JSY1031 AC and DC Self-adaptive Energy Meter Module

一、 **product description**

1.1 Introduction

1.2 Functional features

1.3 Technical parameters
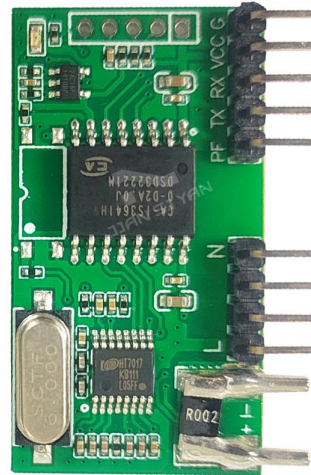
二、 **application**

2.1 Appearance and installation

2.2 Interface definition

2.3 Application instructions

2.4 Electric energy measurement function

三、 **Modbus register**

四、 **Modbus communication protocol**

五、 **Precautions**

1. Product introduction

1.1、 Introduction

JSY1031 is an electrical parameter measurement product that integrates AC and DC measurements and can complete electrical energy measurement, collection and data transmission . Accurately measure single-phase AC parameters (voltage, current , power, power factor, frequency, electricity, etc. , please refer to the electrical parameter register for parameter list details) and DC parameters (voltage, current, power, electricity). This product uses TTL level as the data communication interface, which is completely isolated from the high-voltage area. It has the characteristics of small size, simple interface, wide measurement current range, and high flexibility. It can be flexibly embedded into various devices that need to measure power consumption. Very easy to use .

JSY1031 AC and DC universal metering module can be widely used in energy-saving renovation , electric power, communications, railways, transportation, environmental protection, petrochemical, steel and other industries to monitor the current and power consumption of AC equipment .

1.2、 Features

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

1.2.2. Collect DC power parameters, including voltage, current, power, electric energy and other electrical parameters.

1.2.3. Adopt special measurement chip, effective value measurement method, high measurement accuracy.

1.2.4. With 1-way TTL communication interface, compatible with 5V/3.3V interface.

1.2.5. The communication protocol adopts standard Modbus-RTU, which has good compatibility and facilitates programming.

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

1.3、 Technical Parameters

1.3.1 Data parameters

1) Voltage range: 0~264V.

2) Current range: 10 mA~ 16 A.

3) Overload capability: 1.2 times the current range is sustainable, and 1.5 times the voltage range is not damaged.

4) Input impedance: voltage channel>1 kΩ/V.

1.3.2 Communication Interface

1.3.3 Interface type: 1-way TTL communication interface, compatible with 5V/3.3V .

1) Communication protocol: Modbus-RTU protocol.

2) Data format: The default is "n,8,1", "e,8,1", "o,8,1", "n,8,2" can be set.

3) Communication rate: Default is 9600bps, 4800bps, 19200bps can be set.

1.3.4 Measurement output data

For multiple electrical parameters such as voltage, current, power, electric energy, power factor, frequency, etc., see the Modbus data register list.

1.3.5 measurement accuracy

Voltage , current , power, electricity: less than ± 1.0 % .

1.3.6 isolation

The power supply under test and the power supply are isolated from each other. the isolation withstand voltage is 3000VDC.

1.3.7 power supply

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

1.3.8 working environment

1) Working temperature: -20～+70℃. Storage temperature: -40～+85℃.

2) Relative humidity: 5~95%, no condensation (at 40 ℃).

3) Altitude: 0~3000 meters.

4) Environment: No explosive, corrosive gases and conductive dust, no significant shaking, vibration and impact.

1.3.9 Temperature drift: ≤100ppm/℃.

1.3.10 Installation method: PCB welding, module plane size is 39.5 * 21.0 mm.

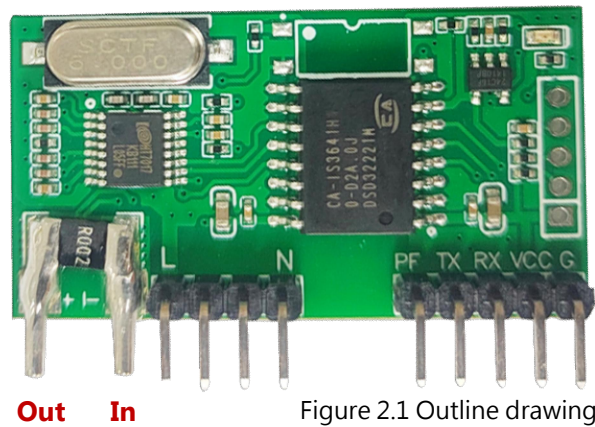**1.3.11** Module size : 39.5 * 21.0 * 8.0mm.

2. Application
2.1 Product appearance

Out   In   Figure 2.1 Outline drawing

2.2 Interface definition

2.2.1 Pin description

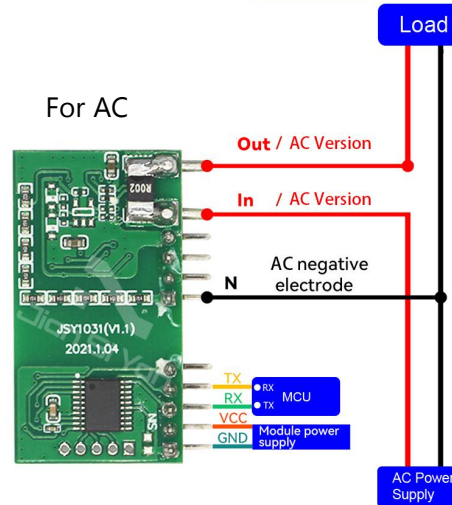| logo	characteristic	Function description
L	Live line	Measured voltage live wire connection port
N	Neutral line	Measured voltage neutral line connection port
PF	output	Active energy verification pulse output, low level output by default, generally does not need to be connected to this pin, but the pin position must be reserved
TxD	output	Module TTL level sending pin
RXD	enter	Module TTL level receiving pin
VCC	Power+	Metering module power supply pin , normal application range: 3.3 V-5V
GND	power supply-	power ground

2.2.2 The live wire enters from the "IN" short end and outputs from the "OUT" end, connected to the load.
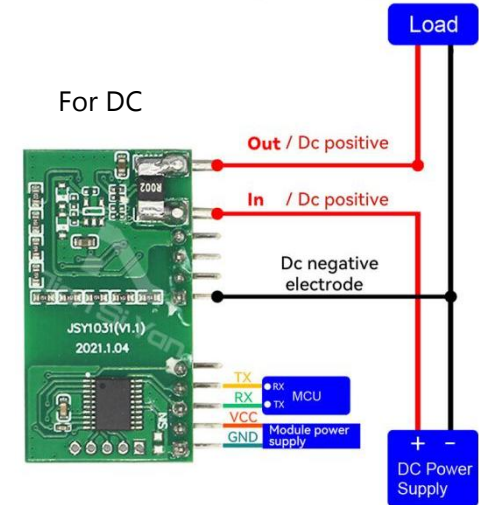
2.3 Application Notes

Please refer to the above diagram for correct wiring according to product specifications and models. Make sure to disconnect all signal sources before wiring to avoid danger and damage to the equipment. After checking to confirm that the wiring is correct, turn on the power and test.

After the power is turned on, the "indicator light " is always on, and during communication, the "indicator light" flashes synchronously during communication data transmission.

When the products leave the factory, they are set to the default configuration: address No. 1, baud rate 9600bps, data format "n,8,1", and transformation ratio of 1.

This product adapts to AC and DC signals and defaults to the AC module. After switching the signal source, you need to send a switching signal source command to the module.

You can use the JSY1031 series product testing software we provide to change the settings of product parameters and general testing of the product.

2.4 Electric energy measurement function

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

Note: The power data can store a maximum of 4 2949672 K w/h power, and will be reset to zero after overflow.

3. JSY1031 Modbus register list

Table 1: System configuration reading parameter register address and data communication table (function code 03H read, 10H write)

serial no.	definition	Register address	Read /write	Specific instructions

| 1 | Address and baud rate | 0004H | Read /write | The default value is 0106H. the default address is 01H, and the default communication format is 8, N, 1,9600bps
illustrate:
The 8-bit high byte is the address, 1~255. 0 is the broadcast address.
The high 2 bits of the low byte are the data format bits.
"00" means 10 bits, no check, that is, "8, N, 1".
"01" means 11 bits, even parity, that is, "8, E, 1".
"10" means 11 bits, odd parity, that is, "8, O, 1".
"11" means 11 bits, no parity, 2 stop bits, that is, "8, N, 2".
The lower four bits of the low byte are the baud rate, 5-4800bps, 6-9600bps, 7-19200bps |
| 2 | Signal source switching settings | 0 005H _ | Write | When 0x 0001 is written , the module automatically switches modes, and writing other values is invalid. |

Table 2: System read-only parameter register address and communication data table (function code 03H, read-only)

serial number	definition	Register address	read/write	Specific instructions
1	Model 1	0000H	read	The value is 01031H
2	Model 2	0001H	read	The high byte 01H is the AC module, 02H is the DC module The low byte is the program version number
3	Voltage range	0002H	read	The value is 250, which represents 250V
4	Current range	0003H	read	The value is 160 , which represents 16 A

Table 3: Measurement electrical parameter register and communication data table (function code 03H to read, 10H to write)

serial number	definition	Register address	read/write	Data types and calculation instructions
1	Voltage	0048H	read	Unsigned number, value=DATA/100, unit V
2	current	0049H 004AH	read	Unsigned number, value=DATA/10000, unit A
3	Active power	004BH 004CH	read	Unsigned number, value = DATA/10000, unit is W
4	Total active energy	004DH 004EH	Read and write	Unsigned number, value=DATA/100, unit is kWh
5	Power factor	004FH	read	Unsigned number, value=DATA/1000
6	frequency	0050H	read	Value = DATA/100, unit is Hz
7	CO2 emissions	0051H 0052H	read	Unsigned number, value=DATA/10000, unit is Kg
9	reserved	0053H	read	
10	reserved	0054H	read	
11	reserved	0055H	read	
12	reserved	0056H	read	
13	inspecting power	0057H 0058H	read	Unsigned number, value = DATA/10000, unit is VA
14	Reactive power	0059H 005AH	read	Unsigned number, value = DATA/10000, unit is var
15	phase angle	005BH	read	Unsigned number, value == DATA/100, unit is degree (°)

Note: When it is necessary to test DC power, except for the 0 048 H ~ 004EH registers, other registers are all 0. the default value of the reserved register is 0.

4. MODBUS communication protocol

Modbus protocol query response data flow
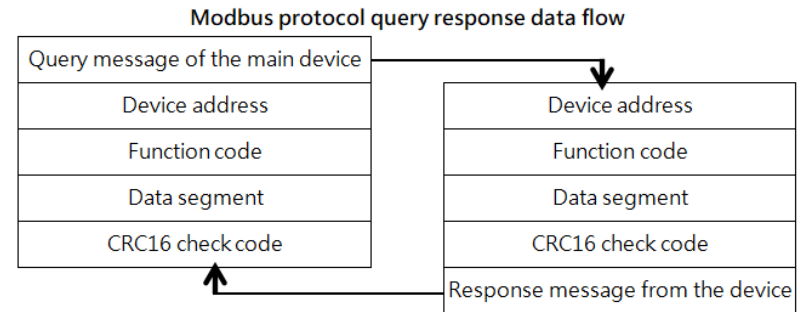
This instrument provides a serial data bus UART communication interface, using the standard MODBUS-RTU protocol. The MODBUS protocol uses a master-slave response mode on one communication line. First, the signal from the host computer is addressed to a terminal device (slave) with a unique address. Then, the response signal from the terminal device is transmitted to the host in the opposite direction, that is, the signal is transmitted along a separate communication line. All communication data streams are transmitted in opposite directions (half-duplex operating mode). The MODBUS protocol only allows communication between the host (PC, PLC, etc.) and terminal devices, but does not allow data exchange between independent terminal devices. In this way, each terminal device will not occupy the communication line when they are initialized, but is limited to responding. Query signal arriving at this machine.

Host query: The query message frame includes device address, function code, data information code, and check code. The address code indicates the slave device to be selected. the function code tells the selected slave device what function it wants to perform. For example, function code 03 or 04 requires the slave device to read registers and return their contents. the data segment contains the requirements of the slave device. Any additional information that performs functions. The check code is used to verify the correctness of a frame of information. The slave device provides a method to verify whether the message content is correct. It uses the calibration rule of CRC16.

Slave response: If the slave device generates a normal response, the response message contains the slave address code, function code, data information code and CRC16 check code. Data information codes include data collected from the device: like

register values or status. If an error occurs, we agree that the slave machine will not respond.

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

The structure of the data frame, that is, the message format:

Device address	function code	data segment	CRC16 check code
1 byte	1 byte	N bytes	2 bytes (low byte first)

Device address: It consists of one byte. The address of each terminal device must be unique. Only the addressed terminal will respond to the corresponding query.

Function code: tells the addressed terminal what function to perform. The following table lists the function codes supported by this series of instruments and their functions.

function code	Function
03H	Read the value of one or more registers
10H	Write the value of one or more registers
01H	Read the output status of relay 1
05H	Write the output status of relay 1

Data segment: Contains the data required by the terminal to perform specific functions or the data collected when the terminal responds to queries. The content of these data may be numerical values, reference addresses or setting values.

Check code: CRC16 occupies two bytes and contains a 16-bit binary value. The CRC value is calculated by the transmitting device and then appended to the data frame. The receiving device recalculates the CRC value when receiving the data and then compares it with the value in the received CRC field. If the two values are not equal, an error occurs. mistake.

The process of generating a CRC16 is:

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

(2) Perform XOR operation on the 8 bits of the first byte in the data frame and the low byte in the CRC register, and store the result back into the CRC register.

(3) Shift the CRC register one bit to the right, fill the highest bit with 0, shift out the lowest bit and detect it.

(4) If the lowest bit is 0: repeat the third step (next shift). if the lowest bit is 1: perform an XOR operation on the CRC register and a preset fixed value (0A001H).

(5) Repeat steps 3 and 4 until 8 shifts. In this way, a complete eight bits are processed.

(6) Repeat steps 2 to 5 to process the next eight bits until all bytes are processed.

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

MODBUS-RTU communication protocol example:

4.1. Function code 0x03: Read multiple registers
Example: The host wants to read 2 slave register data with address 01 and start address 0048H.

Host sends: 01 03 00 48 00 02 CRC

Address function code starting address data length CRC code

Slave response: 01 03 04 12 45 56 68 CRC

Address function code returns the number of bytes Register data 1 Register data 2 CRC code

4.2. Function code 0x10: Write multiple registers
Example: The host wants to save 0000,0000 to the slave register with addresses 000C, 000D (slave address code is 0x01)

Host sends: 01 10 00 0C 00 02 04 00 00 00 00 F3 FA

Address function code starting address number of write registers byte count saved data 1 2 CRC code

Slave response: 01 10 00 0C 00 02 81 CB

Address function code starting address write register number CRC code

4.3. Description
The register in the MODBUS-RTU communication protocol refers to 16 bits (ie 2 bytes), and the high-order bit is first.

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

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

Address code: 1 byte

Function code: 1 byte (the highest bit is 1)

Error code: 1 byte

CRC: 2 bytes

The response returns the following error code:

81: Illegal function code, that is, the received function code module does not support it.

82: Reading or writing illegal data address, that is, the data location exceeds the readable or writable address range of the module.

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

4.4. Example of command analysis:

4.4.1 Read electrical parameter instructions (take the module address as 0x01 as an example):

Send data: 01 03 00 48 00 0F 85 D8 (read 15 registers starting from 0048H)

Received data: 01 03 1E 5A E3 00 00 97 B2 00 00 23 4F 00 00 00 00 03 E8 13 86 00 00 01 84 00 00 03 88 00 00 03 E8 9D E5 (the red part is the data corresponding to the 0048H start register),

     4.4.2 Clear power command (take module address 0x01 as an example):

Send data: 01 10 00 4D 00 02 04 00 00 00 00 36 06

Receive data: 01 10 00 4D 00 02 D1 DF

5. Things to note

1) Pay attention to the auxiliary power information on the product label. Do not connect the wrong auxiliary power level and polarity of the product, otherwise the product may be damaged.

2) Please refer to the diagram for correct wiring according to product specifications and models. Make sure to disconnect all signal sources and power before wiring to avoid danger and damage to the equipment. After checking to confirm that the wiring is correct, turn on the power and test.

3) Please pay attention to the measuring range during use.

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

5) When installed in a centralized manner, the minimum installation interval should not be less than 10mm.

6) This series of products does not have a lightning protection circuit inside. When the input and output feeders of the module are exposed to harsh outdoor weather conditions, lightning protection measures should be taken.

7) Please do not damage or modify the product's label or logo, and do not disassemble or modify the product, otherwise our company will no longer provide "three guarantees" (guaranteed replacement, guaranteed return, and guaranteed repair) service for the product.

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