# 9V~36VDC/20A DC모터
# 정/역회전,RS485, PID제어 콘트롤러

# 1 Communication protocol

The drive uses MODBUS-RTU (GB GB/T19582-2008) protocol for communication, support from a host computer to control multiple machines can be configured via DIP switch 128 slave address, the host can be a microcontroller, PLC or PC, etc. . Addresses from the configuration on the machine, see section 2.1.5

## 1.1 Communication parameters

Potentiometer / analog signal control mode, fixed baud rate 9600bps, 8 data bits, even parity, 1 stop bit; slave address is fixed at 0x01

When serial communication control mode, the default baud rate is 9600bps, 8 data bits, even parity, 1 stop bit; baud rate can be configured range 1200-115200bps, is fixed at 8 data bits, odd parity mode can be configured to school testing, even parity or no parity, stop when the odd, even parity bit is 1, 2 stop bits, no parity; slave address by the DIP switch 1 - Set 7.

Each character using 11 bits (1 start bit, 8 data bits, 1 parity bit 1 stop bit or no parity bit 2 stop bits school); When the baud rate 19200bps and below, the character timeout is 1.5 character intervals; 19200bps over time, timeout is 0.75ms; When a character timeout occurs before the data received will be considered invalid

## 1.2 MODBUS-RTU frame format

The drive supports the MODBUS 0x03 (Read Holding Registers), 0x06 (write single register), 0x10 (write multiple registers) and 0x2B (read device identification code) function code

### 1.2.1 0x03 Read Holding Registers

**Host sends**

| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x03 | Starting register high byte | Starting register low | High byte count register | Register low byte | CRC low byte | CRC high byte |

1 byte ADDR : Slave address code (= 001 ~ 254) 2 byte 0x03 : Read register value function code 3,4 byte : To

read the register start address 5,6 byte : To read the number of registers

7,8 byte : From byte CRC16 checksum 1-6 and

**From the local loopback**

| Byte | 1 | 2 | 3 | 4,5 | 6,7 | | M1,M | M+1 | M+2 |
|---|---|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x03 | Total number of bytes | Register data 1 | Register data 2 | … | Register data M | CRC low byte | CRC high byte |

1 byte ADDR : Slave address code (= 001 ~ 254)

2 byte 0x03 : Return read function code

3 byte : From the total number of bytes to 4 M (including 4 and M) of

4, M byte : Register data

M+1, M+2 byte : From 1 to M bytes CRC16 checksum

**When receiving errors from the machine, from machine to send back**

| Byte | 1 | 2 | 3 | 4 | 5 |
|------|---|---|---|---|---|
| Content | ADDR | 0x83 | Exception code | CRC low byte | CRC high byte |

1 byte ADDR : Slave address code (= 001 ~ 254) 2 byte 0x03 : Reading the error register values 3 byte

Exception code : See section 3.2.4

4,5 byte : From byte CRC16 checksum 1-3 and

## 1.2.2  0x06 write single register

**Host sends**

| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x06 | Register high byte address | Register low byte address | Data High Byte | Data Low Byte | Low byte CRC code | High byte CRC code |

**When receiving the correct slave, the slave back**

| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x06 | Register high byte address | Register low byte address | Data High Byte | Data Low Byte | Low byte CRC code | High byte CRC code |

**When receiving errors from the machine, from machine to send back**

| Byte | 1 | 2 | 3 | 4 | 5 |
|------|---|---|---|---|---|
| Content | ADDR | 0x86 | Exception code | CRC low byte | CRC high byte |

1 byte ADDR : Slave address code (= 001 ~ 254)

2 byte 0x86 : Write the value of the error function code register 3 byte Exception code : See section 3.2.4

4,5 byte : From byte CRC16 checksum 1-3 and

## 1.2.3  0x10 write multiple registers values

| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x10 | Starting register high byte address | Starting register low byte address | Number of registers high byte | Number of registers low byte | Total number of bytes of data |

| Byte | 8,9 | 10,11 | N,N-1 | N+2 | N+3 |
|---|---|---|---|---|---|
| Content | Register data 1 | Register data 2 | Register data M | Low byte CRC code | Low byte CRC code |

**When correctly received from the machine, from machine to send back**

| Byte | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Content | ADDR | 0x10 | Register high byte address | Register low byte address | Number of registers high byte | Number of registers low byte | Low byte CRC code | High byte CRC code |

**When receiving errors from the machine, from machine to send back**

| Byte | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Content | ADDR | 0x90 | Exception code | CRC low byte | CRC high byte |

1 byte ADDR : Slave address code (= 001 ~ 254) 2 byte 0x90 : Write error register values

3 byte Exception code : See section 3.2.4

4,5 byte : From byte CRC16 checksum 1-3 and

## 1.2.4  Error Exception Code

### 1.2.4.1   MODBUS exception code

Table 3.1 MODBUS exception code table

| Exception code | Meaning |
|---|---|
| 0x01 | Illegal function code |
| 0x02 | Illegal data address |
| 0x03 | Illegal data value |
| 0x04 | Slave device failure |
| 0x05 | Request has been confirmed, but it takes a long time to process the request |
| 0x06 | From the device is busy |
| 0x08 | Storing parity error |
| 0x0A | Gateway unavailable |
| 0x0B | Gateway target device failed to respond |

### 1.2.4.2   Extended Error Code

Table 3.2 Extended Error Code Table

| Exception code | Meaning |
|---|---|
| 0x40 | Prohibited actions |
| 0xff | Undefined error |

## 1.3 Register Definition

### 1.3.1 Device Description Information Register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0000 | Device identification | | 0x03 | |
| 0x0001 | lease number | | 0x03 | High byte-oriented version, the low byte is minor version number |
| 0x0002 \| 0x0009 | Device Name | | 0x03 | String '\ 0' end |
| 0x000A | PWM resolution reciprocal | | 0x03 | |
| 0x000B | PWM frequency | | 0x03 | In Hz |
| 0x000C | Maximum output current | | 0x03 | 0.01 multiplied by the value of the current value, in units of A. |
| 0x000D | Current Resolution reciprocal | | 0x03 | In mA |
| 0x000E | Retention | | 0x03 | |
| 0x000F | Retention | | 0x03 | |

### 1.3.2 Real-time Status Register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0010 | Real-time PWM | 0~1000 | 0x03 | Value multiplied by the duty cycle of 0.1% |
| 0x0011 | Real-time current | 0~2000 | 0x03 | 0.01 multiplied by the value of the current value, in units of A. |
| 0x0012 | Commutation frequency | 0~2000 | 0x03 | Units of times / sec; commutation frequency by one rotation of the rotor commutation then multiplied by 60 times the motor speed in RPM. |
| 0x0013 | Retention | | 0x03 | |
| 0x0014 | AI1 voltage | 0~500 | 0x03 | Value is multiplied by 0.01 for the AI1 voltage value, the unit is V. |
| 0x0015 | AI2 voltage | 0~500 | 0x03 | AI2 value is multiplied by 0.01 for the voltage value, the unit is V. |
| 0x0016 | AI1, AI2 differential voltage between | -500~500 | 0x03 | Value is multiplied by 0.01 for the AI1, AI2 differential voltage between units of V. |
| 0x001 | Retention | | 0x03 | |

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0018 | SQ1 level | 0.1 | 0x03 | 0: Low<br>1: High |
| 0x0019 | SQ2 level | 0.1 | 0x03 | 0: Low<br>1: High |
| 0x001A | DE level | 0.1 | 0x03 | 0: Low<br>1: High |

### 1.3.3 Speed control register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0040 | Set speed; Forward value greater than 0 and less than 0 reverse, brake equals 0 | PWM speed control mode:<br>-1000~1000 | 0x06 | Set the output duty cycle value multiplied by 0.1% duty cycle, the motor voltage is approximately equal to the input voltage multiplied by the duty cycle. |
| | | Torque Speed mode:<br>-2000~2000 | | Set the output current value is multiplied by 0.01 for the current value, units of A |
| | | Since speed loop speed control mode:<br>-1000~1000 | | Setting the commutation frequency in cycles / sec. |
| | | External tacho-generator loop speed control mode:<br>-500~500 | | The feedback voltage is set, the value is multiplied by 0.01 for the feedback voltage, the unit is V. |
| 0x0041 | Retention | | | |
| 0x0042 | Stop and self-locking | 0~1000 | 0x06 | Value multiplied by the duty cycle of 0.1% for the self-locking |
| 0x0043 | Retention | | Can not access | |
| 0x0044 | Natural stop or release self-locking | 1 | 0x06 | |

### 1.3.4 AI1 and AI2 use as GPIO control register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0050 | AI1 port direction | 0.1 | 0x03 0x06 0x10 | 0: Enter<br>1:As output<br>When using function code 0x10, when the number of registers to 4:00, it will register 0x0050 ~ 0x0053 batch writes; When the number of registers is 5:00, but also the state of AI1 and AI2 port for storage. |
| 0x0051 | AI2 port direction | 0.1 | 0x03 0x06 | 0: Input<br>1: Output |
| 0x0052 | AI1 port level | 0.1 | 0x03 0x06 | 0: Low<br>1: High |
| 0x0053 | AI2 port level | 0.1 | 0x03 0x06 | 0: Low<br>1: High |
| 0x0054 | Storage AI1 and AI2 port status | 1 | Can not access alone | esume next power state storage AI1 and AI2 port. |

### 1.3.5 System parameter configuration register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0080 | Speed mode | 0,1,2,3 | 0x03 0x06 | 0 : PWM mode<br>1 : Torque mode<br>2 : Since speed loop speed control<br>3 : External tacho-generator loop speed control<br>When using function code 0x06, or 0x10 function code and the number of registers is less than 15, the configuration operations only temporary, are not effective; When the number of function code 0x10 or 0x06 register 15 to 0x0180 register write function code 1, configuration operations to take effect. |
| 0x0081 | Stall stop time | 0~255 | 0x03 0x06 | Value multiplied by 0.1 to stall stop time, in seconds; when the value is 0, no stall stops, when the value of non-zero, the corresponding number of seconds after the stall time limit braking (braking). |
| 0x0082 | Limit is enabled. | 0,1 | 0x03 0x06 | 0: Disable Limit<br>1: Enable the limit |
| 0x0083 | SQ1 limit the action level, forward limit | 0,1 | 0x03 0x06 | 0: Low<br>1: High<br>SQ1 port when the actual level and configuration level is the same, the limit will be forward movement. |
| 0x0084 | SQ2 action level limit, reverse limit | 0,1 | 0x03 0x06 | 0: Low<br>1: High<br>When SQ2 port and configuration of the actual level of the same level, the limit will be reversed action. |
| 0x0085 | Retention | | 0x03 0x06 | |
| 0x0086 | Motor rated current | 0~2000 | 0x03 0x06 | 0.01 multiplied by the value of the current value, in units of A. |
| 0x0087 | Maximum motor start / load current | 0~2000 | 0x03 0x06 | 0.01 multiplied by the value of the current value, in units of A. |
| 0x0088 | Motor brake (brake) Current | 0~600 | 0x03 0x06 | 0.01 multiplied by the value of the current value, in units of A. |
| 0x0089 | Retention | | 0x03 0x06 | |
| 0x008A | Baud four-byte integer halfword | Proposal 1200~115200 | 0x03 0x06 | Unit is bps |
| 0x008B | Baud four-byte integer halfword | | | |
| 0x008C | Check mode | 0,1,2 | 0x03 0x06 | 0: No parity Stop bit +2<br>1: Odd parity + 1 stop bit<br>2: Even parity + 1 stop bit |
| 0x008D | Whether to ban configuration of serial communication control | 0,1 | 0x03 0x06 | 0: not prohibited<br>1: Disable |
| 0x008E | Communication interruption downtime | 0~255 | 0x03 0x06 | Value multiplied by 0.1 for the breakdown in communications downtime, in seconds; when the last communication through this setting next time there is no communication, then the motor will brake (braking). |
| 0x008F | Retention | | 0x03 0x06 | |

### 1.3.6 Closed-loop speed control PID parameter configuration register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0090 | P coefficient four-byte floating-high half-word | Proposed 0.001~1 | 0x03 0x06 0x10 | When the number of function code 0x10 or 0x06 register 7 function code writes to 0x0190 address will only be stored PID parameters, otherwise, the configuration parameters after power is lost. |
| 0x0091 | P coefficient four-byte floating-point halfword | | 0x03 0x06 | |
| 0x0092 | I four-byte floating-point coefficients halfword | Proposed 0.001~1 | 0x03 0x06 | |
| 0x0093 | I four-byte floating-point coefficients halfword | | | |
| 0x0094 | D coefficient four byte float high halfword | Proposed 0.001~1 | 0x03 0x06 | |
| 0x0095 | D coefficient four byte float high halfword | | | |
| 0x0096 | Retention | | 0x03 0x06 | |
| 0x0097 | D beat cycle regulation | 1 ~ 1000 | 0x03 0x06 | D adjust tempo, the unit is ms; PI regulator beats fixed about 1ms. |

### 1.3.7 Default speed parameter configuration register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x00a0 | Speed mode | 0,1,2,3 | 0x03 0x06 0x10 | 0: PWM speed control mode<br>1: Torque Speed mode<br>2: Self-speed closed-loop speed control mode<br>3: external tacho-generator loop speed control mode<br>When the function code number register is 0x10 4 0x06 Function code or use the address of 0x01a0 write speed when preset parameters will be stored, otherwise the configuration parameters after power is lost. |
| 0x00a1 | Trigger | 0,1,2 | 0x03 0x06 | 0: self-preservation mode<br>1: Jog mode<br>2: Level way |
| 0x00a2 | Forward speed | In the range of greater than 0 and 0x0040 register | 0x03 0x06 | |
| 0x00a3 | Reverse speed | In the range of greater than 0 and 0x0040 register | 0x03 0x06 | |

Register under the above configuration parameters take effect at the potentiometer / analog signal reversing speed control mode the default. By DE port level control motor reversing, high forward and low reverse

### 1.3.8 Configuration parameters stored in the register

| Register Address | Description | Ranges | Support function code | Remark |
|---|---|---|---|---|
| 0x0180 | Load / store system configuration parameters | 0,1 | 0x06 | 0: reload the configuration parameters from memory<br>1: Save the configuration parameters to memory |
| 0x0190 | Storage loop speed control PID parameters | 1 | 0x06 | |

| 0x01a0 | Storage preset speed parameters | 1 | 0x06 | |

Only the parameters stored in the memory function code 0x06 configuration parameters stored in the configuration but can register through the above parameters or via batch function code 0x10

## 2 Common Issues and Considerations

### 2.1 Frequently Asked Questions

**1. Switch (including limit switches) or button wiring is longer, and there is no switch or button operation, the drive malfunctions, switch or button operation response is not working**
A: This may be caused by interference signal line switch or button, it is recommended in all signal lines plus a few K pull-up resistor to the RV, or use shielded cables

**2. Host can not communicate with the drive under 485 communication.**
A: Please check the host serial port baud rate, parity, whether the machine address from a consistent drive configuration, the wiring is correct 485, 485 master and slave devices should be according to AA, BB connected, testing whether the frame format correct. If the host is a PC, you can first use the debugging tools to test modbus communications are normal.

**3. Drive rated current parameter configuration for the motor rated current, the motor does not move with the load, but the motor does not go through the drive was able to drive the load directly connected to the power supply**
A: When the motor load is too large overload, the drive will be steady stream output, the output current is configured to work current, limits the maximum operating current of the motor at the same time it also limits the maximum output torque of the motor, the load is too large may cause the motor with fixed load. We can DIP switch or serial port will be slightly larger operating current configuration parameters to improve the driver maximum output current. In addition, the motor current to achieve the rated current of the motor, but with a fixed load, indicating that electrical power is small, if the output current by increasing the drive motor can be driven by overloading the load, the motor overload state in a long time, it may affect the life of the motor recommend switching to a more powerful motor.

**4. Motor stall, motor vibrates, enabled stall stall stall function does not**
A: The rated current parameter configuration can be bigger; If you use a serial configuration parameters can also be configured to work before the current value of the rated current.

### 2.2 Precautions

**1.** Drive actuator supply voltage should be between 7 ~ 44V. If the voltage overpressure, the electric drive may be burned; voltage is too low, the load current is large, it may cause the drive to burn. Due to small size, high integration module, burned beyond repair

**2.** By the control signal line is very fragile, in use, the control signals can not take any signal lines and power supply wiring or motor interface together, or they might burn drive, and difficult to repair.

**3.** Electricity wiring source or do not interface with the motor potentiometer, limit or communication interfaces ride together, or it may burn the drive portion of the device. Power or control signals are not connected to the chassis ground, otherwise it may cause instability drive. If the conditions attached to the cover of your earth.

**4.** Drive actuator-down, do not directly or indirectly, high-speed rotary motor, otherwise the force generated by the motor may burn drive. If the application requires the drive power down when ye fast rotation of the motor, it is recommended that the total power in the drive train of a motor interface relay, the relay coil and drive. Thus, when a power failure, when the relay will disconnect the drive and motor

**5.** Drive should be connected to the motor after power-up, or it may burn the fuse or drive.

**6.** Motor interface must not short-circuit, or it may burn the fuse or drive.

**7.** Note that the drive not damp, do not let the drive element shorted board, do not hand pin and pad touchpad elements.

**8.** If the fuse on the drive when using burning, check the lines properly connected. After the fuse burned, power can not be forced to continue to use; otherwise the drive will severely burned beyond repair.

**9.** When a drive fails, the user should promptly contact the company, not secretly repair and replacement of parts

**10.** This paragraph Drive Only for driving inductive loads (such as motors), can not be used to drive resistive (eg resistance) or capacitive loads (such as capacitors

**11.** Please read the user instructions and warranty considerations, this will reduce the unnecessary trouble for you.

**12.** Please read this user manual carefully user, the proper use of the funds drive.

# 3   Warranty Manual

**1.** Please follow the instructions in the user manual, use

**2**. From the purchase date, if the issues of the product itself quality problems, within three months, shifting. When a fault occurs in normal use, the drive enclosure available with 1 year warranty.

**3**. When asked warranty, be sure to hold receipts and warranty manual contact the company.

**4.** Consumables (such as silica gel, radiator, etc.) and accessories replacement warranty does not belong within the scope of this manual

**5.** Drive failure or after-sales service personnel and users in the repair and replacement of parts, or changes occurring or Remove Programs loss or damage resulting from interest, (and unreasonable demands by third parties), the Company does not assume any responsibility.

**6.** During the warranty period, the following conditions for the repair charges:
  **a.** The company did not produce a receipt stamped
  **b**. After the purchase, due to carry, transport or store a fault caused by wrong
  **c**. Due to the improper use of the fault
  **d.** Due to failure of fire, earthquake, flood, lightning, rodents and other disasters or theft or damage caused
  **e.** Failure and repair damage caused by non-formal

**7.** Violation of the user manual describes the operation caused damage, malfunction and damage secretly converted, CPU damage caused by abnormal voltage, the company does not provide maintenance services

**8.** If the user or the power output of the motor control signal line wiring and ride together, causing the drive failure or damage, the Company does not provide maintenance services.

**9.** If the user in the fuse burned, forced to continue to use the drive power that drives burned, this case is not covered under warranty

**10.** Drive module without housing (bare board) is cost special promotion drive, do not provide warranty service.

**11.** Only charge the cost of the warranty service after the warranty period has expired, the drive enclosure available with 3 years. After the warranty period expires only charge the cost, according to the market price received maintenance costs

**12.** This manual is valid only within the territory of People's Republic of China.

**13.** This specification does not limit the legal rights of customers