# JSY1017 Power metering module

## 1、 Product introduction

# 1, Product introduction

## 1.1、 Introduction

JSY1017 power metering module  is highly  integrated measurement,  digital communication  technology,  can complete  power measurement,  collection  and transmission  of single- phase AC parameter measurement products,  can accurately measure  single-phase  AC voltage, current,  power,  power  factor,  frequency, electricity and other electrical parameters,  1  TTL level interface,  completely isolated circuit, small size, simple interface, It can be easily embedded in all kinds of equipment that need to measure power consumption, and has excellent cost

performance.

JSY1017 power metering module can be widely used in energy saving transformation, electric  power,  charging  pile, communication, railway,  transportation, environmental protection, petrochemical,  steel and other industries,  for monitoring the current and power consumption of AC equipment.

## 1.2、 Function Features

1.2.1. Collect single-phase AC parameters, including voltage, current, power, factor, frequency, electric energy and other electrical parameters;

1.2.2. Using special measuring chip, effective value measurement method, high measurement accuracy;

1.2.3. With 1 TTL communication interface, compatible with 5V/3.3V interface;

1.2.4. Communication protocol using Modbus-RTU, compatibility is good, easy to program;

1.2.5. Low voltage DC5V power supply,  and with anti‑connection and anti‑protection  function,  anti‑power  will  not damage  the module  but can not work;

1.2.6. High isolation voltage, withstand voltage up to DC3000V;

1.2.7. Can be customized according to customer needs;

## 1.3、 Technical parameters

### 1.3.1 Single-phase AC input

1) Voltage range: 100V, 220V, 380V optional;

2) Current range: 5mA-16A;

3) Signal processing: special measuring chip, 24-bit AD sampling;

4) Overload capacity: 1.2 times the range sustainable; Instantaneous (<20mS) current 5 times, voltage 1.5 times the range is not damaged;

5) Input impedance: voltage channel > 1 kΩ / V;

### 1.3.2 Communication interface

1) Interface type: 1 TTL communication interface, compatible with 5V/3.3V ;

2) Communication protocol: MODBUS-RTU protocol;

3) Data format: settable, "n,8,1", "e,8,1", "o,8,1", "n,8,2";

4) Communication rate: Baud rate can be set 1200, 2400, 4800, 9600Bps;
   The baud rate is 4800bps by default ;

**1.3.3** Measurement output data

Voltage, current, power, electric energy, power factor, frequency and other electrical parameters, see Modbus data register list;

**1.3.4** Measurement accuracy

Voltage, current, electricity: less than ±1.0%; Active power level 1

**1.3.5** Isolation

The power supply under test and the power supply are isolated from each other; Isolated voltage 3000VDC;

**1.3.6** Power supply

1) DC 5V power supply, power consumption 8 ~ 10mA.

**1.3.7** Working environment

1) Working temperature: -20 ~ +70C ; Storage temperature: -40 ~ +85C ;

2) Relative humidity: 5 ~ 95%, no condensation (at 40C);

3) Altitude: 0 ~ 3000 m;

4) Environment: no explosion, corrosive gas and conductive dust, no significant shaking, vibration and impact place;

**1.3.8** Temperature drift: ≤100ppm/℃ ;

**1.3.9** Installation method: PCB welding, module plane size is 25*40mm.

**1.3.10** Module size: 25*40*23mm
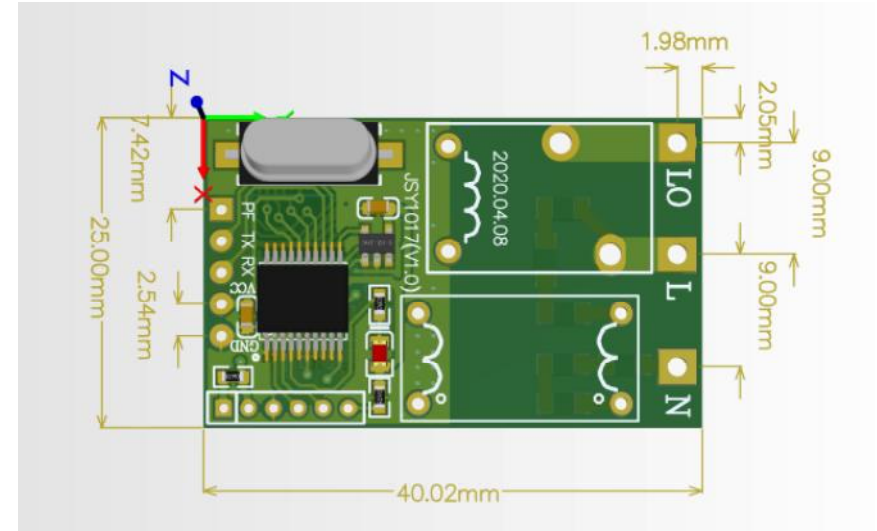
# 2. Application

## 2.1、 Appearance and installation



Figure 2.1 Overall dimensions (unit: mm)

## 2.2、 Interface definition

### 2.2.1 Pin Description

| Identi fication | Features | Function Description |
|---|---|---|
| N | neutral wire | The voltage to be measured of neutral wire terminal |
| L | live wire input | The voltage to be measured of live wire inlet |
| L0 | live wire output | The voltage to be measured of live wire outlet |
| PF | Output | Active power check pulse output, default state low level output, generally do not need to connect this pin, but to leave the pin position |
| TX | Output | Module TTL level transmission |

| RX | Input | Module TTL level reception |
|---|---|---|
| VCC | Power + | Metering module power supply pin, normal application range: 3.3V-5V |
| GND | Power - | Power source |

## 2.3、 Application instructions

Please connect the cables correctly according to the product specifications and models and refer to the above drawings. Before wiring, make sure to disconnect all signal sources to avoid danger and damage to the equipment. Check and confirm that the connection is correct, and then switch on the power test.

After the power is turned on, the "indicator light" is steady on, and the "indicator light" blinks synchronously when the communication data is transmitted.

When the product leaves the factory, it is set to the default configuration: address No. 1, baud rate 4800bps, data format "n,8,1", data update rate 1000ms, and ratio 1;

We can provide JSY-MK-1017 series product testing software to change the Settings of product parameters and general testing of products.

## 2.4、 Power metering function

Can provide single-phase voltage, current, power, power factor, frequency, active energy, carbon emission and other parameters;

The power of the data is 4 bytes of unsigned number, continuous accumulation of 10 years will not overflow, data power down save.

## 3. JSY1017 Modbus register list

### 3.1, measuring electrical parameter register and communication data table (function code 03H, read-only, 4 bytes per address, high byte ahead)

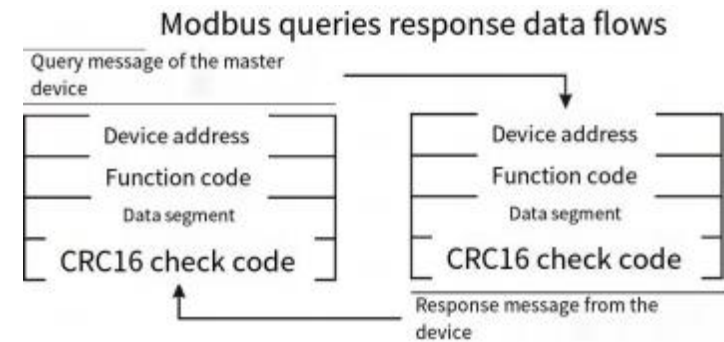| Serial number | definition | Register address | Read / Write | Data type with calculation instructions |
|---|---|---|---|---|
| 1 | Voltage | 0048H | read | Unsigned data, value =DATA/10000, unit V |
| 2 | Current | 0049H | read | Unsigned data, value =DATA/10000, unit A |
| 3 | Power | 004AH | read | Unsigned data, value =DATA/10000, unit W |
| 4 | Total active energy | 004BH | Read/Write | Unsigned data,value =DATA/10000, unit kWh |
| 5 | Power factor | 004CH | read | Unsigned data, value =DATA/1000 |
| 6 | $CO_2$ emissions | 004DH | read | Unsigned data , value =DATA/10000 unit Kg |
| 7 | Temperature | 004EH | read | Reserved (This function is not available in this module) |
| 8 | Frequency | 004FH | read | Value =DATA/100, unit Hz |

### 3.2, system configuration read parameter register address and data communication table (function code 03H read, 10H write)

| Serial Number | Definitions | Register address | Read / write | Specific instructions |
|---|---|---|---|---|

| 1 | Address and baud rate | 0004H | Read/Write | The default is 0105H; The default address is 01H and the default format is 8, N, 1,4800bps<br>Instructions:<br>High byte 8 bits for the address, 1~255; 0 is the broadcast address;<br>The high 2 bits of the low byte are the data format bits,<br>"00" represents as 10 bits ,no parity check, "8, N, 1"<br>"01" represents 11 bits, even parity check, "8, E, 1";<br>"10" represents 11 bits, odd parity check, "8, O, 1";<br>For "11" represents 11 bits, no parity check,, 2 stop bits, "8, N, 2";<br><br>The low four bits of the low byte are the baud rate, 3-1200bps, 4-2400bps, 5-4800Bps, 6- 9600bps |

## 4. MODBUS communication protocol

This instrument provides serial asynchronous half-duplex RS485 communication interface, using the standard MODBUS-RTU protocol, all kinds of data information can be transmitted on the communication line. In a line can be connected at the same time up to 255 network instruments, each network instrument can be set its communication address, communication connection should be used with copper network shield twisted pair wire, wire diameter is not less than $0.5mm^2$. When wiring, the communication line should be far away from the strong current cable or other strong electric field environment.

The MODBUS protocol adopts the communication connection mode of master-slave response on a communication line. First, the signal of the master computer is addressed to a unique address of the terminal device (slave), and then, the response signal sent by the terminal device is transmitted to the host in the opposite direction, that is, in a separate communication line signal along the opposite two directions to transmit all the communication data flow (half duplex working mode). The MODBUS protocol only allows communication between the host (PC, PLC, etc.) and the terminal device, and does not allow the data exchange between the independent terminal devices, so that the terminal devices will not occupy the communication line when they are initialized, but are limited to responding to the query signal arriving at the machine.

### Modbus queries response data flows

Query message of the master device

| Device address |
| Function code |
| Data segment |
| CRC16 check code |

| Device address |
| Function code |
| Data segment |
| CRC16 check code |

Response message from the device

Host query: query message frame including device address, function code, data information code, check code. The address code indicates the slave device to be selected; Function codes tell the selected slave device what function to perform, for example function codes 03 or 04 are required to read registers from the device and return their contents; The data segment contains any additional information

about the function to be performed from the slave device, the check code is used to verify the correctness of a frame of information, and the slave device provides a way to verify that the content of the message is correct, which uses the calibration rules of CRC16.

Slave response: If the slave generates a normal response, there is the slave address code, function code, data information code, and CRC16 check code in the response message. The data information code contains the data collected from the device, such as register value or status. If an error occurs, we agree that the slave machine will not respond.

We specify the communication data format to be used in this instrument: bits per byte (1 start bit, 8 data bits, odd or even or no check, 1 or 2 stop bits).

The structure of the data frame, i.e., the message format:

| Device address | Function code | Data segment | CRC16 check code |
|---|---|---|---|
| 1 byte | 1 byte | N byte | 2 bytes (low bytes before) |

Device address: consists of one byte, the address of each terminal device must be unique, and only the terminal that is addressed will respond to the corresponding query.

Function code: tells the terminal being addressed what function to perform. The following table lists the function codes supported by this series of meters, and what they do.

| Function Codes | Feature |
|---|---|
| 03H | Read the value of one or more registers |
| 10H | Write the value of one or more registers |
| 01H | Read the output status of the route 1 relay |
| 05H | Write the output status of the 1 way relay |

Data segment: contains the data required by the terminal to perform a specific function or the data collected by the terminal in response to a query. The content of this data may be numerical values, reference addresses, or set values.

Check code: CRC16 takes two bytes and contains a 16-bit binary value. The CRC value is calculated by the transmitting device and then attached to the data frame. The receiving device recalculates the CRC value as it receives the data, and then compares it with the received value in the CRC field. If the two values are not equal, an error has occurred.

The process for generating a CRC16 is:

(1) Preset a 16-bit register 0FFFFH (all 1s), called a CRC register.

(2) The 8 bits of the first byte in the data frame are XOR operation with the low byte in the CRC register, and the result is saved back to the CRC register.

(3) The CRC register is moved one bit to the right, the highest bit is filled with 0, and the lowest displacement is detected.

(4) If the lowest position is 0: repeat the third step (next shift); If the lowest position is 1: XOR the CRC register with a preset fixed value (0A001H).

(5) Repeat steps 3 and 4 until 8 shifts. This completes a complete eight.

(6) Repeat steps 2 through 5 for the next eight bits until all bytes have been processed.

(7) The final value of the CRC register is the CRC16 value.

## Example of MODBUS-RTU communication protocol:

### 4.1, function code 0x03: Read multiplexer register

Example: Host to read address 01, start address 0048H 2 slave register data The host sends:

01      03      00 48      00 02      CRC

Address   Function Code   Start address   Data Length   CRC code

Slave response:

01      03      04      12 45   56 68   CRC

Address   Function code   Return bytes   data 1   data 2  CRC code

### 4.2, function code 0x10: Write multiplexed register

Example: The host wants to save 00000000 to the slave register at address 000C,000D (slave address code is 0x01)

The host sends: 01   10   00 0C   00 02   04   00 00 00 00 00   F3 FA

Address   Function code   Start address   Write register Number of bytes count Save data 1 2   CRC code

Slave response:

| 01 | 10 | 00 0C | 00 02 | 81 CB |
|---|---|---|---|---|
| Address | Function code | Start address | Write register Number | CRC code |

## 4.3. Instructions

The register in the MODBUS-RTU communication protocol refers to 16 bits (that is, 2 bytes), and the high position is the first.

When setting parameters, be careful not to write illegal data (i.e., data values that exceed the data range limit);

The format of the error code returned by the slave is as follows:

    Address code: 1 byte

    Function code: 1 byte (highest bit is 1)

    Error code: 1 byte

    CRC: 2 bytes

  The response returns the following error code:

81: Invalid function code, that is, the received function code is not supported by the module.

82: Read or write illegal data address, that is, the data location is outside the module's readable or writable address range.

83: Illegal data value, that is, the module receives the data value sent by the host outside the data range of the corresponding address.

## 4.4. Example of instruction parsing:

  4.4.1 Read electrical parameter instruction (with module address 0x01 as an example) :

  Send data:  01 03 00 48 00 08 C4 1A (read 8 registers starting from 0048)

Receive data: 01 03 20 00 21 95 DC 00 00 C2 FE 00 A7 C1 50 00 00 00 00 00 00 C8 00 00 00 00 03 E8 00 00 00 9D  00 00 13 87 44 22

The red part is the relevant electrical parameters, which can be decomposed as follows:

    The data analysis is as follows : 01 is the module address, 03 is the data read command, 20 is the return data length, a total of 32 bytes, 0x002195DC is the voltage value, 0x002195DC=2201052, divided by 10000, the actual voltage value is 220.1052V, other current, power and other data and voltage calculation formula is similar.

  4.4.2 Clear energy instruction (for example, the module address is 0x01) :

  Send data: 01 10 00 4B 00 02 04 00 00 00 00 00 00 B6 2C

  Received data: 01 10 00 4B 00 02 31 DE

## 5. Precautions

1)  Pay attention to the auxiliary power information on the product label, the auxiliary power level and polarity of the product can not be connected to the wrong, otherwise it may damage the product.

2)  Please connect the cables correctly according to the product specifications and models and refer to the figure. Before wiring, make sure to disconnect all signal sources and power supplies to avoid danger and damage to the equipment. Check and confirm that the connection is correct, and then switch on the power test.

3)  Do not short circuit the voltage circuit or the secondary circuit of the PT.

4) When there is current on the primary side of CT, the secondary circuit of CT is strictly forbidden to open; Live wiring or unplugging terminals are strictly prohibited;

5) When the product is used in an environment with strong electromagnetic interference, please pay attention to the shielding of the input and output signal lines.

6) When centralized installation, the minimum installation interval should not be less than 10mm.

7) There is no lightning protection circuit in this series of products. When the input and output feeder lines of the module are exposed to the harsh outdoor climate environment, lightning protection measures should be taken.

8) Do not damage or modify the label and logo of the product, do not disassemble or modify the product, otherwise the company will no longer provide "three guarantees" (replacement, return, repair) service for the product.

**Contact Information:**

Shenzhen Jiansiyan Technologies Co., Ltd.

Address: 901, Building 1, Taijiale Technology Industrial Park, Tongguan Road, Tianliao Community, Yutang Street,Guangming District,Shenzhen,Guangdong, 518100, China.

Tel.: (+86) 0755 86524536  Fax: (+86) 0755 26628850

Web: www.jsypowermeter.com , E-mail: jsykj@outlook.com