DS_R 485 Bus Type DC Servo

User Manual

Shenzhen Xinlichuan Electric Co., Ltd.

Contents

Chapter I Product Introduction

1.1 Product Introduction

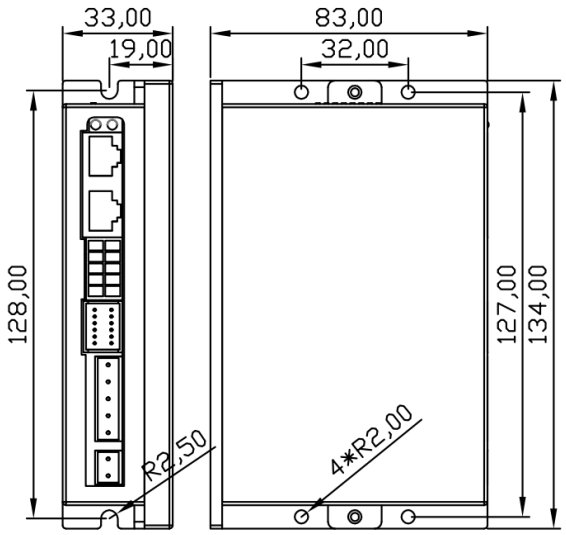
The low-voltage servo drives of DS series are low-voltage servo products developed based on the latest generation 32-bit DSP chips and combined with our company's years of experience in servo motion control, including pulse type, CANopen bus type and RS485 bus type products controlled with three kinds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

This drive can support specs from 100W to 750W. The encoder is a 2500ppr incremental low-voltage servo motor powered by a low-voltage DC supply. External braking resistors can be connected. RS485 interface and standard MODBUS RTU communication protocol are adopted. Up to 31 drives can be used for networking. It also supports position mode, velocity mode, torque mode, internal 16-segment position and internal 16-segment velocity modes and built-in 31 standard homing modes thanks to its easy control, powerful functions, high overload capacity, low noise and quick response, etc.

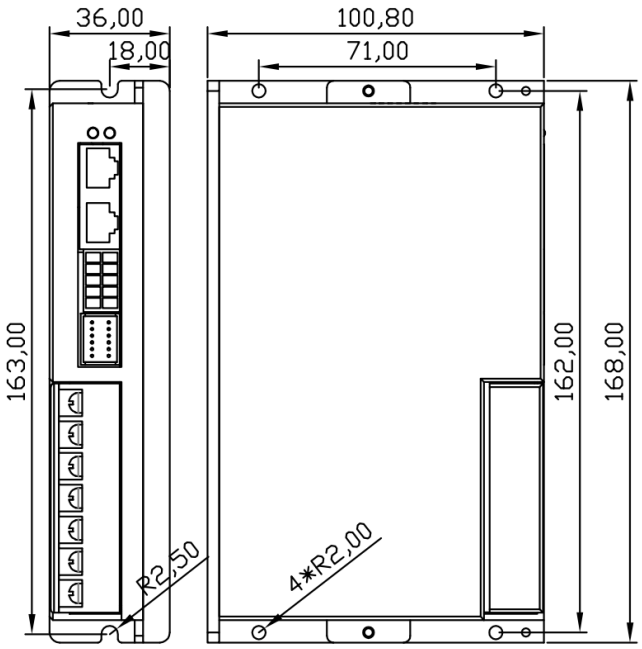
1.2 Product specification

Drive model / Parameter		DS_R_100	DS_R_200	DS_R_400	DS_R_750
Matched motor		100W	200W	400W	750W
Encoder		2500ppr 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_P_100/200/400 drive



Dimensions of DS_P_750 drive

Chapter II Wiring and Setting

2.1 Description of terminal function

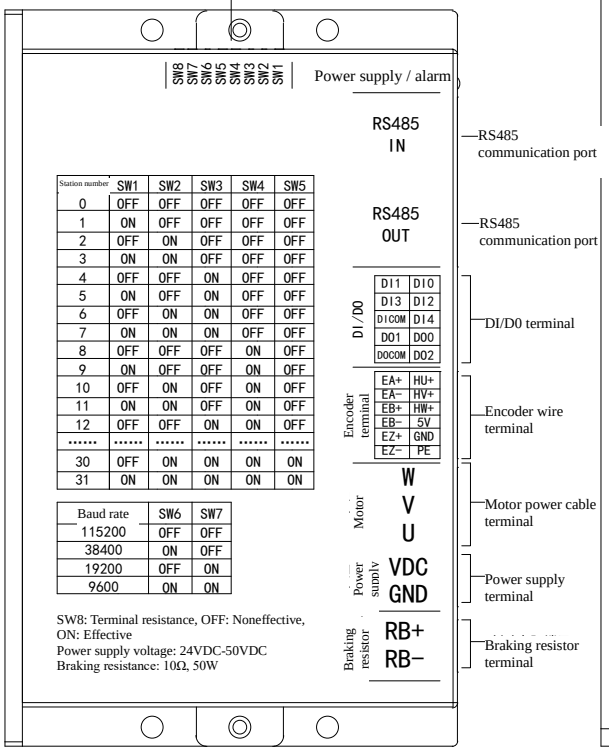


Fig. 1: 100W~400W driver terminals

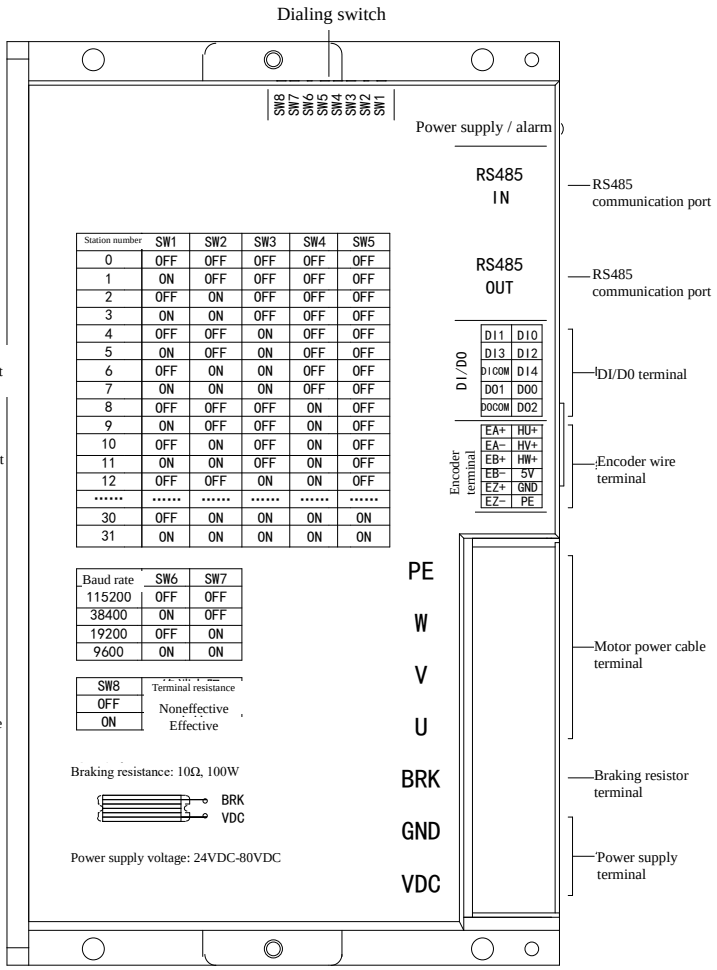


Fig. 2: 750W driver terminals

2.1.1 Power supply terminal

Drive model / Terminal name	DS_R_100	DS_R_200	DS_R_400	DS_R_750
VDC (DC power supply, positive)	DC voltage: 24V~50V Recommended power supply: ≥24V，5A	DC voltage: 24V~50V Recommended power supply: ≥36V，9A	DC voltage: 24V~50V Recommended power supply: 48V, 10A	DC voltage: 24V~80V Recommended power supply: ≥48V，20A
GND (DC power supply, negative)				

2.1.2 Motor winding terminal

Terminal name	Description
PE	Motor ground wire
W	Motor three-phase winding Opposing winding sequence is not allowed, otherwise fault or runaway will be caused!
V	
U	

2.1.3 Braking resistor terminals

1. DS_R_100/200/400 drive terminals

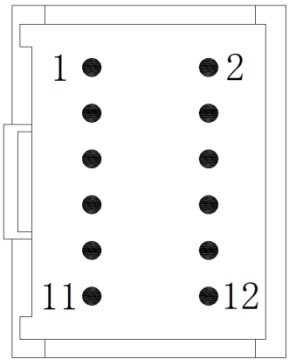
Terminal name	Description
RB+	Connecting the external braking resistor between RB+ and RB - A 10R 50W aluminum case resistor is recommended
RB-	

2. 750W drive terminals

Terminal name	Description
BRK	Connecting the external braking resistor between BRK and VDC A 10R 100W aluminum case resistor is recommended

2.1.4 Definition of drive encoder wire terminal

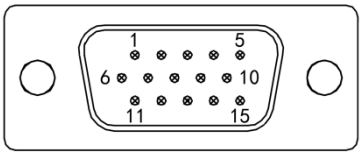
Pin No.	Signal	Color	Pin No.	Signal	Color
1	EA+	Yellow	**2**	HU+	Grey
3	EA-	Yellow/black	**4**	HV+	Orange
5	EB+	Green	**6**	HW+	White
7	EB-	Green/black	**8**	5V	Red
9	EZ+	Brown	**10**	GND	Black
11	EZ-	Brown/black	**12**	PE	Yes



Pins for terminal block

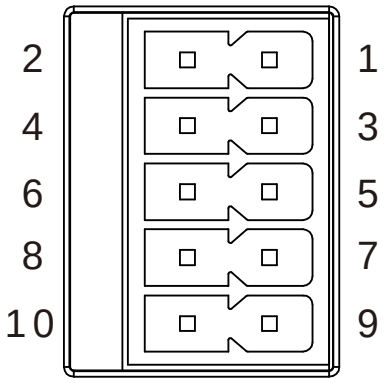
2.1.5 Definition of motor terminal

Pin No.	Definition	Pin No.	Definition	Pin No.	Definition
1	0V	**6**	Z+	**11**	V-
2	5V	**7**	B+	**12**	U-
3	W+	**8**	A+	**13**	Z-
4	V+	**9**	Not connected	**14**	B-
5	U+	**10**	W-	**15**	A-

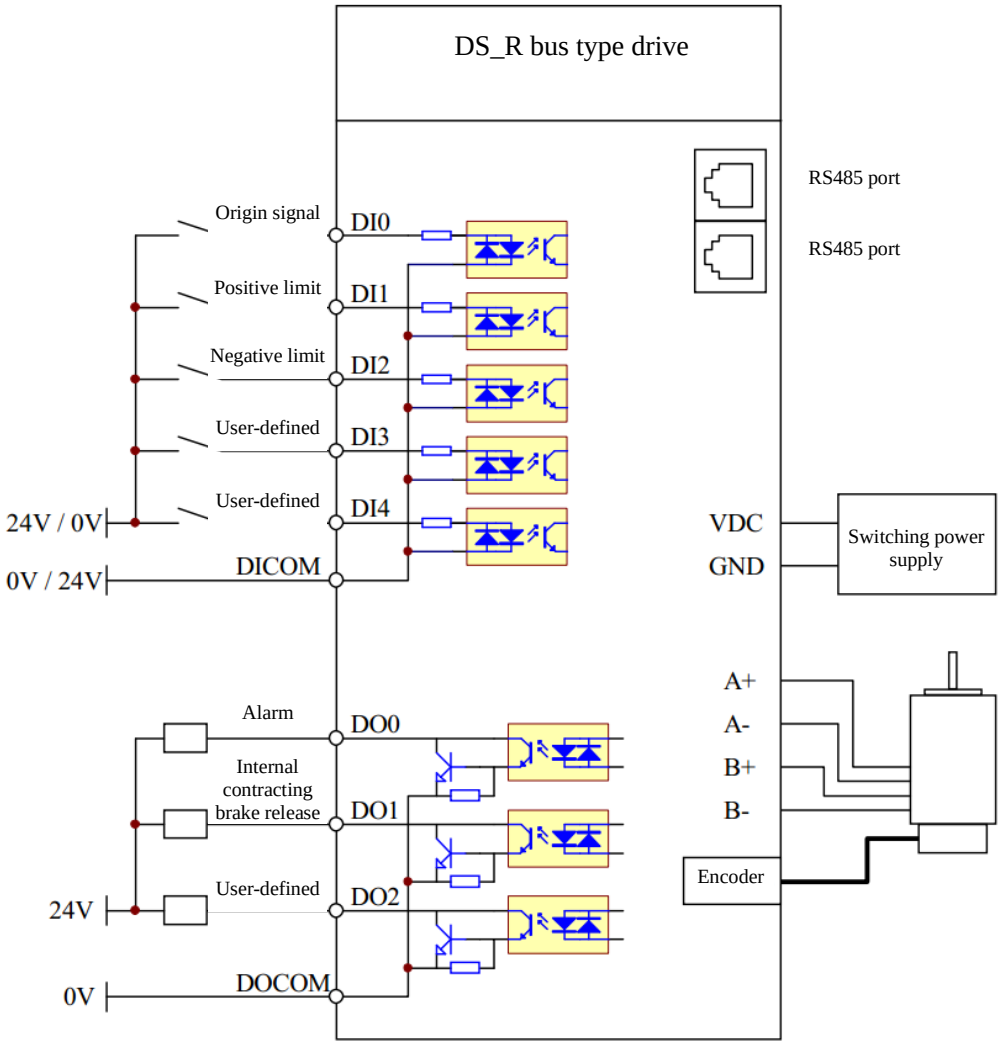


DB15 male pin surface

2.1.6 DI/DO terminal

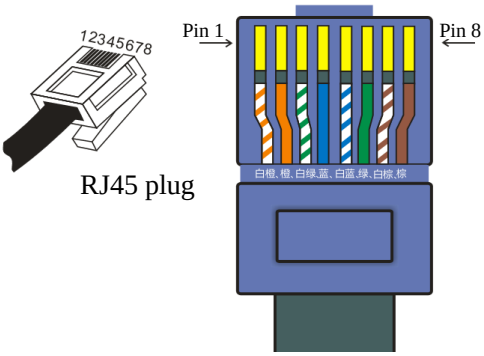
No.	Name	Definition of terminal
1	DI0	
2	DI1	
3	DI2	
4	DI3	
5	DI4	
6	DICOM	
7	DO0	
8	DO1	
9	DO2	
10	DOCOM	

Wiring diagram of input / output signal



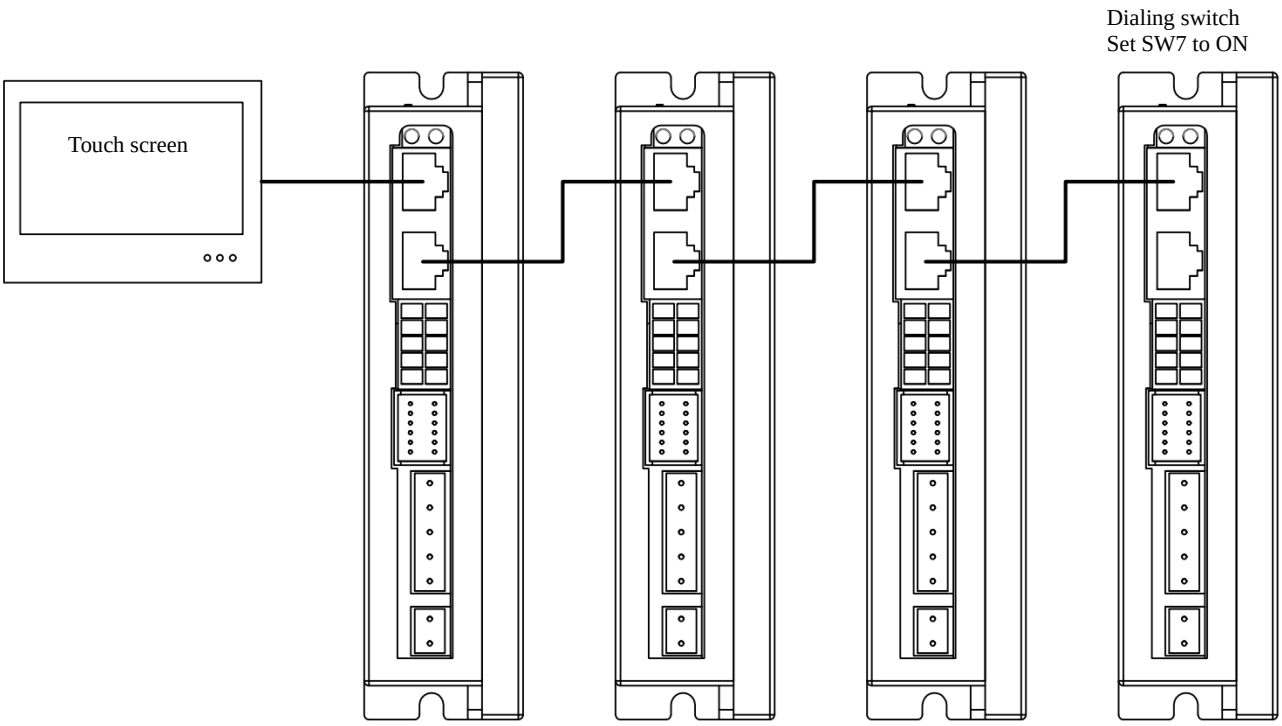
2.1.7 Definition of communication port pins

Pin	Network cable color	Signal definition
1	White/orange	485+
2	Orange	485-
3	White/green	GND
4	Blue	NC
5	White/blue	NC
6	Green	NC
7	White/brown	NC
8	Brown	NC



RJ45 plug

The DS_R bus type drive has 2 standard RJ45 network interfaces, in which Pins 1 and 2 correspond to 485+ and 485- 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. Up to 31 drives can be used for networking. 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.



2.2 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

SW6	SW7	Baud rate
OFF	OFF	115200
ON	OFF	38400
OFF	ON	19200
ON	ON	9600

2.2.3 Terminal resistance

SW8	Terminal resistance
OFF	Noneffective
ON	Effective

Chapter III Parameter Description

3.1 Monitoring parameters

<table>
<tr><th>No.</th><th>Communication address (decimal)</th><th>Meaning</th><th>Description</th><th>Property</th><th>Range</th></tr>
<tr><td>PA_00</td><td>0</td><td>Device information</td><td>Device information</td><td>RO</td><td>-</td></tr>
<tr><td>PA_01</td><td>1</td><td>Software version</td><td>Software version</td><td>RO</td><td>-</td></tr>
<tr><td>PA_02</td><td>2</td><td>Motor model</td><td>1: 100W-2500 motors;
2: 200W-2500 motors;
3: 400W-2500 motors;
4: 750W-2500 motors;</td><td>RW</td><td>1</td></tr>
<tr><td>PA_03</td><td>3</td><td>System status</td><td><table><tr><td>Code</td><td>Operation status</td></tr><tr><td>Bit0</td><td>Out-of-tolerance</td></tr><tr><td>Bit1</td><td>Undervoltage</td></tr><tr><td>Bit2</td><td>Overvoltage</td></tr><tr><td>Bit3</td><td>Overcurrent</td></tr><tr><td>Bit4</td><td>Encoder fault</td></tr><tr><td>Bit5</td><td>Overload</td></tr><tr><td>Bit6</td><td>Error bit</td></tr><tr><td>Bit7</td><td>Motor enabling</td></tr><tr><td>Bit8</td><td>Homing completed</td></tr><tr><td>Bit9</td><td>Effective for positive software limit</td></tr><tr><td>Bit10</td><td>Effective for negative software limit</td></tr><tr><td>Bit11</td><td>In-place signal</td></tr></table></td><td>RO</td><td>-</td></tr>
<tr><td>PA_05</td><td>5</td><td>Bus voltage</td><td>Unit: 0.01V</td><td>RO</td><td>-</td></tr>
<tr><td>PA_06</td><td>6</td><td>DI group terminal status</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><tr><td>Bit5</td><td>DI5</td></tr><tr><td>Bit6</td><td>DI6</td></tr></table></td><td></td><td></td></tr>
<tr><td>PA_07</td><td>7</td><td>DO group terminal status</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></td><td></td><td></td></tr>
</table>

PA_08	8	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	-
PA_09	9	Incorrect Cache 1	See the description of 0x0008	RO	-
PA_0A	10	Incorrect Cache 2	See the description of 0x0008	RO	-
PA_0B	11	Incorrect Cache 3	See the description of 0x0008	RO	-
PA_0C	12	Incorrect Cache 4	See the description of 0x0008	RO	-
PA_0D	13	Incorrect Cache 5	See the description of 0x0008	RO	-
PA_0E	14	Incorrect Cache 6	See the description of 0x0008	RO	-
PA_0F	15	Incorrect Cache 7	See the description of 0x0008	RO	-
PA_10	16	Incorrect Cache 8	See the description of 0x0008	RO	-
PA_11	17	Given velocity	Unit: rpm;	RO	-
PA_12	18	Feedback velocity	Unit: rpm;	RO	-
PA_13	19	Position error	Unit: pulse;	RO	-
PA_14	20	Given pulse H	Unit: Encoder dimension;	RO	-
PA_15	21	Given pulse L	Unit: Encoder dimension;	RO	-
PA_16	22	Feedback pulse H	Unit: Encoder dimension;	RO	-
PA_17	23	Feedback pulse L	Unit: Encoder dimension;	RO	-

3.2 Operating parameters

No.	Communication address (decimal)	Meaning	Description	Property	Default value
PA_2F	47	Max. bus voltage	Unit: 0.001V	RW Effective after release and writing	8000
PA_30	48	Min. bus voltage	Unit: 0.001V	RW Effective after release and writing	1800
PA_31	49	Max. phase current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
PA_32	50	Max. continuous line current	Unit: 0.1% p.u.	RW Effective after release and writing	2500
PA_34	52	Position loop output limit	Unit: rpm	RW Effective after release and writing	4500

PA_35	53	Velocity loop output limit	Unit: 0.1% rated current	RW Effective after release and writing	2000
PA_36	54	d-axis current loop limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	500
PA_37	55	Voltage vector limit	Unit: 0.1% p.u. voltage	RW Effective after release and writing	900
PA_38	56	1st gain of position loop	1st proportional gain of position loop	RW Effective immediately	-
PA_39	57	2nd gain of position loop	2nd proportional gain of position loop	RW Effective immediately	-
PA_3B	59	Velocity feedforward coefficient of position loop	Velocity feedforward coefficient of position loop, unit: 0.1%	RW Effective immediately	-
PA_3C	60	Velocity feedforward low-pass filtering bandwidth	Velocity feedforward low-pass filtering, unit: Hz	RW Effective after release and writing	-
PA_3D	61	1st gain of velocity loop	1st gain of velocity loop	RW Effective immediately	-
PA_3E	62	2nd gain of velocity loop	2nd gain of velocity loop	RW Effective immediately	-
PA_3F	63	1st integral of velocity loop	1st integral of velocity loop	RW Effective immediately	-
PA_40	64	2nd integral of velocity loop	2nd integral of velocity loop	RW Effective immediately	-
PA_41	65	Interference resistance gain	This parameter can be increased gradually during positioning oscillation, and the default value is 0	RW Effective immediately	-
PA_42	66	Acceleration feedforward coefficient	Acceleration feedforward coefficient, unit: 0.1%	RW Effective immediately	-
PA_43	67	Acceleration feedforward low-pass filtering bandwidth	Acceleration feedforward low-pass filtering, unit: Hz	RW Effective after release and writing	-
PA_44	68	Current loop gain	Current loop gain	RW Effective immediately	-
PA_45	69	Current loop integral	Current loop integral	RW Effective immediately	-
PA_46	70	Gain setting	0: Effective 1st gain; 0: Effective 2nd gain;	RW Effective after release and writing	-
PA_48	72	Load inertia ratio	Load inertia ratio	RW Effective after release and writing	-

PA_4A	74	Rigidity coefficient	Rigidity coefficient, effective when SW5 and SW6 dialing are OFF; 0：100%； 1：80%； 2：75%； 3：50%；	RW Effective after release and writing	-
PA_4B	75	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	76	Given velocity filtering bandwidth	Given velocity filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_4D	77	Velocity feedback filtering bandwidth	Velocity feedback filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_4E	78	Given current filtering bandwidth	Given current filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_4F	79	Current feedback filtering bandwidth	Current feedback filtering bandwidth, unit: Hz	RW Effective after release and writing	-
PA_50	80	Torque notch filter frequency	Torque notch filter frequency, unit: Hz	RW Effective after release and writing	-
PA_51	81	Torque notch filter width	Torque notch filter width, unit: Hz	RW Effective after release and writing	-
PA_52	82	Torque notch filter depth	Torque notch filter depth, unit: dB	RW Effective after release and writing	-
PA_53	83	Filter parameter calculation	0: N/A; 1: Calculate filter parameters	RW Effective after release and writing	-
PA_54	84	Jerk smoothing factor	0: N/A; Level 1~7 smoothing ;	RW Effective after release and writing	-
PA_05F	95	Release command enabling	1: Enable; 0: Release;	RW Effective immediately	-
PA_061	97	Clear current position	0: Noneffective; 1: Clear;	RW Effective immediately	-
PA_062	98	Alarm clearing	0: Noneffective; 1: Clear;	RW Effective immediately	-
PA_063	99	Parameter saving	0: Noneffective; 1: Effective;	RW Effective immediately	-

PA_064	100	Factory parameter restoring	0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_065	101	Multi-segment position, relative and absolute	For selecting a relative position or an absolute position under multi-segment position mode 0: Relative; 1: Absolute;	RW Effective immediately	-
PA_067	103	Electronic gear numerator	Electronic gear numerator	RW Effective after power-on	-
PA_068	104	Electronic gear denominator	Electronic gear denominator	RW Effective after power-on	-
PA_069	105	Default direction	0: Default; 1: Negative;	RW Effective after power-on	-
PA_06A	106	Opening delay of brake	Opening delay of brake, unit: ms	RW Effective after power-on	-
PA_06B	107	Closing delay of brake	Closing delay of brake, unit: ms	RW Effective after power-on	-
PA_06C	108	Relief opening threshold	Relief opening threshold, unit: 0.001V	RW Effective after power-on	-
PA_06D	109	Relief closing threshold	Relief closing threshold, unit: 0.001V	RW Effective after power-on	-
PA_070	112	In-place error	Unit: pulse	RW Effective after release and writing	-
PA_071	113	In-place time	Unit: ms	RW Effective after release and writing	-
PA_076	118	Out-of-tolerance threshold	Unit: pulse	RW Effective after release and writing	-
PA_081	129	Input terminal filtering	Input terminal filtering	RW Effective immediately	-
PA_082	130	User-defined output terminals	Code / Status Bit0 / DO0 Bit1 / DO1 Bit2 / DO2 0: Normally open; 1: Normally closed Note: The function of the output port should be configured as a user-defined one first;	RW Effective immediately	-
PA_083	131	Software limit switch	0: Noneffective; 1: Effective after homing	RW Effective immediately	-

<table>
<tr><td>PA_085</td><td>133</td><td>Velocity limit under torque mode</td><td>Unit: rpm</td><td>RW
Effective after release and writing</td><td>-</td></tr>
<tr><td>PA_086</td><td>134</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>135</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><tr><td>0x07</td><td>Location path triggering</td></tr><tr><td>0x08</td><td>Velocity path triggering</td></tr><tr><td>0x09</td><td>Path Address 0</td></tr><tr><td>0x0A</td><td>Path Address 1</td></tr><tr><td>0x0B</td><td>Path Address 2</td></tr><tr><td>0x0C</td><td>Path Address 3</td></tr></table></td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_088</td><td>136</td><td>DI Input Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_089</td><td>137</td><td>DI Input Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08A</td><td>138</td><td>DI Input Port 3</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08B</td><td>139</td><td>DI Input Port 4</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08C</td><td>140</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>141</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>142</td><td>DO Output Port 1</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_08F</td><td>143</td><td>DO Output Port 2</td><td>RW
Effective immediately</td><td>-</td></tr>
</table>

3.3 Motion control parameters

No.	Communication address (decimal)	Meaning	Description	Property	Default value
PA_091	145	Control command	Bit0: Position mode enabling: 0: Noneffective; 1: Enable; Bit1: Position, relative and absolute: 0: Relative position; 1: Absolute position; Bit2: Velocity mode enabling: 0: Noneffective; 1: Enable; Bit3: Torque mode enabling: 0: Noneffective; 1: Enable; Bit4: Homing mode enabling: 0: Noneffective; 1: Enable; Bit8: Stop command: 0: Noneffective; 1: Effective; Bit9: Emergency stop command: 0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_094	148	Operating mode setting	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode; 254: Multi-segment position mode; 255: Multi-segment velocity mode;	RW Effective immediately	-
PA_095	149	Operating mode display	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode; 254: Multi-segment position mode; 255: Multi-segment velocity mode;	RO	-
PA_096	150	Current position H	Unit: pulse	RO	-
PA_097	151	Current position L	Unit: pulse	RO	-
PA_098	152	Current velocity H	Unit: rpm	RO	-
PA_099	153	Current velocity L	Unit: rpm	RO	-
PA_09A	154	Target position H under position mode	Unit: pulse	RW Effective immediately	-
PA_09B	155	Target position L under position mode	Unit: pulse	RW Effective immediately	-

PA_09C	156	Target velocity H under position mode	Unit: rpm	RW Effective immediately	-
PA_09D	157	Target velocity L under position mode	Unit: rpm	RW Effective immediately	-
PA_09E	158	Acceleration time H under position mode	Unit: ms	RW Effective immediately	-
PA_09F	159	Acceleration time L under position mode	Unit: ms	RW Effective immediately	-
PA_0A0	160	Deceleration time H under position mode	Unit: ms	RW Effective immediately	-
PA_0A1	161	Deceleration time L under position mode	Unit: ms	RW Effective immediately	-
PA_0A2	162	Target velocity H under velocity mode	Unit: rpm	RW Effective immediately	-
PA_0A3	163	Target velocity L under velocity mode	Unit: rpm	RW Effective immediately	-
PA_0A6	166	Homing mode	Standard 1~14, 17~30 and 33~35 modes	RW Effective immediately	-
PA_0A7	167	Homing velocity H	Unit: rpm	RW Effective immediately	-
PA_0A8	168	Homing velocity L	Unit: rpm	RW Effective immediately	-
PA_0A9	169	Queried homing velocity H	Unit: rpm	RW Effective immediately	-
PA_0AA	170	Queried homing velocity L	Unit: rpm	RW Effective immediately	-
PA_0AB	171	Homing acceleration / deceleration H	Unit: ms	RW Effective immediately	-
PA_0AC	172	Homing acceleration / deceleration L	Unit: ms	RW Effective immediately	-
PA_0AD	173	Homing offset H	Unit: pulse	RW Effective immediately	-
PA_0AE	174	Homing offset L	Unit: pulse	RW Effective immediately	-
PA_0AF	175	Positive software limit H	Unit: pulse	RW Effective immediately	-
PA_0B0	176	Positive software limit L	Unit: pulse	RW Effective immediately	-
PA_0B1	177	Negative software limit H	Unit: pulse	RW Effective immediately	-
PA_0B2	178	Negative software limit L	Unit: pulse	RW Effective immediately	-

PA_0B3	179	Target torque	Unit: 0.1% p.u.	RW Effective immediately	-
PA_0B4	180	Target torque limit	Unit: 0.1% p.u.	RW Effective immediately	-
PA_0B5	181	Feedback torque	Unit: 0.1% p.u.	RW Effective immediately	-
PA_0B6	182	Torque gradient H	Unit: 0.1% p.u.	RW Effective immediately	-
PA_0B7	183	Torque gradient L	Unit: 0.1% p.u.	RW Effective immediately	-
PA_0C0	192	Positioning target of Positioning Path 0	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0C1	193				
PA_0C2	194	Positioning velocity of Positioning Path 0	Unit: rpm	RW Effective at stop	0~3000
PA_0C3	195	Positioning acceleration time of Positioning Path 0	Unit: ms	RW Effective at stop	0~2000
PA_0C4	196	Positioning deceleration time of Positioning Path 0	Unit: ms	RW Effective at stop	0~2000
PA_0C5	197	Positioning target of Positioning Path 1	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0C6	198				
PA_0C7	199	Positioning velocity of Positioning Path 1	Unit: rpm	RW Effective at stop	0~3000
PA_0C8	200	Positioning acceleration time of Positioning Path 1	Unit: ms	RW Effective at stop	0~2000
PA_0C9	201	Positioning deceleration time of Positioning Path 1	Unit: ms	RW Effective at stop	0~2000
PA_0CA	202	Positioning target of Positioning Path 2	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0CB	203				
PA_0CC	204	Positioning velocity of Positioning Path 2	Unit: rpm	RW Effective at stop	0~3000
PA_0CD	205	Positioning acceleration time of Positioning Path 2	Unit: ms	RW Effective at stop	0~2000
PA_0CE	206	Positioning deceleration time of Positioning Path 2	Unit: ms	RW Effective at stop	0~2000
PA_0CF	207	Positioning target of Positioning Path 3	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0D0	208				
PA_0D1	209	Positioning velocity of Positioning Path 3	Unit: rpm	RW Effective at stop	0~3000
PA_0D2	210	Positioning acceleration time of Positioning Path 3	Unit: ms	RW Effective at stop	0~2000
PA_0D3	211	Positioning deceleration time of Positioning Path 3	Unit: ms	RW Effective at stop	0~2000

PA_0D4	212	Positioning target of Positioning Path 4	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0D5	213				
PA_0D6	214	Positioning velocity of Positioning Path 4	Unit: rpm	RW Effective at stop	0~3000
PA_0D7	215	Positioning acceleration time of Positioning Path 4	Unit: ms	RW Effective at stop	0~2000
PA_0D8	216	Positioning deceleration time of Positioning Path 4	Unit: ms	RW Effective at stop	0~2000
……					
PA_10B	267	Positioning target of Positioning Path 15	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_10C	268				
PA_10D	269	Positioning velocity of Positioning Path 15	Unit: rpm	RW Effective at stop	0~3000
PA_10E	270	Positioning acceleration time of Positioning Path 15	Unit: ms	RW Effective at stop	0~2000
PA_10F	271	Positioning deceleration time of Positioning Path 15	Unit: ms	RW Effective at stop	0~2000
PA_110	272	Running velocity of Velocity Path 0	Unit: r/min	RW Effective at stop	-3000~3000
PA_111	273	Acceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_112	274	Deceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_113	275	Running velocity of Velocity Path 1	Unit: r/min	RW Effective at stop	-3000~3000
PA_114	276	Acceleration time of Velocity Path 1	Unit: ms	RW Effective at stop	0~2000
PA_115	277	Deceleration time of Velocity Path 1	Unit: ms	RW Effective at stop	0~2000
PA_116	278	Running velocity of Velocity Path 2	Unit: r/min	RW Effective at stop	-3000~3000
PA_117	279	Acceleration time of Velocity Path 2	Unit: ms	RW Effective at stop	0~2000
PA_118	280	Deceleration time of Velocity Path 2	Unit: ms	RW Effective at stop	0~2000
……					
PA_13D	317	Running velocity of Velocity Path 0	Unit: r/min	RW Effective at stop	-3000~3000
PA_13E	318	Acceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_13F	319	Deceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000

Chapter IV Communication Description

4.1 Description of communication parameters and register addresses

For the DS_R bus type drive series, the station number and baud rate are set by external dialing, see Section 2.2 for details. **Check bit: without parity check; Data bit: 8-bit; Stop bit: 1-bit.** The above parameters are fixed and cannot be modified.

The hexadecimal address corresponding to the register is the value behind the underline of the parameter No., for example: The hexadecimal address corresponding to PA_0C2 is C2, and the corresponding decimal address converted with the computer calculator is 194.

4.2 Description of position mode

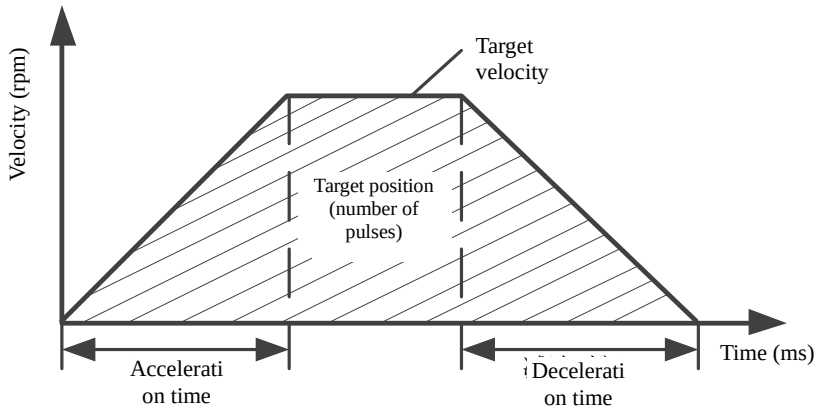
4.2.1 Related parameters

<table>
<tr><th>No.</th><th>Communication address (decimal)</th><th>Description</th><th>Description</th><th>Property</th><th>Range</th></tr>
<tr><td>PA_003</td><td>3</td><td>System status</td><td>
<table>
<tr><td>Corresponding bit</td><td>Operation status</td></tr>
<tr><td>Bit7</td><td>Motor enabling</td></tr>
<tr><td>Bit9</td><td>Effective for positive software limit</td></tr>
<tr><td>Bit10</td><td>Effective for negative software limit</td></tr>
<tr><td>Bit11</td><td>In-place signal</td></tr>
</table>
</td><td>RO</td><td>-</td></tr>
<tr><td>PA_091</td><td>145</td><td>Control command</td><td>
<table>
<tr><td>Bit0</td><td>Position mode enabling:
0: Noneffective;
1: Enable;</td></tr>
<tr><td>Bit1</td><td>Position, relative and absolute:
0: Relative position;
1: Absolute position;</td></tr>
<tr><td>Bit2</td><td>Velocity mode enabling:
0: Noneffective;
1: Enable;</td></tr>
<tr><td>Bit3</td><td>Torque mode enabling:
0: Noneffective;
1: Enable;</td></tr>
<tr><td>Bit4</td><td>Homing mode enabling:
0: Noneffective;
1: Enable;</td></tr>
<tr><td>Bit8</td><td>Stop command:
0: Noneffective;
1: Effective;</td></tr>
<tr><td>Bit9</td><td>Emergency stop command:
0: Noneffective;
1: Effective;</td></tr>
</table>
</td><td>RW
Effective immediately</td><td>-</td></tr>
<tr><td>PA_094</td><td>148</td><td>Operating mode setting</td><td>1: Position mode;
3: Velocity mode;
4: Torque mode;
6: Homing mode;
254: Multi-segment position mode;</td><td>RW
Effective immediately</td><td>-</td></tr>
</table>

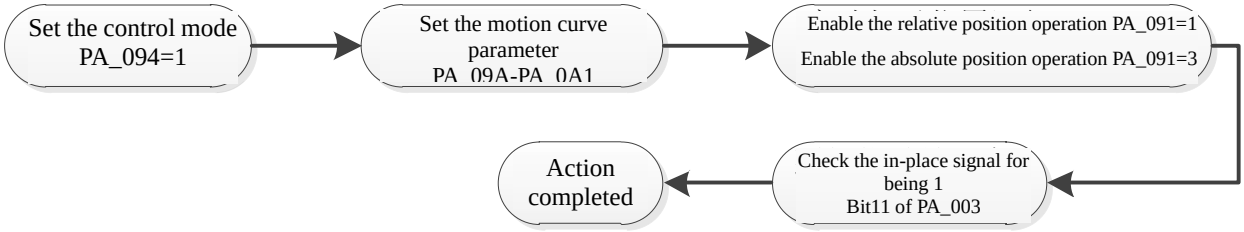
			255: Multi-segment velocity mode;		
PA_095	149	Operating mode display	1: Position mode; 3: Velocity mode; 4: Torque mode; 6: Homing mode; 254: Multi-segment position mode; 255: Multi-segment velocity mode;	RO	-
PA_096	150	Current position H	Unit: pulse	RO	-
PA_097	151	Current position L	Unit: pulse	RO	-
PA_098	152	Current velocity H	Unit: rpm	RO	-
PA_099	153	Current velocity L	Unit: rpm	RO	-
PA_09A	154	Target position H under position mode	Unit: pulse	RW Effective immediately	-
PA_09B	155	Target position L under position mode	Unit: pulse	RW Effective immediately	-
PA_09C	156	Target velocity H under position mode	Unit: rpm	RW Effective immediately	-
PA_09D	157	Target velocity L under position mode	Unit: rpm	RW Effective immediately	-
PA_09E	158	Acceleration time H	Unit: ms	RW Effective immediately	-
PA_09F	159	Acceleration time L	Unit: ms	RW Effective immediately	-
PA_0A0	160	Deceleration time H	Unit: ms	RW Effective immediately	-
PA_0A1	161	Deceleration time L	Unit: ms	RW Effective immediately	-

4.2.2 Description of position mode

The motion parameters can be given by the position mode through the master station, which are: target position (PA_09A, PA_09B), target velocity (PA_09C, PA_09D), acceleration time (PA_09E, PA_09F), deceleration time (PA_0A0, PA_0A1), 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:



4.2.3 Description of control steps



4.2.4 Example of communication message under position mode

1. Set position mode, PA_094=1

Sent message: 01 06 00 94 00 01 09 E6

Returned message: 01 06 00 94 00 01 09 E6

2. Set parameters: Target position 80000 (PA_09A=0x0001, PA_09B=0x3880), target velocity 200 (PA_09C=0x0000, PA_09D=0x00C8), acceleration time 200 (PA_09E=0x0000, PA09F=0x00C8), deceleration time 200 (PA_0A0=0x0000, PA0A1=0x00C8).

Sent message: 01 10 00 9A 00 08 10 00 01 38 80 00 00 00 C8 00 00 00 C8 00 00 00 C8 8C 91

Returned message: 01 10 00 9A 00 08 E1 E0

3. Set the control mode to absolute position and trigger position enabling PA_ 091=3

Sent message: 01 06 00 91 00 03 98 26

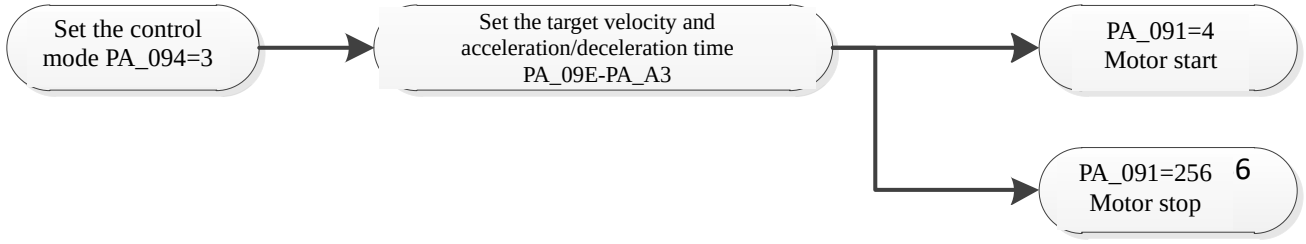
Returned message: 01 06 00 91 00 03 98 26

4.3 Description of velocity mode

4.3.1 Related parameters

No.	Communication address (decimal)	Description	Description	Property	Range
PA_091	145	Control command	Bit2: Velocity mode enabling: 0: Noneffective; 1: Enable; Bit8: Stop command: 0: Noneffective; 1: Effective; Bit9: Emergency stop command: 0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_094	148	Operating mode setting	3: Velocity mode;	RW, effective immediately	-
PA_095	149	Operating mode display	3: Velocity mode;	RO	-
PA_09E	158	Acceleration time H	Unit: ms	RW, effective immediately	-
PA_09F	159	Acceleration time L	Unit: ms	RW, effective immediately	-
PA_0A0	160	Deceleration time H	Unit: ms	RW, effective immediately	-
PA_0A1	161	Deceleration time L	Unit: ms	RW, effective immediately	-
PA_0A2	162	Target velocity H under velocity mode	Unit: rpm	RW, effective immediately	-
PA_0A3	163	Target velocity L under velocity mode	Unit: rpm	RW, effective immediately	-

4.3.2 Control steps



4.3.3 Example of communication message under velocity mode

1. Set velocity mode, PA_094=3

Sent message: 01 06 00 94 00 03 88 27

Returned message: 01 06 00 94 00 03 88 27

2. Set parameters: Acceleration time 200 (PA_09E=0x0000, PA09F=0x00C8), deceleration time 200 (PA_0A0=0x0000, PA0A1=0x00C8), target velocity 200 (PA_0A2=0x0000, PA0A3=0x00C8),

Sent message: 01 10 00 9E 00 06 0C 00 00 00 C8 00 00 00 C8 00 00 00 C8 35 5C

Returned message: 01 10 00 9E 00 06 21 E5

3. Enable operation, PA_091=4

Sent message: 01 06 00 91 00 04 D9 E4

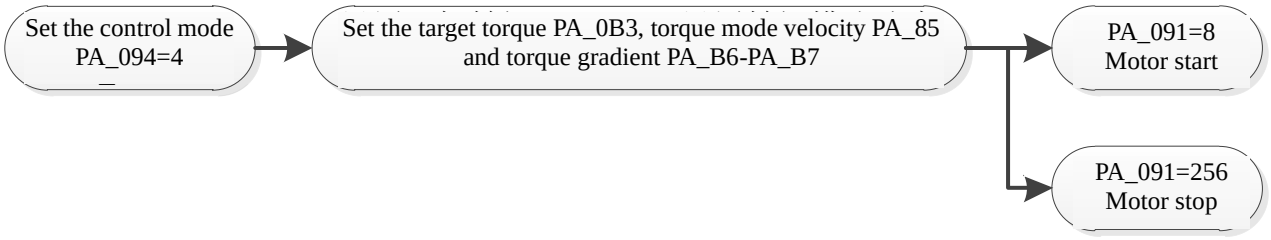
Returned message: 01 06 00 91 00 04 D9 E4

4.4 Description of torque mode

4.4.1 Related parameters

No.	Communication address (decimal)	Description	Description	Property	Range
PA_091	145	Control command	Bit3: Torque mode enabling: 0: Noneffective; 1: Enable; Bit8: Stop command: 0: Noneffective; 1: Effective; Bit9: Emergency stop command: 0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_094	148	Operating mode setting	4: Torque mode;	RW, effective immediately	-
PA_095	149	Operating mode display	4: Torque mode;	RO	-
PA_085	133	Velocity limit under torque mode	Unit: rpm	RW, Effective after release and writing	
PA_0B3	179	Target torque	Unit: 0.1% p.u.	RW, effective immediately	-
PA_0B4	180	Target torque limit	Unit: 0.1% p.u.	RW, effective immediately	-
PA_0B5	181	Feedback torque	Unit: 0.1% p.u.	RW, effective immediately	-
PA_0B6	182	Torque gradient H	Unit: 0.1% p.u.	RW, effective immediately	-
PA_0B7	183	Torque gradient L	Unit: 0.1% p.u.	RW, effective immediately	-

4.4.2 Control steps



4.4.3 Example of communication message under torque mode

1. Set velocity mode, PA_094=4
Sent message: 01 06 00 94 00 04 C9 E5
Returned message: 01 06 00 94 00 04 C9 E5
2. Set parameters: Target torque 300 (PA_0B3=0x012C), torque limit 3000 (PA_0B4=0x0BB8), target velocity 200 (PA_0A2=0x0000, PA0A3=0x00C8)
Sent message: 01 10 00 B3 00 04 08 01 2C 0B B8 00 00 00 C8 7C B8
Returned message: 01 10 00 B3 00 04 30 2D
3. Enable operation, PA_091=8
Sent message: 01 06 00 91 00 08 D9 E1
Returned message: 01 06 00 91 00 08 D9 E1

4.5 Homing mode

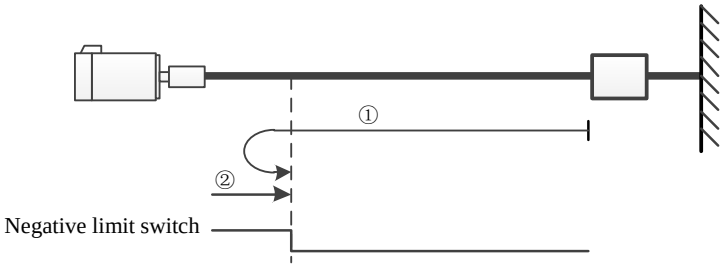
This drive series support 31 standard homing modes (No. 1~14, 17~30, 33~35). This section introduces only several common homing modes.

4.5.1 Related parameters

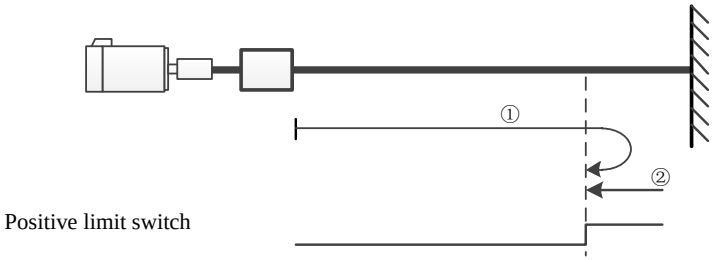
No.	Communication address (decimal)	Description	Description	Property	Range
PA_091	145	Control command	Bit4: Homing mode enabling: 0: Noneffective; 1: Enable; Bit8: Stop command: 0: Noneffective; 1: Effective; Bit9: Emergency stop command: 0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_094	148	Operating mode setting	6: Homing mode;	RW, effective immediately	-
PA_095	149	Operating mode display	6: Homing mode;	RO	-
PA_0A6	166	Homing mode	Standard 1~14, 17~30 and 33~35 modes	RW, effective immediately	-
PA_0A7	167	Homing velocity H	Unit: rpm	RW, effective immediately	-
PA_0A8	168	Homing velocity L	Unit: rpm	RW, effective immediately	-
PA_0A9	169	Queried homing velocity H	Unit: rpm	RW, effective immediately	-
PA_0AA	170	Queried homing velocity L	Unit: rpm	RW, effective immediately	-
PA_0AB	171	Homing acceleration / deceleration H	Unit: ms	RW, effective immediately	-
PA_0AC	172	Homing acceleration / deceleration L	Unit: ms	RW, effective immediately	-
PA_0AD	173	Homing offset H	Unit: pulse	RW, effective immediately	-
PA_0AE	174	Homing offset L	Unit: pulse	RW, effective immediately	-

4.5.2 Description of common homing mode

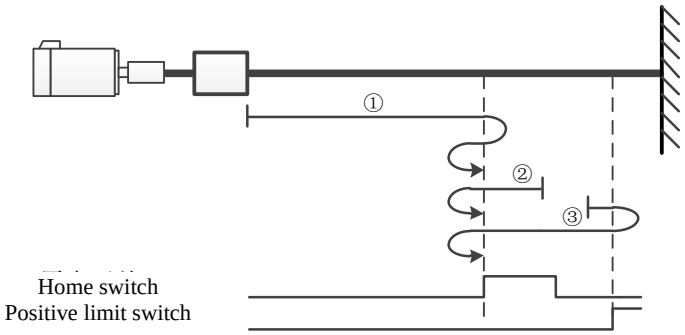
1. Negative limit mode (PA_0A6=17): After homing is allowed, the motor will run in the negative direction at the homing velocity (PA_0A7/ PA_0A8). It will decelerate and stop when the negative limit switch is sensed. Then it will run in the positive direction at the queried velocity (PA_0A9/ PA_0AA). When leaving the negative limit switch is sensed, the motor will stop, indicating that the homing operation is completed.



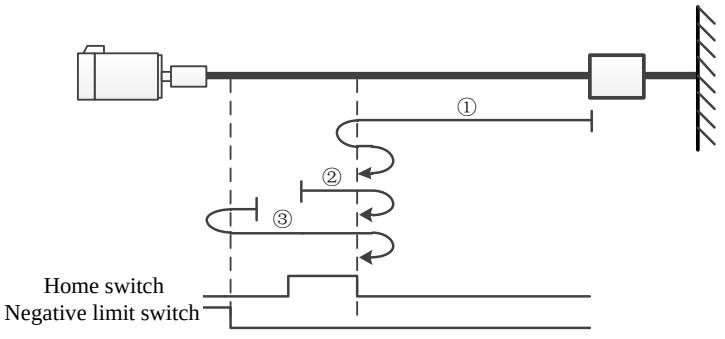
2. Positive limit mode (PA_0A6=18): After homing is allowed, the motor will run in the positive direction at the homing velocity (PA_0A7/ PA_0A8). It will decelerate and stop when the positive limit switch is sensed, it will run in the negative direction at the queried velocity (PA_0A9/ PA_0AA). When leaving the positive limit switch is sensed, the motor will stop, indicating that the homing operation is completed.



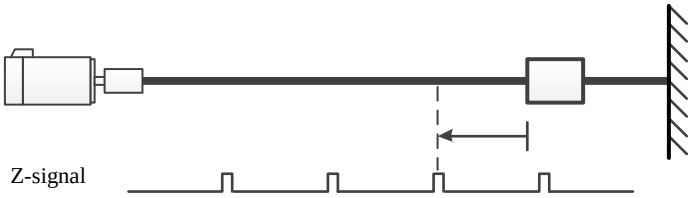
3. Positive origin mode (PA_0A6=24): After homing is allowed, the motor will run in the positive direction at the homing velocity (PA_0A7/ PA_0A8). It will decelerate and stop when the origin switch is sensed, and then run in the negative direction at the queried velocity (PA_0A9/ PA_0AA). When leaving the origin switch is sensed, it will decelerate and stop and then run in the positive direction at the queried velocity (PA_0A9/ PA_0AA). It will decelerate and stop when the origin switch is sensed, indicating that the homing operation is completed.



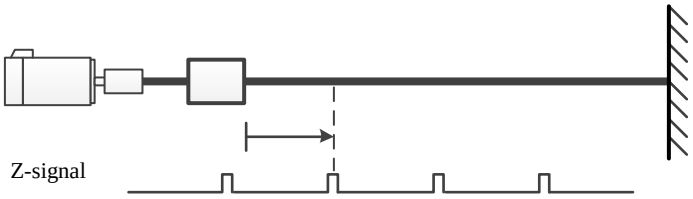
4. Negative origin mode (PA_0A6=28): After homing is allowed, the motor will run in the negative direction at the homing velocity (PA_0A7/ PA_0A8). It will decelerate and stop when the origin switch is sensed, and then run in the positive direction at the queried velocity (PA_0A9/ PA_0AA). When leaving the origin switch is sensed, it will decelerate and stop and then run in the negative direction at the queried velocity (PA_0A9/ PA_0AA). It will decelerate and stop when the origin switch is sensed, indicating that the homing operation is completed.



5. Negative Z-signal homing mode (PA_0A6=33): After homing is allowed, the motor will run in the negative direction at the queried velocity (PA_0A9/PA_0AA). It will stop when Z-signal is sensed, indicating that the homing operation is completed.



6. Positive Z-signal homing mode (PA_0A6=34): After homing is allowed, the motor will run in the positive direction at the queried velocity (PA_0A9/PA_0AA). It will stop when Z-signal is sensed, indicating that the homing operation is completed.



7. Setting the current position as the origin (PA_0A6=35): After homing is allowed, clear the current position directly, and then output the homing completed signal.

4.5.3 Example of communication message under homing mode

1. Set homing mode, PA_094=6
Sent message: 01 06 00 94 00 06 48 24
Returned message: 01 06 00 94 00 06 48 24
3. Enable homing, PA_091=16
Sent message: 01 06 00 91 00 10 D9 EB
Returned message: 01 06 00 91 00 10 D9 EB

4.6 Multi-segment position mode

4.6.1 Related parameters

No.	Communication address (decimal)	Description	Description	Property	Range
PA_091	145	Control command	Bit0: Position mode enabling: 0: Noneffective; 1: Enable; Bit1: Position, relative and absolute: 0: Relative position; 1: Absolute position; Bit8: Stop command: 0: Noneffective; 1: Effective; Bit9: Emergency stop command: 0: Noneffective; 1: Effective;	RW Effective immediately	-
PA_094	148	Operating mode setting	254: Multi-segment position mode;	RW Effective immediately	-
PA_095	149	Operating mode display	254: Multi-segment position mode;	RO	-

PA_065	101	Selection of absolute / relative multi-segment position modes	0: Relative position mode; 1: Absolute position mode;	RW Effective immediately	-
PA_0C0	192	Positioning target of Positioning Path 0	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0C1	193				
PA_0C2	194	Positioning velocity of Positioning Path 0	Unit: rpm	RW Effective at stop	0~3000
PA_0C3	195	Positioning acceleration time of Positioning Path 0	Unit: ms	RW Effective at stop	0~2000
PA_0C4	196	Positioning deceleration time of Positioning Path 0	Unit: ms	RW Effective at stop	0~2000
PA_0C5	197	Positioning target of Positioning Path 1	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_0C6	198				
PA_0C7	199	Positioning velocity of Positioning Path 1	Unit: rpm	RW Effective at stop	0~3000
PA_0C8	200	Positioning acceleration time of Positioning Path 1	Unit: ms	RW Effective at stop	0~2000
PA_0C9	201	Positioning deceleration time of Positioning Path 1	Unit: ms	RW Effective at stop	0~2000
……					
PA_10B	267	Positioning target of Positioning Path 15	Unit: pulse	RW Effective at stop	-2147483648~ 2147483647
PA_10C	268				
PA_10D	269	Positioning velocity of Positioning Path 15	Unit: rpm	RW Effective at stop	0~3000
PA_10E	270	Positioning acceleration time of Positioning Path 15	Unit: ms	RW Effective at stop	0~2000
PA_10F	271	Positioning deceleration time of Positioning Path 15	Unit: ms	RW Effective at stop	0~2000

4.6.2 Description of multi-segment position control

The internal multi-segment position can only run after being selected and triggered through the DI port, see the following details:

No.	Address (decimal)	Set value	Description
PA_087	135	7	DI0 is configured as position path triggering
PA_088	136	9	DI1 is configured as Path Selector Switch 0
PA_089	137	10	DI2 is configured as Path Selector Switch 1
PA_08A	138	11	DI3 is configured as Path Selector Switch 2
PA_08B	139	12	DI4 is configured as Path Selector Switch 3

After configuring the DI port according to the above table, select the position segment through DI1-DI4, and then use DI0 to trigger (rising edge) running of the position segment. See the following table:

Selector Switch 0	Selector Switch 1	Selector Switch 2	Selector Switch 3	Corresponding positioning path	Positioning pulse address (decimal)	Positioning velocity address (decimal)	Acceleration time address (decimal)	Deceleration time address (decimal)
OFF	OFF	OFF	OFF	Path 0	192/193	194	195	196
ON	OFF	OFF	OFF	Path 1	197/198	199	200	201
OFF	ON	OFF	OFF	Path 2	202/203	204	205	206
ON	ON	OFF	OFF	Path 3	207/208	209	210	211
OFF	OFF	ON	OFF	Path 4	212/213	214	215	216

ON	OFF	ON	OFF	Path 5	217/218	219	220	221
OFF	ON	ON	OFF	Path 6	222/223	224	225	226
ON	ON	ON	OFF	Path 7	227/228	229	230	231
OFF	OFF	OFF	ON	Path 8	232/233	234	235	236
ON	OFF	OFF	ON	Path 9	237/238	239	240	241
OFF	ON	OFF	ON	Path 10	242/243	244	245	246
ON	ON	OFF	ON	Path 11	247/248	249	250	251
OFF	OFF	ON	ON	Path 12	252/253	254	255	256
ON	OFF	ON	ON	Path 13	257/258	259	260	261
OFF	ON	ON	ON	Path 14	262/263	264	265	266
ON	ON	ON	ON	Path 15	267/268	269	270	271

4.7 Multi-segment velocity mode

4.7.1 Related parameters

No.	Communication address (decimal)	Description	Description	Property	Range
PA_094	148	Operating mode setting	255: Multi-segment velocity mode;	RW Effective immediately	-
PA_095	149	Operating mode display	255: Multi-segment velocity mode;	RO	-
PA_110	272	Running velocity of Velocity Path 0	Unit: r/min	RW Effective at stop	-3000~3000
PA_111	273	Acceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_112	274	Deceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_113	275	Running velocity of Velocity Path 1	Unit: r/min	RW Effective at stop	-3000~3000
PA_114	276	Acceleration time of Velocity Path 1	Unit: ms	RW Effective at stop	0~2000
PA_115	277	Deceleration time of Velocity Path 1	Unit: ms	RW Effective at stop	0~2000
PA_116	278	Running velocity of Velocity Path 2	Unit: r/min	RW Effective at stop	-3000~3000
PA_117	279	Acceleration time of Velocity Path 2	Unit: ms	RW Effective at stop	0~2000
PA_118	280	Deceleration time of Velocity Path 2	Unit: ms	RW Effective at stop	0~2000
……					
PA_13D	317	Running velocity of Velocity Path 0	Unit: r/min	RW Effective at stop	-3000~3000
PA_13E	318	Acceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000
PA_13F	319	Deceleration time of Velocity Path 0	Unit: ms	RW Effective at stop	0~2000

4.7.2 Description of internal multi-segment velocity control

The internal multi-segment position can only run after being selected and triggered through the DI port, see the following details:

No.	Address (decimal)	Set value	Description
PA_087	135	8	DI0 is configured as velocity path triggering
PA_088	136	9	DI1 is configured as Path Selector Switch 0
PA_089	137	10	DI2 is configured as Path Selector Switch 1
PA_08A	138	11	DI3 is configured as Path Selector Switch 2
PA_08B	139	12	DI4 is configured as Path Selector Switch 3

After configuring the DI port according to the above table, select the velocity segment through DI1-DI4, and then use DI0 to trigger (rising edge) running of the velocity segment. See the following table:

Selector Switch 0	Selector Switch 1	Selector Switch 2	Selector Switch 3	Corresponding velocity path	Running velocity address (decimal)	Acceleration time address (decimal)	Deceleration time address (decimal)
OFF	OFF	OFF	OFF	0	272	273	274
ON	OFF	OFF	OFF	1	275	276	277
OFF	ON	OFF	OFF	2	278	279	280
ON	ON	OFF	OFF	3	281	282	283
OFF	OFF	ON	OFF	4	284	285	286
ON	OFF	ON	OFF	5	287	288	289
OFF	ON	ON	OFF	6	290	291	292
ON	ON	ON	OFF	7	293	294	295
OFF	OFF	OFF	ON	8	296	297	298
ON	OFF	OFF	ON	9	299	300	301
OFF	ON	OFF	ON	10	302	303	304
ON	ON	OFF	ON	11	305	306	307
OFF	OFF	ON	ON	12	308	309	310
ON	OFF	ON	ON	13	311	312	313
OFF	ON	ON	ON	14	314	315	316
ON	ON	ON	ON	15	317	318	319

Chapter V Troubleshooting

5.1 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 VI Description of MODBUS RTU Protocol

6.1 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;]

6.2 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.

6.3 Muiti-register writing command (0x10)

This function can be used to continuously set multiple parameters or set 32-bit data, for example: write 80000 to Positioning Target PA_0C0/PA0C1 of Positioning Path 0. Commands to be sent by the master station (PLC, etc.) can include the following:

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	0xC0	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	0x38	DATA(0)	Upper 8 bits of the first data written.
9th Byte	0x80	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	0x01	DATA(1)	Lower 8 bits of the second data written.
12th Byte	0x32	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	0xB7	CRC_L	Low bit of CRC check.

[For the above example: 2 registers are written from the master station with the slave station address set as 1 and the starting address, as 192(0x0C0), which are: 192(0x0C0)=0x3880 and 193(0x0C1)= 0x0001], respectively

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	0xC0	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	0x41	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	0xF4	CRC_L	Low bit of CRC check.

6.4 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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