JSY-MK-231 Single Phase DC Metering Module with Hall Sensor

1.1、 Introduction

JSY-MK-231 is a Single Phase DC metering module collector that integrates highly integrated measurement and digital communication technology and can complete electric energy measurement, collection and transmission. It can accurately measure DC voltage, current, power, electricity and other electrical parameters. It has 1 RS-485 communication interface, completely isolated circuit, small size, simple interface, and can be easily fixed in various devices that need to measure DC power consumption. It has an excellent cost performance.

JSY-MK-231 DC collector can be widely used in energy-saving transformation, DC charging piles, electricity, communications, railways, transportation, environmental protection, petrochemicals, steel and other industries, and can be used to remotely monitor the use of DC equipment .

1.2、 Features

1.2.1. Collect DC parameters, including voltage, current, power , and electric energy.

1.2.2. Adopting special measurement chip and effective value measurement method, the measurement accuracy is high.

1.2.3. 1-way 485 communication interface.

1.2.4. The communication protocol adopts Modbus-RTU, which has good compatibility and is convenient for programming.

1.2.5. Powered by 12 ~ 36V DC .

1.2.6. Hall sensors of different specifications are available .

1.3、 Technical Parameters

1.3.1 DC input

1) Voltage range: 1~500V, other specifications can be customized .
2) Current range: 100A , other specifications can be customized .
3) Signal processing: using dedicated measurement chip, 24-bit AD sampling.
4) Overload capacity: 1.2 times the voltage and current range without damage.
5) Input impedance: voltage channel＞1 kΩ / V.

1.3.2 Communication Interface

1) Interface type: 1-way 485 communication interface.
2) Communication protocol: MODBUS-RTU protocol.
3) Data format: software-settable, “n,8,1”, “e,8,1”, “o,8,1”, “n,8,2”.
4) Communication rate: The baud rate can be set to 1200, 2400, 4800, 9600 , 19200, 38400bps . the default is 9600bps.

1.3.3 Measurement output data

Voltage, current, power, electric energy and other electrical parameters, see the Mdobus data register list.

1.3.4 measurement accuracy

Voltage, current, power: less than ±1.0%. electric energy level 1.

1.3.5 isolation

The power supply under test is isolated from the power supply. the isolation withstand voltage is 3 000VDC.

1.3.6 power supply

1) DC power supply 12 ~ 36V , power consumption < 50mA (24V power supply) .

1.3.7 working environment

1) Working temperature: -30～+75℃ . 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.

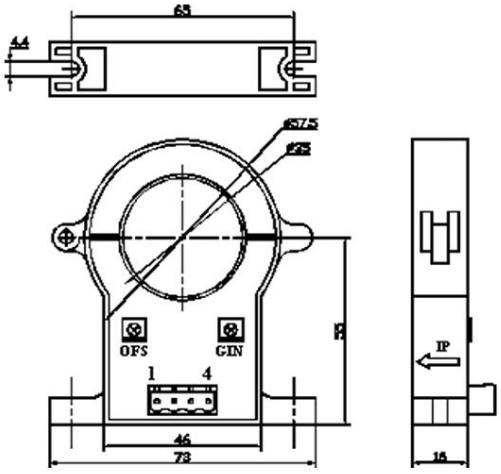
1.3.8 Installation method: 3 5 mm guide rail type

1.3.9 Housing size : 90. 2 * 36. 3 * 56.5mm

2.1、 Appearance and installation:

Figure 2.1 Dimensional drawing (unit: mm)

2.2 Hall Sensor appearance and dimension drawing

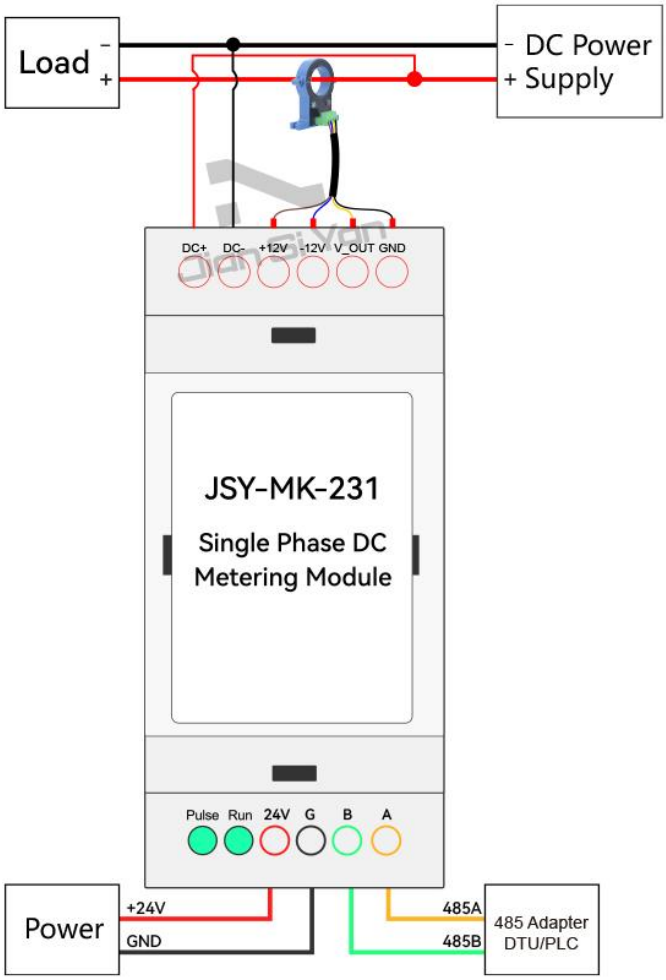


Pin Description:

1, +12V 2, -12V 3, Vout 4, 0V (power ground)

OFS, zero adjustment GIN, amplitude adjustment

2. 3 Terminal wiring diagram description:



Terminal Defination		
Terminal	Characteristic	Functional Description
DC+	DC positive	Positive terminal of the DC voltage under test
DC-	DC negative pole	Negative terminal of the DC voltage to be measured
+12V	Sensor working power supply	Connect to the +12V input port of the sensor
-12V	Sensor working power supply	Connect to the -12V input port of the sensor
GND	Sensor working power supply	Connect to the GND input port of the sensor
V_OUT	Sensor output signal	Connect to the Vo output port of the sensor
24V	Collector working power supply	Positive input port, voltage range is 12~36V
G	Collector working power supply	Negative input port
A	484A	Collector 485 communication port A
B	485B	Collector 485 communication port B

2.5 Application Description:

Please wire correctly according to the product specifications and models and refer to the above diagrams. Make sure to disconnect all signal sources before wiring to avoid danger and damage to the equipment. After checking and confirming that the wiring is correct, turn on the power supply for testing.

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

When the product leaves the factory, it is set to the default configuration: address 1, baud rate 9600bps, data format "n,8,1", data update rate 3 times per second, and transformation ratio 1.

2. 6 Electric energy metering functions:

Can provide single-phase voltage, current, power, electric energy and other parameters.

The data of electricity is a 4-byte unsigned number, and the data is saved when the power is off.

3.1、Measurement of electrical parameter registers and communication data table (function code 03H read, 10H write)

Serial number	definition	Register Address	Read/Write	Data Type and Calculation Instructions
1	Voltage	0100H 0101H	read	Unsigned number, value = DATA/10000, unit V
2	Current	0102H 0103H	read	Unsigned number, value = DATA/10000, unit A
3	Active Power	0104H 0105H	read	Unsigned number, value = DATA/10000, unit is W
4	Reactive power	0106H 0107H	read	reserve
5	inspecting power	0108H 0109H	read	Unsigned number, value = DATA/10000, unit is VA
6	Power Factor	010AH 010BH	read	Unsigned number, value = DATA/1000
7	frequency	010CH 010DH	read	reserve
8	Total active energy	010EH 010FH	Read/Write	Unsigned number, value = DATA/1000, unit is kWh
9	Total reactive energy	0110H 0111H	Read/Write	reserve
10	Power supply properties under test	0112H 0113H	read	reserve
11	Active power direction	0114H	read	The value 0x0000 represents the forward power, and the value 0x0001 represents the reverse power.
12	Reactive power direction	0115H	read	reserve
13	Positive active energy	0116H 0117H	read	Unsigned number, value = DATA/1000, unit is kWh
14	Reverse active energy	0118H 0119H	read	Unsigned number, value = DATA/1000, unit is kWh
15	Positive reactive energy	011AH 011BH	read	reserve
16	Reverse reactive energy	011CH 011DH	read	reserve

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

Serial number	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 format is 8, N, 1,9600bps illustrate: The high byte 8 bits are the address, 1~255. 0 is the broadcast address. The high 2 bits of the low byte are the data format bits, and "00" is represented as 10 bits, i.e. "8, N, 1" "01" means 11 bits, even check, that is, "8, E, 1". "10" is represented by 11 bits, odd-valued, that is, "8, 0, 1". "11" means 11 bits, invalid check, and 2 stop bits, that is, "8, N, 2". The lower four bits of the low byte are the baud rate, 3-1200bps, 4-2400bps, 5-4800bps, 6-9600bps , 7-19200bps, 8-38400bps

3.3、 System read-only parameter register address and communication data table (function code 03H, read-only)

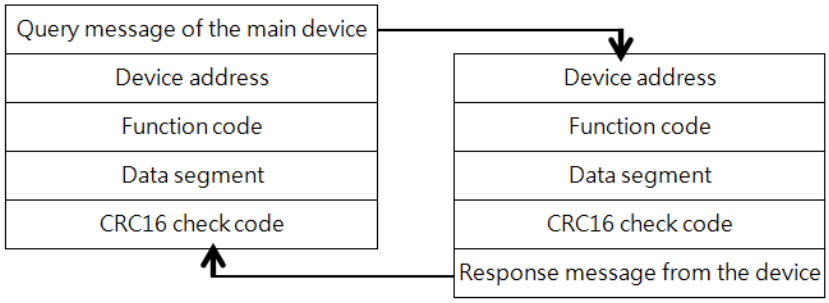
Serial number	definition	Register Address	Read/Write	Specific instructions
1	Model 1	0000H	read	The value is 02 31 H
2	Model 2	0001H	read	The low byte is the program version number
3	Voltage range	0002H	read	The default is 500V , the value is 0 1F4 H
4	Current range	0003H	read	The default value is 1 0 0A, and the value is 0 3E8 H (10 times relationship)

MODBUS Communication Protocol

This instrument provides a serial asynchronous half-duplex RS485 communication interface, using the standard MODBUS-RTU protocol, and all kinds of data information can be transmitted on the communication line. Up to 255 network instruments can be connected on one line at the same time, and each network instrument can set its communication address. The communication connection should use a shielded twisted pair with a copper mesh, with a wire diameter of not less than 0.5mm2 · When wiring, keep the communication line away from strong electric cables or other strong electric field environments.

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

Modbus protocol query response data flow



Host query: The query message frame includes the 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 to perform, for example, function code 03 or 04 requires the slave device to read the register and return their contents. the data segment contains any additional information for the slave device to perform the function, and 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, which uses the CRC16 calibration rule.

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. The data information code includes the data collected by the slave device: such as register value or status. If an error occurs, we agree that the slave will not respond.

We specify the communication data format used in this instrument: bits of each byte (1 start bit, 8 data bits, odd or even 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 checksum
1 byte	1 byte	N bytes	2 bytes (low byte first)

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

We specify the communication data format used in this instrument: bits of each byte (1 start bit, 8 data bits, odd or even 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 checksum
1 byte	1 byte	N bytes	2 bytes (low byte first)

Device address: 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 1 relay
05H	Write the output status of 1 relay

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 this data may be numerical values, reference addresses or setting values.

Checksum: CRC16 occupies 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 when receiving data and then compares it with the value in the received CRC field. If the two values are not equal, an error has occurred.

The process of generating a CRC16 is:

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

(2) Perform an 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 in the CRC register.

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

(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 have been made. This completes the processing of a full eight bits.

(6) Repeat steps 2 to 5 to process the next eight bits until all bytes have been 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 the data of two slave registers with address 01 and start address 0000H.

Host sends: 01 03 00 00 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 Return 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 at address 000C,000D (the 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 Write Register Quantity Byte Count Save Data 1 2 CRC Code

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

Address function code starting address write register quantity CRC code

4.3 Description

The registers in the MODBUS-RTU communication protocol refer to 16 bits (i.e. 2 bytes), with the high bit first.

When setting parameters, be careful not to write illegal data (i.e. 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 is not supported by the module.

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

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

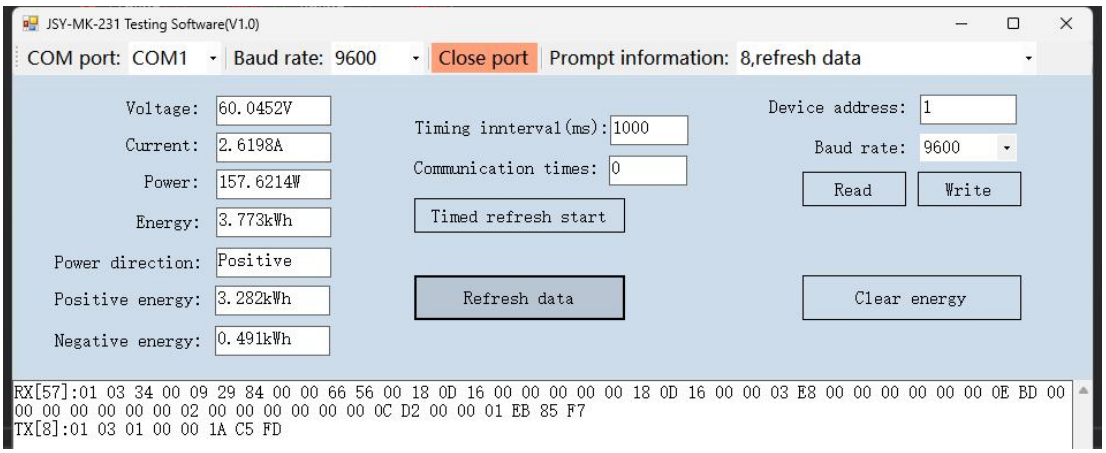
4.4. Example of instruction analysis:

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

Send data: 01 03 0 1 00 00 1A C5 FD (read 26 registers starting from 0 100)

Receive data: 01 03 34 00 09 29 84 00 00 66 56 00 18 0D 16 00 00 00 00 00 18 0D 16 00 00 03 E8 00 00 00 00 00 00 0E BD 00 00 00 00 00 00 00 02 00 00 00 00 00 00 0C D2 00 00 01 EB 85 F7 The red part is the relevant electrical parameters. The decomposed results are as follows:

The red data 00 09 29 84 corresponds to registers 0 100H~0101H , which is the voltage: 0x00 092984 = 600452 , divided by 10000 is 60.0452 V. Each parameter corresponds to 2 registers , and the data is 4 bytes. The other data is calculated in the same way.



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

Send data: 01 10 00 0C 00 02 04 00 00 00 00 F3 FA

Receive data: 01 10 00 0C 00 02 8 1 CB

5. Notes

1) Pay attention to the auxiliary power information on the product label. The auxiliary power level and polarity of the product must not be connected incorrectly, otherwise the product may be damaged.
2) Please connect correctly according to the product specifications and models and refer to the diagram. Before connecting, make sure to disconnect all signal sources and power to avoid danger and damage to the equipment. After checking and confirming that the wiring is correct, turn on the power for testing.
3) The voltage circuit or the secondary circuit of the PT cannot be short-circuited.
4) When there is current on the primary side of the CT, it is strictly forbidden to open the secondary circuit of the CT. it is strictly forbidden to connect wires or unplug terminals when there is current on the primary side of the CT.
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 installing in a centralized manner, the minimum installation interval should not be less than 10mm.
7) This series of products does not have a lightning protection circuit inside. When the input and output feeder lines of the module are exposed to harsh outdoor weather environments, lightning protection measures should be taken.
8) Please do not damage or modify the product labels or logos, and do not disassemble or modify the product. Otherwise, our company will no longer provide the "three guarantees" (exchange, refund, and repair) service for this product.

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