EP Series

Modbus TCP User Manual

1. Driver hardware manual

1.1. Product profile

Thank you for purchasing Rtelligent stepper driver based on Ethernet technology. I hope that our products can help you successfully complete your motion control project.

The EP series product is a stepper motor driver based on MODBUS/TCP communication protocol, which integrates intelligent motion control functions, built-in trapezoidal acceleration/deceleration curve, and can independently set acceleration and deceleration. The driver adopts standard Ethernet interface and is compatible with 10M/100M bps network interface. Compared with MODBUS/RTU products (NT60, maximum speed 115200 bps), the communication speed is greatly improved. At the same time compatible with standard Ethernet layout, low cost.

1.2. Features

◆ **Power supply**	18 - 50VDC.
◆ **Output current**	Maximum 6.0A (Peak).
◆ **Current control**	SVPWM algorithm and PID control.
◆ **Revolution setting**	200 ~ 4,294,967,295.
◆ **Matched motor**	2 phase / 3 phase stepper motor.
◆ **System self-test**	Detect motor parameters during driver power-on initialization and optimize current control gain based on voltage conditions.
◆ **Instruction smoothing**	Trapezoidal curve optimization, 1~512 levels can be set.
◆ **Input port**	There are 6 input ports, of which 2 can receive differential signals of 5V~24V level for Orthogonal encoder signal access (EPT60), and 4 receive 5V/24V signal-ended signal.
◆ **Output port**	2 photoelectric isolation output, the maximum withstand voltage is 30V, and the maximum sink current or source current is 100mA.
◆ **Communication interface**	1 RJ45 network port for bus communication, 1 USB port for firmware upgrade.
◆ **Motion control**	Acceleration, deceleration, speed,stroke can be set, homing function.

1.3. Electrical index

Table 1-1 Electrical index

Driver parameter	Minimum	Typical	Maximum	Unit
Power supply	18	-	50	VDC
Output current (Peak)	0.5	-	6.0	A
Control signal breakover current	6	10	15	mA
Under-voltage protection point	-	20	-	VDC
Over-voltage protection point	-	60	-	VDC
Input signal voltage	3.3	5	7	VDC
Driver initialization time	5	-	9	S

1.4. Safety instructions

- The transportation, installation, use or maintenance of this product must be carried out by persons with professional qualifications and familiar with the above operations.
- In order to minimize potential safety hazards, you should comply with all local and national safety regulations when using this device. Different regions have different safety regulations. You should ensure that the installation and use of the device conform to your region. specification.
- System errors may also cause equipment damage or personal injury. We do not warrant that this product is suitable for your particular application, nor can we assume responsibility for the reliability of your system design.
- Be sure to read all relevant documents before installation and use. Improper use may cause equipment damage or personal injury. Please strictly abide by the relevant technical requirements during installation. Be sure to confirm the grounding of each device in the system. Ungrounded systems cannot guarantee electrical safety.
- Some components inside this product may be damaged by external static electricity. Operators should ensure that they are free of static electricity before touching the product, and avoid touching objects that are prone to static electricity (chemical fibers, plastic films, etc.).
- If your equipment is placed in the control cabinet, please close the cover or door of the control cabinet during operation, otherwise it may cause equipment damage or personal injury.
- It is strictly forbidden to hot-plug the cable when the system is running. The arc generated by the hot-plug may cause harm to operators and equipment.

- Please wait at least 3 seconds after turning off the power before touching the product or removing the wiring. Capacitive devices may still store dangerous electrical energy after a power outage, and it will take a certain amount of time to release it. To be on the safe side, use a multimeter to measure before touching the product.
- Please follow the important safety tips in this manual, including clear warning symbols for potential safety hazards, and read and familiarize yourself with these instructions before installation, operation and maintenance. The purpose of this paragraph is to inform users of necessary safety precautions and to reduce the risk of endangering personal and equipment safety. A miscalculation of the importance of safety precautions can result in serious damage or render the equipment unusable.

2. Hardware connection

2.1. Hardware connection diagram

The following sections provide a detailed description of the hardware and how to use it. The hardware diagram is as follows:

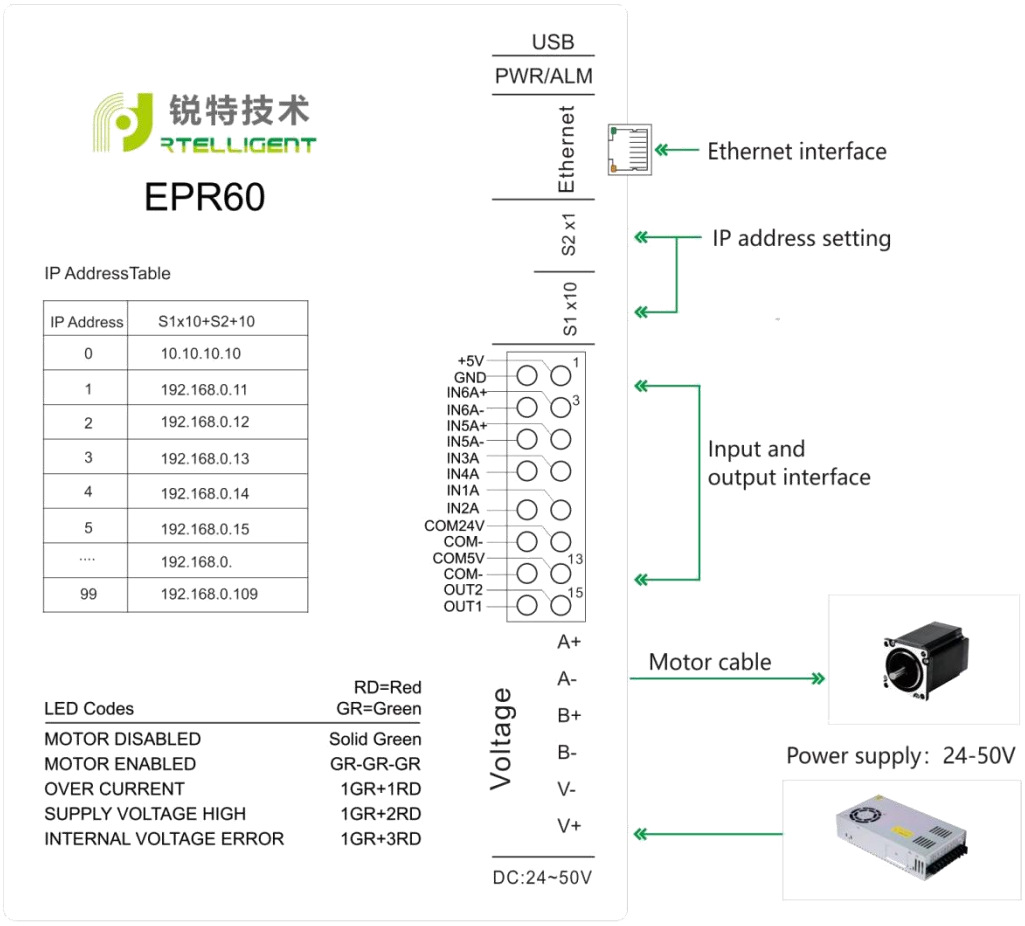


Figure 2-1 Hardware diagram

2.2. Power supply connection

- Connect the driver to DC power supply: V+ is connected to the positive of the DC power supply, V- is connected to the negative of the DC power supply.
- The maximum input voltage of the EPR60/EPT60 is 18~50VDC, do not exceed this specification.
- If your power output does not have a fuse or other device that limits the short-circuit current, you can place an appropriately sized fast-blow fuse (no more than 10Amps) between the power supply and the driver to protect the driver and the power supply, please connect this fuse in series between the

positive of the power supply and the V+ of the driver.

⚠Please be careful not to reverse the connection, the damage to the driver caused by the reverse connection of the power supply cannot be covered by warranty. Please select the appropriate power supply

A. Voltage

When the chopper driver is working, the magnitude and the direction of the motor winding terminal voltage are constantly changed, and the current is detected to obtain the accurate phase current.

If you want to ensure high efficiency and low noise at the same time, the power supply voltage of the driver should be at least 5 times the rated phase voltage of the motor (that is, motor rated phase voltage = motor rated phase current * phase resistance.).

If you need better high speed performance from the motor, you will need to increase the driver supply voltage. If a regulated power supply is used, the power supply voltage should not exceed 50V.

If using an unregulated power supply, the required voltage should not exceed 34V.

B. Current

The maximum supply current should be the sum of the two phase currents. Typically, the current you need depends on the motor model, voltage, speed and load conditions. The actual power supply current value is much lower than this maximum current value, because the driver uses a switching amplifier to convert high voltage and low current into low voltage and high current. The more the power supply voltage exceeds the motor voltage, the less power supply current is required. When the motor is connected to the 48V power supply, the output current of the power supply is half of the output current of the 24V power supply.

2.3. Motor connection

If the motor you are using is our brand stepping motor, please connect the red, blue, green and black wires to the A+, A-, B+, B- ports of the driver in sequence.

The default motor type driven by the driver is a two-phase stepping motor. If the user needs to match a three-phase stepping motor, please modify the motor type through the debugging software before connecting the three-phase stepping motor.

2.4. Digital input and output interface

The EP series driver has 6 digital input ports and 2 digital output ports. The digital input and output ports can be freely configured with various functions according to their own application requirements.

2.4.1. Pin definition

Table 2-1 Pin definition of CN

Pin	Name	Description
1	EXT5V	The driver outputs a 5V power supply for external signals.Maximum load: 150mA. It can be used for power supply of optical encoder.
2	EXTGND	
3	IN6+/EA+	Differential input signal interface, 5V~24V compatible. In open-loop external pulse mode, it can receive direction. In closed-loop mode, this port is used to receive quadrature encoder A-phase signal. Note:The closed-loop mode is only applicable to the EPT60.
4	IN6-/EA-	
5	IN5+/EB+	Differential input signal interface, 5V~24V compatible. In open-loop external pulse mode, it can receive direction. In closed-loop mode, this port is used to receive quadrature encoder B-phase signal. Note:The closed-loop mode is only applicable to the EPT60.
6	IN5-/EB-	
7	IN3	Universal input port 3, default to receive 24V/0V level signal.
8	IN4	Universal input port 4, default to receive 24V/0V level signal.
9	IN1	Universal input port 1, default to receive 24V/0V level signal.
10	IN2	Universal input port 2, default to receive 24V/0V level signal.
11	COM24V	External IO signal power supply 24V positive.
12，14	COM0V	Internal power supply output GND.
13	COM5V	External IO signal power supply 5V positive.
15	OUT2	Output port 2, open collector, output current capability up to 100mA.
16	OUT1	Output port 1, open collector, output current capability up to 30mA.

2.4.2. Input

The schematic diagram of the input port is shown in Figure 2-2 below, and the user can perform system wiring according to the schematic diagram.

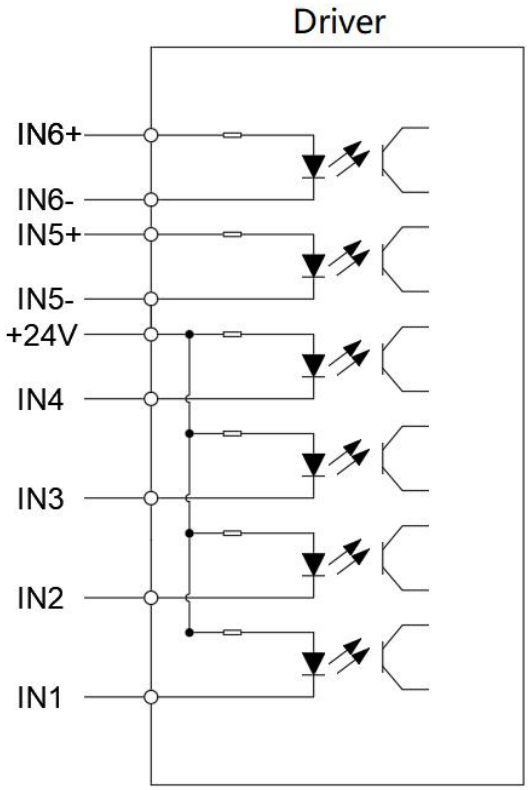


Figure 2-2 Input port schematic diagram

A. IN1, IN2, IN3, IN4 single-ended input signal

IN1, IN2, IN3 , IN4: Photoelectric isolation, signal-ended input, minimum pulse width 100us, maximum pulse frequency 5KHz. The high level can directly receive 5V or 24V signal, 5V signal and 24V signal use different common input ports, namely COM5V and COM24V.

Since the input circuit is an optocoupler isolation circuit, a 5~24VDC power supply is required. For example, when connected to a PLC, the power supply of the PLC can be used; when using a relay or mechanical switch, an external power supply is required. COM5V and COM24V are the common terminals of single-ended input signals. The commonly used wiring methods are shown in Figure 2-3 below.

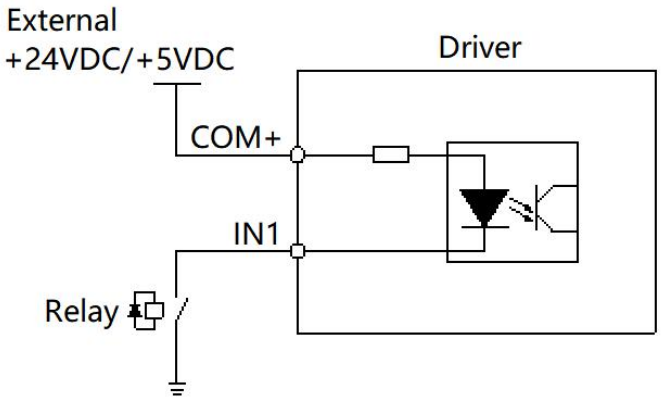


Figure 2-3 single-ended input

Please use RTConfigurator software to configure the functions of IN1, IN2, IN3 and N4.

B. IN5, IN6 differential input signal

IN5 and IN6 are used to receive the encoder differential signal. The wiring method is shown in Figure 2-4 below, and can also be used for other single-ended signals. Compatible with 5~24V signals.

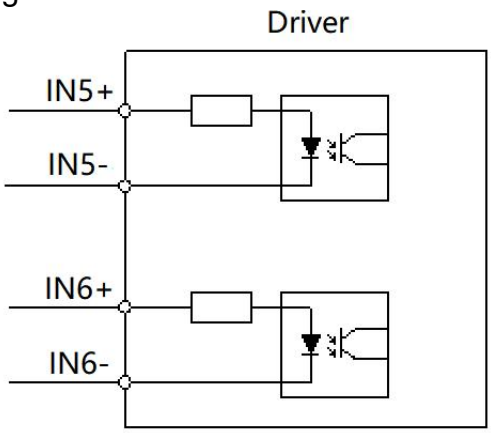


Figure 2-4 Differential input

2.4.3. Output

◆ The EP series driver contains two photoelectric isolation output signals.

◆ The output current capability of OUT1 is up to 30mA, and the output current capability of OUT2 is up to 100mA.

◆ All digital output ports are normally open by default, and the polarity of the output ports can be changed with the RTConfigurator debugging software.

A. The schematic diagram of the single-ended input interface of the output port is shown in Figure 2-5 below.

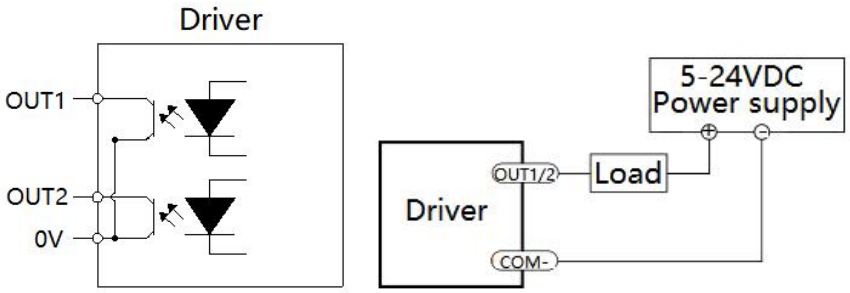


Figure 2-5 Output port single-ended input

B. Connect OUT1/OUT2 as sinking type output and connect it to the PLC input, as shown in Figure 2-6 below.

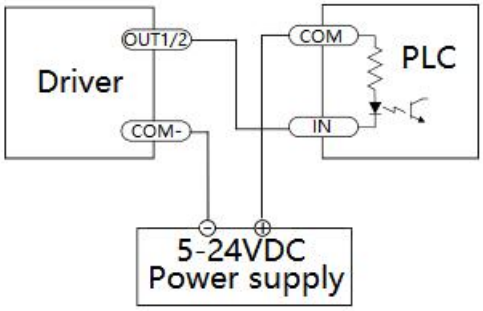


Figure 2-6 Connect with PLC

C. Connect OUT1/OUT2 as sinking type output and connect it to the relay, as shown in Figure 2-7 below.

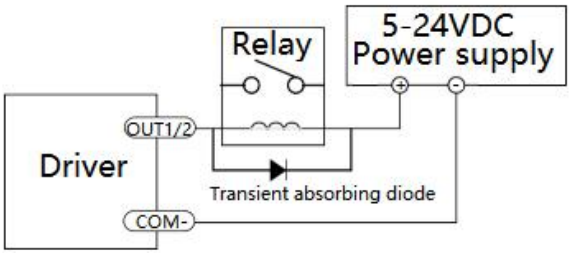


Figure 2-7 Connect with relay

2.5. Network connection and IP address settings

Before you start, please confirm that you have the following fittings.

◆ A stepper motor matching the driver.

◆ A small straight screwdriver for tightening the connector screws.

◆ A computer.

◆ RTConfigurator software(It can be download from: http://www.rtelligent.net/).

◆ A network cable is used for the driver parameter configuration, or for the connection between the driver and the controller.

2.5.1. Download RTConfigurator

◆Download and unzip the RTConfigurator file；

◆Open RTConfigurator software/select communication driver model/communication settings.

2.5.2. Connect your driver and computer using Ethernet

The RJ-45 connector on the EP series driver is a 100BASE-TX (100Mbps) compliant interface that can be connected using a standard network cable. Please use CAT5 or CAT5e (or higher) network cable.

Connecting the driver to the computer involves three steps:

Step 1: Connect the driver to your network from the physical layer

(1) Connection method 1: Connect the driver to your LAN(local area network).

If you have a spare port attached to a switch or router, you can set the driver's IP address and be compatible with your network, which is an easy way to connect. This technique also allows you to connect multiple drivers to your computer.

(2) Connection method 2: Connect the driver to your computer

The specific operation is: connect one end of the network cable to the network card of the computer, and the other end to the driver.

Step 2: Set the IP address of the driver

Every device on an Ethernet network must have a unique IP address. If two devices need to communicate with each other, they must both be connected to the network, and both must have IP addresses under the same subnet. A Subnet is a logical partition in a large network. Devices on one subnet cannot generally communicate with devices on another subnet unless they are connected through special network devices (such as routers). A subnet consists of a selected IP address and a subnet mask.

If you want to know your computer's IP address and subnet mask, select Start...Run. Then enter "cmd", then enter "ipconfig /all" and press Enter. You should see something like Figure 2-8 below:

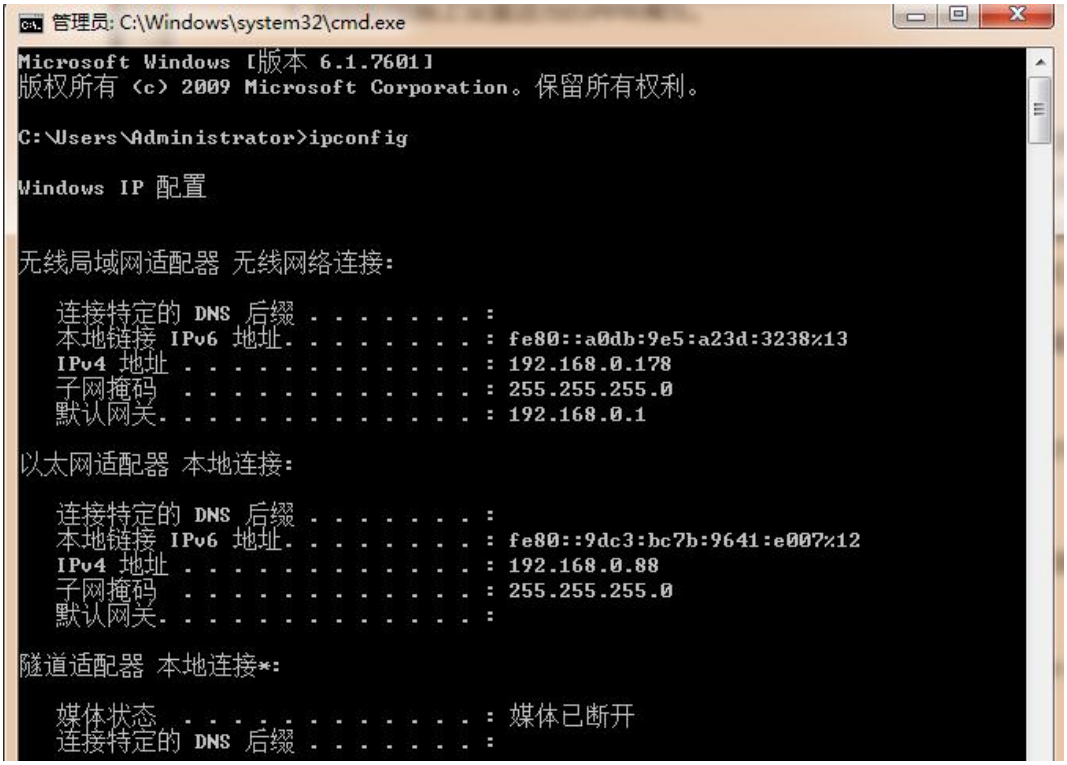


Figure 2-8 IP address and subnet mask

If your computer's subnet mask is set to 255.255.255.0, such a setting is called a Class C subnet mask, and your machine can only communicate with another network device that has the same first three bytes of its IP address..

Note: The numbers between IP address data points are called bytes.

You can refer to the following two situations:

(1) Class C subnet mask

If your computer has a class C subnet mask and the IP address is 192.168.0.20, then it can communicate with the device whose IP address is 192.168.0.40, but cannot communicate with the device whose IP address is 192.168.1.40.

(2) Class B subnet mask

If you change your subnet mask to 255.255.0.0, such a setting is called a class B subnet mask, then your device can communicate with any device with the same first 2 bytes of the subnet mask.

Step 3: Set the appropriate network properties on your computer

Set the drive's two rotary DIP switches to 0 and the IP address to 10.10.10.10.

(1) In Windows XP, right-click "My Network" and select "Properties". Windows 7, click Computer. Scroll down until you see "Network" in the left pane. Right-click and select "Properties". Select "Change Adapter Settings".

(2) You should see an icon for your network interface card (NIC). Right-click and select “Properties”.

(3) Scroll down until you see "Internet Protocol (TCP/IP)." Select this item and click the "Properties" button. windows 7 and vista, look for "(Transmission Control Protocol/IP v4)"

(4) Select the option "Use the following IP address". Enter the address "10.10.10.11". This will give your computer an IP address similar to that of drivers on the same subnet.

(5) Next, enter the subnet mask as "255.255.255.0".

(6) Be sure to leave "Default Gateway" blank. This will prevent your computer from looking for routers from this subnet.

(7) Because the driver is directly connected to the computer, your computer will have a message bubble in the corner of the screen indicating that the network cable is unplugged when the driver is powered off.

2.5.3. IP setting

The IP setting address format is: IPADD0. IPADD1. IPADD2. IPADD3

Default: IPADD0=192, IPADD1=168, IPADD2=0; The EP series driver has two10-bit rotary DIP switches, the combination setting is IPADD3 in the IP address, IPADD3 = (S1*10)+S2+10.

The factory default addresses are listed in Table 2-2 below:

Table 2-2 Factory default address

DIP Combination Value	IP address
0	10.10.10.10
1	192.168.0.11
2	192.168.0.12
3	192.168.0.13
4	192.168.0.14
5	192.168.0.15
...	192.168.0. IP low address
99	192.168.0.109

The switch 0 bit is always "10.10.10.10", and is the universal recovery address. If someone wants to change another IP address but it is not recorded, once the address is forgotten. Then only through the universal recovery address to connect.

The user can set the upper three bits of the IP address, subnet mask, gateway and other parameters through the "10.10.10.10" address. The details are shown in Table 2-3 below, among which:

The IP setting address format is: IPADD0. IPADD1. IPADD2. IPADD3

Default: 192.168.0. IPADD3

The gateway setting format is: GW0. GW1. GW2. GW3

Default: 192.168.0.1

The subnet mask format is: MSK0. MSK1. MSK2. MSK3

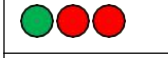
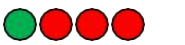
Default: 255.255.255.0

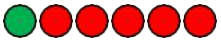
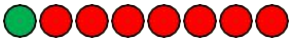
Table 2-3 IP address setting

MODBUS address	Bits	Property	Default	Range	Description
170	8	R/W	192	[0,255]	IPADD0
171	8	R/W	168	[0, 255]	IPADD1
172	8	R/W	0	[0, 255]	IPADD2
173	8	R/W	192	[0, 255]	GW0
174	8	R/W	168	[0, 255]	GW1
175	8	R/W	0	[0, 255]	GW2
176	8	R/W	1	[0, 255]	GW3
177	8	R/W	255	[0, 255]	MSK0
178	8	R/W	255	[0, 255]	MSK1
179	8	R/W	255	[0, 255]	MSK2
180	8	R/W	0	[0, 255]	MSK3

2.6. Alarm code

Table 2-4 Alarm code

LED status		Driver status
	Green indicator is on for long time	Disabled
	Green indicator is flickering	Working normally
	One green indicator, one red indicator	Overcurrent
	One green indicator, two red indicators	Overvoltage
	One green indicator, three red indicators	Internal voltage error
	One green indicator, four red indicators	Encoder out of tolerance alarm

	One green indicator, five red indicators	Encoder error
	One green indicator, six red indicators	Parameter validation error
	One green indicator, seven red indicators	Motor phase loss alarm

2.7. Mechanical dimensions

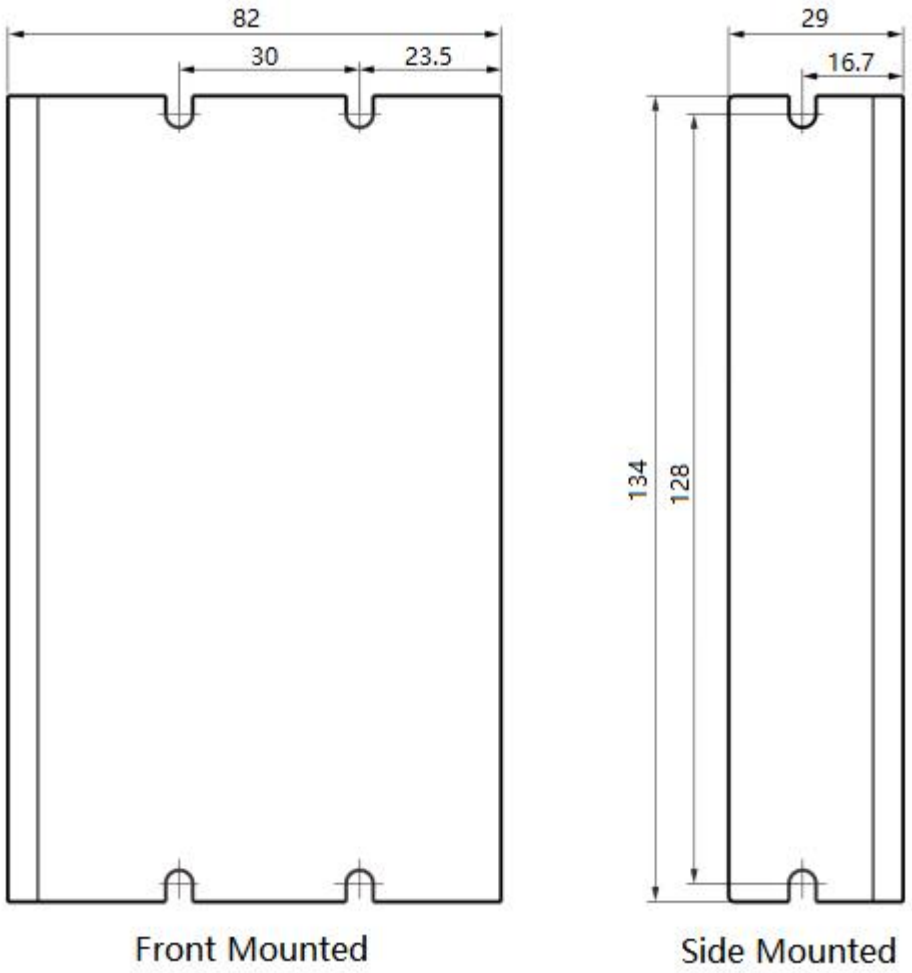


Figure 2-9 Driver dimensions

3. Communication

3.1. Modbus/TCP introduction

Modbus is a communication protocol developed by MODICON in 1979 and is an industrial field bus protocol standard. In 1996, Schneider introduced the MODBUS protocol based on Ethernet TCP/IP-ModbusTCP. Modbus is an application layer messaging protocol used for client/server communication between devices connected on different types of buses or networks.

MODBUSTCP is a transmission protocol running on TCP/IP, (IANA-Internet Assigned Numbers Authority) assigned port 502 for MODBUS/TCP, which is the only port assigned in the instrumentation and automation industry at present.

It is usually used in the following media:

- TCP over Ethernet;
- Various asynchronous serial transmission media: RS-232, RS-422, RS-485.

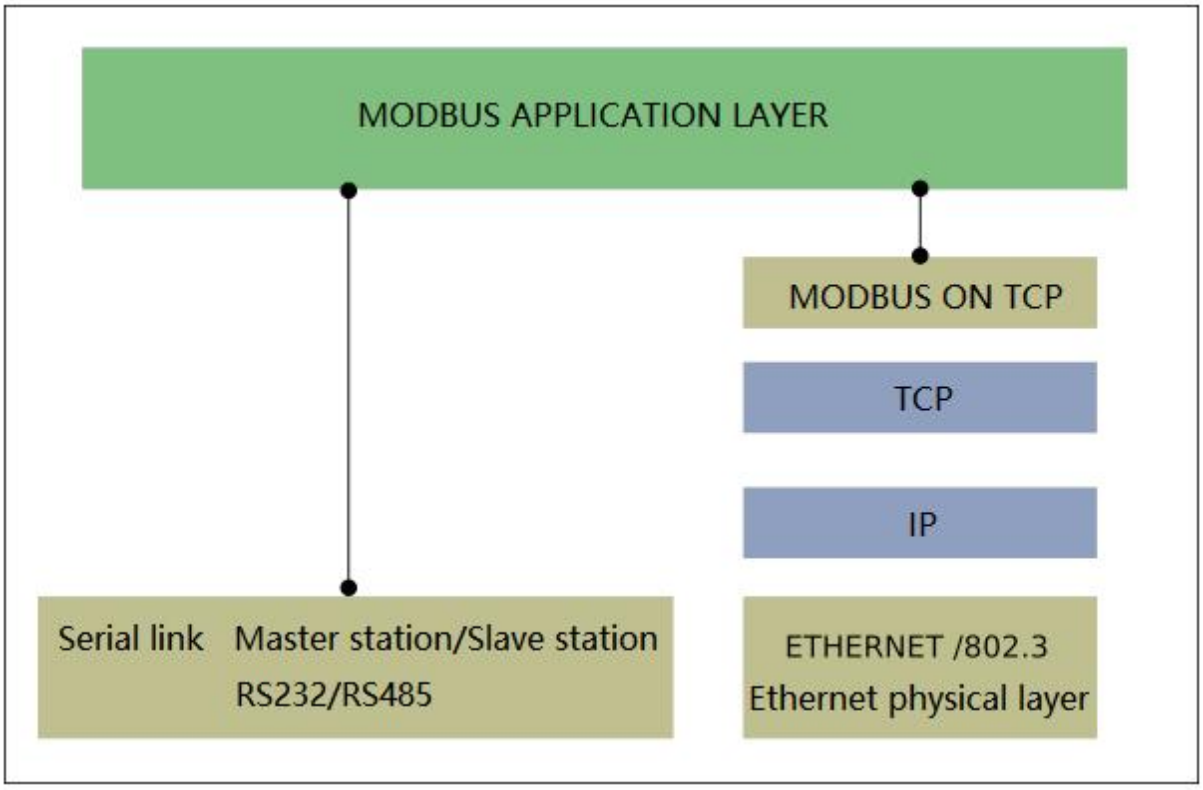


Figure 3-1 Modbus application layer

The MODBUS protocol allows easy communication in all types of network architectures.

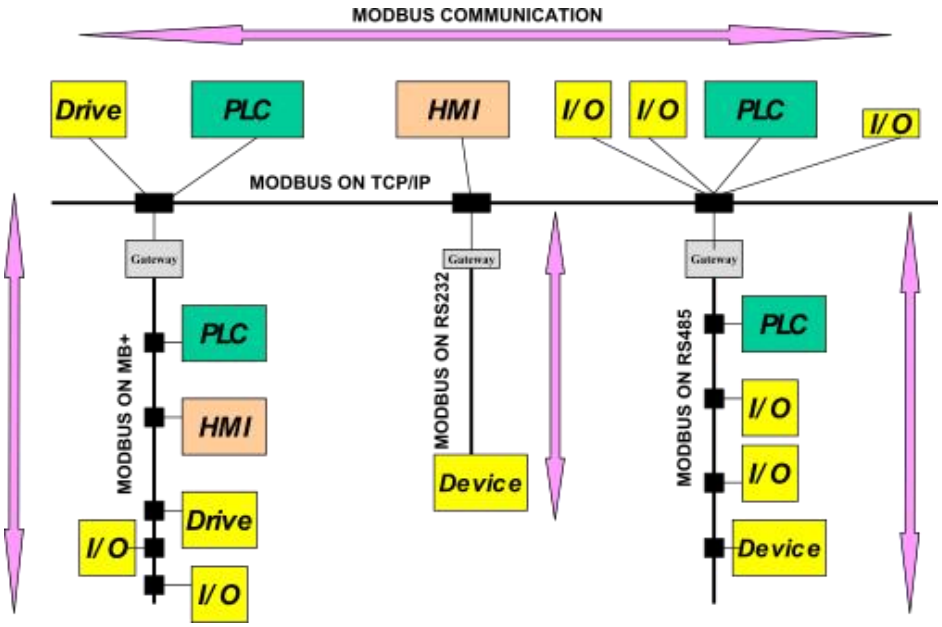


Figure 3-2 Modbus communication

A. Function code supported by Modbus/TCP

EP series drivers currently support the following Modbus function codes:

a. 0x03: Read Holding Registers

b. 0x06: Write Single Register

c. 0x10: Write Multiple Registers

B. Modbus/TCP register

a. Register address description

The MODBUS register starts with 0, while in the touch screen and PLC, the address of the register is usually expressed as 400x type, starting with 1. So: PLC address = MODBUS address + 1.

b. Register operation type

R-Read-only

W-Write-only

R/W-Read/Write

c. Data type

MODBUS defaults a register to 16 bits. Two consecutive registers Form a 32-bit data, the lower 16 bits are first, and the higher 16 bits are last.

SHORT —— 16bit

LONG —— 32bit

3.2. Register summary

Note: The register addresses in the following register summary table are all decimal.

Table 3-1 Register summary

Register address	Operation type	Data type	Function description	Remark
0	R	SHORT	Alarm Code, warning mark	
1	R	SHORT	Status Code, driver status flag	
2	R	SHORT	Current input port value	
3	R	SHORT	Current output port value	
4	R	SHORT	Input port on edge latch register	
5	R	SHORT	Input port shutdown edge latch register	
6	W	SHORT	Input port on edge clear register	
7	W	SHORT	Input port shutdown edge clear register	
8	R	SHORT	Current absolute position in internal pulse mode, low 16 bits	Form a long data
9	R	SHORT	Current absolute position in internal pulse mode, high 16 bits	
10	R	SHORT	Given speed (RPM)	
11	R	SHORT	BUS voltage (mV)	
12	R	SHORT	Motor tracking error in closed-loop mode, low 16 bits	Form a long data
13	R	SHORT	Motor tracking error in closed-loop mode, high 16 bits	
14	R	SHORT	External pulse counter, low 16 bits	Form a long data
15	R	SHORT	External pulse counter, high 16 bits	
16	W	SHORT	Clear external pulse counter	
17	R/W	SHORT	Command working mode: internal command pulse or external command pulse	
18	R/W	SHORT	Control command in internal pulse mode	
19	R	SHORT	Pulse command mode in external pulse	
20	R/W	SHORT	Application Mode Selection in Internal Pulse Mode	
21	R/W	SHORT	Motor type selection: two-phase or three-phase	
22	R/W	SHORT	Motor running mode selection:	

			Open-loop, servo mode one, servo mode two	
23	R/W	SHORT	Reverse the running direction of the motor	
25	R/W	SHORT	Open-loop running current (mA)	
26	R/W	SHORT	Standby Current Percentage (%)	
27	R/W	SHORT	Time to enter standby after pulse stops (ms)	
28	R/W	SHORT	Pulse command filter	
29	R	SHORT	Encoder current position (number of pulses)	
30	R/W	SHORT	Automatic PI enable function	
31	R	SHORT	Automatically recognized resistance value (mOhm)	
32	R	SHORT	Automatically recognized inductance value (mH)	
33	R/W	SHORT	User-set resistance value	
34	R/W	SHORT	User-set inductance value	
35	R/W	SHORT	Reserve	
36	R/W	SHORT	Current loop proportional gain	
37	R/W	SHORT	Current loop integral gain	
38	R/W	SHORT	Current loop phase lead gain	
39	R/W	SHORT	Current loop step test	
40	R/W	SHORT	Motor encoder resolution	
41	R/W	SHORT	Tracking error alarm threshold	
42	R/W	SHORT	Positioning completion accuracy	
43	R/W	SHORT	Positioning completion duration	
44	R/W	SHORT	Time from pulse stop to start detection of positioning completion	
45	R/W	SHORT	Closed-loop maximum current	
46	R/W	SHORT	Basic current percentage (%)	
47	R/W	SHORT	Level one speed feedback filter	
48	R/W	SHORT	Level two speed feedback filter	
49	R/W	SHORT	Servo mode one low speed anti-resonance gain	
50	R/W	SHORT	Servo mode two position loop proportional gain	
51	R/W	SHORT	Servo mode two position loop integral gain	
52	R/W	SHORT	Servo mode two speed loop damping 1	

53	R/W	SHORT	Servo mode two speed loop damping 2	
54	R/W	SHORT	Servo mode two speed loop feedforward gain	
55	R/W	SHORT	Servo mode two gravity compensation	
56	R/W	SHORT	Servo mode two acceleration gain	
57	R/W	SHORT	Servo mode two acceleration feedforward gain	
58	R/W	SHORT	Servo mode two speed loop output filter	
59	R/W	SHORT	Servo mode two acceleration feedforward filter	
60	R/W	SHORT	Input port 1 function setting register	
61	R/W	SHORT	Input port 2 function setting register	
62	R/W	SHORT	Input port 3 function setting register	
63	R/W	SHORT	Input port 4 function setting register	
64	R/W	SHORT	Input port 5 function setting register	
65	R/W	SHORT	Input port 6 function setting register	
66	R/W	SHORT	Output port 1 function setting register	
67	R/W	SHORT	Output port 2 function setting register	
68	R/W	SHORT	Output state setting when OUT0 and OUT1 are used as normal output	
69	R	SHORT	Input function status	
70	R/W	SHORT	Point-to-point motion acceleration (r/s^2)	
71	R/W	SHORT	Point-to-point motion deceleration (r/s^2)	
72	R/W	SHORT	Point-to-point motion maximum speed (rpm)	
73	R/W	SHORT	Point-to-point motion stroke, low 16 bits (Pulse)	Form a long data
74	R/W	SHORT	Point-to-point motion stroke, high 16 bits(Pulse)	
75	R/W	SHORT	Jog acceleration (r/s^2)	
76	R/W	SHORT	Jog deceleration (r/s^2)	
77	R/W	SHORT	Jog speed (rpm)	
78	R/W	SHORT	Emergency stop deceleration (r/s^2)	
84	R/W	SHORT	Position mode selection	
85	R/W	SHORT	Internal command counter clear	
88	R/W	SHORT	Out of tolerance alarm is invalid	
89	R/W	SHORT	Servo mode one integral gain	
90	R/W	SHORT	Save parameters	
91	R/W	SHORT	Reset	
92	R	SHORT	Reserve	

93	R	SHORT	Driver ID	
94	R	SHORT	Driver version	
95	R	SHORT	Non-label	
96	R/W	SHORT	Motor subdivision (Pulses/revolution), low 16 bits	Form a long data
97	R/W	SHORT	Motor subdivision (Pulses/revolution), high 16 bits	
100	R/W	SHORT	IO switching effective time in speed table/position table mode	
101	R/W	SHORT	Current step test current (mA)	
102	R/W	SHORT	Output port 3 function setting register (other products)	
103	R/W	SHORT	Reserve	
104	R	SHORT	Reserve	
105	R/W	SHORT	Segment 0 speed	
106	R/W	SHORT	Segment 1 speed	
107	R/W	SHORT	Segment 2 speed	
108	R/W	SHORT	Segment 3 speed	
109	R/W	SHORT	Segment 4 speed	
110	R/W	SHORT	Segment 5 speed	
111	R/W	SHORT	Segment 6 speed	
112	R/W	SHORT	Segment 7 speed	
113	R/W	SHORT	Segment 8 speed	
114	R/W	SHORT	Segment 9 speed	
115	R/W	SHORT	Segment 10 speed	
116	R/W	SHORT	Segment 11 speed	
117	R/W	SHORT	Segment 12 speed	
118	R/W	SHORT	Segment 13 speed	
119	R/W	SHORT	Segment 14 speed	
120	R/W	SHORT	Segment 15 speed	
121	R/W	SHORT	Currently triggered position table	
122	R/W	SHORT	Default parameter ID	
123	R	SHORT	Encoder multi-turn count, low 16 bits	Form a long data
124	R	SHORT	Encoder multi-turn count, high 16 bits	

125	R/W	SHORT	Segment 0 displacement, low 16 bits	Form a long data
126	R/W	SHORT	Segment 0 displacement, high 16 bits	
127	R/W	SHORT	Segment 1 displacement, low 16 bits	Form a long data
128	R/W	SHORT	Segment 1 displacement, high 16 bits	
129	R/W	SHORT	Segment 2 displacement, low 16 bits	Form a long data
130	R/W	SHORT	Segment 2 displacement, high 16 bits	
131	R/W	SHORT	Segment 3 displacement, low 16 bits	Form a long data
132	R/W	SHORT	Segment 3 displacement, high 16 bits	
133	R/W	SHORT	Segment 4 displacement, low 16 bits	Form a long data
134	R/W	SHORT	Segment 4 displacement, high 16 bits	
135	R/W	SHORT	Segment 5 displacement, low 16 bits	Form a long data
136	R/W	SHORT	Segment 5 displacement, high 16 bits	
137	R/W	SHORT	Segment 6 displacement, low 16 bits	Form a long data
138	R/W	SHORT	Segment 6 displacement, high 16 bits	
139	R/W	SHORT	Segment 7 displacement, low 16 bits	Form a long data
140	R/W	SHORT	Segment 7 displacement, high 16 bits	
141	R/W	SHORT	Segment 8 displacement, low 16 bits	Form a long data
142	R/W	SHORT	Segment 8 displacement, high 16 bits	
143	R/W	SHORT	Segment 9 displacement, low 16 bits	Form a long data
144	R/W	SHORT	Segment 9 displacement, high 16 bits	
145	R/W	SHORT	Segment 10 displacement, low 16 bits	Form a long data
146	R/W	SHORT	Segment 10 displacement, high 16 bits	
147	R/W	SHORT	Segment 11 displacement, low 16 bits	Form a long data
148	R/W	SHORT	Segment 11 displacement, high 16 bits	
149	R/W	SHORT	Segment 12 displacement, low 16 bits	Form a long data
150	R/W	SHORT	Segment 12 displacement, high 16 bits	
151	R/W	SHORT	Segment 13 displacement, low 16 bits	Form a long data
152	R/W	SHORT	Segment 13 displacement, high 16 bits	
153	R/W	SHORT	Segment 14 displacement, low 16 bits	Form a long data
154	R/W	SHORT	Segment 14 displacement, high 16 bits	
155	R/W	SHORT	Segment 15 displacement, low 16 bits	Form a long data
156	R/W	SHORT	Segment 15 displacement, high 16 bits	
213	R	SHORT	Motor feedback speed	

221	R/W	SHORT	Multi-segment position running mode setting	
222	R/W	SHORT	Multi-segment position displacement end-point number setting	
223	R/W	SHORT	Multi-segment position running waiting time unit setting	
224	R/W	SHORT	Segment 0 displacement maximum speed	
225	R/W	SHORT	Segment 0 displacement acceleration and deceleration	
226	R/W	SHORT	Segment 0 wait time after completion of displacement	
227	R/W	SHORT	Segment 1 displacement maximum speed	
228	R/W	SHORT	Segment 1 displacement acceleration and deceleration	
229	R/W	SHORT	Segment 1 wait time after completion of displacement	
230	R/W	SHORT	Segment 2 displacement maximum speed	
231	R/W	SHORT	Segment 2 displacement acceleration and deceleration	
232	R/W	SHORT	Segment 2 wait time after completion of displacement	
233	R/W	SHORT	Segment 3 displacement maximum speed	
234	R/W	SHORT	Segment 3 displacement acceleration and deceleration	
235	R/W	SHORT	Segment 3 wait time after completion of displacement	
236	R/W	SHORT	Segment 4 displacement maximum speed	
237	R/W	SHORT	Segment 4 displacement acceleration and deceleration	
238	R/W	SHORT	Segment 4 wait time after completion of displacement	
239	R/W	SHORT	Segment 5 displacement maximum speed	
240	R/W	SHORT	Segment 5 displacement acceleration and deceleration	
241	R/W	SHORT	Segment 5 wait time after completion of	

			displacement	
242	R/W	SHORT	Segment 6 displacement maximum speed	
243	R/W	SHORT	Segment 6 displacement acceleration and deceleration	
244	R/W	SHORT	Segment 6 wait time after completion of displacement	
245	R/W	SHORT	Segment 7 displacement maximum speed	
246	R/W	SHORT	Segment 7 displacement acceleration and deceleration	
247	R/W	SHORT	Segment 7 wait time after completion of displacement	
248	R/W	SHORT	Segment 8 displacement maximum speed	
249	R/W	SHORT	Segment 8 displacement acceleration and deceleration	
250	R/W	SHORT	Segment 8 wait time after completion of displacement	
251	R/W	SHORT	Segment 9 displacement maximum speed	
252	R/W	SHORT	Segment 9 displacement acceleration and deceleration	
253	R/W	SHORT	Segment 9 wait time after completion of displacement	
254	R/W	SHORT	Segment 10 displacement maximum speed	
255	R/W	SHORT	Segment 10 displacement acceleration and deceleration	
256	R/W	SHORT	Segment 10 wait time after completion of displacement	
257	R/W	SHORT	Segment 11 displacement maximum speed	
258	R/W	SHORT	Segment 11 displacement acceleration and deceleration	
259	R/W	SHORT	Segment 11 wait time after completion of displacement	
260	R/W	SHORT	Segment 12 displacement maximum speed	
261	R/W	SHORT	Segment 12 displacement acceleration and deceleration	

262	R/W	SHORT	Segment 12 wait time after completion of displacement	
263	R/W	SHORT	Segment 13 displacement maximum speed	
264	R/W	SHORT	Segment 13 displacement acceleration and deceleration	
265	R/W	SHORT	Segment 13 wait time after completion of displacement	
266	R/W	SHORT	Segment 14 displacement maximum speed	
267	R/W	SHORT	Segment 14 displacement acceleration and deceleration	
268	R/W	SHORT	Segment 14 wait time after completion of displacement	
269	R/W	SHORT	Segment 15 displacement maximum speed	
270	R/W	SHORT	Segment 15 displacement acceleration and deceleration	
271	R/W	SHORT	Segment 15 wait time after completion of displacement	
280	R/W	SHORT	Modbus bus error counter	
282	R/W	SHORT	Modbus receive bytes error counter	
287	R/W	SHORT	Homing start control method	
288	R/W	SHORT	Homing mode	
289	R/W	SHORT	High-speed search origin signal	
290	R/W	SHORT	Low-speed search origin signal	
291	R/W	SHORT	Acceleration and deceleration of search origin signal	
292	R	SHORT	Reserve	
293	R/W	SHORT	Mechanical origin offset, low 16 bits	Form a long data
294	R/W	SHORT	Mechanical origin offset, high 16 bits	
295	R/W	SHORT	Mechanical origin offset processing method	

3.3. Register details

3.3.1. Driver flag register [0～1]

1. Warning mark register [0]

All alarm flags of the driver are defined. MODBUS address: 0

15					11	10	9	8
Reserve								ECDE1
		R-0				R-0		
7	6	5	4	3		2	1	0
POSE	MPE	MEM	OT	UV		OV	OC	IVE
R-0	R-0	R-0	R-0	R-0		R-0	R-0	R-0

Table 3-2 Register details [0]

BIT	Name	Description
9～15	Reserve	Read always returns 0.
8	ECDE1	Encoder failure 0: The encoder signal is normal 1: The encoder signal is abnormal
7	POSE	Tracking Error Alarm 0: No tracking error alarm 1: A tracking error alarm occurs, and the motor cannot follow the encoder normally. Possible reasons are as follows: ● Position out-of-tolerance alarm threshold ● Encoder wiring ● Motor wiring ● Whether the settings of parameters such as speed and acceleration are reasonable
6	MPE	Motor phase loss alarm 0: No phase loss alarm 1: A phase loss alarm occurs, and the driver cannot detect the current of the motor winding normally. Need to check motor wiring, motor type
5	MEM	Parameter validation error 0: Parameter verification is correct 1: Parameter verification error.

4	OT	Over temperature alarm sign 0: The driver temperature is normal 1: The internal components temperature of the driver is too high
3	UV	Under-voltage alarm sign 0: No under-voltage alarm 1: The driver is under-voltage
2	OV	Over-voltage alarm sign 0: No over-voltage alarm 1: Over-voltage occurs in the drive, and the following check are required: ● Check the input power ● Check the pumping voltage when the motor is decelerating
1	OC	Over-current alarm sign 0: No over-current alarm 1: The drive has an over-current alarm, the possible reasons are as follows: ● The motor winding is short-circuited ● The current set by the driver is too large, causing the motor to burn out ● Internal components of the driver are damaged
0	IVE	Internal voltage error alarm flag 0: No internal voltage error 1: Internal voltage error, usually caused by damage to the internal components of the driver

2. Driver status flag register [1]

Some status flags inside the driver are defined. MODBUS address: 1

15 ~ 11	10	9	8
Reserve	POW	NL	PL
R-0			

7	6	5	4	3	2	1	0
CLAMP	ARRSPD	RDY	HOME	MOV	INPOS	ALM	ENA
R-0	R-0	R-0	R-1	R-0	R-0	R-0	R-1

Table 3-3Register details [1]

BIT	Name	Description
11～15	Reserve	Read always returns 0.
10	POW	power state 0: The drive is not powered 1: The driver is powered on
9	NL	Negative limit valid state 0: Not in the negative limit position 1: In the negative limit position
8	PL	Positive limit valid state 0: Not in the positive limit position 1: in the position limit position
7	CLAMP	Motor mechanical brake state 0: The brake is not opened, and the motor shaft is mechanically locked 1: The brake has been opened and the motor can run
6	ARRSPD	Whether the motor runs to the set speed 0: Speed has not reached 1: Speed has reached In the internal pulse command mode, it is used to indicate whether the motor has reached the set speed
5	RDY	Drive ready flag 0: Unready 1: Ready Normally the driver is in the ready state when it is enabled. However, it takes 100ms of time for the motor to be in the ready state during the transition from the disable to enable. For example, automatic parameter identification and current step test at power-on will cause the motor to be in an unready state.
4	HOME	Homing flag 0: Homing is not completed 1: Homing has been completed
3	MOV	Motor motion flag 0: The motor is in stop state 1: The motor is running

		When the motor is running, it cannot respond to new motion commands, but only to stop commands
2	INPOS	Motor positioning completion flag in closed-loop mode 0: Positioning is not completed 1: Positioning has been completed
1	ALM	Driver alarm flag 0: The driver has no alarm 1: The driver has an alarm, please check the state of the register REG_ALMCODE (address 0)
0	ENA	Driver enable flag 0: The driver is not enabled 1: The driver has been enabled By default, the driver is already enabled when it is powered on.

3.3.2. Input-output status register [2～7]

1. Input port value register [2]

Used to indicate the value of the current input port. Since the input port is optically isolated, in order to facilitate understanding, the state of the input port is represented by whether the optocoupler is on or off. MODBUS address: 2

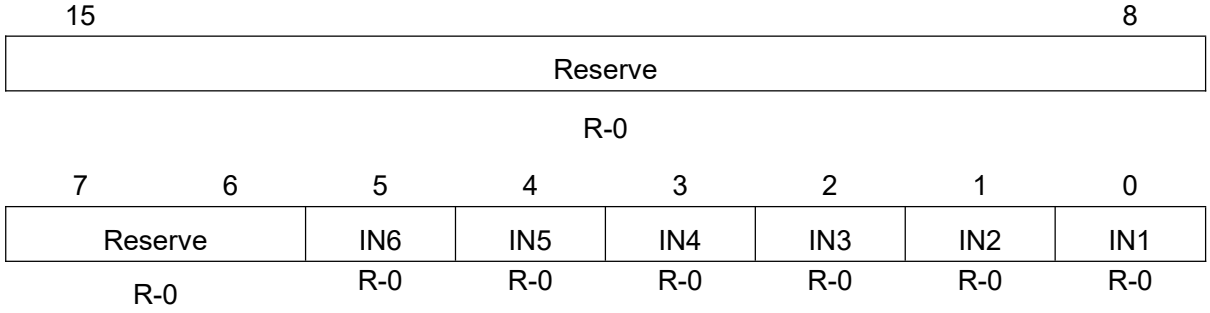


Table 3-4 Register details [2]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	IN6	Input port IN6 level state 0: Input port 6 is off 1: Input port 6 is on
4	IN5	Input port IN5 level state 0: Input port 5 is off

		1: Input port 5 is on
3	IN4	Input port IN4 level state 0: Input port 4 is off 1: Input port 4 is on
2	IN3	Input port IN3 level state 0: Input port 3 is off 1: Input port 3 is on
1	IN2	Input port IN2 level state 0: Input port 2 is off 1: Input port 2 is on
0	IN1	Input port IN1 level state 0: Input port 1 is off 1: Input port 1 is on

2. Output port value register [3]

Output port value register. MODBUS address: 3

15 ~ 8	7 ~ 4	3	2	1	0
Reserve	Reserve	OUT4	OUT3	OUT2	OUT1
R-0	R-0	R-0	R-0	R-0	R-0

Table 3-5 Register details [3]

BIT	Name	Description
4～15	Reserve	Read always returns 0.
3	OUT4	Output port OUT4 level state (other products) 0: Output port 4 is off 1: Output port 4 is on
2	OUT3	Output port OUT3 level state (other products) 0: Output port 3 is off 1: Output port 3 is on
1	OUT2	Output port OUT2 level state 0: Output port 2 is off 1: Output port 2 is on
0	OUT1	Output port OUT1 level state 0: Output port 1 is off 1: Output port 1 is on

3. Input port on edge latch register [4]

Each time the port changes from the off state to the on state, the driver will latch this change edge. MODBUS address: 4

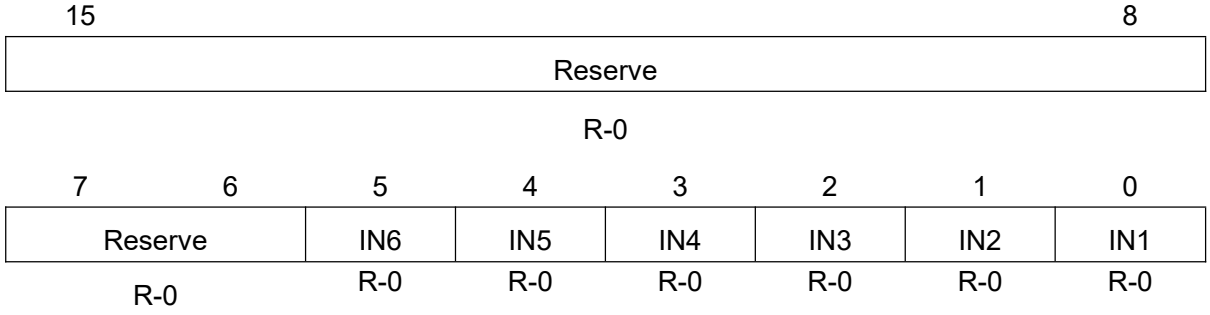


Table 3-6 Register details [4]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	IN6	Input port IN6 on edge latch flag 0: Input port IN6 has no on edge 1: Input port IN6 has a on edge
4	IN5	Input port IN5 on edge latch flag 0: Input port IN5 has no on edge 1: Input port IN5 has a on edge
3	IN4	Input port IN4 on edge latch flag 0: Input port IN4 has no on edge 1: Input port IN4 has a on edge
2	IN3	Input port IN3 on edge latch flag 0: Input port IN3 has no on edge 1: Input port IN3 has a on edge
1	IN2	Input port IN2 on edge latch flag 0: Input port IN2 has no on edge 1: Input port IN2 has a on edge
0	IN1	Input port IN1 on edge latch flag 0: Input port IN1 has no on edge 1: Input port IN1 has a on edge

4. Input port shutdown edge latch register [5]

Each time the port changes from the on state to the off state, the driver will latch this change edge. MODBUS address: 5

15							8
Reserve							
R-0							
7	6	5	4	3	2	1	0
Reserve		IN6	IN5	IN4	IN3	IN2	IN1
R-0		R-0	R-0	R-0	R-0	R-0	R-0

Table 3-7 Register details [5]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	IN6	Input port IN6 shutdown edge latch flag 0: Input port IN6 has no shutdown edge 1: Input port IN6 has a shutdown edge
4	IN5	Input port IN5 shutdown edge latch flag 0: Input port IN5 has no shutdown edge 1: Input port IN5 has a shutdown edge
3	IN4	Input port IN4 shutdown edge latch flag 0: Input port IN4 has no shutdown edge 1: Input port IN4 has a shutdown edge
2	IN3	Input port IN3 shutdown edge latch flag 0: Input port IN3 has no shutdown edge 1: Input port IN3 has a shutdown edge
1	IN2	Input port IN2 shutdown edge latch flag 0: Input port IN2 has no shutdown edge 1: Input port IN2 has a shutdown edge
0	IN1	Input port IN1 shutdown edge latch flag 0: Input port IN1 has no shutdown edge 1: Input port IN1 has a shutdown edge

5. Input port on edge clear register [6]

Used to clear the latched on edge flag. MODBUS address: 6

15	14	13	12	11	10	9	8
Reserve							
R-0							

7	6	5	4	3	2	1	0
Reserve		IN6	IN5	IN4	IN3	IN2	IN1
R-0		R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0

Table 3-8 Register details [6]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	IN6	Clear the on edge latch state flag of IN6 0: No effect 1: Clear the on edge latch flag of the IN6 port
4	IN5	Clear the on edge latch state flag of IN5 0: No effect 1: Clear the on edge latch flag of the IN5 port
3	IN4	Clear the on edge latch state flag of IN4 0: No effect 1: Clear the on edge latch flag of the IN4 port
2	IN3	Clear the on edge latch state flag of IN3 0: No effect 1: Clear the on edge latch flag of the IN3 port
1	IN2	Clear the on edge latch state flag of IN2 0: No effect 1: Clear the on edge latch flag of the IN2 port
0	IN1	Clear the on edge latch state flag of IN1 0: No effect 1: Clear the on edge latch flag of the IN1 port

6. Input port shutdown edge clear register [7]

Used to clear the latched shutdown edge flag. MODBUS address: 7

15 … 8	7	6	5	4	3	2	1	0
Reserve	Reserve		IN6	IN5	IN4	IN3	IN2	IN1
R-0	R-0		R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0

Table 3-9 Register details [7]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	IN6	Clear the shutdown edge latch state flag of IN6 0: No effect 1: Clear the shutdown edge latch flag of the IN6 port
4	IN5	Clear the shutdown edge latch state flag of IN5 0: No effect 1: Clear the shutdown edge latch flag of the IN5 port
3	IN4	Clear the shutdown edge latch state flag of IN4 0: No effect 1: Clear the shutdown edge latch flag of the IN4 port
2	IN3	Clear the shutdown edge latch state flag of IN3 0: No effect 1: Clear the shutdown edge latch flag of the IN3 port
1	IN2	Clear the shutdown edge latch state flag of IN2 0: No effect 1: Clear the shutdown edge latch flag of the IN2 port
0	IN1	Clear the shutdown edge latch state flag of IN1 0: No effect 1: Clear the shutdown edge latch flag of the IN1 port

3.3.3. Motor current position and speed related registers [8～16]

Table 3-10 Register detail [8-16]

Register address	Bits	Property	Default	Range	Description
8	16	R	0	[0,65535]	In the internal pulse mode, the current absolute position, low 16 bits
9	16	R	0	[0,65535]	In the internal pulse mode, the current absolute position, high 16 bits
10	16	R	0	[-3000,3000]	Current command speed. Signed 16-bit data, unit: rpm
11	16	R	-	[0,100]	Current bus voltage value, unit: mV
12	16	R	0	[0,65535]	In closed-loop mode, motor tracking error, low 16 bits, unit: encoder resolution Note: Closed-loop mode is only available for EPT60.
13	16	R	0	[0,65535]	In closed-loop mode, motor tracking error, high 16 bits, unit: encoder resolution Note: Closed-loop mode is only available for EPT60.
14	16	R	0	[0,65535]	External pulse counter, low 16 bits
15	16	R	0	[0,65535]	External pulse counter, high 16 bits
16	16	R/W	0	[0,1]	Clear external pulse counter 0: No effect, reading always returns 0 1: It will clear the external pulse counter and register 14 and 15 will become 0. Then this register will become 0.

3.3.4. Driver control mode settings [17～23]

Table 3-11 Register details [17-23]

Register address	Bits	Property	Default	Range	Description
17	16	R/W	0	[0,1]	Command mode setting register, set the pulse command source of the driver 0: Internal pulse command 1: External pulse command

18	16	R/W	0	[0,6]	Control commands in internal pulse mode 0: Waiting state When the driver receives any control command, it will restore the bit wait state after processing by the driver. So reading this register always returns 0. 1: Fixed-length forward In the relative position mode, the motor runs forward according to registers 70~74 parameters. In absolute position mode, the running state is determined based on the current position and the absolute position set by 70~74. 2: Fixed-length reverse In the relative position mode, the motor runs reverse according to registers 70~74 parameters. In the absolute position mode, the running state is determined based on the current position and the absolute position set by 70~74. 3: Speed mode, jog forward The motor performs forward acceleration operation according to registers 75 and 76. 4: Speed mode, jog reverse The motor performs reverse acceleration operation according to registers 75 and 76. 5: Emergency stop The motor decelerates and stops according to the register 77. 6: Decelerate to stop In position mode, the motor decelerates and stops according to the register 71; In speed mode, the motor decelerates and stops according to the register 76;

					Other: No effect. This register works only when the value of internal pulse mode register 20 is 0.
19	16	R/W	0	[0,2]	External pulse command mode setting register 0: IN1 is the pulse input port, IN2 is the direction input port 1: IN1 is the forward pulse input port, IN2 is the reverse pulse input port 2: IN1 is the A-phase input port of the quadrature encoder, and IN2 is the B-phase input port of the quadrature encoder Other: invalid ● Note: In mode 2 here, although the driver receives the quadrature encoder signal, the driver only follows it, which is a form of command. Not the position feedback signal of the stepper motor itself. This function can be used to follow the encoder signal output by other devices such as servo drivers.
20	16	R/W	0	[0,5]	Application Mode Selection in Internal Pulse Mode 0: Response to the command of register 18 1: Homing mode 2: Preset IO control mode 1: start-stop + direction 3: Preset IO control mode 2: Forward + Reverse 4: Preset IO control mode 3: Internal speed table 5: Preset IO control mode 4: Internal position table 6: Preset IO control mode 5: Step position 7: Customized 1 8: Customized 2 9: Customized 3 10: Customized 4 11: Customized 5

21	16	R/W	0	[0,1]	Motor type setting register 0: Two-phase stepper motor 1: Three-phase stepper motor
22	16	R/W	0	[0,2]	Motor running mode setting register 0: Open-loop running 1: Servo mode one 2: Servo mode two
23	16	R/W	0	[0,1]	Motor direction inversion setting register 0: Default running direction 1: Reverse the running direction of the motor

3.3.5. Open-loop running parameter settings [24～29]

Table 3-12 Register details [24-29]

Register address	Bits	Property	Default	Range	Description
25	16	R/W	3000	[0,6000]	Open-loop running current Sine peak value when the driver is running in open-loop. Unit: mA
26	16	R/W	50	[0,100]	Standby Current Percentage Set the current as a percentage of the running current when the driver enters the standby state in open-loop running mode. Unit: %
27	16	R/W	500	[10,65535]	Standby time setting Set the time for the driver to enter the standby state after the pulse stops for a certain period of time when the driver is running in open-loop. Unit: ms
28	16	R/W	128	[1,512]	Pulse command filter For smoothing pulse commands (including internal and external pulses), Filter time = set value * 50us
29	16	R	-	-	Encoder current position (number of pulses)

3.3.6. Motor and current loop parameters [30～39]

Table 3-13 Register details [30-39]

Register address	Bits	Property	Default	Range	Description
30	16	R/W	0	[0,1]	Automatic PI enable function The driver has built-in parameter identification and gain optimization algorithms. Usually, better results can be achieved. If the customer needs optimization, this function can be canceled. 0: Cancel the automatic PI function 1: Turn on the automatic PI function
31	16	R	-	[100,65535]	Automatically recognized resistance value Read the motor winding resistance value automatically recognized by the driver. Unit: mOhm
32	16	R	-	[1,65535]	Automatically recognized inductance value Read the motor winding inductance value automatically recognized by the driver. Unit: mH
33	16	R/W	1000	[100,10000]	User-set resistance value In the case of canceling the automatic PI function, the resistance value set by the user takes effect. Unit: mOhm
34	16	R/W	1	[1,10]	User-set inductance value In the case of canceling the automatic PI function, the inductance value set by the user takes effect. Unit: mH
36	16	R/W	1000	[200,10000]	Current loop proportional gain KP in the current loop PI algorithm. When the automatic PI function is enabled, the ILOOPKP is automatically generated. When the automatic PI function is not enabled, the user can modify the ILOOPKP.

37	16	R/W	200	[0,2000]	Current loop integral gain KI in the current loop PI algorithm. When the automatic PI function is enabled, the ILOOPKI is automatically generated. When the automatic PI function is not enabled, the user can modify the ILOOPKP.
38	10	R/W	256	[0,1024]	Current Loop PI Algorithm KC
39	16	R/W	0	[0,1]	Current loop step test 0: No effect, read always returns 0; 1: The current loop step test will be started. At this time, the current of the motor winding is first 0, and then increases to 1000mA.

3.3.7. Closed-loop control of motor parameters [40～48]

Table 3-14 Register details [40-48]

Register address	Bits	Property	Default	Range	Description
40	16	R/W	4000	[256,65535]	Motor encoder resolution The driver is capable of receiving a quadrature encoder input signal and performing a 4-multiplication process. Encoder Resolution = Encoder Lines * 4
41	16	R/W	2000	[100,65535]	Tracking error alarm threshold The alarm threshold is in units of encoder resolution.
42	16	R/W	10	[1,65535]	Positioning completion accuracy The unit is the encoder resolution.
43	16	R/W	50	[1,65535]	Positioning completion duration Set the time that the motor will last after entering the completion precision. Duration = set value * 50us
44	16	R/W	100	[1,65535]	Time from pulse stop to start detection of positioning completion Set the driver to stop receiving pulses, after

					the set time, and then start to determine whether the positioning is complete. Set time = set value * 50us
45	16	R/W	4000	[0,5000]	Closed-loop maximum current Set the maximum allowable current when the drive is running in closed-loop, peak sine. Unit: mA
46	16	R/W	50	[0,100]	Basic current percentage for closed-loop control. Unit: %
47	16	R/W	200	[10,5000]	Level one speed feedback filter. Unit: Hz
48	16	R/W	600	[10,5000]	Level two speed feedback filter. Unit: Hz
213	16	R	0	[0,65535]	Motor feedback speed

3.3.8. Closed-loop servo parameters [49～59]

Table 3-15 Register details [49-59]

Register address	Bits	Property	Default	Range	Description
49	16	R/W	0	[0,500]	Servo mode one low speed anti-resonance gain
50	16	R/W	3000	[0,65535]	Servo mode two position loop proportional gain
51	16	R/W	1000	[0,65535]	Servo mode two position loop integral gain
52	16	R/W	0	[0,65535]	Servo mode two speed loop damping 1
53	16	R/W	800	[0,65535]	Servo mode two speed loop damping 2
54	16	R/W	600	[0,65535]	Servo mode two speed loop feedforward gain
55	16	R/W	512	[0,1024]	Servo mode two gravity compensation
56	16	R/W	0	[0,65535]	Servo mode two acceleration gain
57	16	R/W	0	[0,65535]	Servo mode two acceleration feedforward gain
58	16	R/W	5000	[10,5000]	Servo mode two speed loop output filter
59	16	R/W	2000	[10,5000]	Servo mode two acceleration feedforward filter

3.3.9. Input-output setting registers [60～69]、[102～104]

1．Input port setting register [60～65]

The driver contains 6 input ports, and each input port is set in the same way.

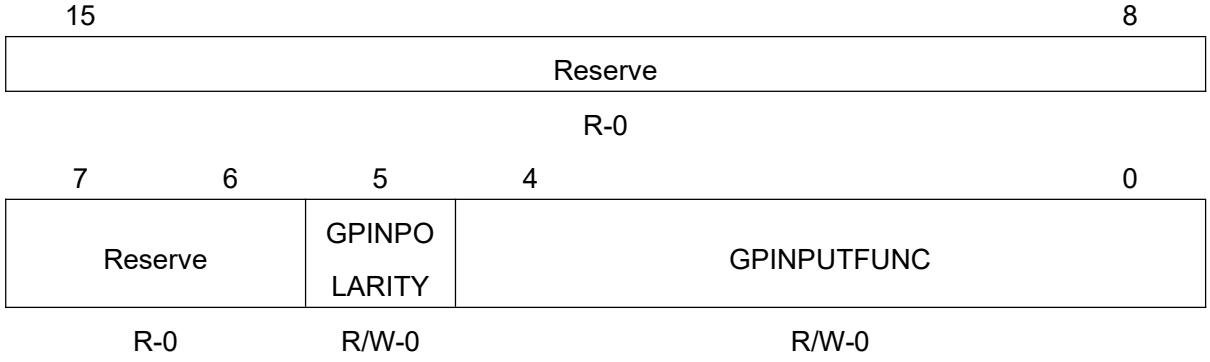


Table 3-16 Register details [60-65]

BIT	Name	Description
6～15	Reserve	Read always returns 0.
5	GPINPOLARITY	Polarity of the input port 0: Normally closed 1: Normally open (Default)
0～4	GPINPUTFUNC	Input port function selection 0: Pulse input 1: Direction input 2: Quadrature Encoder Phase A Input 3: Quadrature Encoder Phase A Input 4: Motor offline 5: Clear fault 6: Emergency stop 7: Jog forward/Start-stop 8: Jog reverse/Direction 9: Positive limit input 10: Reverse limit input 11: Zero point signal 12: Start homing 13: Reverse the running direction of the motor 14: Multi-segment speed control 0 15: Multi-segment speed control 1

		16: Multi-segment speed control 2 17: Multi-segment speed control 3 18: Multi-segment position control 0 19: Multi-segment position control 1 20: Multi-segment position control 2 21: Multi-segment position control 3 Others: No effect, only a common input port.

Table 3-17 Register details [60-65]

Register address	Bits	Property	Default	Range	Description
60	16	R/W	0	[0,21]	Input port 1 function setting register
61	16	R/W	1	[0,21]	Input port 2 function setting register
62	16	R/W	4	[0,21]	Input port 3 function setting register
63	16	R/W	7	[0,21]	Input port 4 function setting register
64	16	R/W	12	[0,21]	Input port 5 function setting register
65	16	R/W	11	[0,21]	Input port 6 function setting register

2. Output port setting registers [66～69]、[104]

The driver contains 2 output ports, and each output port is set in the same way.

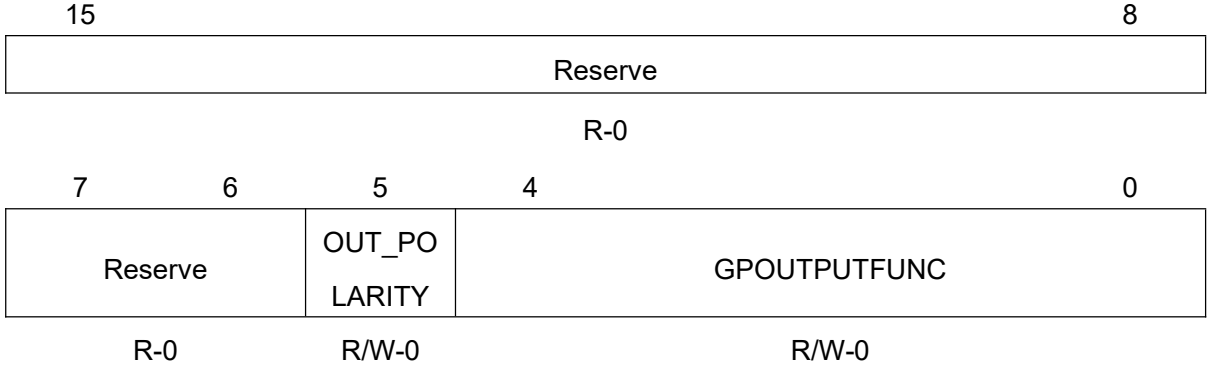


Table 3-18 Register details [66-67]

BIT	Name	Description
5～15	Reserve	Read always returns 0.
4	OUT_POLARITY	Polarity of the output port 0: Normally closed 1: Normally open (Default)

0～3	GPOUTPUTF UNC	Output port function selection 0: Normal output, user control 1: Alarm output, OUT1 default 2: Brake signal output 3: In-position signal output 4: Speed reach output, OUT2 default 5: Zero return complete output 6: Driver ready output 7: Motor stop state output 8: Positive limit output 9: Negative limit output 10: Power indicating output Others: No effect, only a common input port

Table 3-19 Register details [66-67]

Register address	Bits	Property	Default	Range	Description
66	16	R/W	1	[0,11]	Output port 1 function setting register
67	16	R/W	4	[0,11]	Output port 2 function setting register

When the output port 1/2 setting register value is set to 0 (normal output, user control function), the MODBUS address register 68 is used to set whether the output port is turned on. Note that the output port polarity in MODBUS address66/67 still works. The description of the MODBUS address68 register is as follows:

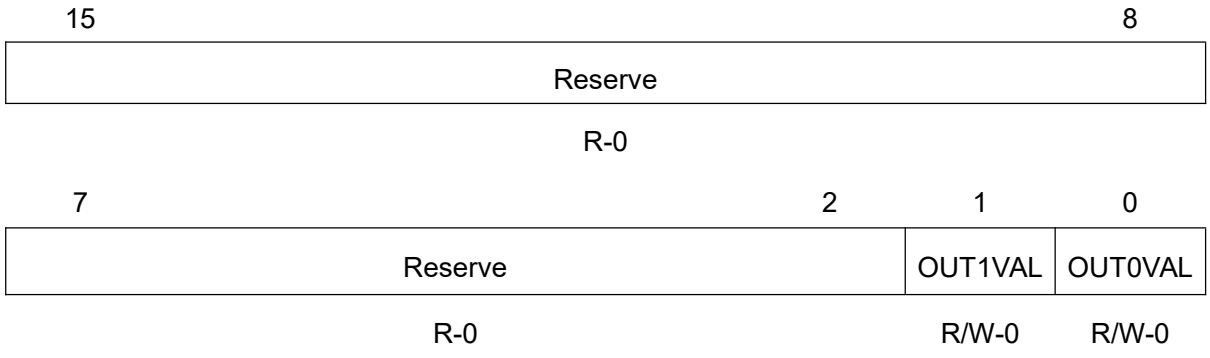


Table 3-20 Register details [68]

BIT	Name	Description
2～15	Reserve	Read always returns 0.
1	OUT1VAL	Set the level state of the output port OUT2 0: Output port 2 is off 1: Output port 2 is on
0	OUT0VAL	Set the level state of the output port OUT1 0: Output port 1 is off 1: Output port 1 is on

Table 3-21 Register detail [68-69]、[104]

Register address	Bits	Property	Default	Range	Description
68	16	R/W	0	[0,1]	Output state setting when OUT1 and OUT2 are used as normal output
69	16	R	-	-	Current input function valid flag bit (consistent with digital input port function) 0: The corresponding function is invalid 1: The corresponding function is valid
104	16	R	-	-	The current output function valid flag bit (consistent with the digital output port function) 0: The corresponding function is invalid 1: The corresponding function is valid

3.3.10. Point-to-point motion parameter settings [70～74]

Table 3-22 Register details [70~74]

Register address	Bits	Property	Default	Range	Description
70	16	R/W	200	[10,1000]	Point-to-point motion acceleration, Unit: r/s^2
71	16	R/W	200	[10,1000]	Point-to-point motion acceleration, Unit: r/s^2
72	16	R/W	600	[0,3000]	Point-to-point motion maximum speed, Unit: rpm

73	16	R/W	2000	[0,65535]	Running distance during point-to-point motion, low 16 bits, Unit: Number of pulses, based on the subdivision setting
74	16	R/W	0	[0,65535]	Running distance during point-to-point motion, high 16 bits, Unit: Number of pulses, based on the subdivision setting

Registers 73 and 74 form a 32-bit signed register.

In the incremental running mode, the absolute values of 73 and 74 represent the running distance, and the motor is controlled to run forward or reverse by writing 1 or 2 to the register 18.

In the absolute position mode, the signed data composed of 73 and 74 represents the target position, and the motor is driven to the set distance by writing 1 to the register 18.

3.3.11. Jog speed mode parameter settings [75～78]

Table 3-23 Register details [75~78]

Register address	Bits	Property	Default	Range	Description
75	16	R/W	100	[10,1000]	Jog acceleration, unit: r/s^2
76	16	R/W	100	[10,1000]	Jog deceleration, unit: r/s^2
77	16	R/W	100	[0,3000]	Jog speed, unit: rpm
78	16	R/W	500	[10,1000]	Emergency stop deceleration, unit: r/s^2

3.3.12. Internal pulse control parameters [84～85]、[88～89]

Table 3-24 Register details [84～85]、[88～89]

Register address	Bits	Property	Default	Range	Description
84	16	R/W	0	[0,1]	Position mode selection 0: Incremental position mode 1: Absolute position mode
85	16	R/W	0	[0,1]	Internal command counter clear 0: Write 0 is invalid, read returns 0

					1: The internal pulse command counter is cleared
88	16	R/W	0	[0,1]	Out of tolerance alarm is invalid 0: The out of tolerance alarm is valid 1: The out of tolerance alarm is invalid
89	16	R/W	50	[0,500]	Servo mode one integral gain

3.3.13. Driver basic parameter registers [90～97]

Table 3-25 Register details [90～97]

Register address	Bits	Property	Default	Range	Description
90	16	R/W	0	[0,1]	Save parameters 0: Write 0 is invalid, read returns 0 1: Write 1 to save the current parameters, and then automatically clear
91	16	R/W	0	[0,1]	Reset 0: Write 0 is invalid, read returns 0 1: Write 1 to restore factory settings, then automatically clear
92	-	-	-	-	Reserve
93	16	R	-	-	Driver ID
94	16	R	-	-	Driver version
95	16	R	-	-	Non-label
96	32	R/W	4000	[200,65535]	Motor subdivision (Pulses/revolution), low 16 bits
97	32	R/W	0	[0,65535]	Motor subdivision (Pulses/revolution), high 16 bits

3.3.14. Speed table parameter settings [100～120]

Table 3-26 Register details [100～120]

Register address	Bits	Property	Default	Range	Description
100	16	R/W	200	[0,65535]	IO switching effective time in speed table/position table mode IO switching effective time = Setting value * 62.5us

101	16	R/W	1000	[0,3000]	Current step test current setting, unit: mA
105	16	R/W	0	[0,3000]	Segment 0 speed, unit: rpm
106	16	R/W	100	[0,3000]	Segment 1 speed, unit: rpm
107	16	R/W	200	[0,3000]	Segment 2 speed, unit: rpm
108	16	R/W	300	[0,3000]	Segment 3 speed, unit: rpm
109	16	R/W	400	[0,3000]	Segment 4 speed, unit: rpm
110	16	R/W	500	[0,3000]	Segment 5 speed, unit: rpm
111	16	R/W	600	[0,3000]	Segment 6 speed, unit: rpm
112	16	R/W	700	[0,3000]	Segment 7 speed, unit: rpm
113	16	R/W	800	[0,3000]	Segment 8 speed, unit: rpm
114	16	R/W	900	[0,3000]	Segment 9 speed, unit: rpm
115	16	R/W	1000	[0,3000]	Segment 10 speed, unit: rpm
116	16	R/W	1100	[0,3000]	Segment 11 speed, unit: rpm
117	16	R/W	1200	[0,3000]	Segment 12 speed, unit: rpm
118	16	R/W	1300	[0,3000]	Segment 13 speed, unit: rpm
119	16	R/W	1400	[0,3000]	Segment 14 speed, unit: rpm
120	16	R/W	1500	[0,3000]	Segment 15 speed, unit: rpm

3.3.15. Position table parameter settings [121～156]

Table 3-27 Register details [121～156]

Register address	Bits	Property	Default	Range	Description
121	16	R	-	-	Currently triggered position table
122	16	R/W	100	[100,110]	Default parameter ID (Do not modify)
123	16	R	-	-	Encoder multi-turn count, low 16 bits
124	16	R	-	-	Encoder multi-turn count, high 16 bits
125	16	R/W	0	[0,65535]	Segment 0 displacement, low 16 bits
126	16	R/W	0	[0,65535]	Segment 0 displacement, high 16 bits
127	16	R/W	0	[0,65535]	Segment 1 displacement, low 16 bits
128	16	R/W	0	[0,65535]	Segment 1 displacement, high 16 bits
129	16	R/W	0	[0,65535]	Segment 2 displacement, low 16 bits
130	16	R/W	0	[0,65535]	Segment 2 displacement, high 16 bits

131	16	R/W	0	[0,65535]	Segment 3 displacement, low 16 bits
132	16	R/W	0	[0,65535]	Segment 3 displacement, high 16 bits
133	16	R/W	0	[0,65535]	Segment 4 displacement, low 16 bits
134	16	R/W	0	[0,65535]	Segment 4 displacement, high 16 bits
135	16	R/W	0	[0,65535]	Segment 5 displacement, low 16 bits
136	16	R/W	0	[0,65535]	Segment 5 displacement, high 16 bits
137	16	R/W	0	[0,65535]	Segment 6 displacement, low 16 bits
138	16	R/W	0	[0,65535]	Segment 6 displacement, high 16 bits
139	16	R/W	0	[0,65535]	Segment 7 displacement, low 16 bits
140	16	R/W	0	[0,65535]	Segment 7 displacement, high 16 bits
141	16	R/W	0	[0,65535]	Segment 8 displacement, low 16 bits
142	16	R/W	0	[0,65535]	Segment 8 displacement, high 16 bits
143	16	R/W	0	[0,65535]	Segment 9 displacement, low 16 bits
144	16	R/W	0	[0,65535]	Segment 9 displacement, high 16 bits
145	16	R/W	0	[0,65535]	Segment 10 displacement, low 16 bits
146	16	R/W	0	[0,65535]	Segment 10 displacement, high 16 bits
147	16	R/W	0	[0,65535]	Segment 11 displacement, low 16 bits
148	16	R/W	0	[0,65535]	Segment 11 displacement, high 16 bits
149	16	R/W	0	[0,65535]	Segment 12 displacement, low 16 bits
150	16	R/W	0	[0,65535]	Segment 12 displacement, high 16 bits
151	16	R/W	0	[0,65535]	Segment 13 displacement, low 16 bits
152	16	R/W	0	[0,65535]	Segment 13 displacement, high 16 bits
153	16	R/W	0	[0,65535]	Segment 14 displacement, low 16 bits
154	16	R/W	0	[0,65535]	Segment 14 displacement, high 16 bits
155	16	R/W	0	[0,65535]	Segment 15 displacement, low 16 bits
156	16	R/W	0	[0,65535]	Segment 15 displacement, high 16 bits

3.3.16. Multi-segment position running control mode parameters [221~271]

Table 3-28 Register details [221～271]

<table>
<tr><th>Register address</th><th>Property</th><th>Default</th><th>Range</th><th>Description</th></tr>
<tr><td>221</td><td>R/W</td><td>0</td><td>[0,2]</td><td>Multi-segment position running mode setting
0: Single running mode
It runs sequentially from the displacement of segment 0 to the end point displacement segment number set by the parameter P222, and then stops;
1: Cyclic running mode
It runs sequentially from the displacement of segment 0 to the end point displacement segment number set by the parameter P222, and then starts to run circularly from the displacement of segment 0 again;
2: Mode controlled by IN input signal
The selection of the displacement segment is performed by the IN input function for "multi-segment position control 3/2/1/0"
<table>
<tr><th>Multi-segment position control 3</th><th>Multi-segment position control 2</th><th>Multi-segment position control 1</th><th>Multi-segment position control 0</th><th>Displacement selection</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>Segment 0</td></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>Segment 1</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>OFF</td><td>Segment 2</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>Segment 15</td></tr>
</table>
</td></tr>
<tr><td>222</td><td>R/W</td><td>16</td><td>[1,16]</td><td>Multi-segment position displacement end-point number setting
● This parameter takes effect only when the parameter P221 is set to 0/1</td></tr>
</table>

223	R/W	0	[0,1]	Multi-stage position running waiting time unit setting 0：ms 1：s ● This parameter takes effect only when the parameter P221 is set to 0/1
224	R/W	100	[0,3000]	Segment 0 displacement maximum speed, unit: rpm For displacement stroke, please refer to the Position table parameter settings [121~156] "Segment 0 displacement" setting
225	R/W	100	[1,2000]	Segment 0 displacement acceleration and deceleration, unit: r/s^2
226	R/W	100	[0,65535]	Segment 0 wait time after completion of displacement ● This parameter takes effect only when the parameter P221 is set to 0/1
227	R/W	100	[0,3000]	Segment 1 displacement maximum speed, unit: rpm
228	R/W	100	[1,2000]	Segment 1 displacement acceleration and deceleration, unit: r/s^2
229	R/W	100	[0,65535]	Segment 1 wait time after completion of displacement
230	R/W	100	[0,3000]	Segment 2 displacement maximum speed, unit: rpm
231	R/W	100	[1,2000]	Segment 2 displacement acceleration and deceleration, unit: r/s^2
232	R/W	100	[0,65535]	Segment 2 wait time after completion of displacement
233	R/W	100	[0,3000]	Segment 3 displacement maximum speed, unit: rpm
234	R/W	100	[1,2000]	Segment 3 displacement acceleration and deceleration, unit: r/s^2
235	R/W	100	[0,65535]	Segment 3 wait time after completion of displacement
236	R/W	100	[0,3000]	Segment 4 displacement maximum speed, unit: rpm
237	R/W	100	[1,2000]	Segment 4 displacement acceleration and deceleration, unit: r/s^2
238	R/W	100	[0,65535]	Segment 4 wait time after completion of displacement
239	R/W	100	[0,3000]	Segment 5 displacement maximum speed, unit: rpm
240	R/W	100	[1,2000]	Segment 5 displacement acceleration and deceleration, unit: r/s^2
241	R/W	100	[0,65535]	Segment 5 wait time after completion of displacement

242	R/W	100	[0,3000]	Segment 6 displacement maximum speed, unit: rpm
243	R/W	100	[1,2000]	Segment 6 displacement acceleration and deceleration, unit: r/s^2
244	R/W	100	[0,65535]	Segment 6 wait time after completion of displacement
245	R/W	100	[0,3000]	Segment 7 displacement maximum speed, unit: rpm
246	R/W	100	[1,2000]	Segment 7 displacement acceleration and deceleration, unit: r/s^2
247	R/W	100	[0,65535]	Segment 7 wait time after completion of displacement
248	R/W	100	[0,3000]	Segment 8 displacement maximum speed, unit: rpm
249	R/W	100	[1,2000]	Segment 8 displacement acceleration and deceleration, unit: r/s^2
250	R/W	100	[0,65535]	Segment 8 wait time after completion of displacement
251	R/W	100	[0,3000]	Segment 9 displacement maximum speed, unit: rpm
252	R/W	100	[1,2000]	Segment 9 displacement acceleration and deceleration, unit: r/s^2
253	R/W	100	[0,65535]	Segment 9 wait time after completion of displacement
254	R/W	100	[0,3000]	Segment 10 displacement maximum speed, unit: rpm
255	R/W	100	[1,2000]	Segment 10 displacement acceleration and deceleration, unit: r/s^2
256	R/W	100	[0,65535]	Segment 10 wait time after completion of displacement
257	R/W	100	[0,3000]	Segment 11 displacement maximum speed, unit: rpm
258	R/W	100	[1,2000]	Segment 11 displacement acceleration and deceleration, unit: r/s^2
259	R/W	100	[0,65535]	Segment 11 wait time after completion of displacement
260	R/W	100	[0,3000]	Segment 12 displacement maximum speed, unit: rpm
261	R/W	100	[1,2000]	Segment 12 displacement acceleration and deceleration, unit: r/s^2
262	R/W	100	[0,65535]	Segment 12 wait time after completion of displacement
263	R/W	100	[0,3000]	Segment 13 displacement maximum speed, unit: rpm
264	R/W	100	[1,2000]	Segment 13 displacement acceleration and deceleration, unit: r/s^2

265	R/W	100	[0,65535]	Segment 13 wait time after completion of displacement
266	R/W	100	[0,3000]	Segment 14 displacement maximum speed, unit: rpm
267	R/W	100	[1,2000]	Segment 14 displacement acceleration and deceleration, unit: r/s^2
268	R/W	100	[0,65535]	Segment 14 wait time after completion of displacement
269	R/W	100	[0,3000]	Segment 15 displacement maximum speed, unit: rpm
270	R/W	100	[1,2000]	Segment 15 displacement acceleration and deceleration, unit: r/s^2
271	R/W	100	[0,65535]	Segment 15 wait time after completion of displacement

3.3.17. Homing control mode settings [287～295]

Table 3-29 Register details [287～295]

<table>
<tr><th>Register address</th><th>Property</th><th>Default</th><th>Range</th><th>Description</th></tr>
<tr><td rowspan="5">287</td><td rowspan="5">R/W</td><td rowspan="5">1</td><td rowspan="5">[0,6]</td><td>Homing start control method setting
<table>
<tr><th>Set value</th><th>Control method</th></tr>
<tr><td>0</td><td>The homing function is prohibited.</td></tr>
<tr><td>1</td><td>Use the IN terminal whose IN input function is "Start homing" to trigger the mechanical return-to-origin function.</td></tr>
<tr><td>2</td><td>Use the IN terminal whose IN input function is "Start homing" to trigger the electrical return-to-origin function. Electrical return-to-origin is generally used after mechanical return-to-origin, and no sensor input signal is required. Run directly according to the absolute position and return to the position command set by the parameter P293/294. After the electrical return-to-origin is completed, the parameter P8/9 is equal to the parameter P293/294.</td></tr>
<tr><td>3</td><td>Power-on automatic mechanical return-to-origin.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>After setting this value and saving the parameter permanently by writing 1 to the parameter P90, it will automatically return to the origin at the next power-on. Return-to-origin is only triggered after re-power and the motor is enabled.</td></tr>
<tr><td>4</td><td>Communication triggers the mechanical return-to-origin function.
When the motor is enabled, writing this value will immediately trigger the mechanical return-to-origin function. After return-to-origin is completed, this register is cleared.</td></tr>
<tr><td>5</td><td>Communication triggers the electrical return-to-origin function.
When the motor is enabled, writing this value will immediately trigger the electrical return-to-origin function. After return-to-origin is completed, this register is cleared.</td></tr>
<tr><td>6</td><td>Communication triggers the current position as the origin.
When the motor is enabled, write this value and the driver will take the current position as the origin. After return-to-origin is completed, this register is cleared.</td></tr>
</table>
</td></tr>
<tr><td>288</td><td>R/W</td><td>0</td><td>[0,5]</td><td>
Homing mode setting
<table>
<tr><th>Set value</th><th>Homing mode</th></tr>
<tr><td>0</td><td>Positive homing
Deceleration point: Origin switch
Origin: Origin switch</td></tr>
<tr><td>1</td><td>Negative homing
Deceleration point: Origin switch
Origin: Origin switch</td></tr>
<tr><td>2</td><td>Positive homing
Deceleration point: Positive limit switch
Origin: Positive limit switch</td></tr>
<tr><td>3</td><td>Negative homing
Deceleration point: Negative limit</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>switch
Origin: Negative limit switch</td></tr>
<tr><td>4</td><td>Positive homing
Deceleration point: Mechanical limit position
Origin: Mechanical limit position
● Note: This mode is only available for EPT60.</td></tr>
<tr><td>5</td><td>Negative homing
Deceleration point: Mechanical limit position
Origin: Mechanical limit position
● Note: This mode is only available for EPT60.</td></tr>
</table>
</td></tr>
<tr><td>289</td><td>R/W</td><td>50</td><td>[0,1000]</td><td>High-speed search origin signal, unit: rpm</td></tr>
<tr><td>290</td><td>R/W</td><td>10</td><td>[0,1000]</td><td>Low-speed search origin signal, unit: rpm</td></tr>
<tr><td>291</td><td>R/W</td><td>200</td><td>[1,1000]</td><td>Acceleration and deceleration of search origin signal, unit: r/s^2</td></tr>
<tr><td>292</td><td>-</td><td>-</td><td>-</td><td>Reserve</td></tr>
<tr><td>293
294</td><td>R/W</td><td>0</td><td>[-1048576, 1048576]</td><td>Set the machine origin offset, unit: Command pulse
● Note: When the value of parameter P293/294 is positive, it means forward running</td></tr>
<tr><td>295</td><td>R/W</td><td>0</td><td>[0,1]</td><td>Mechanical origin offset and limit processing method:
<table>
<tr><th>Set value</th><th>Mechanical origin offset and limit processing method</th></tr>
<tr><td>0</td><td>P293/P294 is the coordinate after encountering the origin. After encountering the limit sensor and re-triggering the origin return, the origin is reversely searched.
Remark:
Mechanical origin: The mechanical origin does not coincide with the mechanical zero point. After finding the origin switch signal, the current position parameter P8/9 is forced to be the set value of the parameter P293/294.</td></tr>
</table>
</td></tr>
</table>

					Limit processing method: The origin return trigger signal is given again, and the motor performs the origin return in the reverse direction.
				1	P293/P294 is the relative offset after encountering the origin. After encountering the limit sensor and re-triggering the origin return, the origin is reversely searched. Remark: Mechanical origin: The mechanical origin coincides with the mechanical zero point. After finding the origin switch signal, the motor runs the command stroke set by the parameter P293/394 and then stops, and the parameter P8/9 is equal to the set value of the parameter P293/P294. Limit processing method: The origin return trigger signal is given again, and the motor performs the origin return in the reverse direction.

4. Modbus routines

4.1. Communication control mode

In this mode, the user can make the motor run the specified pulse stroke or jog running by communicating the given running command. The details are as follows.

4.1.1. Point-to-point control mode

EP series drivers have the function of controlling the motor to run the specified pulse stroke through communication. The specific modes and parameters that need to be set are as follows:

Note:The register address is a decimal number unless it is specially marked or explained.

(1) Set the value of register 20 to 0. Among them, register 20 indicates the preset application program selection in internal pulse mode; P20=0 indicates communication control, responding to the instruction of register 18.

(2) Set the functions of digital input and output ports according to application needs and actual wiring terminals.

(3) Set motion parameters:

Table 4-1 Motion parameter settings in point-to-point control mode

Register address	Unit	Description
70	r/s^2	Point-to-point motion acceleration
71	r/s^2	Point-to-point motion deceleration
72	rpm	Point-to-point motion maximum speed
73	Command pulse	Point-to-point motion stroke, low 16 bits
74	Command pulse	Point-to-point motion stroke, high 16 bits
78	r/s^2	Emergency stop deceleration
84	-	Set position running mode 0: Incremental 1: Absolute

(4) Communication given running command: start the point-to-point motion by writing the value 1 (fixed-length forward) and 2 (fixed-length reverse) to register 18 (for the detailed description of this register, please refer to "Driver control mode settings [17~23]" in register 18)

(5) During operation, if you need to stop, you can write value 6 (deceleration stop, deceleration is the setting value of register 71) and value 5 (emergency stop, deceleration is the setting value of register 78) into register 18.

⚠ Precautions:

- When the motor is running, it only responds to the stop command (deceleration stop or emergency stop). If you need to change the running direction of the motor by command, you need to send a stop command to wait for the motor to stop, and then send the start signal in the other direction.
- During the operation of the motor, the acceleration (register 70), deceleration (register 71), and speed (register 72) can be changed, but the driver will not respond to these set values immediately, and it needs to be restarted after the motor stops. Operates with the set value. It should be specially pointed out that the emergency stop deceleration (register 78) is responded to the emergency stop of the current movement, and there is no need to wait for the emergency stop of the next movement.

4.1.2. Jog control mode

EP series drivers have the function of controlling motor jog operation through communication. The specific modes and parameters that need to be set are as follows:

Note:The register address is a decimal number unless it is specially marked or explained.

(1) Set the value of register 20 to 0. Among them, register 20 indicates the preset application program selection in internal pulse mode; P20=0 indicates communication control, responding to the instruction of register 18.

(2) Set the functions of digital input and output ports according to application needs and actual wiring terminals.

(3) Set motion parameters:

Table 4-2 Motion parameter settings in jog control mode

Register address	Unit	Description
75	r/s^2	Jog acceleration
76	r/s^2	Jog deceleration
78	r/s^2	Emergency stop deceleration

(4) Communication given running command: start the jog motion by writing the value 3 (jog forward) and 4 (jog reverse) to register 18 (for the detailed description of this register, please refer to "Driver control mode settings [17~23]" in register 18).

(5) During operation, if you need to stop, you can write value 6 (deceleration stop, deceleration is the setting value of register 71) and value 5 (emergency stop, deceleration is the setting value of register 78) into register 18.

Precautions:

- When the motor is running, it only responds to the stop command (deceleration stop or emergency stop). If you need to change the running direction of the motor by command, you need to send a stop command to wait for the motor to stop, and then send the start signal in the other direction.
- During the operation of the motor, the acceleration (register 75) and deceleration (register 76) can be changed, but the driver will not respond to these set values immediately, and it needs to be restarted after the motor stops. Operates with the set value. It should be specially pointed out that the emergency stop deceleration (register 78) is responded to the emergency stop of the current movement, and there is no need to wait for the emergency stop of the next movement.
- The speed (register 77) can be changed while the motor is running, and the driver will respond immediately, that is, the motor will run at the set speed value immediately, without the need to stop and restart to respond.

4.2. IO control: Start-stop + Direction

EP series drivers can use two IN ports to control the operation of the motor through this mode. One of the IN terminals is used to control the start/stop of the motor, and one of the IN terminals is used to control the running direction of the motor. The specific settings are as follows:

(1) Set the value of register 20 to 0. Among them, register 20 indicates the preset application program selection in internal pulse mode; P20=2 indicates Start-stop + Direction mode.

(2) Set the functions of digital input and output ports according to application needs and actual wiring terminals. Among them, please set the function of the two IN terminals to "Jog forward/Start-stop" and “Jog reverse/Direction" to control the start/stop and running direction of the motor. For the function setting of IN terminal, please refer to "Input port setting register [60~65]".

(3) Set motion parameters:

Table 4-3 Motion parameter settings in Start-stop + Direction mode

Register address	Unit	Description
75	r/s^2	Jog acceleration
76	r/s^2	Jog deceleration
77	rpm	Jog speed
78	r/s^2	Emergency stop deceleration

(4) Input the appropriate level through the corresponding IN port to control the running and direction of the motor.

Precautions:

- Acceleration (register 75), deceleration (register 76), speed (register 77) and emergency stop (register 78) can be dynamically changed during motor running, and the driver will respond to these settings immediately.
- The direction signal can be switched during the motor running. At this time, the motor will decelerate and stop at the deceleration set by register 75, and then accelerate to the set speed in the opposite direction.

4.3. IO control: Forward + Reverse

EP series drivers can use two IN ports to control the operation of the motor through this mode. One of the IN terminals is used to control the forward of the motor, and one of the IN terminals is used to control the reverse of the motor. The specific settings are as follows:

(1) Set the value of register 20 to 0. Among them, register 20 indicates the preset application program selection in internal pulse mode; P20=2 indicates Forward + Reverse mode.

(2) Set the functions of digital input and output ports according to application needs and actual wiring terminals. Among them, please set the function of the two IN terminals to "Jog forward/Start-stop" and “Jog reverse/Direction" to control the forward and reverse motion of the motor. For the function setting of IN terminal, please refer to "Input port setting register [60~65]".

(3) Set motion parameters:

Table 4-4 Motion parameter settings in Forward + Reverse mode

Register address	Unit	Description
75	r/s^2	Jog acceleration
76	r/s^2	Jog deceleration
77	rpm	Jog speed
78	r/s^2	Emergency stop deceleration

(4) Input the appropriate level through the corresponding IN port to control the forward and reverse motion of the motor

Precautions:

- Acceleration (register 75), deceleration (register 76), speed (register 77) and emergency stop (register 78) can be dynamically changed during motor running, and the driver will respond to these settings immediately.
- To change the running direction while the motor is running, please cancel the running signal in this direction first, and then give the running signal in the other direction after the motor stops.

4.4. IO control: Speed table mode

This mode selects 16 speeds with up to 4 IOs. Normally, the first speed is set to 0, which means the motor stops.

After switching the IO state, the new speed takes effect after the time set by register 100. The related registers are as follows:

Table 4-5 Motion parameter settings in Speed table mode

Parameters	Unit	RTU register address	Routine setting
Jog acceleration	r/s^2	40076（0x004B）	100（0x0064）
Jog deceleration	r/s^2	40077（0x004C）	100（0x0064）
Emergency stop deceleration	r/s^2	40079（0x004E）	500（0x01F4）

IN1 port function	-	40061（0x003C）	46（0x002E）
IN2 port function	-	40062（0x003D）	47（0x002F）
IN3 port function	-	40063（0x003E）	48（0x0030）
IN4 port function	-	40064（0x003F）	49（0x0031）
Effective time after IO switch	50us	40101（0x0064）	200（Time=200*50us=1ms）
Segment 0 speed	rpm	40106（0x0069）	0
Segment 1 speed	rpm	40107（0x006A）	100
Segment 2 speed	rpm	40108（0x006B）	200
Segment 3 speed	rpm	40109（0x006C）	300
Segment 4 speed	rpm	40110（0x006D）	400
Segment 5 speed	rpm	40111（0x006E）	500
Segment 6 speed	rpm	40112（0x006F）	600
Segment 7 speed	rpm	40113（0x0070）	700
Segment 8 speed	rpm	40114（0x0071）	800
Segment 9 speed	rpm	40115（0x0072）	900
Segment 10 speed	rpm	40116（0x0073）	1000
Segment 11 speed	rpm	40117（0x0074）	1100
Segment 12 speed	rpm	40118（0x0075）	1200
Segment 13 speed	rpm	40119（0x0076）	1300
Segment 14 speed	rpm	40120（0x0077）	1400
Segment 15 speed	rpm	40121（0x0078）	1500

Step: Input the appropriate level in the corresponding IO port to control the motor to run. The user can dynamically modify the speed table, acceleration and deceleration information during the running process.

The user can also use an input port to control the running direction of the motor. The function of this port should be set as:Reverse the running direction of the motor.

When the user switches the direction signal during the running of the motor, the motor will first decelerate to stop and then accelerate to the set speed in the opposite direction.

4.5. IO control: Position table mode

The setting method is the same as 4.4.

5. Appendix

5.1. Appendix A Function code message format

MBAP (Transaction Identifier, Protocol Identifier, Length, Unit Identifier)

Transaction Identifier	Protocol Identifier	Length	Unit Identifier	Function Code	Data

5.1.1. Function 03: Read Holding Registers

Query message:

97 76 00 00 00 06 04 03 00 7D 00 7D

	Example	Length	Description	Remark
Map message header	0x97	1	Transaction Identifier, H	Client initiated, server replicated, for transaction pairing
	0x96	1	Transaction Identifier, L	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0.
	0x0006	2	Length	From the next to the last of this byte
	0x04	1	Unit Identifier	Initiated by the client, the server replicates the ID of the remote terminal on the serial link or other bus
Function code	0x03	1	Function Code, read register	
Data	0x007D	2	Start address	
	0x007D	2	Number of registers	

Response message:

97 76 00 00 00 FD 04 03 FA AB 9E 41 18 7A E1 3F 94 7A E1 3F 94 0A 3D 3F 97 51 EC 3F 98 CC CD C0 6C 33 33 C0 E3 CC CD C0 EC EB 85 41 F1 D7 0A 41 E9 47 AE 41 ED EB 85 41 F1 19 9A 43 D0 E6 66 43 C9 4C CD 43 CF EB 85 41 F3 66 66 42 0F CC CD 41 C2 E6 66 44 0A 1E B8 41 FB A3 D7 42 0C CC CD 41 BC C0 00 44 0A B8 52 41 F6 5C 29 42 0F 47 AE 41 D1 C6 66 44 0A 00 00 00 00 C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F C9 9E FF 7F 05 16 00 00 04 11 00 00 05 16 00 00 04 11 00 00 05 16 00 00 04 11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0A 00 0A 00 0A 00 0A 00 04 00 04 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0F

	Example	Length	Description	Remark
Map message header	0x97	1	Transaction Identifier, H	Client initiated, server replicated, for transaction pairing
	0x96	1	Transaction Identifier, L	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0.
	0x00FD	2	Length	From the next to the last of this byte
	0x04	1	Unit Identifier	Initiated by the client, the server replicates the ID of the remote terminal on the serial link or other bus
Function code	0x03	1	Function Code, read register	
Data	0xFA	1	Number of bytes	
	0x	1	Data	

5.1.2. Function 10: Write Multiple Registers

Query message:

97 79 00 00 00 09 04 10 00 00 00 01 02 00 01

	Example	Length	Description	Remark
Map message header	0x97	1	Transaction Identifier, H	Client initiated, server replicated, for transaction pairing
	0x79	1	Transaction Identifier, L	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0.
	0x0009	2	Length	From the next to the last of this byte
	0x04	1	Unit Identifier	Initiated by the client, the server replicates the ID of the remote terminal on the serial link or other bus
Function code	0x10	1	Function Code, read register	
Data	0x0000	2	Start address	
	0x0001	2	Number of registers	
	0x02	1	Number of bytes written	
	0x0001	2	Target value	

Response message: 97 79 00 00 00 06 04 10 00 00 00 01				
	Example	Length	Description	Remark
Map message header	0x97	1	Transaction Identifier, H	Client initiated, server replicated, for transaction pairing
	0x79	1	Transaction Identifier, L	
	0x0000	2	Protocol Identifier	Client initiates, server replicates Modbus protocol = 0.
	0x0006	2	Length	From the next to the last of this byte
	0x04	1	Unit Identifier	Initiated by the client, the server replicates the ID of the remote terminal on the serial link or other bus
Function code	0x10	1	Function Code, read register	Refer to standard Modbus protocol
Data	0x0000	2	Start address	
	0x0001	2	Number of registers	