JSY-MK-339 three-phase voltage and current collector

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1. Product introduction

1.1、 Introduction

The JSY-MK-339 three-phase voltage and current collector is a three-phase power quality detector developed by our company using microelectronics technology and dedicated large-scale integrated circuits, digital sampling processing technology and SMT technology and other advanced technologies with completely independent intellectual property rights. The technical performance of the detector is in full compliance with the relevant technical requirements of the 1 class three-phase active energy meter in the IEC 62053-21 national standard, and can directly and accurately measure the voltage, current, power, power factor, electricity and total electrical parameters in the three-phase AC power grid with a rated frequency of 50HZ or 60HZ. The collector has a built-in 4G communication module, 1 channel RS485 communication interface, and a MODBUS-RTU communication protocol to facilitate connection with various AMR systems. It has the characteristics of good reliability, small size, light weight, beautiful appearance, and convenient installation.

JSY-MK-339 three-phase voltage and current collector can be widely used in energy-saving transformation, electric power, communication, railway, transportation, Environmental protection, petrochemical, steel and other industries, used to monitor the current and power consumption of AC equipment.

1.2、 Functional features

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

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

1.2.3. Built-in 4G communication module with 1 channel RS485 interface;

1.2.4. With 1 channel residual current measurement;

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

1.2.6. Dot matrix liquid crystal display;

1.2.7. Wide working voltage AC80 ~ 240V;

1.2.8. Using industrial-grade chips, built-in watchdog, and has a sound anti-lightning anti-interference measures to ensure reliability;

1.2.9. High isolation voltage, withstand voltage up to AC:2000V;

1.2.10. It can be equipped with different specifications of single-turn core transformer or open-close transformer, convenient and easy to use;

1.3、 Technical parameters

1.3.1 Three-phase AC input

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

2) Current range: 5A, 50A, 100A, 200A, etc. optional; External external opening current

transformer model optional;

3) Signal processing: using dedicated measurement chip, 24 AD sampling;

4) Overload capacity: 1.2 times the range is sustainable; Instantaneous (<200mS) current 5 times, voltage 2 times the range is not damaged;

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

1.3.2 Switching quantity output

1 relay, open circuit output, voltage, current overload alarm protection output function;

1.3.3 Communication Interface

1) Wireless communication standard 4G,CAT1. Support LTE-TDD(B34/B38/B39/B40/B41) and LTE-FDD(B1/B3/B5/B8);

2) Interface type: Provide 1 channel RS-485 interface;

3) Communication Statute: MODBUS-RTU protocol;

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

5) Communication rate: the baud rate of the RS-485 communication interface can be set to 1200, 2400, 4800 and 9600Bps; The factory default baud rate is 9600bps, and the data "n,8,1" format is used;

6) Communication data:

Voltage, current, power, energy and other electrical parameters. See Mdobus data register list.

1.3.4 Measurement accuracy

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

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

1.3.5 Power

1) Optional 100V, 220V, 380V, voltage line 100V ~ 380V

When AC220V power supply, the peak voltage shall not exceed 265V; Typical power consumption: < 2W;

1.3.6 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 explosion, corrosive gas and conductive dust, no significant shaking, vibration and impact of the place;

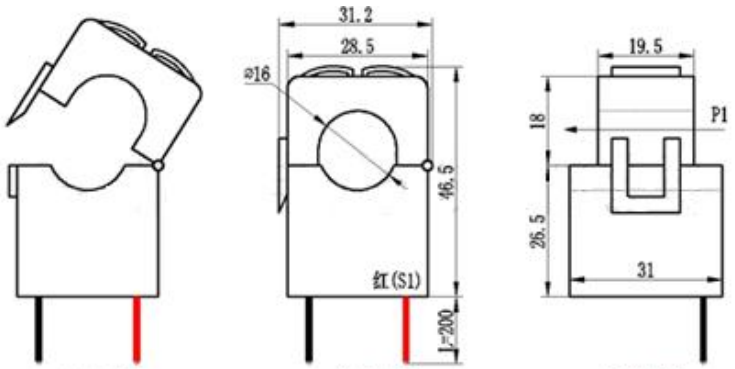
1.3.7 Temperature drift: <100ppm/ ℃;

1.3.8 Installation method: 4P guide rail installation;

1.3.9 Module size: 72*92*58mm

2. application

2.1、 Shape of 100A transformer



2.2、 Terminal Definition

Terminals	Definition	Description	Terminals	Definition	Description
	UA	Phase A voltage input		A	RS485 positive
	UB	Phase B voltage input		B	RS485 negative
	UC	Phase C voltage input			
	UN	Zero Line Input		COM	Switch value function reservation
				NO	Switch value function reservation
	A+	Phase A current transformer +		IN+	Residual current transformer +

	A-	Phase A current transformer-		IN-	Residual current transformer-
	B +	Phase B current transformer +			
	B-	Phase B current transformer-			
	C+	Phase C current transformer +			
	C-	C phase current transformer-			

2.3、 Application notes

Please refer to the above figure for correct wiring according to the product specification and model. Make sure to disconnect all signal sources before wiring to avoid danger and damage to equipment. After checking and confirming that the wiring is correct, turn on the power for testing.

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

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 1000ms, change ratio 1;

You can change the set product parameters and the general testing of the product through the JSY-MK-301 product testing software provided by us.

2.4 RS-485 network connections:

The host generally only has RS-232 interface, at this time can be connected to the 485 network through the 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 equipment on a bus are connected in parallel, and the B- terminals are connected in parallel, and cannot be connected in reverse. Up to 255 network meters can be connected on a line at the same time. Each network meter can set its communication address. The communication connection shall use shielded twisted pair with a wire diameter of not less than 0.5mm ^{2}. When wiring, the communication line should be kept away from strong electric cables or other strong electric field environment.

RS-485 communication lines should use shielded twisted pair; 485 communication distance of up to 1200 meters, when a bus connected to a lot of RS485 equipment, or use a higher baud rate when the communication distance will be shortened accordingly, at this time can be extended using 485 repeater.

RS-485 networking has a variety of topologies, and linear connections are generally used, I .e. multiple devices are connected to the network one by one from near and far from the upper host. A terminal matching resistor of 120~300 Ω /0.25W can be connected at the farthest end (it depends on the specific communication quality, I .e. it is not necessary to install it when the communication is good).

2.5 Electric energy metering function:

It can provide three-phase voltage, current, power, power factor, active energy and other parameters;

The data of the power degree is an unsigned number of 4 bytes, which will not overflow for 10 consecutive years, and the data will be saved after power failure.

3. List of JSY-MK-339 Modbus registers

Table 1: Measured electrical parameter register and communication data table (function code 03H read, function 10H write)

Serial Number	register address	Bytes	Read/Write	Function	Description	
0	0x0000	2	Read	Model	Model, value 0x339	
1	0x0001	2	Read	Hardware version	0x1001	
2	0x0002	2	Read	Software version	0x1001	
3	0x0003	2	Read	Protocol Version	0x1001	
4	0x0004	2	Read	Rated voltage	250V value is 0x00FA	
5	0x0005	2	Read	Rated current	100A value is 0x 0064	

6	0x0006	2	Read/Write	RS485 address and baud rate	The default value is 0106H;The high byte is the address, the default is 0x01; and the default communication format is 8,N,1,9600bps Description:The 8 bits of the high byte are the address, 1~255;0 is the broadcast address;Low byte for baud rate, 5-4800bps,6-9600bps,7-19200bps
7	0x000B	2	Read	Alarm Clear	Write 0x0000 alarm cleared, write other values invalid
8	0x000C 0x000D		Write	Power Clear	Write 0x0000 all energy registers clear, write other values invalid

Table 2: Three-phase electrical parameter register list

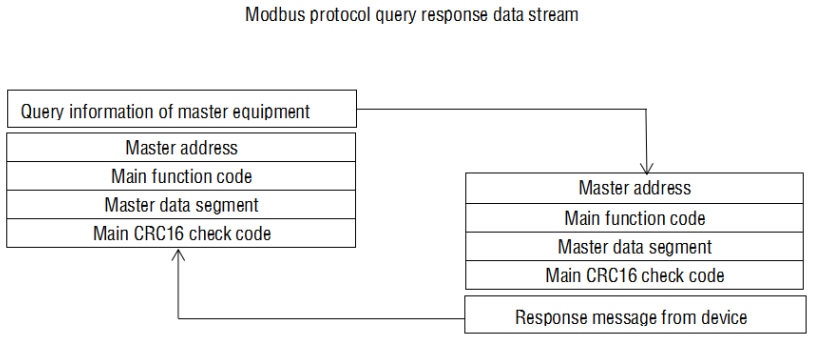
Serial Number	register address		Read/Write	Function	Description
1	0x0048	2	Read	Phase A voltage	Unsigned data, value = DATA/100; unit V
2	0x0049	2	Read	Phase B voltage	Unsigned data, value = DATA/100; unit V
3	0x004A	2	Read	phase C voltage	Unsigned data, value = DATA/100; unit V
4	0x004B	2	Read	Phase A current	Unsigned data, value = DATA/100; unit A
5	0x004C	2	Read	Phase B current	Unsigned data, value = DATA/100; unit A
6	0x004D	2	Read	phase C current	Unsigned data, value = DATA/100; unit A
7	0x004E	2	Read	leakage current	Unsigned data, value = DATA/10000; unit A
8	0x004F	2	Read	Phase A active power	Unsigned data, value = DATA/100; unit kW
9	0x0050	2	Read	Phase B active power	Unsigned data, value = DATA/100; unit kW
10	0x0051	2	Read	Phase C active power	Unsigned data, value = DATA/100; unit kW
11	0x0052	2	Read	Total active power	Unsigned data, value = DATA/100; unit kW
12	0x0053	2	Read	Phase A reactive power	Unsigned data, value = DATA/100; unit kVar
13	0x0054	2	Read	Phase B reactive power	Unsigned data, value = DATA/100; unit kVar
14	0x0055	2	Read	Phase C reactive power	Unsigned data, value = DATA/100; unit kVar
15	0x0056	2	Read	Total reactive power	Unsigned data, value = DATA/100; unit kVar
16	0x0057	2	Read	Phase A apparent power	Unsigned data, value = DATA/100; unit kVA
17	0x0058	2	Read	Phase B apparent power	Unsigned data, value = DATA/100; unit kVA
18	0x0059	2	Read	Phase C apparent power	Unsigned data, value = DATA/100; unit kVA
19	0x005A	2	Read	Total apparent power	Unsigned data, value = DATA/100; unit kVA
20	0x005B	2	Read	Phase A power factor	Unsigned data, value = DATA/1000
21	0x005C	2	Read	Phase B power factor	Unsigned data, value = DATA/1000;
22	0x005D	2	Read	Phase B power factor	Unsigned data, value = DATA/1000;
23	0x005E	2	Read	Total power factor	Unsigned data, value = DATA/1000;
24	0x005F	4	Read	Phase A accumulated active energy	Unsigned data, value = DATA/100; unit kWh, four bytes
25	0x0061	4	Read	Phase B accumulated active energy	Unsigned data, value = DATA/100; unit kWh, four bytes
26	0x0063	4	Read	Phase C accumulated active energy	Unsigned data, value = DATA/100; unit kWh, four bytes
27	0x0065	4	Read	Total accumulated active energy	Unsigned data, value = DATA/100; unit kWh, four bytes
28	0x0067	4	Read	Phase A accumulated reactive energy	Unsigned data, value = DATA/100; unit kvarh, four bytes
29	0x0069	4	Read	Phase B accumulated reactive energy	Unsigned data, value = DATA/100; unit kvarh, four bytes
30	0x006B	4	Read	Phase C accumulated reactive energy	Unsigned data, value = DATA/100; unit kvarh, four bytes
31	0x006D	4	Read	Total accumulated reactive energy	Unsigned data, value = DATA/100; unit kvarh, four bytes

32	0x006F	4	Read	Phase A cumulative apparent energy	Unsigned data, value = DATA/100; unit kVAh, four bytes
33	0x0071	4	Read	Phase B cumulative apparent energy	Unsigned data, value = DATA/100; unit kVAh, four bytes
34	0x0073	4	Read	Phase C cumulative apparent energy	Unsigned data, value = DATA/100; unit kVAh, four bytes
35	0x0075	4	Read	Total cumulative apparent energy	Unsigned data, value = DATA/100; unit kVAh, four bytes
36	0x0076	2	Read	Frequency	Unsigned data, value = DATA/100; unit Hz

4. MODBUS Communication Protocol

This instrument provides serial asynchronous half duplex RS485 communication interface, using standard MODBUS-RTU protocol, all kinds of data information can be transmitted on the communication line. Up to 255 network meters can be connected on one line at the same time. Each network meter can set its communication address. Shielded twisted pair with copper mesh shall be used for communication connection, and the wire diameter shall not be less than 0.5mm ^{2}. When wiring, the communication line should be kept away from strong electric cables or other strong electric field environment.

The MODBUS protocol uses a master-slave response communication connection on the 1 root communication line. First, the host computer's signal is addressed to a terminal device (slave) with a unique address, and then the reply signal sent by the terminal device is transmitted to the host in the opposite direction, that is, the signal on 1 single communication line transmits all communication data streams in the opposite directions (half-duplex mode of operation). The MODBUS protocol only allows communication between the host (PC,PLC, etc.) and the terminal equipment, and does not allow data exchange between independent terminal equipment, so that the terminal equipment will not occupy the communication line when they are initialized, but only respond to the inquiry signal arriving at the machine.



Host query: the query message frame includes a device address, a function code, a data information code, and a check code. The address code indicates the slave device to be selected; the function code indicates what function the selected slave device will perform, for example, the function code 03 or 04 requires the slave device to read registers and return their contents; the data segment contains any additional information of the function to be performed by the slave device, the check code is used to check the correctness of the 1 frame information, and the slave device provides a 1 method to verify whether the message content is correct, it uses CRC16 calibration rules.

The slave response: if the slave device generates a normal response, there are the slave address code, function code, data information code and CRC16 check code in the response message. The data information code includes data collected from the device: like register values 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 check or even check 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 bytes	2 bytes (low byte first)

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

Function code: tells what function the addressed terminal performs. The following

table lists the function codes supported by this series of instruments, as well as 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 1 relay output status
05h	Write the output status of 1 relay

Data segment: contains data required by the terminal to perform a specific function or data collected when the terminal responds to a query. The contents of these data may be numerical values, reference addresses, or setting 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 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 has occurred.

The process for generating a CRC16 is:

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

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

(3) The CRC register is shifted to the right by the 1 bit, the highest bit is filled with 0, and the lowest bit is shifted out and detected.

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

(5) Repeat the third and fourth steps until 8 shifts. This completes a complete eight.

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

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

MODBUS-RTU Communication Protocol Example:

4.1. Function Code 0x 03: Read Multiple Register

Example: The host needs to read 2 slave register data with address 01 and start address 0048H

Host Sent:

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	Register Data 1	Register Data 2	CRC Code

4.2. Function Code 0x10: Write Multiple Register

Example: The host should save 0000 and 0000 to the slave register with address 000C,000D (the slave address code is 0x 01)

Host Sent:

01	10	00 0C	00 02	04	00 00 00 00	F3 FA
Address	function code	start address	write register number	byte 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. Function Code 00x 01: Read 1 Switch Output Status

Example: The host should read the output state of the-phase relay (the address code of the slave is 0x 01)

Host Sent:

01	01	00 00	00 01	CRC
Address function	code	start bit	read switch number	CRC code

Slave Response:

01	01	01	01	CRC
Address	Function Code	Data Length	Status Data	CRC Code

4.4. Function Code 0x 05: Write 1 Relay

The control command is: "FF00" is the output switch value is "1", that is, the control relay "on"; "0000" is the output switch value is "0", that is, the control relay "points".

Example: The host should control the-phase relay "on" (the slave address is 0x 01)

Host Sent:

01	05	00 00	FF 00	8C 3A
Address	function code	output bit	bit control command	CRC code

Response from the machine: the message and data content sent by the host are exactly the same

4.5. Description

The register in the MODBUS-RTU communication protocol refers to 16 bits (I. e., 2 bytes), and the high bits preceded.

When setting parameters, be careful not to write illegal data (that is, 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 (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: Read or write 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 host received by the module exceeds the data range of the corresponding address.

4.6. Examples of communication messages

4.6.1 Read Data Register (Function Code 03H): Read the 3 register values of Phase A, and the results are: voltage 231.5V, current 10.123A, power 2343W, and meter address 1.

Host Read Data Frame:

Address	Command	Start address (high bit first)	Number of registers (high bits first)	Check code (lower bit first)
01H	03H	00H,48H	00H,03H	85H,DDH

Instrument Response Data Frame:

Address	Command	Data length	Data Segment (6 bytes)	check code
01H	03H	06h	5AH,6EH,27H,8BH,09H,27H	F8H,92H

4.6.2 Write data register (function code 10H): Set the upper limit of phase A voltage to 260V, the upper limit of phase A current to 50A, and the instrument address to 1.

Host Write Data Frame:

Address	Command	Start Address	Number of registers	Bytes	Data Segment	check code
01H	10h	00H,20H	00H,02H	04H	01H,04H,01H,F4H	B1H,9DH

Instrument Response Data Frame:

Address	Command	Start Address	Number of registers	check code
01H	10h	00H,20H	00H,02H	40H,02H

5. considerations

1) Pay attention to the auxiliary power information on the product label. The auxiliary power level and polarity of the product cannot be connected incorrectly, otherwise the product may be damaged.
2) Please refer to the figure for correct wiring according to the product specification and model. Make sure to disconnect all signal sources and power supplies before wiring to avoid danger and damage to 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 PT shall not be short-circuited.
4) When there is current on the primary side of CT, the secondary circuit of CT is strictly prohibited to open circuit; it is strictly prohibited to wire or unplug the terminal;
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 shall not be less than 10mm.
7) There is no lightning protection circuit in this series of products. When the input and output feeders of the module are exposed to outdoor harsh weather 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