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**SCT1-86E-RS**

**485 control speed and torque regulating closed loop driver**

**User Manual V1.0.3**

Shenzhen Gerui IoT Technology Co., Ltd.

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# **Product Introduction**

## 1.1 Product Overview

SCT1-86E-RS is a speed and torque adjustable closed-loop stepper driver with 485 control recently launched by Green IoT Technology Co., Ltd. It integrates the MODBUS-RTU standard protocol specification. Users can set various parameters such as speed value, torque level value, speed mode, relative position mode, etc. through the host computer debugging software, which greatly enriches the practical functions of the product and can meet the application needs of most occasions.

The panel has 4-digit digital tubes.CanDisplays the set speed and torque values.Users can adjust the speed and torque values ​​through the knob or through 485 communication commands; they can control the start and stop of the motor through the switch on the panel or by issuing a start command through 485 communication.

Driver supply voltage rangeDC24V~70V, mainly matches the closed-loop motor of 86 base, but can also drive the closed-loop motor of 42~60 base.

## 1.2 Product Features

●Small design, easy to install

●New generation 32-bit DSP technology, good stability, strong compatibility and high cost performance

● Using RS485 bus with isolation, supporting standard MODBUS-RTU protocol

●Support speed mode, relative position mode, JOG+, JOG-

The default communication address of the driver is 0x01. More addresses can be set through 485 communication or through the function knob on the panel.

●Can be adapted to closed-loop motors with 42-86 bases,Mainly matches the closed-loop motor of 86 base

●With 4-digit digital tube to display the speed value and torque level value

●The speed value and torque level value can be adjusted by the knob

●You can control the start and stop through the 3-position 3-pin switch on the panel.The motor can also be controlled by sending a start command via 485 communicationForward, reverse, stop

●Low vibration and low noise

●With overvoltage, undervoltage and other alarm protection functions

Input voltage range:DC24V~70V

## 1.3 Application Areas

Suitable for various small and medium-sized automation equipment and instruments, such as: intelligent logistics, textile industry, gate industry, winding industry, etc.

## 1.4 Naming conventions

The driver model naming rules are as follows:

SCT1-86E-RS-🞎🞎🞎🞎

① ② ③ ④ ⑤ ⑥

|  |  |
| --- | --- |
| **Serial number** | **meaning** |
| ① | Product series name; SCT: speed control type product; |
| ② | Product series number; 1: The series number is 1; |
| ③ | Matching motor base; 86: mainly matching motors with 86 base; |
| ④ | Open loop/closed loop drive; E: closed loop; |
| ⑤ | Special function code; RS: with 485 control; |
| ⑥ | Design change code; |

# **Electrical, Mechanical and Environmental Specifications**

## 2.1 Mechanical installation diagram

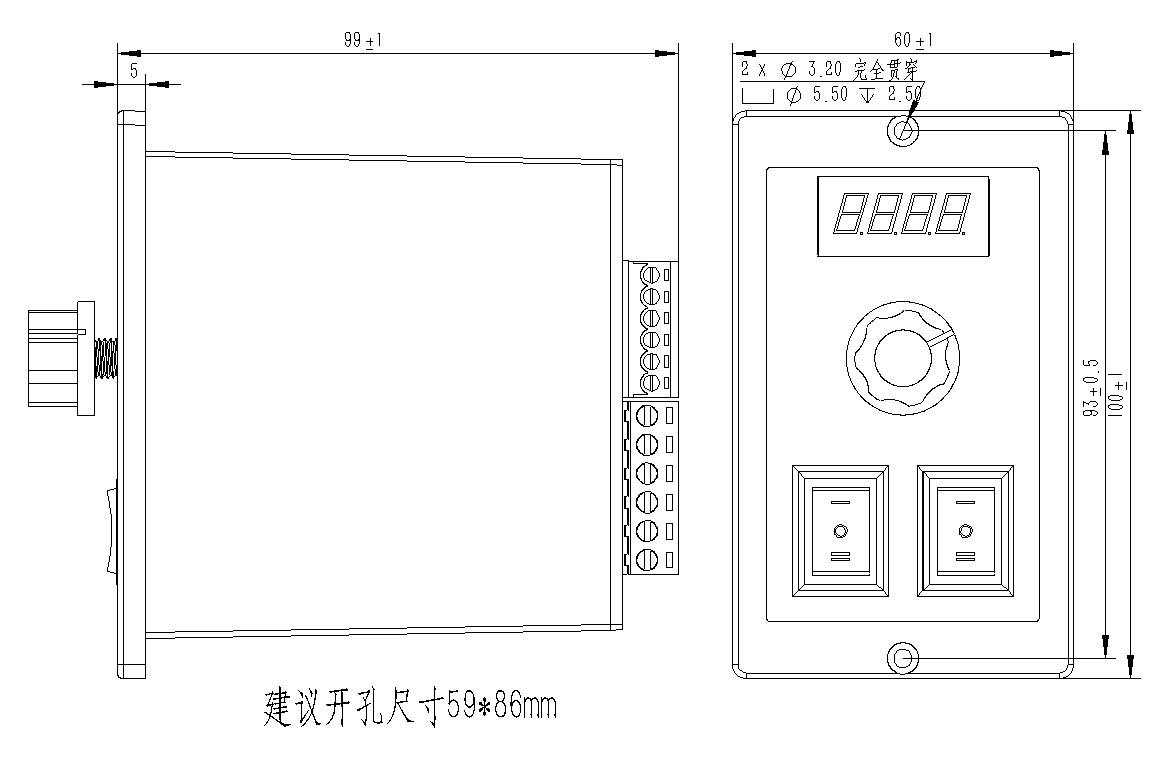


Figure 2.1 Installation dimensions (unit: mm)

**It is recommended to use side installation for better heat dissipation. When designing the installation dimensions, the size of the wiring terminals and the wiring should be considered.**

## 2.2 Enhanced heat dissipation

1. The reliable operating temperature of the driver is usually within 50℃, and the operating temperature of the motor is within 80℃;
2. When installing the driver, strong air convection can be formed on the side of the driver; if necessary, a fan can be installed inside the machine near the driver to form air convection, assist in drive heat dissipation, and ensure that the driver operates within a reliable operating temperature range.

## 2.3 Electrical specifications

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **SCT1-86E-RS** | | | |
| **Minimum** | **Typical Value** | **Maximum** | **unit** |
| **Input DC power supply voltage** | twenty four | 48 | 70 | VDC |
| **Insulation resistance** | 50 |  |  | MΩ |

## 2.4 Operating environment and parameters

|  |  |  |
| --- | --- | --- |
| **Cooling method** | | **Natural cooling, fan cooling** |
| **Usage Environment** | **occasion** | Do not place it near other heating equipment. Avoid dust, oil mist, corrosive gas, high humidity and strong vibration. Flammable gas and conductive dust are prohibited. |
| **temperature** | 0——50℃ |
| **humidity** | 40-90%RH |
| **vibration** | 10~55Hz/0.15mm |
| **Storage temperature** | | -20℃~65℃ |

# **Driver interface and wiring introduction**

## 1dfee5705d3b6784218a72e68fdd1a93.1 Interface Diagram

Figure 3.1 SCT1-86E-RS interface diagram

## 3.2 Interface Description

The power supply and motor interface of the SCT1-86E-RS 485 controlled speed and torque regulating closed loop driver adopt 5.08-6P wiring terminals, the encoder interface adopts 3.81-6P wiring terminals, and the 485 communication interface currently adopts the lead wire method. The specific definition of the interface is described in the following sections.

### 3.2.1 Encoder interface

|  |  |
| --- | --- |
| **name** | **Function** |
| PB+ | Encoder B phase input interface, please pay attention to the line sequence. |
| PB- |
| PA+ | Encoder A phase input interface, please pay attention to the line sequence. |
| PA- |
| VCC | Encoder 5V power supply positive terminal. |
| GND | Negative terminal of the encoder 5V power supply. |

### 3.2.2 Motor control output interface

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **name** | | **color** | **illustrate** | **Function** |
| Motor | A+ | red | Motor interface | Two-phase stepper motor wiring port, pay attention to the line sequence |
| A- | blue |
| B+ | green |
| B- | black |

### 3.2.3 Power input interface

|  |  |  |  |
| --- | --- | --- | --- |
| **name** | | **illustrate** | **Function** |
| VDC | DC+ | Power interface | Support AC and DC power input  DC24V~70V |
| GND |

## **3.3 RS485 communication interface**

The communication interface of the SCT1-86E-RS 485 speed and torque regulating closed-loop driver is on the back of the driver. It uses a 3.81-6P terminal. The pin definitions are shown in the following table.

|  |  |  |
| --- | --- | --- |
| **name** | **illustrate** | **Function** |
| 485A | RS485 communication interface | RS485 communication terminal A |
| 485B | RS485 communication terminal B |
| NC | No definition | Alley-oop |
| NC |
| NC |
| NC |

## 3.3 Wiring requirements

1. The motor line and encoder line must use shielded cables to prevent interference signals from entering the encoder signal end and affecting the operating effect, causing system instability and other faults.
2. If one power supply supplies multiple drives, they should be connected in parallel at the power supply. Chain connection from one drive to another is not allowed.
3. It is strictly forbidden to plug or unplug the high-voltage terminals of the driver while it is powered on. When the motor is stopped, there is still a large current flowing through the coil. Plugging or unplugging the terminals while it is powered on will cause a huge instantaneous induced electromotive force that will burn out the driver.
4. It is strictly forbidden to connect the wire end to the terminal after tinning it, otherwise the contact resistance may increase and the terminal may be damaged by overheating.
5. The wiring ends must not be exposed outside the terminals to prevent accidental short circuits and damage to the driver.

# **Functional Description**

## 4.1 Panel Function Diagram

The functional diagram of the SCT1-86E-RS 485 controlled speed and torque regulating closed-loop driver panel is shown below.



Figure 4.1 SCT1-86E-RS panel function diagram

## 4.2 Digital tube displayFunction

SCT1-86E-RS 485 control speed and torque regulating closed loop driver uses 4-digit digital tube to display speed value and torque level value.As shown in the following figure.

|  |  |
| --- | --- |
| **Digital tube display example** | **meaning** |
| 8fd2e1faf7ea5bb8d9192573244b308 | The digital tube displays 'C200', indicating that the current torque value is 200; at this time, the torque output value can be adjusted by the knob, and the default adjustment range is 0-200; |
| b049a5dbd965a246b61110614843e0c | The digital tube displays 'U200', indicating that the current speed output value is 200rev/min; at this time, the speed output can be adjusted by the knob, and the default adjustment range is 0-999rev/min; |
| 94386b35ff87b23adb2cd575c42c5dd | The digital tube displays 'U.200', indicating that the current speed is 200rev/min, and rotating the knob is invalid at this time, and will not affect the set torque value and speed value; |

## 4.3 Torque and speed adjustment

The setting range of torque value and speed value can be switched to the corresponding gear (torque adjustment or speed adjustment) through the 3-pin 3-gear switch, and then adjusted through the knob. The specific relationship is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Torque and speed adjustment**  **Switch position** | **Knob adjustment value** | **describe** | **Remark** |
| 'I' | Adjust the torque output value | Range: 0-200 | You can also adjust the torque and speed value through 485 communication, seeSection 5.2.3; |
| 'II' | Adjust the speed value output size | Range: 0-999, Unit: rev/min |
| 'O' | The knob adjustment function is invalid | - |

## 4.4 Start-Stop Control

The 3-position switch on the front of the SCT1-86 drive panel can control the forward, reverse and stop of the motor (Note: if the motor is running through 485 control, the motor control through this switch is invalid). The control logic is shown in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Forward and reverse adjustment**  **Switch position** | **Motor motion status** | **describe** | **Remark** |
| 'I' | Forward | - | You can also start and stop via 485 communication control, seeSection 5.2.3; |
| 'II' | Reversal | - |
| 'O' | stop | It will eventually be in a released state, allowing the user to rotate it without resistance |

## 4.5 Special features

### 4.5.1 Maximum output torque value adjustment

When the torque and speed adjustment switch is in the 'I' position, press and hold the knob for 3 seconds, and the digital tube will switch to the display shown in the figure below. At this time, the maximum output current of the driver can be adjusted by the knob. The default setting value is 4000, unit: mA, the adjustable range is 0-6000, and the resolution is 100; after setting the required maximum current value, press the knob switch, the set current (i.e. torque) maximum value will be automatically saved, and the current torque setting value Cxxx will be displayed.(xxx is the torque setting value).



This upper limit can also be set via 485 communication. For details, see Section 5.2.4.

### 4.5.2 Maximum output speed adjustment

When the torque and speed adjustment switch is in the 'II' position, press and hold the knob for 3 seconds, and the digital tube will switch to the display shown in the figure below. At this time, the maximum speed of the driver can be adjusted by the knob. The default setting value is 200, unit: rev/min, the adjustable range is 0-3000, and the resolution is 1; after setting the required maximum speed value, press the knob switch, the set maximum speed value will be automatically saved and the current speed value Uxxx will be displayed.(xxx is the speed value).



### 4.5.3 Other functional adjustments

When the torque and speed adjustment switch is in the 'O' position, press and hold the knob for 3 seconds, and the digital tube switches to the function display Pxxx (xxx is the function code) as shown in the figure below:



There are currently three selectable function codes: P000, P001, and P002, which can be selected using the knob. After selecting the function code to be adjusted, press the knob switch to enter the corresponding parameter adjustment interface. The specific description of the function code is shown in the following table:

|  |  |  |
| --- | --- | --- |
| **Function code** | **Functional Description** | **Detailed Description** |
| P000 | Select the motor serial number | There are four optional values: 86, 57, 42, and 60, corresponding to four series of motors. The default setting value is 86. After selecting the corresponding motor series, press the knob switch to automatically save the selected motor series. Then the digital tube will normally display the current speed value U.xxx(xxx is the speed value); |
| P001 | Select the current ratio of the lock machine after shutdown | The setting range is 0~100, and the default value is 0. After setting the lock current ratio, press the knob switch to automatically save the set lock current ratio value, and then the digital tubeNormal display of current speed value U.xxx(xxx is the speed value); |
| P002 | Set up 485 communication address | The setting range is 0~999, and the default value is 1, which means the current communication address of the driver is 1. After setting the required address, press the knob switch to automatically save the set communication address, and then the digital tubeNormal display of current speed value U.xxx(xxx is the speed value); |

## 4.6 CommonFunction

### 4.6.1StallTorqueOutput signal

When the driver controls the motor and it is completely blocked during operation, Bit 9 of register 0x0008 will be set to 1, indicating that the driver is in the state of reaching the blocking torque. When the blocking disappears, Bit 9 of register 0x0008 will be set to 0. The specific functions represented by each bit of register 0x0008 are shown in the following table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Register Address** | **project** | **illustrate** | **Setting range Note: Other values ​​are invalid.** | **default value** |
| **Status parameter group 1 (read only)** | | | | |
| 0x0008 | Input/output signal status query | Bit0~Bit7: Indicates the input terminal status;  Bit0: start/stop switch 'I' status;  Bit1: start/stop switch 'II' status;  Bit2: Speed ​​and torque regulation switch 'I' state;  Bit3: Speed ​​and torque regulation switch 'II' status;  Bit4~Bit7: reserved;  0: Input level is invalid;  1: Input level is valid;  Bit8~Bit15: indicates output status;  Bit8: Alarm output status;  **Bit9: Stall torque arrival signal output status;**  Bit10～Bit15: reserved;  0: output level is invalid;  1: Output level is valid; | (read only) | - |

# **MODBUS communication protocol and functions**

## **5.1 Basic communication parameters**

Table 5.1 Basic communication parameters

|  |  |  |
| --- | --- | --- |
| **name** | **describe** | **Remark** |
| Hardware Interface | RS485 | No RS232 support |
| Communication Type | Asynchronous half-duplex | Communication between master and slave devices |
| Baud rate | 9600 (default) | Can be set by dial code or host computer |
| Communication Protocol | MODBUS-RTU | - |
| Function code | 0x03: Read single or multiple data  0x06: Write single data  0x10: Write multiple data | - |
| Data character composition | Start bit: 1 bit Data bit: 8 bits  Parity bit: None (default)/Odd/Even Stop bit: 1 bit (default)/2 bits | Communication data format |
| Verification method | CRC16 | Low position in front, high position in the back |
| Number of devices | 1 (default) | Higher adjustable |

**485 bus single message communication rate:**

|  |  |
| --- | --- |
| **Baud rate** | **Time from start of receiving to completion of sending T1 (ms)** |
| 115200 | 3.49 |
| 38400 | 6.30 |
| 19200 | 10.46 |
| 9600 | 20.32 |

When multiple axes send messages continuously, there will be a PLC processing waiting time T2 between messages. This value varies depending on the master station and baud rate.

## **5.2 MODBUS register address definition**

### 5.2.1 Status parameter group (read only)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Register Address** | **project** | **illustrate** | **Setting range Note: Other values ​​are invalid.** | **default value** |
| **Status parameter group 1 (read only)** | | | | |
| 0x0000 | Driver Model | The abbreviation of the drive model. If the query returns 10086 | (read only) | - |
| 0x0001 | Driver version | Driver version | (read only) | - |
| 0x0002 | Drive Node Number | Current communication slave node number | (read only) | - |
| 0x0004 | Motor status  /Direction of movement | Bit0~Bit1: indicates the status of the motor;  0: stationary (axis locked);  1: Exercise;  2: Release;  Bit2~Bit3: Indicates the movement direction of the motor;  0: positive direction;  1: Reverse direction;  2: Invalid - stop state; | (read only) | - |
| 0x0006 | Current error code | 0: normal;  0x01～0x07: Error; | (read only) | - |
| 0x0007 | Current error subcode | 0: normal;  0x10～0x72: Error; | (read only) | - |
| 0x0008 | Input/output signal status query | Bit0~Bit7: Indicates the input terminal status;  Bit0: start/stop switch 'I' status;  Bit1: start/stop switch 'II' status;  Bit2: Speed ​​and torque regulation switch 'I' state;  Bit3: Speed ​​and torque regulation switch 'II' status;  Bit4~Bit7: reserved;  0: Input level is invalid;  1: Input level is valid;  Bit8~Bit15: indicates output status;  Bit8: Alarm output status;  Bit9: Stall torque arrival signal output status;  Bit10～Bit15: reserved;  0: output level is invalid;  1: Output level is valid; | (read only) | - |
| 0x000F | Current actual running speed | The actual running speed value at present;  Unit: rev/min | (read only) | - |

### 5.2.2 Public parameter group 1 (read and write)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Register Address** | **project** | **illustrate** | **Setting range**  **Note: Other values ​​are invalid.** | **default value** |
| **Open and closed loop basic control common parameter group** | | | | |
| 0x0010 | Custom communication baud Rate | 0:9600  1:14400  2:19200  3:38400  4:115200  5:128000  6:256000 Note: After modification, power must be turned on again to take effect; | 0～6 (Read and Write) | 0 |
| 0x0011 | Serial port data format | 0: 8-bit data, no parity, 1 stop bit; 1: 8-bit data, no parity, 2 stop bits; 2: 8-bit data, even parity, 1 stop bit; 3: 8-bit data, odd parity, 1 stop bit; Note: After modification, power must be turned on again to take effect; | 0～3 (Read and Write) | 0 |
| 0x0012 | Save parameter function | The corresponding bit position is 1, and the corresponding parameter group can be saved; the specific corresponding relationship is as follows:  Bit0: Synchronous update function (0x0001). It is generally not recommended to enable this function.  0: do not update EEPROM synchronously;  1: Update EEPROM synchronously;  Bit15: Save all parameter function (0x8000);  0: do not save;  1: Save all 'read and write' attribute parameters;  It takes about 10 seconds to save all parameters. Please wait patiently for the saving to complete before performing other operations. You can also query this bit through the master station. If it is 0, it means that the parameters are saved successfully; | 0～65535 (Read and Write) | 0 |
| 0x0017 | Alarm clear | 0: invalid; 1: Alarm cleared; | 0～1 (Read and Write) | 0 |
| 0x0018 | Parameters restored to factory settings Place | 0: invalid; 1: Restore factory settings; | 0～1 (Read and Write) | 0 |

### 5.2.3 Control parameter group (read and write)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Register Address** | **project** | **illustrate** | **Setting range**  **Note: Other values ​​are invalid.** | **default value** |
| **Open and closed loop spontaneous pulse basic control parameter group** | | | | |
| 0x0070 | Button IO control start and stop  Operation mode selection | Used for IO control start and stop.  If you use the 3-position button on the panel to control the start and stop, you can set this bit to run the corresponding mode;  0: Speed ​​mode  1: Relative position mode | 0～1  (Read and Write) | 0 |
| 0x0071 | Maximum speed | Set the maximum speed of the motor;  Unit: rev/min  **Note: In speed mode, the direction of the motor is determined by the positive or negative value of the set value;**  The calculation of negative values ​​can be done using the following formula:  2^16 - abs(maximum speed value) | -3000~3000  (Read and Write) | 200 |
| 0x0072 | Starting speed | Set the starting speed of the motor;  Unit: rev/min | 0-900  (Read and Write) | 1 |
| 0x0073 | Acceleration time | Acceleration time;  Unit: ms | 0~5000  (Read and Write) | 1000 |
| 0x0074 | Deceleration time | Deceleration time;  Unit: ms | 0~5000  (Read and Write) | 500 |
| 0x0076 | Relative Position Mode  Total pulse count low | In position mode, the total number of pulses of the motor running, including the total number of steps in the three stages of acceleration, constant speed, and deceleration; the highest bit represents the sign bit, a positive number represents the number of pulses running in the positive direction, and a negative number represents the number of pulses running in the reverse direction;  **Note: If 100000 pulses are set, the high-order given value is 0x0001 and the low-order given value is 0x86A0;**  If -100000 pulses are set, the high-order given value is 0xFFFE and the low-order given value is 0x7960;  **The given pulse number in the reverse direction can be calculated using the following formula:**  **2^32-abs (number of pulses given in the reverse direction)** | -2147483648~  2147483648  (Read and Write) | 10000 |
| 0x0077 | Relative Position Mode  Total pulse count high |
| 0x0078 | Startup Command | The corresponding bit position 1 can start the corresponding mode;  0x01: speed mode trigger;  0x02: Relative position mode trigger;  0x40: JOG+motion;  0x80: JOG-motion;  **Note: The 3-speed switch on the drive panel that controls the start and stop must be in the middle stop position before the start and stop of the motor can be controlled through this register;** | 0~255  (Read and Write) | 0 |
| 0x0079 | Stop Command | 0: normal stop;  1: Emergency stop;  2: Run at the set speed or along the planned trajectory until it stops; | 0~2  (Read and Write) | 2 |
| 0x00A2 | Current torque value | Set the current output torque value of the motor, the adjustable range is 0-200;  If the set value is 100, the torque output ratio is 100/200=50%; | 0~200  (Read and Write) | 200 |

### 5.2.4 Public parameter group 2 (read and write)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Register Address** | **project** | **illustrate** | **Setting range**  **Note: Other values ​​are invalid.** | **default value** |
| **Open and closed loop spontaneous pulse basic control parameter group** | | | | |
| 0x0058 | Closed loop maximum current setting | Set the upper limit of the maximum current value for closed-loop operation;  Unit: mA; | 0~6000  (Read and Write) | 4000 |
| 0x006D | Closed loop motor locking force | Set the locking force when the closed-loop motor stops. The larger the value, the greater the locking force.  0: The motor will automatically release after about 3 seconds of shutdown;  1~100: After stopping, the motor always has holding force; | 0~100  (Read and Write) | 0 |
| 0x007D | Segment settings | Set the number of pulses per revolution in relative position mode;  Unit: Pul/Rev | 200~60000  (Read and Write) | 10000 |
| 0x007F | Motor selection | Adapt to different motor parameter settings;  0:86 motor;  1:57 motor;  2:42 motor; | 0~2  (Read and Write) | 0 |
| 0x00A1 | Driver Node Settings | The default driver address is 1, and a new node can be set through this register;  **Note:**  (1) After modification, save the changes and restart the power to take effect;  (2) You can also set the address using the function knob on the panel. For specific modification methods, see Section 4.5.3. | 0-999  (Read and Write) | 1 |

## **5.3 Common MODBUS function codes**

### 5.3.1 Read Holding Register Command 0x03

(1) The command to read a single register is as follows:

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 71 | 00 01 | D4 11 |
| explain | The host sends a query to the slave for the 'Maximum Speed ​​(0x0071)' register command | | | | |

**Slave->Master data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Returns the number of bytes** | **Register Value** | **CRC Check** |
| Message | 01 | 03 | 02 | 00 C8 | B9 D2 |
| explain | Slave return data: Maximum speed 200rev/min | | | | |

1. The commands to read multiple registers are as follows:

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 71 | 00 04 | 14 12 |
| explain | The host queries the slave for the 4 register values ​​starting with 'Start Speed ​​(0x0030)' | | | | |

**Slave->Master data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Returns the number of bytes** | **Register Value** | **CRC Check** |
| Message | 01 | 03 | 08 | 00 C8 00 01  03 E8 01 F4 | 61 BC |
| explain | Data returned by the slave: maximum speed 200rev/min, starting speed 1rev/min, acceleration time 1000ms, deceleration time 500ms | | | | |

**Note: The maximum number of registers that can be queried must not exceed 16.**

### 5.3.2 Write Single Register Command 0x06

(1) Write the set value to the register

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Writing Data** | **CRC Check** |
| Message | 01 | 06 | 00 71 | 00 64 | D8 3A |
| explain | The master writes a value of 100 to the slave's 'Maximum Speed ​​(0x0071)' register | | | | |

**Slave->Master data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Writing Data** | **CRC Check** |
| Message | 01 | 06 | 00 71 | 00 64 | D8 3A |
| explain | After receiving the command, the slave returns the same command for confirmation | | | | |

### 5.3.3 Write multiple registers command 0x10

**Master->Slave data:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Starting address** | **Number of registers written** | **Total bytes** | **Write data 1** | **Write data 2** | **CRC Check** |
| Message | 01 | 10 | 00 71 | 00 02 | 04 | 00 64 | 00 01 | B5 58 |
| explain | The host writes two registers to the slave, setting the 'starting speed (0x0030)' and 'acceleration time (0x0031)' registers respectively. | | | | | | | |

**Slave->Master data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Starting address** | **Number of registers written** | **CRC Check** |
| Message | 01 | 10 | 00 71 | 00 02 | 11 D3 |
| explain | After receiving this instruction, the slave returns the number of registers written for confirmation | | | | |

## **5.4 Communication Error Codes**

The 485 series MODBUS communication abnormal code table is shown in the following table:

|  |  |  |
| --- | --- | --- |
| **Exception code** | **name** | **meaning** |
| 01 | CRC check error | CRC check error. |
| 02 | Function code sending error | The slave receives a function code other than 0x03, 0x06, or 0x10. |
| 03 | Error reading illegal data address | The data address requested to be read does not exist in the slave. |
| 04 | Write data address exceeds  Address range | The register address to which data is written exceeds the register address definition range. |
| 05 | Read register count overflow | A maximum of 16 addresses can be read at one time. |
| 06 | Function code illegal read and write data error | Function code read and write attributes are divided into three types: read-only, write-only, and read-write. Operations on data that do not conform to the function code attributes will result in abnormal errors. |
| 07 | The data written into the register exceeds the limit | The data content written to the register exceeds its specified range. |

### 5.4.1 CRC check error

As shown in the following table, if the host sends a frame of read data command, an error occurs during data transmission, and the CRC check value calculated by the slave device for a frame of data is not D8 3A, the slave returns the exception code 01.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 71 | 00 64 | D8 3A |

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 83 | 01 | 80 F0 |

### 5.4.2 Function code sending error

As shown in the following table,If the function code requested by the host is not 0x03, 0x06 or 0x10, the slave returns the exception code 02.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 02 | 00 00 | 00 04 | 79 C9 |

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 82 | 02 | 61 C1 |

### 5.4.3 Reading illegal data address error

As shown in the following table,If the data address requested by the host to read is illegal, that is, does not exist, the slave returns an exception code 03.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 FF | 00 01 | B4 3A |

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 83 | 03 | 01 31 |

### 5.4.4 The write data address exceeds the address range

As shown in the following table,If the register address to which the host writes data is out of the defined range, the slave returns an exception code 04.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Writing Data** | **CRC Check** |
| Message | 01 | 06 | FF 00 | 0B 00 | BE FE |

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 86 | 04 | 43 A3 |

### 5.4.5 Read register count overflow

As shown in the following table,If the number of registers requested by the host to be read exceeds the maximum range that can be read at one time, the slave returns an exception code 05.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 71 | 00 20 | 14 09 |

The data of 32 addresses are read at one time, which exceeds the set range, and the abnormal code 05 is returned.

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 83 | 05 | 81 33 |

### 5.4.6 Illegal read and write data error of function code

As shown in the following table,Function code read and write attributes are divided into three types: read-only, write-only, and read-write. For register operations that do not conform to the function code attributes,The slave returns exception code 06.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Read register number** | **CRC Check** |
| Message | 01 | 03 | 00 71 | 00 01 | D4 11 |

Assuming that register 0x0027 is a write-only address, an exception code 06 is reported when a read operation is performed on it.

**Slave->Master data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |
| Message | 01 | 83 | 06 | C1 32 |

### 5.4.7 Data written into register exceeds limit

As shown in the following table,If the data written into the register exceeds its specified range,The slave returns the exception code 07.

**Master->Slave data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code** | **Register Address** | **Writing Data** | **CRC Check** |
| Message | 01 | 06 | 00 73 | 27 10 | 62 2D |

**Slave->Master data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **illustrate** | **Device Address** | **Function code + 0x80** | **Exception code** | **CRC Check** |  |
| Message | 01 | 86 | 07 | 03 A2 |  |

# **Power supply selection**

The power supply voltage can work normally within the specified range. The SCT1-86E-RS driver is best powered by a regulated DC switching power supply. It should be noted that the output current range of the switching power supply must be set to the maximum. An unregulated DC power supply can also be used, but it should be noted that the peak value of the rectified voltage ripple should not exceed the specified maximum voltage. It is recommended that users use a DC voltage lower than the maximum voltage to avoid grid fluctuations exceeding the driver voltage operating range.

If a voltage-regulated switching power supply is used, it should be noted that the output current range of the switching power supply must be set to the maximum.

**Notice:**

1. When wiring, pay attention to the positive and negative poles of the power supply and do not connect them in reverse;
2. When wiring, pay attention to the position of the power interface and do not connect it to the motor port. After connecting, it is best to confirm whether it is connected correctly;
3. It is best to use a regulated DC switching power supply;
4. When using an unregulated DC power supply, the power supply current output capacity should be greater than 60% of the driver set current;
5. When using a regulated DC switching power supply, the output current of the power supply should be greater than or equal to the operating current of the driver;
6. To reduce costs, two or three drivers can share one power supply, but the power supply must be large enough.

# **Indicator lights and alarm indicators**

SCT1-86E-RS 485 controls the speed and torque regulating closed loop driver and displays the driver status through the digital tube. When the driver is powered on, the digital tube first displays 4 digits 0, and then displays the current speed setting U.xxx (xxx is the speed value). If the torque and speed switch is in the 'I' or 'II' position, it will switch to display Cxxx (xxx is the torque value) or Uxxx (xxx is the speed value).

When the drive fails, the digital tube will display Erxx (xx is the alarm code), as shown in Table 6.1 below.

Table 7.1 Digital tube status indication

|  |  |  |
| --- | --- | --- |
| **Digital tube display** | **Fault Description** | **Treatment measures** |
| 811b89e0f33262d2a49feffaac30fa3 | Overpressure alarm(Will not automatically return to normal state) | Check whether the power supply is normal;  Check whether the overspeed and overload phenomena are serious; |
| 0bc6c1817d86e809daf6e7c639e881e | Undervoltage alarm(Will not automatically return to normal state) | Check whether the power supply is normal; |

# **Warranty and after-sales**

## **8.1 Warranty**

### 8.1.1 Free warranty

Our company solemnly promises that for all products purchased from our company, if they are damaged due to the product itself during use, we will provide one year of free repair service. The round-trip shipping cost of the product shall be borne by both parties in half.

### 8.1.2 Warranty exclusions

1. The driver is damaged due to the customer's own wiring error;
2. The drive is damaged due to exceeding the rated working voltage;
3. The DC power supply driver is connected to the AC power supply, causing the driver to be damaged;
4. The driver is damaged due to the customer's extremely harsh on-site environment, such as humidity, extreme cold, extreme heat, etc., without informing our company in advance;
5. The customer dismantles the drive housing without permission or the serial label number is torn off;
6. 15 days after the customer confirms receipt, the housing is obviously damaged or hit, resulting in damage to the drive;
7. Forceful natural disasters, such as fire, earthquake, tsunami, typhoon, etc.;

In the above cases, our company will charge a certain amount of repair cost after evaluating the interests of all parties. In other cases, repairs will be provided free of charge forever.

## **8.2 Exchange**

### 8.2.1 Product replacement due to product failure

For faults in new products, our company provides three months of free replacement service.

After our technical support staff confirms that the problem is with the product itself, they will send the product back to our company to avoid wasting time and postage on the round trip. Customers need to send the faulty product back by express or logistics first, and our company will send another new product back to the customer as soon as possible after receiving it.

**Notice:**All our products undergo rigorous testing and aging before leaving the warehouse, so it is extremely rare for new products to malfunction. Please be sure to read the instructions carefully or consult our technical support staff when operating, or our technical support staff will remotely assist customers in operating.

* **Please note the following points when exchanging goods:**

1. Please ensure that the packaging is complete when sending back to avoid damage during transportation;
2. Please ensure that the attached accessories are complete when exchanging;
3. Each driver should be packed in its original box to avoid secondary damage to the product during transportation;
4. If after the driver is sent back, it is confirmed that the failure is not due to product failure, but due to the customer's negligence in operation, which leads to mistakenly thinking that the driver is faulty, the company will not bear the shipping fee (the customer's negligence in operation includes: damage to the driver due to wrong wiring, poor wiring leading to mistakenly thinking that the driver is damaged, operation errors causing the driver to fail to work properly, etc.).

### 8.2.2 Replacement for non-product failure

If the customer is not satisfied with the appearance or function of the product received and wants to replace it with a better driver, he or she can apply for a replacement service from our company within one week of receiving the product. After verification, our company will return the product. If the returned product is confirmed to be undamaged, with complete accessories and good packaging, the company will replace it with another product for the customer. For the replaced product, if there is a price difference, the customer will make up the difference.

**Note: The replaced product will no longer be eligible for the non-product fault replacement service. The round-trip shipping costs and other costs incurred by the non-product fault replacement service shall be borne by the customer!**

## 8.3 Returns

Our company provides a 7-day return service for products with quality problems. If you find quality problems with the product within 7 days of receiving the product (based on the actual date of receipt by the customer), please communicate with our salesperson or technical support personnel in time. After our technical support personnel confirms that it is a quality problem of the company's product itself, the customer can send the original complete product and its inner and outer packaging, accessories and shipping order back to our company by express or logistics.

If the customer still insists on returning the goods after our company has checked and confirmed that they are correct, the round-trip shipping costs and all other costs incurred shall be borne by the customer.

* **Please note the following points when returning goods:**

(1) Please contact the relevant department of our company before making a refund;

(2) The product must be in new condition and intact packaging. Please send it back to our company by express or logistics;

(3) We will not accept any complaints caused by customers, such as product appearance damage, incomplete accessories, etc.

## 8.4 After-sales service

If you need after-sales service support when using this product, please contact our company as soon as possible.

National free service hotline: 0755-23206995;

Website: http://www.grmot.com//

Technical specialist service hotline: 18576758897 (Mr. Xie), 17666115681 (Mr. Tuo);

Service hours: 8:30-17:30, Monday to Friday (except national holidays).

# **Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Version Number** | **illustrate** | **Modify deadline** | **Preparer/Reviewer** |
| V1.0.0 | Initial use version; | 2024.8.14 | TCJ/XH |
| V1.0.1 | (1) Minor changes to the product features description in Section 1.2;  (2) Optimization statement descriptions in Sections 4.3, 4.4, 4.5.1, and 4.5.3;  (3) Section 5.2.3 changes the register function description information;  (4) Added the content of Section 5.2.4; | 2024.8.16 | TCJ/XH |
| V1.0.2 | 1. The torque percentage is changed to the torque level value; 2. In the table in Section 4.5.3, the detailed description of P001 adds the parameters of motor 60; 3. Section 5.2.1 adds the stall output register 0x0008 and the current actual running speed register 0x000F; 4. Added chapter 4.6; | 2024.10.30 | TCJ, JQ/XH |
| V1.0.3 | (1) Add register 0x006D in section 5.2.4; | 2024.11.12 | TCJ/XH |