JSY-MK-354 Three-phase power energy meter module

1. Product Introduction

1.1、 Introduction

JSY-MK-354 Three phase inductive electric energy metering detector is a metering product developed by our company using microelectronics technology and dedicated large-scale integrated circuits, digital sampling and processing technology, SMT technology and other advanced technologies, with completely independent intellectual property rights. The technical performance of the detector meets the relevant technical requirements of the 1.0 level three-phase active energy meter in the IEC 62053-2 standard, and can directly and accurately measure the voltage, current, power, power factor, reactive power and other electrical parameters in the three-phase AC power grid with a rated frequency of 50Hz or 60Hz. The detector has a built-in RS485 communication interface and adopts MODBUS-RTU communication protocol, which is convenient for connection with various AMR systems. It has the characteristics of good reliability, small size, light weight, beautiful appearance and easy installation.

JSY-MK-354 Three phase inductive electric energy meter can be widely used in energy-saving transformation , new energy charging piles, electricity, communications, railways, transportation, environmental protection, petrochemicals, steel and other industries to monitor the current and power consumption of AC equipment.

1.2、 Features

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

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

1.2.3. With 1 RS-485 communication interface.

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

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

1.2.6. DC 9-24 V power supply.

1.2.7. It uses industrial-grade chips, has a built-in watchdog, and has complete lightning protection and anti-interference measures to ensure reliability.

1.2.8. High isolation voltage, withstand voltage up to AC: 3000V .

1.2.9. You can choose to use single-turn through-core transformers or split-type transformers of different specifications, which is convenient and easy to use.

(Note: Split-type current transformers are mainly used in industrial city grids, power transmission systems, and rural project transformation.

Easy to install, no need to disassemble the primary busbar, can be operated with power on, and will not affect the normal power consumption of customers,

The project saves a lot of manpower, material resources and financial resources, and improves the efficiency of transformation.)

1.3、 Technical Parameters

1.3.1 Three-phase AC input

1) Voltage range: three-phase four-wire input, 3*220/380V.
2) Current range: AC 1mA-5A, 20mA~50A, 20mA~63A, 20mA~80A,, 20mA~100A, 50mA~250A, 100mA~500A optional

3) Signal processing: using a dedicated measurement chip, 24 -bit 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 Communication Interface

1) Interface type: 1 RS-485 interface.
2) Communication protocol: MODBUS-RTU protocol.
3) Data format: software-settable, “8,N,1”, “8,E,1”, “8,O,1”, “8,N,2”.
4) Communication rate: The communication interface baud rate can be set to 4800, 9600, 19200, 38400Bps, and the default communication format is "n,8,1", 9600bps.
5) Communication data :

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

1.3.3 measurement accuracy

Voltage , current , power : ± 1.0 % . Active energy level 1.

1.3.4 power supply

1) When powered by DC 9~24V , the peak voltage shall not exceed 30V . typical power consumption : < 30mA.

1.3.5 isolation

Strong current and weak current are isolated by mutual inductor, and the isolation withstand voltage is > 3000V .

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 explosive, corrosive gases and conductive dust, no significant shaking, vibration and impact.

1.3.7 Temperature drift: ≤100ppm/ ℃ .

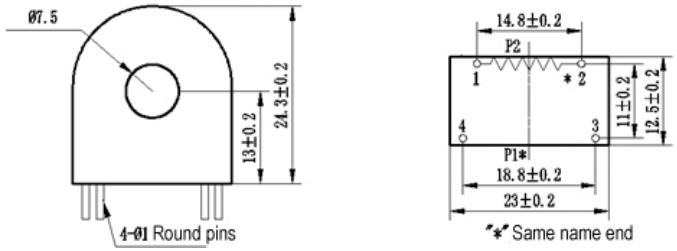
1.3.8 Installation method: screw hole fixation.

1.3.9 Detector size : 114.7*89.9mm.

2. Application

2.1、 Product appearance

Figure 2.1 Product appearance



Dimensional drawing of 50A core-type current transformer

2.2、 Terminal definition

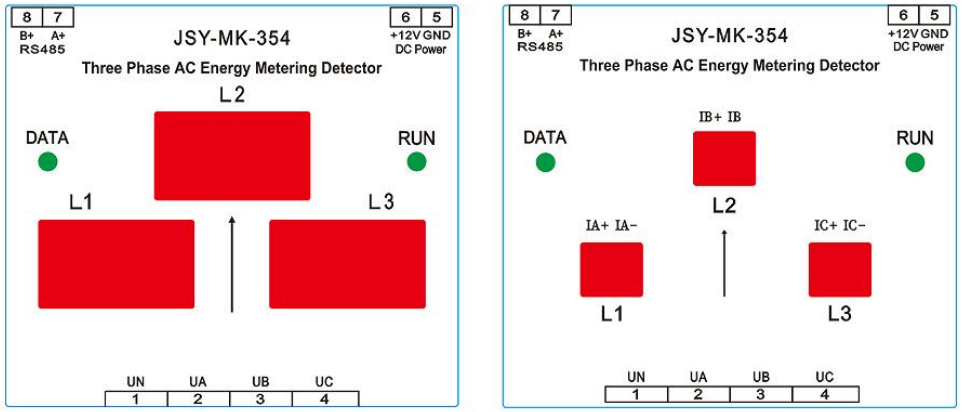
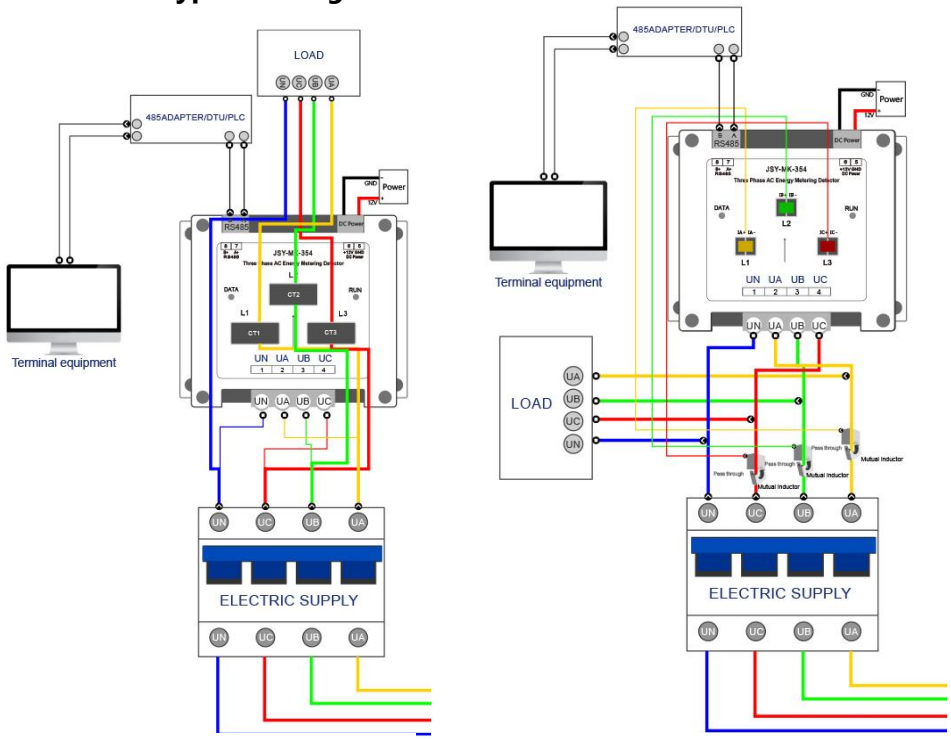


Figure 2.2.1 Product dimensions and functional pins

terminal	illustrate
UA	Measured phase A voltage input terminal
UB	Measured B phase voltage input terminal
UC	Measured C phase voltage input terminal
UN	Measured neutral line input terminal
+12V	Wide voltage power input positive (9-24 VDC)
GND	Negative power input
A	485 communication port A
B	485 communication port B

Figure 2.2.2 Product Function Pin Description

2.3、 Typical wiring



①On board type ②External CT type

2.4、 Application Notes

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 "Power " 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, ratio 1.

354 product testing software we provide can be used to change and set product parameters and perform general product tests.

2.4.1、 RS-485 network connection:

The host usually only has an RS - 232 interface. In this case, 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+ and B- terminals of all devices on a bus are connected in parallel, and they cannot be connected in reverse. Up to 255 network modules can be connected to a line at the same time. Each network module can set its communication address. The communication connection should use shielded twisted pair cables 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 RS - 485 communication line should use shielded twisted pair cable. the communication distance of 485 can reach 1200 meters. When there are many RS485 devices connected to a bus , or a higher baud rate is used, the communication distance will be shortened accordingly. At this time, a 485 repeater can be used for expansion.

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

2.4.2、 Electric energy metering function:

Can provide three-phase voltage, current, power, power factor, active and reactive electric energy and other parameters.

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

3. JSY-MK-354 Modbus register list

Table 1: Measurement electrical parameter register and cmmunication data table (function code 03H, read-only)

Note: In the second-ratio version, the energy data in the table below is already the data after the ratio has been adjusted.

Serial Number	definition	Register address	Reading/Writing	Data types and calculation instructions
1	Phase A voltage	0100H	read	Unsigned number, value = DATA/100, unit V
2	Phase B voltage	0101H	read	Unsigned number, value = DATA/100, unit V
3	C-phase voltage	0102H	read	Unsigned number, value = DATA/100, unit V
4	Phase A current	0103H	read	Unsigned number, value = DATA/100, unit: A
				Version 5A: Unsigned number, value = DATA/100, unit: A
5	B-phase current	0104H	read	Unsigned number, value = DATA/100, unit: A Version 5A: Unsigned number, value = DATA/100, unit: A
6	C-phase current	0105H	read	Unsigned number, value = DATA/100, unit: A Version 5A: Unsigned number, value = DATA/100, unit: A
7	Phase A active power	0106H	read	Unsigned number, value = DATA, unit is W 150 A and above : Unsigned number, value = DATA, unit: 100,000
8	Phase B active power	0107H	read	Unsigned number, value = DATA, unit is W 150A and above : Unsigned number, value = DATA, unit 100,000
9	C-phase active power	0108H	read	Unsigned number, value = DATA, unit is W 150A and above : Unsigned number, value = DATA, unit 100,000
10	Total three-phase active power	0109H 010AH	read	Unsigned number, value = DATA, unit is W (Register 0109H corresponds to the high 16 bits)
11	Phase A reactive power	010BH	read	Unsigned number, value = DATA, unit is Var 150A and above : Unsigned number, value = DATA, unit 10 Var
12	Phase B reactive power	010CH	read	Unsigned number, value = DATA, unit is Var 150A and above : Unsigned number, value =

				DATA, unit 10 Var
13	C-phase reactive power	010DH	read	Unsigned number, value = DATA, unit is Var 150A and above : Unsigned number, value = DATA, unit 10 Var
14	Total three-phase reactive power	010EH 010FH	read	Unsigned number, value = DATA, unit is Var
15	Phase A appears to have power	0110H	read	Unsigned number, value = DATA, unit is VA 150A and above : Unsigned number, value = DATA, unit 10VA
16	Phase B apparent power	0111H	read	Unsigned number, value = DATA, unit is VA 150A and above : Unsigned number, value = DATA, unit 10VA
17	C-phase power	0112H	read	Unsigned number, value = DATA, unit is VA 150A and above : Unsigned number, value = DATA, unit 10VA
18	Three-phase total apparent power	0113H 0114H	read	Unsigned number, value = DATA, unit is VA (Register 0114H corresponds to the high 16 bits)
19	voltage frequency	0115H	read	Unsigned number, value = DATA/100, unit is Hz.
20	Phase A power factor	0116H	read	Unsigned number, value = DATA/1000
21	Phase B power factor	0117H	read	Unsigned number, value = DATA/1000
22	C-phase power factor	0118H	read	Unsigned number, value = DATA/1000
23	Three-phase total power factor	0119H	read	Unsigned number, value = DATA/1000
24	Phase A active energy (forward + reverse)	011AH 011BH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00, unit kWh
25	Phase B active energy (forward + reverse)	011CH 011DH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00, unit kWh
26	C-phase active energy (forward + reverse)	011EH 011FH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00, unit kWh
28	Total three-phase active power (cumulative absolute value)	0120H 0121H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00, unit kWh
29	Phase A reactive power (forward + reverse)	0122H 0123H	read	Unsigned number, value = DATA/100, unit is kV arh Version 5A: Unsigned number, value = DATA/10 00, unit kVA arh
30	Phase B reactive power (forward +	0124H 0125H	read	Unsigned number, value = DATA/100, unit is kV arh

	reverse)			Version 5A: Unsigned number, value = DATA/10 00, unit kVA arh
31	C-phase reactive power (forward + reverse)	0126H 0127H	read	Unsigned number, value = DATA/100, unit is kV arh Version 5A: Unsigned number, value = DATA/10 00, unit kVA arh
32	Total three-phase reactive power (cumulative absolute value)	0128H 0129H	read	Unsigned number, value = DATA/100, unit is kV arh Version 5A: Unsigned number, value = DATA/10 00, unit kVA arh
33	A phase view in electrical energy	012AH 012BH	read	Unsigned number, value = DATA/100, unit is kVAh Version 5A: Unsigned number, value = DATA/10 00, unit kVAh
34	Phase B appears to be related to electrical energy.	012CH 012DH	read	Unsigned number, value = DATA/100, unit is kVAh Version 5A: Unsigned number, value = DATA/10 00, unit kVAh
35	Phase C is considered in terms of electrical energy	012EH 012FH	read	Unsigned number, value = DATA/100, unit is kVAh Version 5A: Unsigned number, value = DATA/10 00, unit kVAh
36	Three-phase apparent total electrical energy	0130H 0131H	read	Unsigned number, value = DATA/100, unit is kVAh Version 5A: Unsigned number, value = DATA/10 00, unit kVAh
	(PQS calculation method)			
37	Current power direction	0132H	read	The high byte is unused. Bits 7 to 0 of the low byte correspond to the total reactive power, reactive power of phase C, reactive power of phase B, reactive power of phase A, total active power, active power of phase C, active power of phase B, and active power of phase A, respectively (0 for positive, 1 for negative). See status word 1.
38	Current alarm status	0133H	read	When the high byte bit0 is 1, it represents reverse phase sequence; a value of 0 is normal. The low byte bits 6-4 indicate that the current of phases C-A is out of control, and bits 2-0 indicate that the voltage of phases C-A is out of control. See status word 2.
39	A-phase positive active energy	0134H 0135H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00 , unit kWh
40	B-phase positive active energy	0136H 0137H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/10 00 , unit kWh
41	C-phase positive	0138H	read	Unsigned number, value = DATA/100, unit is

	active energy	0139H		kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
42	Three-phase positive total active power	013AH 013BH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
43	A. Reverse active energy	013CH 013DH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
44	B. Reverse active energy	013EH 013FH	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
45	C. Reverse active energy	0140H 0141H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
46	Three-way reverse total active energy	0142H 0143H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1 0 00 , unit kWh
47	A-phase positive reactive power	0144H 0145H	read	Unsigned number, value = DATA/100 , unit is kVArh
				: Unsigned number, value = DATA / 1000 , unit kVArh
48	B-phase positive reactive power	0146H 0147H	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
49	C-phase positive reactive power	0148H 0149H	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
50	Three-phase positive total reactive power	014AH 014BH	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
51	A reverse reactive power	014CH 014DH	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
52	B is the opposite reactive power.	014EH 014FH	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
53	C. Reverse reactive energy	0150H 0151H	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit

				kVArh
54	Three-way reverse total reactive power	0152H 0153H	read	Unsigned number, value = DATA/100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh
55	Uab line voltage	0154H	read	Unsigned number, value = DATA/100, unit V
56	U bc line voltage	0155H	read	Unsigned number, value = DATA/100, unit V
57	U c a line voltage	0156H	read	Unsigned number, value = DATA/100, unit V
58	Y _Uab voltage phase angle difference	0157H	read	Unsigned number, value = DATA/100, unit: °
59	Y _U bc voltage phase angle difference	0158H	read	Unsigned number, value = DATA/100, unit: °
60	Y _Uca voltage phase angle difference	0159H	read	Unsigned number, value = DATA/100, unit: °
61	Y _ I ab Current Phase Angle Difference	015AH	read	Unsigned number, value = DATA/100, unit: °
62	Y _I bc Current Phase Angle Difference	015BH	read	Unsigned number, value = DATA/100, unit: °
63	Y_Ica current phase angle	015CH	read	Unsigned number, value = DATA/100, unit: °
	difference			
64	Y _ U a I ab Voltage current phase angle difference	015DH	read	Unsigned number, value = DATA/100, unit: °
65	Y _ Ub Ib Voltage Current Phase Angle Difference	015EH	read	Unsigned number, value = DATA/100, unit: °
66	Y _ U clc voltage current phase angle difference	015FH	read	Unsigned number, value = DATA/100, unit: °
67	Phase A voltage total harmonics	0160H	read	Unsigned number, value = DATA/100, unit %
68	B- phase voltage total harmonics	0161H	read	Unsigned number, value = DATA/100, unit %
69	C- phase voltage total harmonics	0162H	read	Unsigned number, value = DATA/100, unit %
70	A-phase current total harmonics	0163H	read	Unsigned number, value = DATA/100, unit %
71	B -phase current total harmonics	0164H	read	Unsigned number, value = DATA/100, unit %
72	C- phase current total harmonics	0165H	read	Unsigned number, value = DATA/100, unit %
73	Total active energy of three phases (algebraic sum and	0166H 0167H	read	Unsigned number, value = DATA/100, unit is kWh Version 5A: Unsigned number, value = DATA/1

	cumulative)			0 00 , unit kWh
75	Total three-phase reactive power (algebraic sum and cumulative)	01 68 H 01 69 H	read	Unsigned number, value = DATA/ 100 , unit is kVArh : Unsigned number, value = DATA / 1000 , unit kVArh

1	Phase A voltage total harmonics	0200H	read	Unsigned number, value = DATA/100, unit % (same as 0160H)
2	Phase A voltage second harmonic	0201H	read	Unsigned number, value = DATA/100, unit %
3	Phase A voltage third harmonic	0202H	read	Unsigned number, value = DATA/100, unit %
4	Phase A voltage fourth harmonic	0203H	read	Unsigned number, value = DATA/100, unit %
5	Phase A voltage 5th harmonic	0204H	read	Unsigned number, value = DATA/100, unit %
6	Phase A voltage 6th harmonic	0205H	read	Unsigned number, value = DATA/100, unit %
7	Phase A voltage 7th harmonic	0206H	read	Unsigned number, value = DATA/100, unit %
8	Phase A voltage 8th harmonic	0207H	read	Unsigned number, value = DATA/100, unit %
9	Phase A voltage 9th harmonic	0208H	read	Unsigned number, value = DATA/100, unit %
10	Phase A voltage 10th harmonic	0209H	read	Unsigned number, value = DATA/100, unit %
11	Phase A voltage 11th harmonic	020AH	read	Unsigned number, value = DATA/100, unit %
12	Phase A voltage 12th harmonic	020BH	read	Unsigned number, value = DATA/100, unit %
13	Phase A voltage 13th harmonic	020CH	read	Unsigned number, value = DATA/100, unit %
14	Phase A voltage 14th harmonic	020DH	read	Unsigned number, value = DATA/100, unit %
15	Phase A voltage 15th harmonic	020EH	read	Unsigned number, value = DATA/100, unit %
16	Phase A voltage 16th harmonic	020FH	read	Unsigned number, value = DATA/100, unit %
17	Phase A voltage 17th harmonic	0210H	read	Unsigned number, value = DATA/100, unit %
18	Phase A voltage 18th harmonic	0211H	read	Unsigned number, value = DATA/100, unit %
19	Phase A voltage 19th harmonic	0212H	read	Unsigned number, value = DATA/100, unit %
20	Phase A voltage 20th harmonic	0213H	read	Unsigned number, value = DATA/100, unit %
21	Phase A voltage 21st harmonic	0214H	read	Unsigned number, value = DATA/100, unit %
22	B-phase voltage total harmonics	0215H	read	Unsigned number, value = DATA/100, unit % (same as 0161H)

23	Phase B voltage second harmonic	0216H	read	Unsigned number, value = DATA/100, unit %
24	Phase B voltage third harmonic	0217H	read	Unsigned number, value = DATA/100, unit %
25	Phase B voltage fourth harmonic	0218H	read	Unsigned number, value = DATA/100, unit %
26	Phase B voltage 5th harmonic	0219H	read	Unsigned number, value = DATA/100, unit %
27	Phase B voltage sixth harmonic	021AH	read	Unsigned number, value = DATA/100, unit %
28	7th harmonic of phase B voltage	021BH	read	Unsigned number, value = DATA/100, unit %
29	8th harmonic of phase B voltage	021CH	read	Unsigned number, value = DATA/100, unit %
30	9th harmonic of phase B voltage	021DH	read	Unsigned number, value = DATA/100, unit %
31	Phase B voltage 10th harmonic	021EH	read	Unsigned number, value = DATA/100, unit %
32	11th harmonic of phase B voltage	021FH	read	Unsigned number, value = DATA/100, unit %
33	Phase B voltage 12th harmonic	0220H	read	Unsigned number, value = DATA/100, unit %
34	13th harmonic of phase B voltage	0221H	read	Unsigned number, value = DATA/100, unit %
35	14th harmonic of phase B voltage	0222H	read	Unsigned number, value = DATA/100, unit %
36	15th harmonic of phase B voltage	0223H	read	Unsigned number, value = DATA/100, unit %
37	16th harmonic of phase B voltage	0224H	read	Unsigned number, value = DATA/100, unit %
38	17th harmonic of phase B voltage	0225H	read	Unsigned number, value = DATA/100, unit %
39	18th harmonic of phase B voltage	0226H	read	Unsigned number, value = DATA/100, unit %
40	19th harmonic of phase B voltage	0227H	read	Unsigned number, value = DATA/100, unit %
41	Phase B voltage 20th harmonic	0228H	read	Unsigned number, value = DATA/100, unit %
42	21st harmonic of phase B voltage	0229H	read	Unsigned number, value = DATA/100, unit %
43	C-phase voltage total harmonics	022AH	read	Unsigned number, value = DATA/100, unit % (same as 0162H)
44	C-phase voltage second harmonic	022BH	read	Unsigned number, value = DATA/100, unit %
45	C-phase voltage third harmonic	022CH	read	Unsigned number, value = DATA/100, unit %
46	C-phase voltage fourth harmonic	022DH	read	Unsigned number, value = DATA/100, unit %
47	C-phase voltage 5th harmonic	022EH	read	Unsigned number, value = DATA/100, unit %

48	C-phase voltage sixth harmonic	022FH	read	Unsigned number, value = DATA/100, unit %
49	C-phase voltage 7th harmonic	0230H	read	Unsigned number, value = DATA/100, unit %
50	C-phase voltage 8th harmonic	0231H	read	Unsigned number, value = DATA/100, unit %
51	C-phase voltage 9th harmonic	0232H	read	Unsigned number, value = DATA/100, unit %
52	C-phase voltage 10th harmonic	0233H	read	Unsigned number, value = DATA/100, unit %
53	11th harmonic of C-phase voltage	0234H	read	Unsigned number, value = DATA/100, unit %
54	C-phase voltage 12th harmonic	0235H	read	Unsigned number, value = DATA/100, unit %
55	C-phase voltage 13th harmonic	0236H	read	Unsigned number, value = DATA/100, unit %
56	14th harmonic of C-phase voltage	0237H	read	Unsigned number, value = DATA/100, unit %
57	C-phase voltage 15th harmonic	0238H	read	Unsigned number, value = DATA/100, unit %
58	C-phase voltage 16th harmonic	0239H	read	Unsigned number, value = DATA/100, unit %
59	C-phase voltage 17th harmonic	023AH	read	Unsigned number, value = DATA/100, unit %
60	18th harmonic of C-phase voltage	023BH	read	Unsigned number, value = DATA/100, unit %
61	C-phase voltage 19th harmonic	023CH	read	Unsigned number, value = DATA/100, unit %
62	C-phase voltage 20th harmonic	023DH	read	Unsigned number, value = DATA/100, unit %
63	C-phase voltage 21st harmonic	023EH	read	Unsigned number, value = DATA/100, unit %
64	A-phase current total harmonics	023FH	read	Unsigned number, value = DATA/100, unit % (same as 0163H)
65	Second harmonic of phase A current	0240H	read	Unsigned number, value = DATA/100, unit %
66	Phase A current third harmonic	0241H	read	Unsigned number, value = DATA/100, unit %
67	Phase A current fourth harmonic	0242H	read	Unsigned number, value = DATA/100, unit %
68	Phase A current 5th harmonic	0243H	read	Unsigned number, value = DATA/100, unit %
69	Phase A current 6th harmonic	0244H	read	Unsigned number, value = DATA/100, unit %
70	Phase A current 7th harmonic	0245H	read	Unsigned number, value = DATA/100, unit %
71	Phase A current 8th harmonic	0246H	read	Unsigned number, value = DATA/100, unit %
72	Phase A current 9th harmonic	0247H	read	Unsigned number, value = DATA/100, unit %

73	Phase A current 10th harmonic	0248H	read	Unsigned number, value = DATA/100, unit %
74	11th harmonic of phase A current	0249H	read	Unsigned number, value = DATA/100, unit %
75	Phase A current 12th harmonic	024AH	read	Unsigned number, value = DATA/100, unit %
76	Phase A current 13th harmonic	024BH	read	Unsigned number, value = DATA/100, unit %
77	14th harmonic of phase A current	024CH	read	Unsigned number, value = DATA/100, unit %
78	Phase A current 15th harmonic	024DH	read	Unsigned number, value = DATA/100, unit %
79	16th harmonic of phase A current	024EH	read	Unsigned number, value = DATA/100, unit %
80	17th harmonic of phase A current	024FH	read	Unsigned number, value = DATA/100, unit %
81	Phase A current 18th harmonic	0250H	read	Unsigned number, value = DATA/100, unit %
82	Phase A current 19th harmonic	0251H	read	Unsigned number, value = DATA/100, unit %
83	Phase A current 20th harmonic	0252H	read	Unsigned number, value = DATA/100, unit %
84	Phase A current 21st harmonic	0253H	read	Unsigned number, value = DATA/100, unit %
85	B-phase current total harmonics	0254H	read	Unsigned number, value = DATA/100, unit % (same as 0164H)
86	B-phase current second harmonic	0255H	read	Unsigned number, value = DATA/100, unit %
87	B-phase current third harmonic	0256H	read	Unsigned number, value = DATA/100, unit %
88	B-phase current fourth harmonic	0257H	read	Unsigned number, value = DATA/100, unit %
89	5th harmonic of phase B current	0258H	read	Unsigned number, value = DATA/100, unit %
90	B-phase current sixth harmonic	0259H	read	Unsigned number, value = DATA/100, unit %
91	7th harmonic of phase B current	025AH	read	Unsigned number, value = DATA/100, unit %
92	8th harmonic of phase B current	025BH	read	Unsigned number, value = DATA/100, unit %
93	9th harmonic of phase B current	025CH	read	Unsigned number, value = DATA/100, unit %
94	10th harmonic of phase B current	025DH	read	Unsigned number, value = DATA/100, unit %
95	11th harmonic of phase B current	025EH	read	Unsigned number, value = DATA/100, unit %
96	12th harmonic of phase B current	025FH	read	Unsigned number, value = DATA/100, unit %
97	13th harmonic of phase B current	0260H	read	Unsigned number, value = DATA/100, unit %

98	14th harmonic of phase B current	0261H	read	Unsigned number, value = DATA/100, unit %
99	15th harmonic of phase B current	0262H	read	Unsigned number, value = DATA/100, unit %
100	16th harmonic of phase B current	0263H	read	Unsigned number, value = DATA/100, unit %
101	17th harmonic of phase B current	0264H	read	Unsigned number, value = DATA/100, unit %
102	18th harmonic of phase B current	0265H	read	Unsigned number, value = DATA/100, unit %
103	19th harmonic of phase B current	0266H	read	Unsigned number, value = DATA/100, unit %
104	20th harmonic of phase B current	0267H	read	Unsigned number, value = DATA/100, unit %
105	21st harmonic of phase B current	0268H	read	Unsigned number, value = DATA/100, unit %
106	C-phase current total harmonics	0269H	read	Unsigned number, value = DATA/100, unit % (same as 0165H)
107	C-phase current second harmonic	026AH	read	Unsigned number, value = DATA/100, unit %
108	C-phase current third harmonic	026BH	read	Unsigned number, value = DATA/100, unit %
109	C-phase current fourth harmonic	026CH	read	Unsigned number, value = DATA/100, unit %
110	C-phase current 5th harmonic	026DH	read	Unsigned number, value = DATA/100, unit %
111	C-phase current sixth harmonic	026EH	read	Unsigned number, value = DATA/100, unit %
112	C-phase current 7th harmonic	026FH	read	Unsigned number, value = DATA/100, unit %
113	C-phase current 8th harmonic	0270H	read	Unsigned number, value = DATA/100, unit %
114	C-phase current 9th harmonic	0271H	read	Unsigned number, value = DATA/100, unit %
115	C-phase current 10th harmonic	0272H	read	Unsigned number, value = DATA/100, unit %
116	11th harmonic of C-phase current	0273H	read	Unsigned number, value = DATA/100, unit %
117	C-phase current 12th harmonic	0274H	read	Unsigned number, value = DATA/100, unit %
118	C-phase current 13th harmonic	0275H	read	Unsigned number, value = DATA/100, unit %
119	14th harmonic of C-phase current	0276H	read	Unsigned number, value = DATA/100, unit %
120	15th harmonic of C-phase current	0277H	read	Unsigned number, value = DATA/100, unit %
121	16th harmonic of C-phase current	0278H	read	Unsigned number, value = DATA/100, unit %
122	17th harmonic of C-phase current	0279H	read	Unsigned number, value = DATA/100, unit %

123	18th harmonic of C-phase current	027AH	read	Unsigned number, value = DATA/100, unit %
124	19th harmonic of C-phase current	027BH	read	Unsigned number, value = DATA/100, unit %
125	C-phase current 20th harmonic	027CH	read	Unsigned number, value = DATA/100, unit %
126	21st harmonic of C-phase current	027DH	read	Unsigned number, value = DATA/100, unit %

0x0300 ~0x0322 contain the module 's measured values multiplied by the voltage-current ratio.

1	Phase A voltage	0300H	read	Floating-point number, unit V
2	Phase B voltage	0302H	read	Floating-point number, unit V
3	C-phase voltage	0304H	read	Floating-point number, unit V
4	Phase A current	0306H	read	Floating-point number, unit A
5	B-phase current	0308H	read	Floating-point number, unit A
6	C-phase current	030AH	read	Floating-point number, unit A
7	Phase A active power	030CH	read	Floating-point number, unit is W
8	Phase B active power	030EH	read	Floating-point number, unit is W
9	C-phase active power	0310H	read	Floating-point number, unit is W
10	Total three-phase active power	0312H	read	Floating-point number, unit is W
11	Phase A reactive power	0314H	read	Floating-point number, unit is Var
12	Phase B reactive power	0316H	read	Floating-point number, unit is Var
13	C-phase reactive power	0318H	read	Floating-point number, unit is Var
14	Total three-phase reactive power	031AH	read	Floating-point number, unit is Var
15	Phase A appears to have power	031CH	read	Floating-point number, unit is VA
16	Phase B apparent power	031EH	read	Floating-point number, unit is VA
17	C-phase power	0320H	read	Floating-point number, unit is VA
18	Three-phase total apparent power	0322H	read	Floating-point number, unit is VA

Table 2: System parameter register address and communication data table (function code 03H read, 10H write)

Serial Number	definition	Register address	Reading/ Writing	Detailed Explanation
1	Model 1	0000H	read	The value is 333H
2	Hardware version	000 1H	read	0x1001-> V 1.00.1
3	Software version	0002 H	read	0x1001-> V 1.00.1
4	Protocol version	0003 H	read	0x1001-> V 1.00.1

5	Address and baud rate	0004H	Reading/ Writing	The default value is 0106H; the default address is 01H; and the default communication format is 8, N, 1,9600bps. illustrate: The high byte (8 bits) is the address, ranging from 1 to 255; 0 represents the broadcast address. The high 2 bits of the low byte are the data format bits. "00" indicates 10 bits with no parity, i.e., "8, N, 1"; "01" indicates 11 bits, even parity, i.e. "8, E, 1"; A value of "10" indicates 11 bits, odd parity, i.e., "8, 0, 1"; "11" indicates 11 bits, no parity, and 2 stop bits, i.e., "8, N, 2"; The lower four bits of the low byte represent the baud rate , 2–600 bps . 3 — 1 2 00bps , 4-24 00bps , 5-4800bps, 6-9600bps, 7-19200bps, 8-38400bps (The communication baud rate of both the 485 port and the TTL port is related to this register, and the baud rate of both is the same.)

Table 3: Alarm upper limit register and communication data table (function code 03H reads, 10H writes)

Serial Number	Definition	Register address	Reading/Writing	Detailed Explanation
1	Voltage limit	0020H	Reading/Writing	Default value 0x104=260V
2	Current limit	0021H	Reading/Writing	The default value is 0x1F4, 0x1F4/10 = 50A
3	Voltage transformer ratio	002 2 H	Reading/Writing	Default value 0x 0001 ; ratio 1
4	Current transformer ratio	002 3 H	Reading/Writing	Default value 0x 0001 ; ratio 1
5	Current noise	0 024H	Reading/Writing	Default value 0x000A, unit mA
6	Mode Selection	0 025H	Reading/Writing	The default value is 0x0001, 0x0001 for three-phase three-wire; other values are three-phase four-wire .
7	minutes/second	0 0 30 H	Reading/Writing	Time in minutes and seconds, such as 0x2010 which represents 32 minutes and 16 seconds (this function is only available with a clock chip).
8	Day/Hour	0 0 31 H	Reading/Writing	Day and time, such as 0x0510, which represents the 5th day at 16:00.
9	years	0 0 32 H	Reading/Writing	Year, month, and time; for

				example, 0x1605 represents May 2022.

Table 4: Power Direction Register (Status Word 1)

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
No results achieved: 1—Reverse 0—positive	Phase C is reactive: 1—Reverse 0—positive	Phase B is inactive: 1—Reverse 0—positive	Phase A is inactive: 1—Reverse 0—positive	Always meritorious: 1—Reverse 0—positive	Phase C is effective: 1—Reverse 0—positive	Phase B is commendable: 1—Reverse 0—positive	Phase A is meritorious: 1—Reverse 0—positive

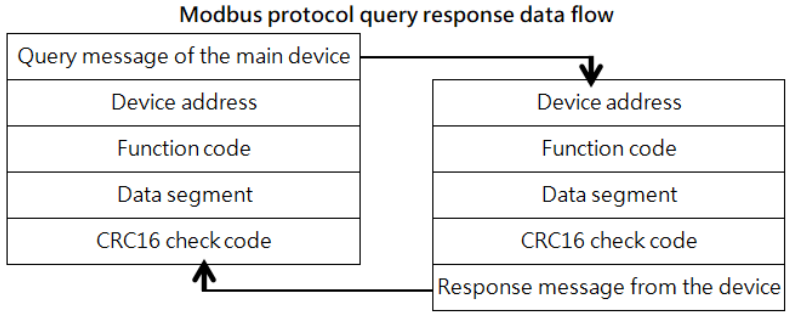
Table 5: Meaning of alarm status indicator word **(status word 2)** :

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Not used	C-phase current: 1— Overcurrent 0—Normal	Phase B current: 1— Overcurrent 0—Normal	Phase A current: 1— Overcurrent 0—Normal	Not used	C-phase voltage: 1— Overvoltage 0—Normal	Phase B voltage: 1—Overvoltage 0—Normal	Phase A voltage: 1—Overvoltage 0—Normal

4. MODBUS Communication Protocol

This module 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 modules can be connected on one line at the same time, and each module 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.



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 module: 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 modules and their functions.

Function Code	Function
03H	Read the value of one or more registers
10H	Write the value of one or more registers

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.

Code example:

```
uint16_t GetModBusCRC16(uint8_t *aucData, u16 iBytesCount)
{
    uint8_t wHi = 0;
    uint8_t wLo = 0;
    uint16_t wCRC = 0xFFFF;
    u16 i, j;
    uint8_t wCheck = 0;
    for (i = 0; i < iBytesCount; i++)
    {
        Wdt_Feed();
        wCRC ^= aucData[i];
        for (j = 0; j < 8; j++)
        {
            wCheck = wCRC & 1;
            wCRC = wCRC >> 1;
            wCRC = wCRC & 0x7fff;
            if (wCheck == 1)
                wCRC = wCRC ^ 0xa001;
            wCRC = wCRC & 0xffff;
        }
    }
    wHi = wCRC / 256;
    wLo = wCRC % 256;
    wCRC = (wHi << 8) | wLo;
    return wCRC;
}
```

MODBUS-RTU communication protocol example:

4.1、 Function code 0x03: Read multiple registers

Example: The host wants to read the data of three slave registers with address 01 and starting address 0100H.

Host sends: 01 03 01 00 00 03 04 37

Address function code starting address data length CRC code

Slave response: 01 03 06 56 11 56 22 56 33 1F 77

Address Function Code Return Bytes Register Data 1 Register 2 Register 3 CRC Code

4.2. Function code 0x10: Write multiple registers

Example: The host wants to save 0104H, 01F4H to the slave register with address 0020H, 0021H (the slave address code is 0x01)

Host sends: 01 10 00 20 00 02 04 01 04 01 F4 B1 9D

Address Function Code Starting Address Write Register Quantity Byte Count Save Data 1 2 CRC Code

Slave response: 01 10 00 20 00 02 40 02

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 Communication message example

4.4.1 Read data register (function code 03H): Read the voltage data of phase A, phase B, and phase C, a total of 6 registers, the results are: phase A voltage 231.51V, phase B voltage 229.32V, phase C voltage 230.56V, the module address is 1.

The host reads the data frame:

Address	Order	Starting address (high bit first)	Number of registers (high end first)	Check code (low digit first)
01H	03H	01H,00H	00H,03H	04H,37H

The module responds with a data frame:

address	Order	Data length	Data segment (6 bytes)	Check code
01H	03H	06H	56H,11H,56H,22H,56H,33H	1FH,77H

4.4.2 Write data register (function code 10H): Set the module address to 2, the baud rate to 19200bps, and the module address to 1.

The host writes data frame:

Address	Order	initial address	Number of registers	Number of bytes	Data segment	Check code
01H	10H	00H,20H	00H,02H	04H	01H,04H,01H,F4H	B1H,9DH

The module responds with a data frame:

address	Order	initial address	Number of registers	Check code
01H	10H	00H,20H	00H,02H	40H,02H

4.4.3 Clear all electric energy data (function code 10H, write 2 registers starting from 000CH, the written data is 4 bytes of 00H):

address	Order	initial address	Number of registers	Number of bytes	data segment	Check code
01H	10H	00H,0CH	00H,02H	04H	00H,00H, 00H,F0H	F3H,FAH

The module responds with a data frame:

address	Order	initial address	Number of registers	Check code
01H	10H	00H,0CH	00H,02H	81H,CBH

5. Safety Information

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 centrally, 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.

Manufacturer: Shenzhen Jiansiyan Technologies Co., Ltd.

Online Technical Support Staff:

+86 18675534520(Mr.Jack)

+86 18665924579(Mr.Jimmy)

E-mail: jsy-mk@jsypowermeter.com

Web: www.jsypowermeter.com

official website

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