus type drive series drives are developed based on the CIA301 and CIA402.V2 standard communication protocols, which are compatible with most of the CANopen master station controllers in the market. Up to 31 drives can be used for networking for realizing synchronous multi-axis high-velocity bus control. The drive supports position mode, velocity mode, torque mode and homing mode and is characterized by high overload capacity, low noise and quick response, etc.

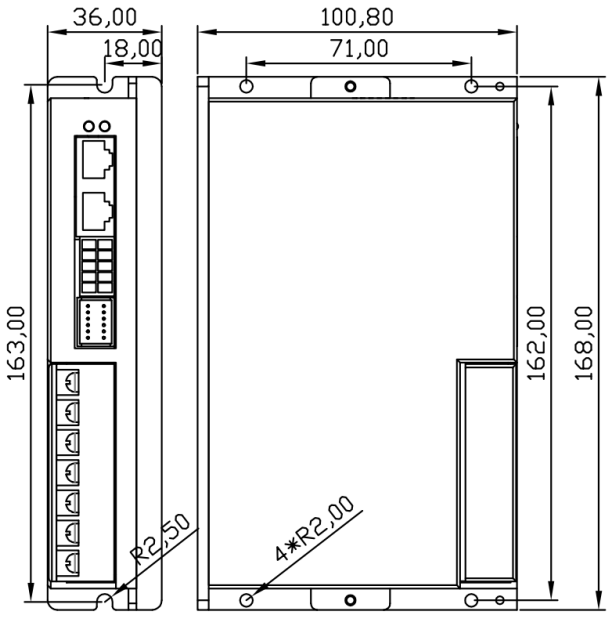
1.2 Product specification

Drive model / Parameter		DS_C_100	DS_C_200	DS_C_400	DS_C_750
Matched motor		100W	200W	400W	750W
Encoder		2500-line incremental			
Supply voltage		24V-50V	24V-50V	24V-50V	24V-80V
Output Current	Rated value	5A	7A	10A	20A
	Maximum	15A	21A	30A	57A
Drive size (mm) （L*H*W）		134 * 83 * 33			168 * 100 * 36
Drive weight (kg)		0.35			0.7

1.3 Mounting dimensions



Dimensions of DS_C_100/200/400 drive



Dimensions of DS_C_750 drive

Chapter II Wiring and Setting

2.1 Description of terminal function

2.1.1 Braking resistor terminals

Terminal name	Description
RB+	Connected to external braking resistor DS_P_100/200/400 drive: 10R 50W DS_P_750 drive: 10R 100W
RB-	

2.1.2 Power supply terminal

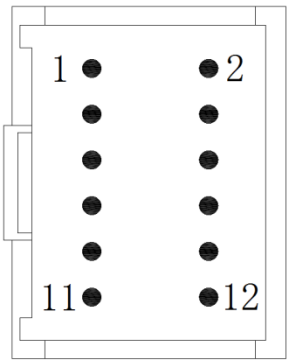
Terminal name / Drive model	VDC: DC power supply, positive GND: DC power supply, negative
DS_C_100	DC voltage: 24V~50V Recommended power supply: 24V, 5A
DS_C_200	DC voltage: 24V~50V Recommended power supply: 36V, 9A
DS_C_400	DC voltage: 24V~50V Recommended power supply: 48V, 10A
DS_C_750	DC voltage: 24V~80V Recommended power supply: 48V or higher, 20A

2.1.3 Motor winding terminal

Terminal name	Description
U	Motor three-phase winding
V	
W	

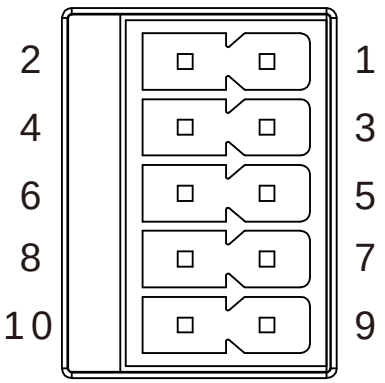
2.1.4 Encoder wire terminal

Pin No.	Signal	Color	Pin No.	Signal	Color
1	EA+	Yellow	**2**	HU+	Grey
3	EA-	Yellow/black	**4**	HV+	Orange
5	EB+	Green	**6**	HW+	White
7	EB-	Green/black	**8**	EVCC	Red
9	EZ+	Brown	**10**	EGND	Black
11	EZ-	Brown/black	**12**	PE	Yes

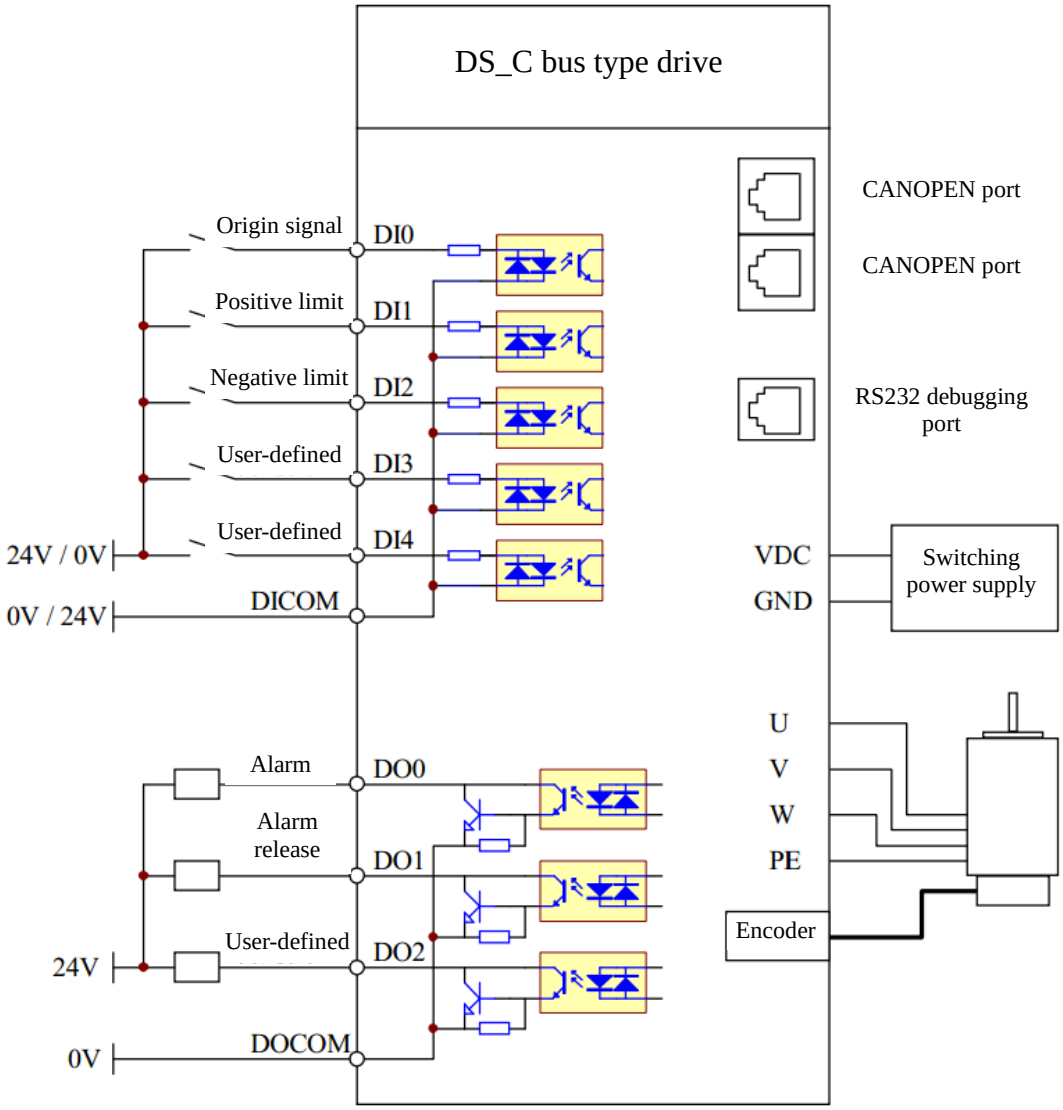


Pins for terminal

2.1.5 DI/DO terminal

No.	Name	Definition of terminal
1	DI0	
2	DI1	
3	DI2	
4	DI3	
5	DI4	
6	DICOM	
7	DO0	
8	DO1	
9	DO2	
10	DOCOM	

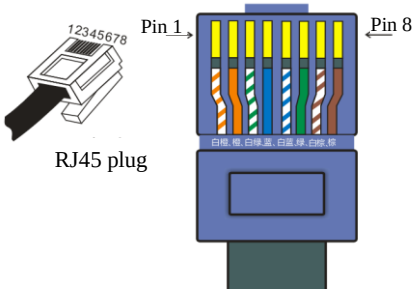
Wiring diagram of input / output signal



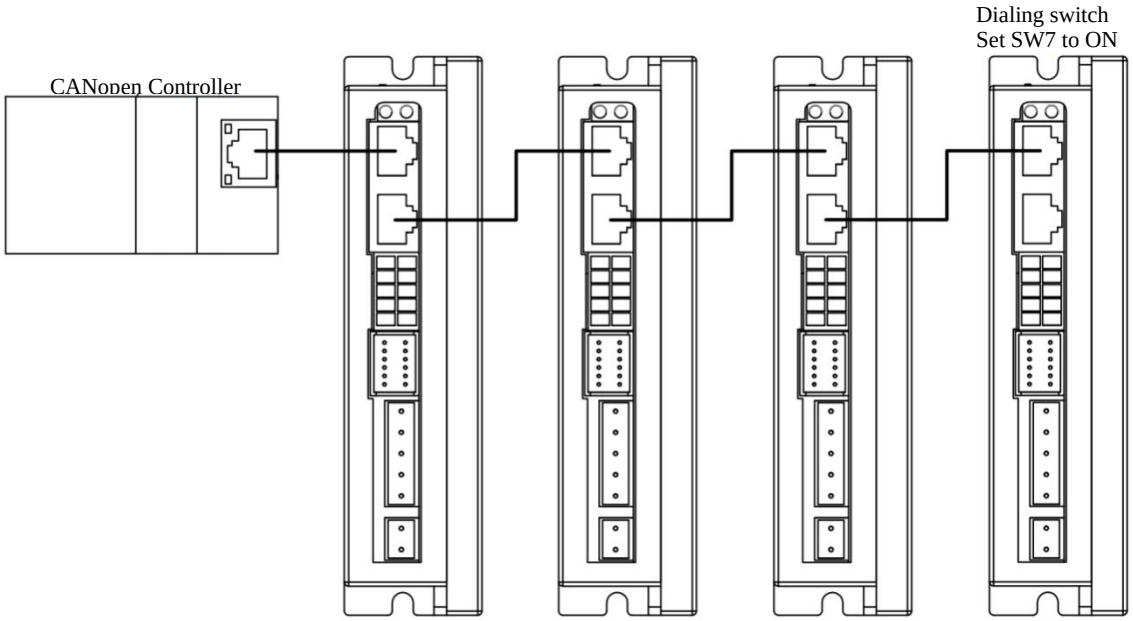
Note: Both the common cathode and common anode connection methods can be used for the DI port, while for the output port, only the common cathode connection method can be used.

2.1.6 Definition of communication port pins

Pin	Network cable color	Signal definition
1	White/orange	CAN+
2	Orange	CAN-
3	White/green	GND
4	Blue	NC
5	White/blue	NC
6	Green	NC
7	White/brown	NC
8	Brown	NC

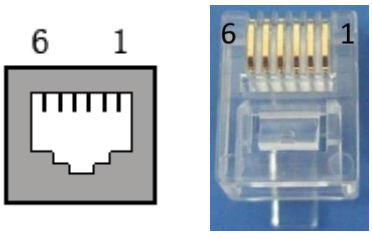


The DS_C bus type drive has 2 standard RJ45 network interfaces, in which Pins 1 and 2 correspond to CAN+ and CAN- signal wires, respectively, and Pin 3, to GND. It is recommended to use a shielded twisted-pair or network cable as the transmission medium for communication. All nodes shall be directly connected to this pair of public transmission medium and arranged in parallel for receiving or sending data information. For the drive at the end of the bus, the dial switch SW7 shall be set to ON, indicating that a terminating resistance shall be connected for termination in order to prevent the signal sent by the node on the network from being reflected when reaching the end of the cable.



2.1.7 Definition of RS232 debugging port pins

Pin	Symbol	RMK
2	GND	Signal ground
3	TXD	RS232 sending port
4	RXD	RS232 receiving port
5	GND	Signal ground



Communication cable connection method

Computer terminal (9-pin female)		Drive terminal (6-pin RJ)
3 TXD	----------	4 RXD
2 RXD	----------	3 TXD
5 GND	----------	5/2 GND

2.2 Dial function description

2.2.1 Station number setting

Station number	SW1	SW2	SW3	SW4	SW5	Station number	SW1	SW2	SW3	SW4	SW5
0	OFF	OFF	OFF	OFF	OFF	16	OFF	OFF	OFF	OFF	ON
1	ON	OFF	OFF	OFF	OFF	17	ON	OFF	OFF	OFF	ON
2	OFF	ON	OFF	OFF	OFF	18	OFF	ON	OFF	OFF	ON
3	ON	ON	OFF	OFF	OFF	19	ON	ON	OFF	OFF	ON
4	OFF	OFF	ON	OFF	OFF	20	OFF	OFF	ON	OFF	ON
5	ON	OFF	ON	OFF	OFF	21	ON	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF	OFF	22	OFF	ON	ON	OFF	ON
7	ON	ON	ON	OFF	OFF	23	ON	ON	ON	OFF	ON
8	OFF	OFF	OFF	ON	OFF	24	OFF	OFF	OFF	ON	ON
9	ON	OFF	OFF	ON	OFF	25	ON	OFF	OFF	ON	ON
10	OFF	ON	OFF	ON	OFF	26	OFF	ON	OFF	ON	ON
11	ON	ON	OFF	ON	OFF	27	ON	ON	OFF	ON	ON
12	OFF	OFF	ON	ON	OFF	28	OFF	OFF	ON	ON	ON
13	ON	OFF	ON	ON	OFF	29	ON	OFF	ON	ON	ON
14	OFF	ON	ON	ON	OFF	30	OFF	ON	ON	ON	ON
15	ON	ON	ON	ON	OFF	31	ON	ON	ON	ON	ON

2.2.2 Baud rate setting

SW7	SW6	Baud rate
OFF	OFF	1Mbps
OFF	ON	500Kbps
ON	OFF	250Kbps
ON	ON	125Kbps

2.2.3 Terminal resistance

SW8	Terminal resistance
OFF	Noneffective
ON	Effective

Chapter III Description of Communication Control

3.1 Control mode

Each drive of this series supports 3 control modes, which can be set through Object 6060h. The current control mode the drive can be monitored through Object 6061h.

Index	Subindex	Name	Parameter value	Data Type	Property
6060h	00	Operating mode	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode;	INTEGER8	RW

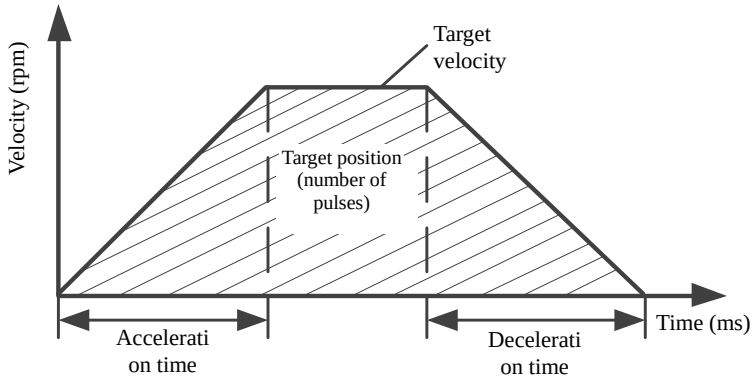
3. 2 Profile position mode

3.2.1 Related parameters

Index	Subindex	Name	Setting range	Data Type	Property
6040h	00	Control command word	0 ～ 65535	UNSIGNED16	RW
6060h	00	Operating mode setting	1,3,4,6	INTEGER8	RW
607Ah	00	Target position	-1000000 ～ +1000000	INTEGER32	RW
6081h	00	Target velocity (rpm)	0 ～ 3000	UNSIGNED32	RW
6083h	00	Acceleration time (ms)	0 ～ 2000	UNSIGNED32	RW
6084h	00	Deceleration time (ms)	0 ～ 2000	UNSIGNED32	RW
2300h	00	Electronic gear numerator	0 ～ 65535	UNSIGNED16	RW
2301h	00	Electronic gear denominator	0 ～ 65535	UNSIGNED16	RW
6041h	00	Status word		UNSIGNED16	RO
6061h	00	Operating mode monitoring		INTEGER8	RO
6064h	00	Current position		INTEGER32	RO

3.2.2 Description of position mode

The motion parameters can be given by the CANopen bus position mode through the master station, which are: target position (607Ah-00), target velocity (6081h-00), acceleration time (6083h-00), deceleration time (6084h-00), and then the motion path can be established by the drive according to these parameters to achieve accurate position control. The motion curve is shown in the following figure:



3.2.3 Description of control steps

1. First, set the operating mode (6060h-00) to 1, and then set the monitoring operating mode (6061h-00) to 1, indicating that it is in the position mode;
2. Write 6, 7 and 15 into the control word in turn at an interval of about 10ms. After writing, the motor can be enabled;
3. Write the motion parameters into the target position (607Ah-00), target velocity (6081h-00), acceleration time (6083h-00) and deceleration time (6084h-00);
4. Enable motor running through Bit4-Bit6 of the control word (6040h-00). See the following for the description of the control word:

Control bit of the command word	Function description
Bit4	1: Enabling a new target position (rising edge triggered)
Bit5	0: Updating motion parameters after completing the current position curve; 1: Updating motion parameters immediately.
Bit6	0: Absolute positioning mode; 1: Relative positioning mode.

Table of control word values:

Command word (6040h-00) setting value (decimal)	Description
6->7->15	Yes
15->31	Enabling absolute positioning (under position mode)
15->95	Enabling relative positioning (under position mode)
15->63	Performing absolute positioning immediately according to the new motion parameters.
15->127	Performing relative positioning immediately according to the new motion parameters.
15->11	Emergency stop

5. The current status of the drive can be monitored through the status word (6041h-00), see the following table:

Corresponding bits of the status word	Description
Bit0~Bit2	When 6040=0, the corresponding bit of 6041 is 000 When 6040=6, the corresponding bit of 6041 is 001 When 6040=7, the corresponding bit of 6041 is 011 When 6040=15, the corresponding bit of 6041 is 111
Bit7	0: Drive ready 1: Drive alarm
Bit8	0: Homing not completed 1: Homing completed
Bit10	0: Motor in operating 1: Motor velocity: 0
Bit12	0: Target position to be effective 1: Target position, effective
Bit15	0: Position mode not in place 1: Position mode positioning completed

3.3 Profile velocity mode

3.3.1 Related parameters

Index	Subindex	Name	Setting range	Data Type	Property
6040h	00	Control command word	0 ～ 65535	UNSIGNED16	RW
6060h	00	Operating mode setting	1,3,4,6	INTEGER8	RW
60FFh	00	Target velocity (rpm)	0 ～ 3000	UNSIGNED32	RW
6083h	00	Acceleration time (ms)	0 ～ 2000	UNSIGNED32	RW
6084h	00	Deceleration time (ms)	0 ～ 2000	UNSIGNED32	RW
6041h	00	Status word		UNSIGNED16	RO
6061h	00	Operating mode monitoring		INTEGER8	RO

3.3.2 Description of control steps

1. First, set the operating mode (6060h-00) to 3, and then set the monitoring operating mode (6061h-00) to 3, indicating that it is in the velocity mode;
2. Write the motion parameters into the target velocity (60FFh-00), acceleration time (6083h-00) and deceleration time (6084h-00);
3. Write 6, 7 and 15 into the control word in turn at an interval of about 10ms. After writing, the motor can be enabled and operated;

3.4 Profile torque mode

3.4.1 Related parameters

Index	Subindex	Name	Setting range	Data Type	Property
6040h	00	Control command word	0 ～ 65535	UNSIGNED16	RW
6060h	00	Operating mode setting	1,3,4,6	INTEGER8	RW
6071h	00	Target torque	-32768 ～ 32767	INTEGER16	RW
6072h	00	Target torque limit	-32768 ～ 32767	INTEGER16	RW
6087h	00	Torque gradient	0 ～ 65535	UNSIGNED32	RW
2406h	00	Velocity limit under torque mode	0 ～ 65535	UNSIGNED16	RW
6077h	00	Feedback torque		INTEGER16	RO
6041h	00	Status word		UNSIGNED16	RO
6061h	00	Operating mode monitoring		INTEGER8	RO

3.4.2 Description of control steps

1. First, set the operating mode (6060h-00) to 4, and then set the monitoring operating mode (6061h-00) to 4, indicating that it is in the torque mode;
2. Write the motion parameters into the target torque (6071h-00), torque limit (6072h-00), torque gradient (6087h-00) and torque velocity limit (2406h-00);
3. Write 6, 7 and 15 into the control word in turn at an interval of about 10ms. After writing, the motor can be enabled and then operated;

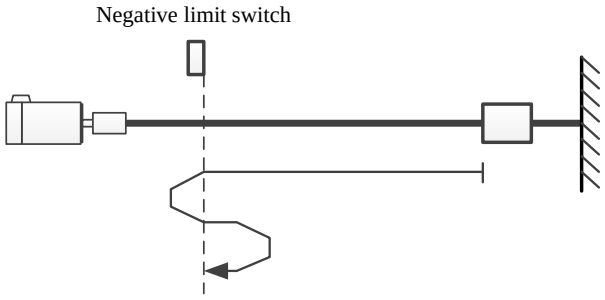
3.5 Homing mode

3.5.1 Related parameters

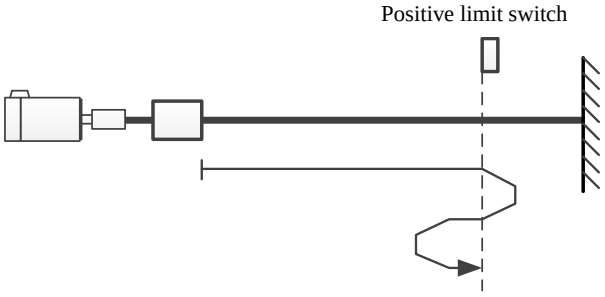
Index	Subindex	Name	Setting range	Data Type	Property
6040h	00	Control command word	0 ～ 65535	UNSIGNED16	RW
6060h	00	Operating mode setting	1,3,4,6	INTEGER8	RW
6098h	00	Homing mode	Standard 1~14, 17~30 and 33～35 modes	UNSIGNED8	RW
6099h	01	Homing velocity (rpm)	0 ～ 3000	UNSIGNED32	RW
6099h	02	Homing creep time (rpm)	0 ～ 3000	UNSIGNED32	RW
609Ah	00	Acceleration / deceleration time (ms)	0 ～ 2000	UNSIGNED32	RW
607Ch	00	Homing offset	-1000000 ～ +1000000	INTEGER32	RW
6041h	00	Status word		UNSIGNED16	RO
6061h	00	Operating mode monitoring		INTEGER8	RO

3.5.2 Description of homing mode

1. Negative limit mode (6098h=17): After homing is allowed, the motor will run in the negative direction at the homing velocity (6099h-01). It will decelerate and stop when the negative limit switch is sensed, then it will run in the positive direction at the homing velocity (6099h-01) for a certain distance and decelerate and stop. Then it will run in the negative direction at a homing creep velocity (6099h-02). When the negative limit switch is sensed, the motor will stop, indicating that the homing operation is completed.

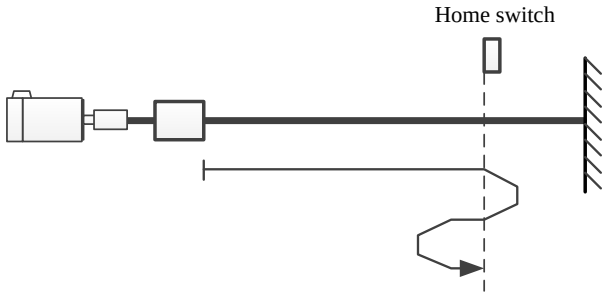


2. Positive limit mode (6098h=18): After homing is allowed, the motor will run in the positive direction at the homing velocity (6099h-01). It will decelerate and stop when the positive limit switch is sensed, then it will run in the negative direction at the homing velocity (6099h-01) for a certain distance and decelerate and stop. Then it will run in the positive direction at a homing creep velocity (6099h-02). When the positive limit switch is sensed, the motor will stop, indicating that the homing operation is completed.

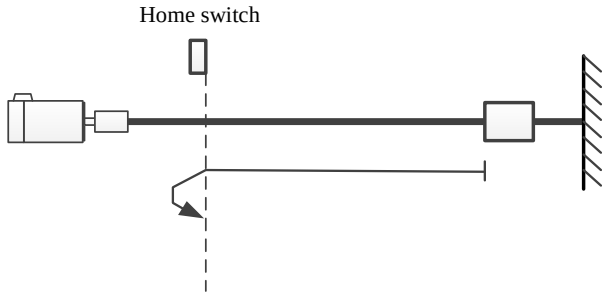


3. Positive origin mode (6098h=24): After homing is allowed, the motor will run in the positive direction at the homing velocity (6099h-01). It will decelerate and stop when the origin switch is sensed, then it will run in the negative direction at the homing velocity (6099h-01) for a certain distance and decelerate and stop. Then it will run in the positive direction at a homing creep velocity (6099h-02). When the origin switch is sensed, the

motor will stop, indicating that the homing operation is completed.



4. Negative origin mode (6098h=29): After homing is allowed, the motor will run in the negative direction at the homing velocity (6099h-01). It will decelerate and stop when the origin switch is sensed. Then it will run in the positive direction at a homing creep velocity (6099h-02). When leaving the origin switch is sensed, the motor will stop, indicating that the homing operation is completed.



3.4.3 Description of control steps

1. First, set the operating mode (6060h-00) to 6, and then set the monitoring operating mode (6061h-00) to 6, indicating that it is in the homing mode;
2. Write 6, 7 and 15 into the control word in turn at an interval of about 10ms. After writing, the motor can be enabled;
3. Write the homing parameters into the homing mode (6098h-00), homing velocity (6099h-01), homing creep velocity (6099h-02), acceleration / deceleration time (609Ah-00);
4. Enable homing through Bit4 of the control word (6040h-00). See the following:

Control bit of the command word	Function description
Bit4	0->1: Starting homing; 1->0: Stopping homing;

5. The current status of the drive can be monitored through the status word (6041h-00), see the following table:

Corresponding bits of the status word	Name	Description
Bit8	Homing status	0: Homing not completed 1: Homing completed
Bit10	Motion status	0: Motor in operating 1: Motor velocity: 0

3.6 Other common functions

3.6.1 Clearing current position

When the value in Index 2200h-00 changes from 0 to 1, the current position value will be cleared to zero, which

should be manually set to 0. This operation can be performed through the SDO-command.

3.6.2 Saving parameters

When 1 is written into Index 2201h-00 through SDO, the current parameters of the drive will be saved. This operation is often used to save parameters such as homing velocity, acceleration/deceleration and homing mode.

3.6.2 Alarm reset

Set Bit7 of Control Word 6040h-00 to 1 to reset the drive alarm. It should be set to 0 manually.

Chapter IV Description of Object Dictionary and Parameter

4.1 Object dictionary

4.1.1 1000h group objects

Index	Subindex	Register address	Meaning	Description	Property	Data Type
1000	00		Device type	This device supports CIA301 and CIA402 protocols	（RO）	U32
1009	00		Hardware version	Hardware version	（RO）	U16
100A	00		Software version	Software version	（RO）	U16
1600	00		Receive PDO 1 Mapping	Receive PDO 1 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1601	00		Receive PDO 2 Mapping	Receive PDO 2 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1602	00		Receive PDO 3 Mapping	Receive PDO 3 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1603	00		Receive PDO 4 Mapping	Receive PDO 4 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1A00	00		TransmitPDO 1 Mapping	TransmitPDO 1 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1A01	00		TransmitPDO 2 Mapping	TransmitPDO 2 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32
1A02	00		TransmitPDO 3 Mapping	TransmitPDO 3 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32

1A03	00		TransmitPDO 4 Mapping	TransmitPDO 4 Mapping	（RW）	U8
	01				（RW）	U32
	02				（RW）	U32
	03				（RW）	U32
	04				（RW）	U32

4.1.2 Factory defined 2000h parameters

Index	Subindex	Register address	Meaning	Description	Property	Range
2000	00	0x0000	Device information	Device information	RO	-
2001	00	0x0001	Software version	Software version	RO	-
2100	00	0x0006	DI group terminal status	Code / Status Bit0 / DI0 Bit1 / DI1 Bit2 / DI2 Bit3 / DI3 Bit4 / DI4 Bit5 / DI5 Bit6 / DI6	RO	-
2101	00	0x0007	DO group terminal status	Code / Status Bit0 / DO0 Bit1 / DO1 Bit2 / DO2	RO	-
2102	00	0x0008	Drive error code	1000: Overcurrent; 1001: Overvoltage; 1002: Undervoltage; 1003: Encoder HALL signal error; 1004: U-phase overcurrent; 1005: V-phase overcurrent; 1006: W-phase overcurrent; 1007: Overload; 1008: Position out-of-tolerance; 1009: U-phase current calibration error; 1010: V-phase current calibration error; 1011: Bus voltage calibration error; 1012: EEPROM read error; 1013: EEPROM writing error;	RO	-
2200	00	0x0061	Clear current position	0: Noneffective; 1: Clear;	RW Effective immediately	-
2201	00	0x0063	Parameter saving	0: Noneffective; 1: Effective;	RW Effective immediately	-
2202	00	0x0064	Factory parameter restoring	0: Noneffective; 1: Effective;	RW Effective immediately	-
2203	00	0x0062	Alarm clearing	0: Noneffective; 1: Clear;	RW Effective immediately	-
2300	00	0x0067	Electronic gear numerator	Electronic gear numerator	RW Effective after power-on	-
2301	00	0x0068	Electronic gear denominator	Electronic gear denominator	RW Effective after power-on	-

<table>
<tr><td>2302</td><td>00</td><td>0x0069</td><td>Default direction</td><td>0: Default;
1: Negative;</td><td>RW
Effective after power-on</td><td>-</td></tr>
<tr><td>2400</td><td>01</td><td>0x0086</td><td>Input terminal polarity</td><td><table><tr><td>Code</td><td>Status</td></tr><tr><td>Bit0</td><td>DI0</td></tr><tr><td>Bit1</td><td>DI1</td></tr><tr><td>Bit2</td><td>DI2</td></tr><tr><td>Bit3</td><td>DI3</td></tr><tr><td>Bit4</td><td>DI4</td></tr></table>0: Normally open; 1: Normally closed</td><td>RW
Effective after release and writing</td><td>-</td></tr>
<tr><td>2400</td><td>02</td><td>0x0087</td><td>DI Input Port 0</td><td rowspan="5"><table><tr><td>Code</td><td>Functions</td></tr><tr><td>0x00</td><td>N/A</td></tr><tr><td>0x01</td><td>Origin signal</td></tr><tr><td>0x02</td><td>Positive limit</td></tr><tr><td>0x03</td><td>Negative limit</td></tr><tr><td>0x04</td><td>Signal release</td></tr><tr><td>0x05</td><td>Signal stop</td></tr><tr><td>0x06</td><td>Forced emergency stop</td></tr></table></td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>03</td><td>0x0088</td><td>DI Input Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>04</td><td>0x0089</td><td>DI Input Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>05</td><td>0x008A</td><td>DI Input Port 3</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>06</td><td>0x008B</td><td>DI Input Port 4</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>07</td><td>0x0081</td><td>Input terminal filtering</td><td>Input terminal filtering</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>0C</td><td>0x008C</td><td>Output terminal polarity</td><td><table><tr><td>Code</td><td>Status</td></tr><tr><td>Bit0</td><td>DO0</td></tr><tr><td>Bit1</td><td>DO1</td></tr><tr><td>Bit2</td><td>DO2</td></tr></table>0: Normally open; 1: Normally closed</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>0D</td><td>0x008D</td><td>DO Output Port 0</td><td rowspan="3"><table><tr><td>Code</td><td>Functions</td></tr><tr><td>0x00</td><td>N/A</td></tr><tr><td>0x01</td><td>Alarm output</td></tr><tr><td>0x02</td><td>Motor running</td></tr><tr><td>0x03</td><td>Homing completed</td></tr><tr><td>0x04</td><td>In-place signal</td></tr><tr><td>0x05</td><td>Z signal</td></tr><tr><td>0x06</td><td>Signal of internal contracting brake</td></tr><tr><td>0x09</td><td>User Definition 0</td></tr><tr><td>0x0A</td><td>User Definition 1</td></tr><tr><td>0x0B</td><td>User Definition 2</td></tr></table></td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>0E</td><td>0x008E</td><td>DO Output Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2400</td><td>0F</td><td>0x008F</td><td>DO Output Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>2401</td><td>00</td><td>0x006A</td><td>Opening delay of brake</td><td>Opening delay of brake, unit: ms</td><td>RW
Effective after power-on</td><td>-</td></tr>
<tr><td>2402</td><td>00</td><td>0x006B</td><td>Closing delay of brake</td><td>Closing delay of brake, unit: ms</td><td>RW
Effective after power-on</td><td>-</td></tr>
<tr><td>2403</td><td>00</td><td>0x006C</td><td>Relief opening threshold</td><td>Relief opening threshold, unit: 0.001V</td><td>RW
Effective after power-on</td><td>-</td></tr>
<tr><td>2404</td><td>00</td><td>0x006D</td><td>Relief closing threshold</td><td>Relief closing threshold, unit: 0.001V</td><td>RW
Effective after power-on</td><td>-</td></tr>
</table>

2405	00	0x0083	Software limit switch	0: Noneffective; 1: Effective after homing	RW Effective immediately	-
2406	00	0x0085	Velocity limit under torque mode	Unit: rpm	RW Effective after release and writing	-
2500	00	0x0076	Out-of-tolerance threshold	Unit: pulse	RW Effective after release and writing	-
2501	00	0x0070	In-place error	Unit: pulse	RW Effective after release and writing	-
2502	00	0x0071	In-place time	Unit: ms	RW Effective after release and writing	-
2503	00	0x002F	Max. bus voltage	Unit: 0.001V	RW Effective after release and writing	8000
2504	00	0x0030	Min. bus voltage	Unit: 0.001V	RW Effective after release and writing	1800
2505	00	0x0031	Max. phase current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
2506	00	0x0032	Max. continuous line current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
2508	00	0x0034	Position loop output limit	Unit: rpm	RW Effective after release and writing	4500
2509	00	0x0035	Velocity loop output limit	Unit: 0.1% rated current	RW Effective after release and writing	2000
250A	00	0x0036	d-axis current loop limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	500
250B	00	0x0037	Voltage vector limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	900
250C	00	0x0048	Load inertia ratio	Load inertia ratio	RW Effective after release and writing	-
250D	00	0x004A	Rigidity coefficient	Rigidity coefficient 0：100%； 1：80%； 2：75%； 3：50%；	RW Effective after release and writing	-

4.1.3 6000h group objects

Index	Subindex	Register address	Meaning	Description	Property	Range
603F	00	0x0200	603F mapping	603F mapping	RO	-
6040	00	0x0201	Control command	Control word	RW Effective immediately	-
6041	00	0x0202	6041 mapping	6041 mapping	RO	-
6060	00	0x0204	Operating mode	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode;	RW Effective immediately	-
6061	00	0x0205	Operating mode display	6061 mapping	RO	-
6064	00	0x0206	Current position H	Unit: pulse	RO	-
		0x0207	Current position L	Unit: pulse	RO	-
606C	00	0x0208	Current velocity H	Unit: rpm	RO	-
		0x0209	Current velocity L	Unit: rpm	RO	-
607A	00	0x020A	Target position H under position mode	Unit: pulse	RW Effective immediately	-
		0x020B	Target position L under position mode	Unit: pulse	RW Effective immediately	-
6081	00	0x020C	Target velocity H under position mode	Unit: rpm	RW Effective immediately	-
		0x020D	Target velocity L under position mode	Unit: rpm	RW Effective immediately	-
6083	00	0x020E	Acceleration time H under position mode	Unit: ms	RW Effective immediately	-
		0x020F	Acceleration time L under position mode	Unit: ms	RW Effective immediately	-
6084	00	0x0210	Deceleration time H under position mode	Unit: ms	RW Effective immediately	-
		0x0211	Deceleration time L under position mode	Unit: ms	RW Effective immediately	-
60FF	00	0x0212	Target velocity H under velocity mode	Unit: rpm	RW Effective immediately	-
		0x0213	Target velocity L under velocity mode	Unit: rpm	RW Effective immediately	-
6098	00	0x0214	Homing mode	Standard 1~14, 17~30 and 33~35 modes	RW Effective immediately	-
6099	01	0x0215	Homing velocity H	Unit: rpm	RW Effective immediately	-
		0x0216	Homing velocity L	Unit: rpm	RW Effective immediately	-
6099	02	0x0217	Queried homing velocity H	Unit: rpm	RW Effective immediately	-
		0x0218	Queried homing velocity L	Unit: rpm	RW Effective immediately	-

609A	00	0x0219	Homing acceleration / deceleration H	Unit: ms	RW Effective immediately	-
		0x021A	Homing acceleration / deceleration L	Unit: ms	RW Effective immediately	-
607C	00	0x021B	Homing offset H	Unit: pulse	RW Effective immediately	-
		0x021C	Homing offset L	Unit: pulse	RW Effective immediately	-
607D	01	0x021D	Positive software limit H	Unit: pulse	RW Effective immediately	-
		0x021E	Positive software limit L	Unit: pulse	RW Effective immediately	-
607D	02	0x021F	Negative software limit H	Unit: pulse	RW Effective immediately	-
		0x0220	Negative software limit L	Unit: pulse	RW Effective immediately	-
6071	00	0x0221	Target torque	Unit: 0.1% p.u.	RW Effective immediately	-
6072	00	0x0222	Target torque limit	Unit: 0.1% p.u.	RW Effective immediately	-
6077	00	0x0223	Feedback torque	Unit: 0.1% p.u.	RW Effective immediately	-
6087	00	0x0224	Torque gradient H	Unit: 0.1% p.u.	RW Effective immediately	-
		0x0225	Torque gradient L	Unit: 0.1% p.u.	RW Effective immediately	-
60FD	00	0x0226	60FD mapping	Bit0: Negative limit; Bit1: Positive limit; Bit2: Origin;	RW Effective immediately	-
		0x0227	60FD mapping		RW Effective immediately	-
60FE	01	0x0228	60FE 01 mapping	Physical output	RW Effective immediately	-
		0x0229	60FE 01 mapping		RW Effective immediately	-
60FE	02	0x022A	60FE 02 mapping	Output shield	RW Effective immediately	-
		0x022B	60FE 02 mapping		RW Effective immediately	-

4.2 Drive parameters

4.2.1 Motor parameters

No.	Register address	Meaning	Description	Property	Range
PA_02	0x0002	Motor model	1: 100W-2500 motors; 2: 200W-2500 motors; 3: 400W-2500 motors; 4: 750W-2500 motors;	RW	1
PA_18	0x0018	Rated power	Unit: W;	RW is effective after power-on	-
PA_19	0x0019	Rated voltage	Unit: 0.001V	RW is effective after power-on	-
PA_1A	0x001A	Rated current	Unit: 0.001A	RW is effective after power-on	-
PA_1B	0x001B	Rotating velocity	Unit: rpm	RW is effective after power-on	-
PA_1C	0x001C	Rated torque	Unit: 0.001Nm	RW is effective after power-on	-
PA_1D	0x001D	Peak torque	Unit: 0.001Nm	RW is effective after power-on	-
PA_1E	0x001E	Line inductance	Unit: 0.001mH	RW is effective after power-on	-
PA_1F	0x001F	Line resistance	Unit: 0.001 Ω	RW is effective after power-on	-
PA_20	0x0020	Rotational inertia	Unit: Kg.m2×10e-7	RW is effective after power-on	-
PA_21	0x0021	Torque coefficient	Unit: mN.m/Arms	RW is effective after power-on	-
PA_22	0x0022	Back EMF coefficient	Unit: V/rpm	RW is effective after power-on	-
PA_24	0x0024	Number of pole pairs	Default 5-pole-pair motor	RW is effective after power-on	-
PA_25	0x0025	Number of encoder lines	Default 2500-line motor	RW is effective after power-on	-

4.2.2 Operating parameters

	Register address	Meaning	Description	Property	Range
PA_2F	0x002F	Max. bus voltage	Unit: 0.001V	RW Effective after release and writing	8000
PA_30	0x0030	Min. bus voltage	Unit: 0.001V	RW Effective after release and writing	1800
PA_31	0x0031	Max. phase current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
PA_32	0x0032	Max. continuous line current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
PA_34	0x0034	Position loop output limit	Unit: rpm	RW Effective after release and writing	4500
PA_35	0x0035	Velocity loop output limit	Unit: 0.1% rated current	RW Effective after release and writing	2000
PA_36	0x0036	d-axis current loop limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	500

PA_37	0x0037	Voltage vector limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	900
PA_38	0x0038	1st gain of position loop	1st proportional gain of position loop	RW Effective immediately	-
PA_39	0x0039	2nd gain of position loop	2nd proportional gain of position loop	RW Effective immediately	-
PA_3B	0x003B	Velocity feedforward coefficient of position loop	Velocity feedforward coefficient of position loop, unit: 0.1%	RW Effective immediately	-
PA_3C	0x003C	Velocity feedforward low-pass filtering bandwidth	Velocity feedforward low-pass filtering, unit: Hz	RW Effective after release and writing	-
PA_3D	0x003D	1st gain of velocity loop	1st gain of velocity loop	RW Effective immediately	-
PA_3E	0x003E	2nd gain of velocity loop	2nd gain of velocity loop	RW Effective immediately	-
PA_3F	0x003F	1st integral of velocity loop	1st integral of velocity loop	RW Effective immediately	-
PA_40	0x0040	2nd integral of velocity loop	2nd integral of velocity loop	RW Effective immediately	-
PA_41	0x0041	Interference resistance gain	This parameter can be increased gradually during positioning oscillation, and the default value is 0	RW Effective immediately	-
PA_42	0x0042	Acceleration feedforward coefficient	Acceleration feedforward coefficient, unit: 0.1%	RW Effective immediately	-
PA_43	0x0043	Acceleration feedforward low-pass filtering bandwidth	Acceleration feedforward low-pass filtering, unit: Hz	RW Effective after release and writing	-
PA_44	0x0044	Current loop gain	Current loop gain	RW Effective immediately	-
PA_45	0x0045	Current loop integral	Current loop integral	RW Effective immediately	-
PA_46	0x0046	Gain setting	0: Effective 1st gain; 0: Effective 2nd gain;	RW Effective after release and writing	-
PA_48	0x0048	Load inertia ratio	Load inertia ratio	RW Effective after release and writing	-
PA_4A	0x004A	Rigidity coefficient	Rigidity coefficient 0：100%； 1：80%； 2：75%； 3：50%；	RW Effective after release and writing	-
PA_4B	0x004B	Filter On configuration	Bit definition, 0: Disable; 1: Enable; Bit0: Given velocity filtering; Bit1: Velocity feedback filtering; Bit2: Given current filtering; Bit3: Current feedback filtering; Bit4: Torque filter, second-order notch filter;	RW Effective after release and writing	7
PA_4C	0x004C	Given velocity filtering bandwidth	Given velocity filtering bandwidth, unit: Hz	RW Effective after release and writing	-

PA_4D	0x004D	Velocity feedback filtering bandwidth	Velocity feedback filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_4E	0x004E	Given current filtering bandwidth	Given current filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_4F	0x004F	Current feedback filtering bandwidth	Current feedback filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_50	0x0050	Torque notch filter frequency	Torque notch filter frequency, unit: Hz	RW Effective after release and writing	-
PA_51	0x0051	Torque notch filter width	Torque notch filter width, unit: Hz	RW Effective after release and writing	-
PA_52	0x0052	Torque notch filter depth	Torque notch filter depth, unit: dB	RW Effective after release and writing	-
PA_53	0x0053	Filter parameter calculation	0: N/A; 1: Calculate filter parameters	RW Effective after release and writing	-
PA_54	0x0054	Jerk smoothing factor	0: N/A; Level 1~7 smoothing ;	RW Effective after release and writing	-
PA_067	0x0067	Electronic gear numerator	Electronic gear numerator	RW Effective after power-on	-
PA_068	0x0068	Electronic gear denominator	Electronic gear denominator	RW Effective after power-on	-
PA_069	0x0069	Default direction	0: Default; 1: Negative;	RW Effective after power-on	-
PA_06A	0x006A	Opening delay of brake	Opening delay of brake, unit: ms	RW Effective after power-on	-
PA_06B	0x006B	Closing delay of brake	Closing delay of brake, unit: ms	RW Effective after power-on	-
PA_06C	0x006C	Relief opening threshold	Relief opening threshold, unit: 0.001V	RW Effective after power-on	-
PA_06D	0x006D	Relief closing threshold	Relief closing threshold, unit: 0.001V	RW Effective after power-on	-
PA_070	0x0070	In-place error	Unit: pulse	RW Effective after release and writing	-
PA_071	0x0071	In-place time	Unit: ms	RW Effective after release and writing	-
PA_076	0x0076	Out-of-tolerance threshold	Unit: pulse	RW Effective after release and writing	-
PA_081	0x0081	Input terminal filtering	Input terminal filtering	RW Effective immediately	-
PA_083	0x0083	Software limit switch	0: Noneffective; 1: Effective after homing	RW Effective immediately	-
PA_085	0x0085	Velocity limit under torque mode	Unit: rpm	RW Effective after release and writing	-

<table>
<tr><td>PA_086</td><td>0x0086</td><td>Input terminal polarity</td><td><table><tr><td>Code</td><td>Status</td></tr><tr><td>Bit0</td><td>DI0</td></tr><tr><td>Bit1</td><td>DI1</td></tr><tr><td>Bit2</td><td>DI2</td></tr><tr><td>Bit3</td><td>DI3</td></tr><tr><td>Bit4</td><td>DI4</td></tr></table>0: Normally open; 1: Normally closed</td><td>RW
Effective after release and writing</td><td>-</td></tr>
<tr><td>PA_087</td><td>0x0087</td><td>DI Input Port 0</td><td rowspan="5"><table><tr><td>Code</td><td>Functions</td></tr><tr><td>0x00</td><td>N/A</td></tr><tr><td>0x01</td><td>Origin signal</td></tr><tr><td>0x02</td><td>Positive limit</td></tr><tr><td>0x03</td><td>Negative limit</td></tr><tr><td>0x04</td><td>Signal release</td></tr><tr><td>0x05</td><td>Signal stop</td></tr><tr><td>0x06</td><td>Forced emergency stop</td></tr></table></td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_088</td><td>0x0088</td><td>DI Input Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_089</td><td>0x0089</td><td>DI Input Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08A</td><td>0x008A</td><td>DI Input Port 3</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08B</td><td>0x008B</td><td>DI Input Port 4</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08C</td><td>0x008C</td><td>Output terminal polarity</td><td><table><tr><td>Code</td><td>Status</td></tr><tr><td>Bit0</td><td>DO0</td></tr><tr><td>Bit1</td><td>DO1</td></tr><tr><td>Bit2</td><td>DO2</td></tr></table>0: Normally open; 1: Normally closed</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08D</td><td>0x008D</td><td>DO Output Port 0</td><td rowspan="3"><table><tr><td>Code</td><td>Functions</td></tr><tr><td>0x00</td><td>N/A</td></tr><tr><td>0x01</td><td>Alarm output</td></tr><tr><td>0x02</td><td>Motor running</td></tr><tr><td>0x03</td><td>Homing completed</td></tr><tr><td>0x04</td><td>In-place signal</td></tr><tr><td>0x05</td><td>Z signal</td></tr><tr><td>0x06</td><td>Signal of internal contracting brake</td></tr><tr><td>0x09</td><td>User Definition 0</td></tr><tr><td>0x0A</td><td>User Definition 1</td></tr><tr><td>0x0B</td><td>User Definition 2</td></tr></table></td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08E</td><td>0x008E</td><td>DO Output Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08F</td><td>0x008F</td><td>DO Output Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
</table>

4.2.3 Motion parameters

No.	Register address	Meaning	Description	Property	Range
PA_201	0x0201	Control command	Control word	RW Effective immediately	-
PA_204	0x0204	Operating mode	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode;	RW Effective immediately	-
PA_20A	0x020A	Target position H under position mode	Unit: pulse	RW Effective immediately	-
PA_20B	0x020B	Target position L under position mode	Unit: pulse	RW Effective immediately	-

PA_20C	0x020C	Target velocity H under position mode	Unit: rpm	RW Effective immediately	-
PA_20D	0x020D	Target velocity L under position mode	Unit: rpm	RW Effective immediately	-
PA_20E	0x020E	Acceleration time H under position mode	Unit: ms	RW Effective immediately	-
PA_20F	0x020F	Acceleration time L under position mode	Unit: ms	RW Effective immediately	-
PA_210	0x0210	Deceleration time H under position mode	Unit: ms	RW Effective immediately	-
PA_211	0x0211	Deceleration time L under position mode	Unit: ms	RW Effective immediately	-
PA_212	0x0212	Target velocity H under velocity mode	Unit: rpm	RW Effective immediately	-
PA_213	0x0213	Target velocity L under velocity mode	Unit: rpm	RW Effective immediately	-
PA_214	0x0214	Homing mode	Standard 1~14, 17~30 and 33~35 modes	RW Effective immediately	-
PA_215	0x0215	Homing velocity H	Unit: rpm	RW Effective immediately	-
PA_216	0x0216	Homing velocity L	Unit: rpm	RW Effective immediately	-
PA_217	0x0217	Queried homing velocity H	Unit: rpm	RW Effective immediately	-
PA_218	0x0218	Queried homing velocity L	Unit: rpm	RW Effective immediately	-
PA_219	0x0219	Homing acceleration / deceleration H	Unit: ms	RW Effective immediately	-
PA_21A	0x021A	Homing acceleration / deceleration L	Unit: ms	RW Effective immediately	-
PA_21B	0x021B	Homing offset H	Unit: pulse	RW Effective immediately	-
PA_21C	0x021C	Homing offset L	Unit: pulse	RW Effective immediately	-
PA_21D	0x021D	Positive software limit H	Unit: pulse	RW Effective immediately	-
PA_21E	0x021E	Positive software limit L	Unit: pulse	RW Effective immediately	-
PA_21F	0x021F	Negative software limit H	Unit: pulse	RW Effective immediately	-
PA_220	0x0220	Negative software limit L	Unit: pulse	RW Effective immediately	-

PA_221	0x0221	Target torque	Unit: 0.1% p.u.	RW Effective immediately	-
PA_222	0x0222	Target torque limit	Unit: 0.1% p.u.	RW Effective immediately	-
PA_223	0x0223	Feedback torque	Unit: 0.1% p.u.	RW Effective immediately	-
PA_224	0x0224	Torque gradient H	Unit: 0.1% p.u.	RW Effective immediately	-
PA_225	0x0225	Torque gradient L	Unit: 0.1% p.u.	RW Effective immediately	-
PA_226	0x0226	60FD mapping	Bit0: Negative limit; Bit1: Positive limit; Bit2: Origin;	RW Effective immediately	-
PA_227	0x0227	60FD mapping		RW Effective immediately	-
PA_228	0x0228	60FE 01 mapping	Physical output	RW Effective immediately	-
PA_229	0x0229	60FE 01 mapping		RW Effective immediately	-
PA_22A	0x022A	60FE 02 mapping	Output shield	RW Effective immediately	-
PA_22B	0x022B	60FE 02 mapping		RW Effective immediately	-

Chapter V Troubleshooting

4.1 Description and handling method of alarm indicator

Number of flashes	Description	Troubleshooting
1	Overcurrent	1. Motor line power line short circuit or motor fault; 2. Incorrect phase sequence of motor power line, check the phase sequence; 3. Incorrect set motor model. Check the motor model; 4. Too heavy load, first check the no-load operation for being normal; 5. Too high set gain parameter, reduce the gain parameter. 6. Internal failure of drive, send it back to the factory for maintenance.
2	Overvoltage	1. Check for too high power supply voltage, reduce the voltage or replace the power supply if necessary; 2. Internal fault of drive, sent it back to the factory for maintenance.
3	Undervoltage	1. Check the power supply voltage for being low, reduce the voltage or replace the power supply; 2. Internal fault of drive, sent it back to the factory for maintenance.
4	Encoder disconnection error	1. Check the encoder for being disconnected and the plug for loose insertion; 2. Replace the motor and check the motor encoder for malfunction; 3. Bad drive encoder, send it back to the factory for maintenance.
5	Phase current error	1. Motor phase sequence error. Check the motor power line for incorrect connection; 2. Internal fault of drive, sent it back to the factory for maintenance.
6	I2T error	Initialize the parameters and restart the device to check for alarms. If the alarms still occur, send it back to the factory for maintenance.
7	Position out-of-tolerance	1. Check the power line for phase loss; 2. Check for too high load; 3. Check for too high velocity, and reduce the velocity if necessary; 4. Too low set position out-of-tolerance threshold, increase this parameter PA_76;

Chapter V Description of MODBUS RTU Protocol

5.1 Parameter reading command (0x03)

Command sent by master station (PLC, etc.):

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x03	CMD	Function code, here is 0x03, indicating that it is a command to read parameters
3rd Byte	0x00	Start AddrH	Upper 8 bits of the starting address of the read parameter
4th Byte	0x0A	Start AddrL	Lower 8 bits of the starting address of the read parameter
5th Byte	0x00	Num_ High(Byte)	Upper 8 bits of the number of read parameters Note: The number here refers to how many registers (words), not how many bytes.
6th Byte	0x01	Num_Low(Byte)	Lower 8 bits of the number of read parameters
7th Byte	0Xa4	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 6th byte).
8th Byte	0x08	CRC_L	Low bit of CRC check.

[For the above example: A parameter is read from the master station with the slave station address set as 1 and the starting address, as 10 (0x000A), namely, two bytes are read]

Slave station (drive) response:

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x03	CMD	Function code, 0x03, corresponding to the master command
3rd Byte	0x02	Data Lenth	Data length of the response, unit: bytes
4th Byte	0x00	Data0	Data 0 (high bit of the 1st register)
5th Byte	0x00	Data0	Data 0 (low bit of the 1st register)
6th Byte	0Xb8	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 9th byte).
7th Byte	0x44	CRC_L	Low bit of CRC check.

[Responded data0: 0x0000;]

5.2 Single-register writing command (0x06)

Command sent by master station (PLC, etc.):

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x06	CMD	Function code, here is 0x06, indicating that it is to write a parameter command
3rd Byte	0x00	Start AddrH	Upper 8 bits of the starting address of the written parameter
4th Byte	0x70	Start AddrL	Lower 8 bits of the starting address of the written parameter
5th Byte	0x00	DATA(0)	Upper 8 bits of the written data.
6th Byte	0x14	DATA(1)	Lower 8 bits of the written data.
7th Byte	0x88	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 6th byte).
8th Byte	0x1E	CRC_L	Low bit of CRC check.

[For the above example: A parameter is written from the master station with the slave station address set as 1 and the starting address, as 112(0x0070), the value is 20(0x0014)]

Slave station (drive) response:

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x06	CMD	Function code, 0x06, corresponding to the master command
3rd Byte	0x00	Start AddrH	Upper 8 bits of the starting address of the written parameter
4th Byte	0x70	Start AddrL	Lower 8 bits of the starting address of the written parameter
5th Byte	0x00	DATA(0)	Upper 8 bits of the written data.
6th Byte	0x14	DATA(1)	Lower 8 bits of the written data.
7th Byte	0x88	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 6th byte).
8th Byte	0x1E	CRC_L	Low bit of CRC check.

5.3 Muiti-register writing command (0x10)

Command sent by master station (PLC, etc.):

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x10	CMD	Function code, here is 0x10, indicating that it is to write multiple parameter commands
3rd Byte	0x00	Start AddrH	Upper 8 bits of the starting address of the written parameter
4th Byte	0xB0	Start AddrL	Lower 8 bits of the starting address of the written parameter
5th Byte	0x00	NUM_H	Upper 8 bits of the number of parameters (registers) written
6th Byte	0x02	NUM_L	Lower 8 bits of the number of parameters (registers) written
7th Byte	0x04	Data Length	The number of bytes of the parameter written is twice the number of registers
8th Byte	0x03	DATA(0)	Upper 8 bits of the first data written.
9th Byte	0xE8	DATA(0)	Lower 8 bits of the first data written.
10th Byte	0x00	DATA(1)	Upper 8 bits of the second data written.
11th Byte	0x64	DATA(1)	Lower 8 bits of the second data written.
12th Byte	0x79	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 6th byte).
13th Byte	0x40	CRC_L	Low bit of CRC check.

[For the above example: 2 parameters are written from the master station with the slave station address set as 1 and the starting address, as 176(0x00B0), which are:
176(0x00B0)=1000(0x03E8)、177(0x00B1)=100(0x0064)]

Slave station (drive) response:

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x10	CMD	Function code, 0x10, corresponding to the master command
3rd Byte	0x00	Start AddrH	Upper 8 bits of the starting address of the written parameter
4th Byte	0xB0	Start AddrL	Lower 8 bits of the starting address of the written parameter
5th Byte	0x00	NUM_H	Upper 8 bits of the number of parameters to be written (number of registers).
6th Byte	0x02	NUM_L	Lower 8 bits of the number of parameters to be written (number of registers).
7th Byte	0x40	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 6th byte).
8th Byte	0x2F	CRC_L	Low bit of CRC check.

5.4 Abnormal response and error code

Regardless of the read or write command, if the slave responds abnormally, its response frame is changed. As follows

Byte order	Command example	Functional symbols	Functions
1st Byte	0x01	Slave Addr	Slave address, here is 1
2nd Byte	0x06	CMD|0x80	Highest Position 1 of function code
3rd Byte	0x04	Error Code	Error code. There are the following types:
			0x02: Illegal address
			0x03: Illegal data
			0x04: Refused to execute
4th Byte	0x10	CRC_H	High bit of CRC check. CRC check refers to the CRC checksum of the 1st to the previous byte (here is the 3rd byte).
5th Byte	0x00	CRC_L	Low bit of CRC check.

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