JSY-MK-138 12-channel mutual inductance metering module

1. product description

1.1 Introduction

1.2 Functional features

1.3 Technical parameters

2. application

2.1 Appearance and installation

2.2 Terminal definition

2.3 Typical wiring

2.4 Application instructions

3. Modbus register

4. Modbus communication protocol

5. Notes

1. Product introduction

1.1、 Introduction

The JSY-MK-138 12-channel mutual inductance measurement module is an AC parameter measurement product that can complete electrical energy collection, measurement and data transmission . It can accurately measure three-phase AC voltage, current , power, power factor, frequency, electricity, etc. Electrical parameters , it can also measure 12 channels of single-phase AC voltage, current , power, power factor, frequency, electricity and other electrical parameters . It provides 1 channel of RS-485 communication interface , which can provide separate power supply. MODBUS-RTU protocol, with extremely high Excellent value for money.

The JSY-MK-138 12 - channel mutual inductance 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 12 AC power parameters, including three-phase or single-phase voltage, current, power, power factor, frequency, electric energy and other electrical parameters;

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

1.2.3. With 1 RS-485 communication interface;

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

1.2.5. RS-485 communication interface with ESD protection circuit ;

1.2.6. Wide working voltage AC80~265V;

1.2.7. High isolation voltage, withstand voltage up to DC2000V;

1.2.8. Optional single-turn through-core PCB fixed or open transformers of different specifications are convenient and easy to use;

1.2.9. Any voltage input can be configured according to the actual wiring situation;

1.3、 Technical Parameters

1.3.1 Single-phase or three-phase AC input

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

2) Current range: 5A, 50A, 100A, etc. optional; external open current transformer model optional;

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

4) Overload capacity: 1.2 times the range is sustainable; instantaneous (<20mS) current is 5 times, voltage is 1.2 times the range without damage;

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

1.3.2 Communication Interface

1) Interface type: 1-way RS-485 interface;

2) Communication protocol: MODBUS-RTU protocol;

3) Data format: can be set by software, "n,8,1" , "e,8,1" , "o,8,1" , "n,8,2" ;

4) The baud rate of the RS-485 communication interface can be set to 9600, 19200 , 38400 Bps; the default baud rate is 9600bps;

1.3.3 Measurement output data

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

1.3.4 measurement accuracy

Voltage , current , power : ± 1.0 % ; active electricity level 1

1.3.5 isolation

RS-485 interface, isolated from power supply, voltage input, and current input; isolation withstand voltage 2000VDC;

1.3.6 power supply

1) power can be taken from the input AC phase C, please note that the voltage range is AC 85~265V ;

DC power supply can also be selected, and the input range is +9V~15V;

2) Typical power consumption: ≤ 1 W;

1.3.7 working environment

1) Working temperature: -20～+ 60 ℃ ; 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 Temperature drift: ≤100ppm/ ℃ ;

1.3.9 Installation method: screw fixed installation hole distance is 105*58.5MM

2. Application
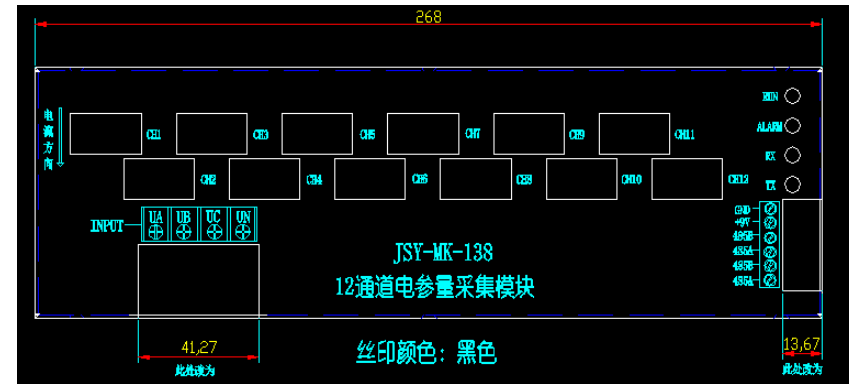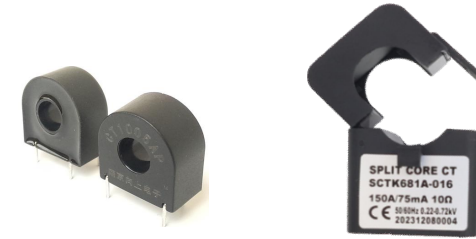
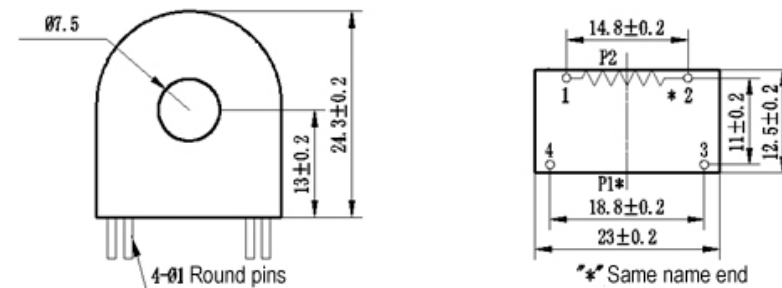**2.1、 Appearance and installation**

Figure 2.1 Overall dimensions 268*84*46 (**plus transformer height**) (unit: mm)

Current transformer outline drawing

Current transformer appearance and dimensions:

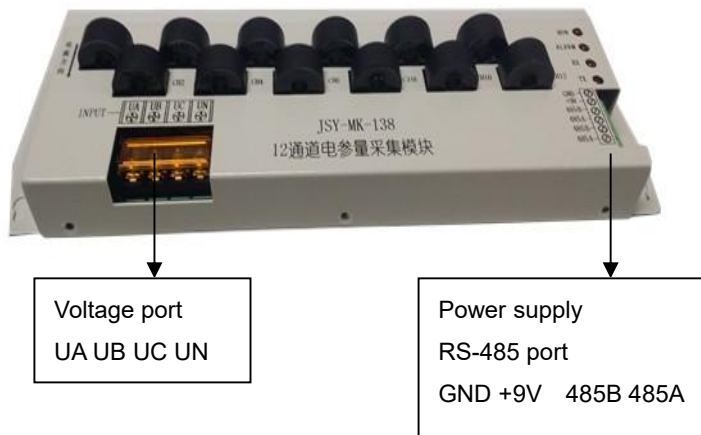
Dimensional drawing of 50A core-type current transformer
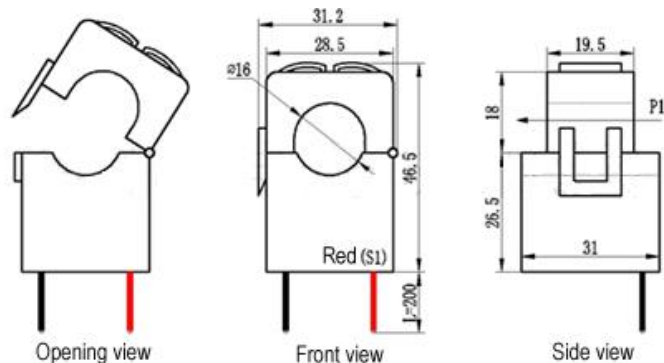
Dimensional drawing of 100A open type current transformer

2.2、 Interface definition

Voltage port
UA UB UC UN

Power supply
RS-485 port
GND +9V   485B 485A

2.2.1 UA UB UC (live wire) and UN (neutral wire) are the measured voltage connection ports, and phase C can also be used as the power supply input port;

2.2.2 The current line to be measured passes through the current transformer or external transformer ;

2.2.3 The power interface is the module's DC working power supply 9V, which is GND +9V from top to bottom ;

2.2.4 The RS-485 communication interface is a 4P wiring socket, which is 485B, 485A, 485B, and 485A from top to bottom (the same interface provides two wiring terminals for convenient wiring).

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 power indicator light (RUN) is always on, the indicator light (RX) will flash when receiving data, and the indicator light (TX) will flash when the module sends data.

When the products leave the factory, they are set to the default configuration: address No. 1, baud rate 9600bps, data format 8, N, 1 data update rate is 1000ms, and transformation ratio is 1;

You can use the JSY-MK-141 series product testing software we provide to change the settings of product parameters and general testing of the product.

2.4、 RS-485 communication connection

The host generally only has an RS‐232 interface. At this time, it can be connected to the 485 network through an RS‐232/ RS‐485 converter. It is recommended to use an isolated 485 converter to improve the reliability of the system;

The A+ terminals of all devices on a bus are connected in parallel, and the B- terminals are connected in parallel. They cannot be connected in reverse. Up to 255 network instruments can be connected to one line at the same time. Each network instrument can set its communication address. The communication connection should use With shielded twisted pair, the wire diameter is not less than 0.5mm[2] . When wiring, communication lines should be kept away from strong current cables or other strong electric field environments .

RS‐485 communication lines should use shielded twisted pairs; the communication distance of 485 can reach 1200 meters. When there are many RS485 devices connected to a bus , or when a higher baud rate is used, the communication distance will be shortened accordingly. At this time, you can Expand using 485 repeater.

RS - 485 networking has a variety of topologies, and generally uses linear connection, that is, starting from the upper host, multiple devices are connected to the network one by one from near to far. A terminal matching resistor of 120 ~ 300 Ω /0.25 watt can be connected at the farthest end (it depends on the specific communication quality, that is, it does not need to be installed when the communication is very good).

2.5、 Electric energy measurement function

Can provide voltage, current, power, power factor, frequency, active energy and other parameters for each channel;

The electricity data is a 4-byte unsigned number. It will not overflow for 10 consecutive years and the data will be saved when the power is turned off.

3. JSY-MK-138 Modbus register list

Register is used for MODBUS-RTU communication protocol. Valid registers are as follows:

Register address	illustrate
0000H (read only)	Model, value is 013 8 H,
0001H (read only)	reserve
0002H (read only)	Voltage range: value is 250, representing 250V
0003H (read only)	Circuit range: The value is 400, which represents 5 0A
0004H (readable and writable)	The default value is 0106H; the default address is 01H, and the default format is 8, N, 1, 9600bps Description: 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, that is, "8, N, 1" "01" means 11 bits, even parity, that is, "8, E, 1"; "10" means 11 digits, which is "8, O, 1"; "11" means 11 bits, no validation, 2 stop bits, that is, "8, N, 2"; The lower four bits of the low byte are the baud rate , 0

	6-9600bps , 07-19200bps, 08-38400bps
0010H (read and write)	No. 1 and No. 2 voltage selection, the high byte is No. 1, the low byte is No. 2; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to phase B voltage. C phase voltage
0011H (read and write)	No. 3 and 4 voltage selection, the high byte is No. 3, the low byte is No. 4; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to phase B voltage. C phase voltage
0012H (read and write)	No. 5 and 6 voltage selection, the high byte is No. 5, the low byte is No. 6; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to phase B voltage. C phase voltage
0013H (read and write)	No. 7 and 8 voltage selection, the high byte is No. 7, the low byte is No. 8; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to phase B. C phase voltage
0014H (read and write)	No. 9 and 10 voltage selection, the high byte is No. 9, the low byte is No. 10; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to

	phase B. C phase voltage	00 4 CH (read only)	No. 2 power factor, unsigned number, value=DATA/1000
0015H (read and write)	No. 11 and 12 voltage selection, the high byte is No. 11, the low byte is No. 12; when the value is 1, it means connecting to phase A voltage, when the value is 2, it means connecting to phase B voltage, and when the value is 3, it means connecting to phase B voltage. C phase voltage	00 4 DH (read only)	Channel 2 frequency, unsigned number, value=DATA/100
		004EH (read only)	No. 3 voltage, unsigned number, value = DATA/100, unit V
0040H (read only)	No. 1 voltage, unsigned number, value = DATA/100, unit V	00 4 FH (read only)	The 3rd current, unsigned number, value=DATA/1000, unit A
00 41 H (read only)	Current No. 1, unsigned number, value = DATA/1000, unit A	0050H (read only)	Channel 3 active power, unsigned number, value = DATA , unit is W
00 42 H (read only)	Channel 1 active power, unsigned number, value = DATA , unit is W	0051~ 0052H (read and write)	Total active energy of channel 3, unsigned number, value = DATA/100, unit is kWh
00 43 ~ 00 44 H (read and write)	The total active energy of channel 1, unsigned number, value = DATA/100, unit is kWh	0053H (read only)	No. 3 power factor, unsigned number, value=DATA/1000
00 45 H (read only)	No. 1 power factor, unsigned number, value=DATA/1000	0054H (read only)	Frequency No. 3, unsigned number, value=DATA/100
00 46 H (read only)	Frequency of channel 1, unsigned number, value=DATA/100		
		0055H (read only)	No. 4 voltage, unsigned number, value = DATA/100, unit V
0047H (read only)	No. 2 voltage, unsigned number, value = DATA/100, unit V	0056H (read only)	The 4th channel current, unsigned number, value = DATA/1000, unit A
00 4 8H (read only)	The 2nd current, unsigned number, value = DATA/1000, unit A	0057H (read only)	Channel 4 active power, unsigned number, value = DATA , unit is W
00 4 9H (read only)	Channel 2 active power, unsigned number, value = DATA , unit is W	0058~ 0059H (read and write)	Total active energy of channel 4, unsigned number, value = DATA/100, unit is kWh
00 4A ~ 00 4 BH (read and write)	Total active energy of channel 2, unsigned number, value = DATA/100, unit is kWh	005AH (read only)	No. 4 power factor, unsigned number, value=DATA/1000
		005BH (read only)	Frequency No. 4, unsigned number,

	value=DATA/100		unit V
		006BH (read only)	No. 7 current, unsigned number, value = DATA/1000, unit A
005CH (read only)	No. 5 voltage, unsigned number, value = DATA/100, unit V	006CH (read only)	Channel 7 active power, unsigned number, value = DATA , unit is W
005DH (read only)	The 5th channel current, unsigned number, value = DATA/1000, unit A	006D~ 006EH (read and write)	The total active energy of channel 7, unsigned number, value = DATA/100, unit is kWh
005EH (read only)	Channel 5 active power, unsigned number, value = DATA , unit is W		
005F~ 0060H (read and write)	The total active energy of channel 5, unsigned number, value = DATA/100, unit is kWh	006FH (read only)	No. 7 power factor, unsigned number, value=DATA/1000
		0070H (read only)	Channel 7 frequency, unsigned number, value=DATA/100
0061H (read only)	No. 5 power factor, unsigned number, value=DATA/1000		
0062H (read only)	No. 5 frequency, unsigned number, value=DATA/100	0071H (read only)	No. 8 voltage, unsigned number, value = DATA/100, unit V
		0072H (read only)	The 8th channel current, unsigned number, value = DATA/1000, unit A
0063H (read only)	No. 6 voltage, unsigned number, value = DATA/100, unit V	0073H (read only)	Channel 8 active power, unsigned number, value = DATA , unit is W
0064H (read only)	No. 6 current, unsigned number, value = DATA/1000, unit A	0074~ 0075H (read and write)	The total active energy of channel 8, unsigned number, value = DATA/100, unit is kWh
0065H (read only)	Channel 6 active power, unsigned number, value = DATA , unit is W		
0066~ 0067H (read and write)	The total active energy of channel 6, unsigned number, value = DATA/100, unit is kWh	0076H (read only)	No. 8 power factor, unsigned number, value=DATA/1000
		0077H (read only)	No. 8 frequency, unsigned number, value=DATA/100
0068H (read only)	No. 6 power factor, unsigned number, value=DATA/1000		
0069H (read only)	Channel 6 frequency, unsigned number, value=DATA/100	0078H (read only)	No. 9 voltage, unsigned number, value = DATA/100, unit V
		0079H (read only)	No. 9 current, unsigned number, value = DATA/1000, unit A
006AH (read only)	No. 7 voltage, unsigned number, value = DATA/100,		

007AH (read only)	Channel 9 active power, unsigned number, value = DATA , unit is W	008AH (read and write)	value = DATA/100, unit is kWh
007B~ 007CH (read and write)	The total active energy of channel 9, unsigned number, value = DATA/100, unit is kWh	008BH (read only)	No. 11 power factor, unsigned number, value = DATA/1000
007DH (read only)	No. 9 power factor, unsigned number, value = DATA/1000	008CH (read only)	Frequency No. 11, unsigned number, value=DATA/100
007EH (read only)	No. 9 frequency, unsigned number, value = DATA/100		
		008DH (read only)	No. 12 voltage, unsigned number, value = DATA/100, unit V
007FH (read only)	No. 10 voltage, unsigned number, value = DATA/100, unit V	008EH (read only)	No. 12 current, unsigned number, value = DATA/1000, unit A
0080H (read only)	The 10th current, unsigned number, value = DATA/1000, unit A	008FH (read only)	Channel 12 active power, unsigned number, value = DATA , unit is W
0081H (read only)	Channel 10 active power, unsigned number, value = DATA , unit is W	0090~ 0091H (read and write)	Total active power of channel 12, unsigned number, value = DATA/100, unit is kWh
0082~ 0083H (read and write)	The total active power of channel 10, unsigned number, value = DATA/100, unit is kWh	0092H (read only)	No. 12 power factor, unsigned number, value = DATA/1000
0084H (read only)	No. 10 power factor, unsigned number, value = DATA/1000	0093H (read only)	Frequency No. 12, unsigned number, value=DATA/100
0085H (read only)	The 10th channel frequency, unsigned number, value = DATA/100		
		0094H (read only)	Total power of channels 1~3, unsigned number, value = DATA , unit is W
0086H (read only)	No. 11 voltage, unsigned number, value = DATA/100, unit V	0095~ 0096H (read and write)	of channels 1~3 , unsigned number, value=DATA/100, unit is kWh
0087H (read only)	No. 11 current, unsigned number, value = DATA/1000, unit A	0097H (read only)	Total power factor of channels 1~3, unsigned number, value=DATA/1000
0088H (read only)	Channel 11 active power, unsigned number, value = DATA , unit is W	0098H (read only)	Total power of channels 4~6, unsigned number, value = DATA , unit is W
0089~	Total active power of channel 11, unsigned number,	0099~	of channels 4~6 , unsigned number,

009AH (read and write)	value=DATA/100, unit is kWh
009BH (read only)	Total power factor of channels 4~6, unsigned number, value=DATA/1000
009CH (read only)	Total power of channels 7~9, unsigned number, value = DATA , unit is W
009D~ 009EH (read and write)	of channels 7~9 , unsigned number, value=DATA/100, unit is kWh
009FH (read only)	Total power factor of channels 7~9, unsigned number, value=DATA/1000
00A0H (read only)	Total power of channels 10~12, unsigned number, value = DATA , unit is W
00A1~ 00A2H (read and write)	of channels 10~12 , unsigned number, value = DATA/100, unit is kWh
00A3H (read only)	Total power factor of channels 10~12, unsigned number, value=DATA/1000

The red part is the new content added in 19.7.18

4. MODBUS-RTU protocol communication examples and error explanations

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

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

2. 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:

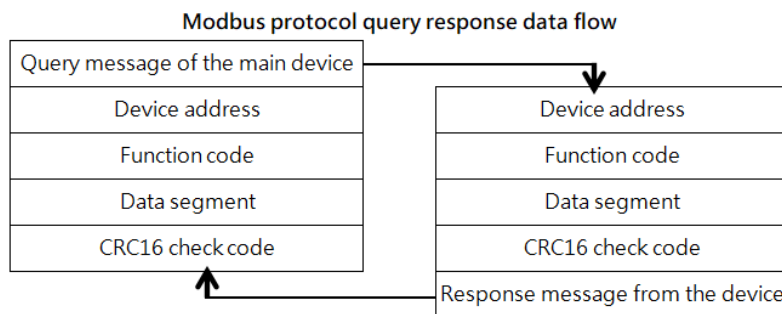81: Illegal function code, that is, the received function code module does not support it.

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.

This instrument provides a serial asynchronous half-duplex RS485 communication interface, using the standard MODBUS-RTU protocol, and various data information can be transmitted on the communication line. Up to 255 network instruments can be connected to one line at the same time. Each network instrument can set its communication address. The communication connection should use a shielded twisted pair with a copper mesh, and the wire diameter should not be less than 0.5mm ^{2} . When wiring, communication lines should be kept away from strong current cables or other strong electric field environments.

The MODBUS protocol adopts the master-slave response communication connection

method 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.

Modbus protocol query response data flow

Query message of the main device	
Device address	Device address
Function code	Function code
Data segment	Data segment
CRC16 check code	CRC16 check code
	Response message from the device

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 to perform the function. 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

Command example:

(1)Copy all 12 electrical parameters: 01 03 00 40 00 54 45 E1

(2)Clear the power of channel 12: 01 10 00 0C 00 02 04 00 00 00 00   F3 FA

(3)Change address No. 1 to address No. 2: 01 10 00 04 00 01 02 02   06 26 B6

Testing software:

5. Notes

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) The voltage circuit or the secondary circuit of the PT must not 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 make live connections or unplug

terminals;

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

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

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.

Manufacturer: Shenzhen Jiansiyan Technologies Co., Ltd.

Online Technical Support Staff:

    +86 18675534520(Jack Jia)

    +86 18665924579(Jimmy Yang)

E-mail: jsy-mk@jsypowermeter.com

Web: www.jsypowermeter.com

Address: 901, Building 1, Taijiale Technology Industrial Park, Tongguan Road, Tianliao Community, Yutang Street,Guangming District,Shenzhen,Guangdong, 518132, China.

official website