407

ADW350WD Smart Meter

Installation and Use Manual V1.0

Acrel Electric Co., Ltd.

Declaration

Acrel reserves the right to modify the product specifications herein without notification. Please consult the local agent about the latest specifications before placing a purchase order.

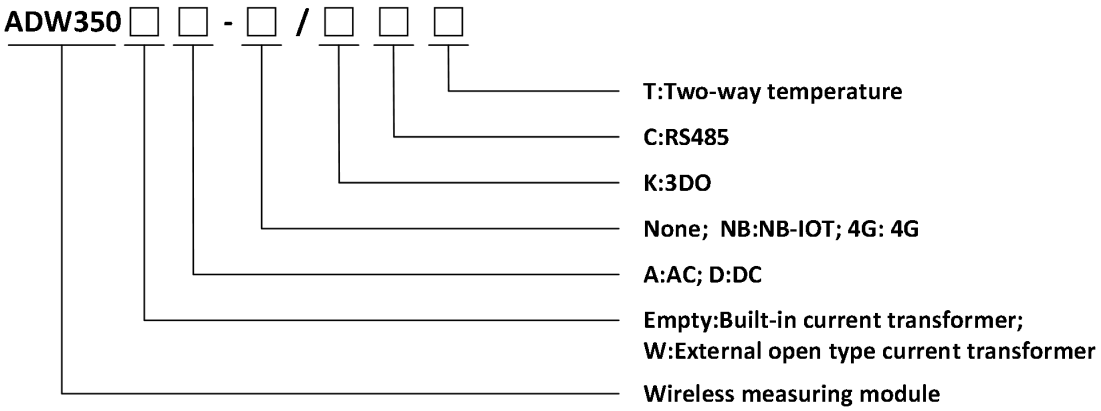
Contents

1 Overview

ADW350 Wireless Metering Meter is mainly used to metering three phase active energy on low voltage network. The product boasts of advantages including compact size, high precision, rich features. According to different requirements, there are many communications functions like RS485 communication, NB, 4G, adding the new current sampling mode using external transformer. It can be flexibly installed in the distribution box to achieve sub-item electric energy metering, operation and maintenance supervision or power monitoring requirements for different regions and different loads.

2 Product model and specification

2.1 Naming Rules



2.2 Functional Characteristics

Chart 1 Functions of ADW350

Functions	Description
Display mode	LED
Energy metering	Active kWh (positive and negative)，quadrant reactive power energy
Electrical measurement	U、I、 P、Q、S、PF、F
Harmonic function	THDv、Harmonic on 2nd-31st
Pulse output	Active pulse output
Three-phase unbalance degree	Voltage unbalance,current unbalance
Temperature measurement	Two way temperature（Alternate configuration:T）
DI/DO	3DO（Alternate configuration:K）
External current transformer	External open type current transformer （Alternate configuration:W）
Electrical parameter	Undervoltage, undercurrent, overcurrent, underload, etc

Communication	Infrared communication
	RS485（Alternate configuration:C）
	NB-IOT（Alternate configuration:NB）
	4G（Alternate configuration:4G）

3 Technical parameter

3.1 Electrical performance

Chart 2 Electrical performance of ADW350WD

Voltage input	Rated voltage	DC: 48V
	Consumption	<0.5VA (Each phase)
Current input	Input current	DC: 50A，100A
	Consumption	<1VA (Each phase)
Auxiliary power	Power Supply	AC: 85~265V or DC: 48V±20%
	Power consumption	<5W
Measurement performance	Electrical parameter	Class 0.5
	Active energy accuracy	Class 1
	Temperature Range	-40℃~100℃
	Temperature accuracy	±2℃
DO	Contact Rating	5A，AC250V/DC30V
Pulse	Width of pulse	80±20ms
	Pulse constant	AC：400imp/kWh DC：1600imp/kWh
Communication	Infrared communication	The constant baud rate is 1200
	Interface	RS485(A、B)
	Connection mode	Shielded twisted pair conductors
	Protocol	MODBUS-RTU

3.2 Work environment

Chart 3 Work environment

Temperature range	Operating temperature	-20℃~55℃
	Storage temperature	-40℃~70℃
Humidity		≤95% (No condensation)
Altitude		<2000m

4 Dimension and installing description

4.1 Dimension (Unit: mm)

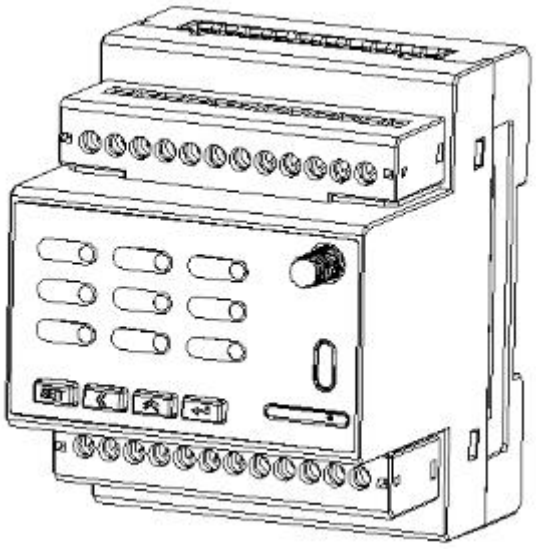


Figure 1 Rendering of ADW350

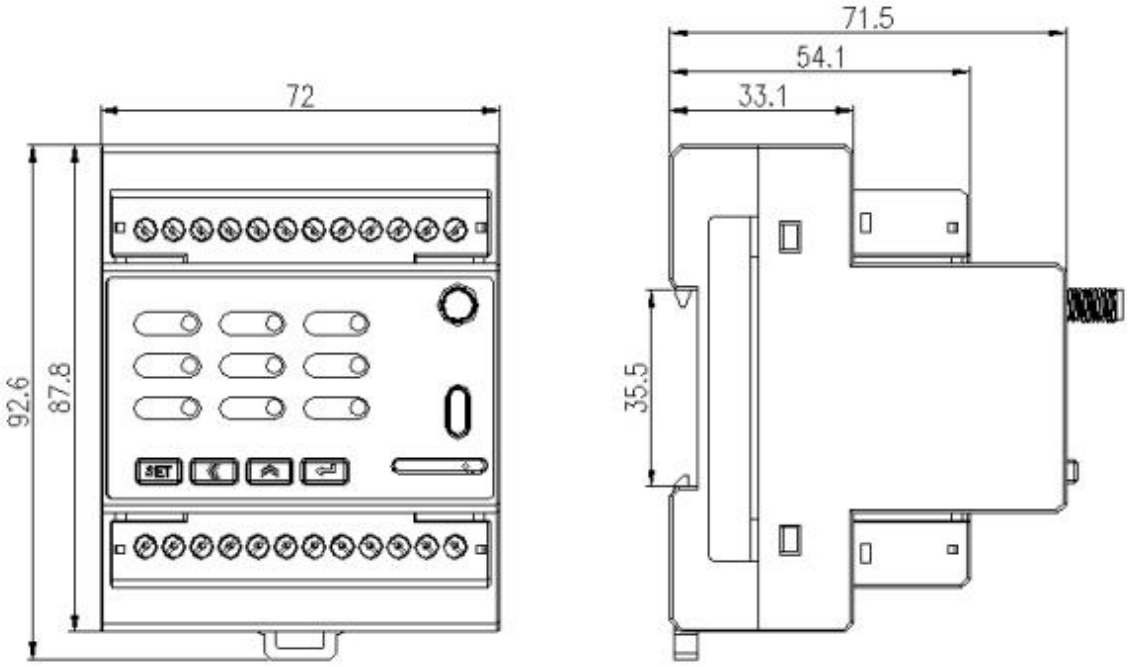


Figure 2 Dimension of ADW350

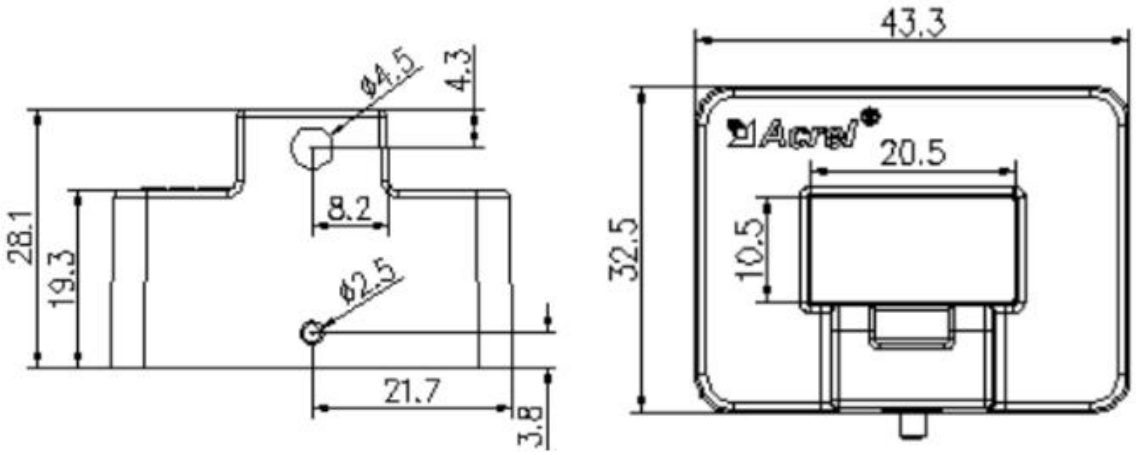


Figure 4 Dimension of Hall current sensor AHKC-BS (ADW350WD)

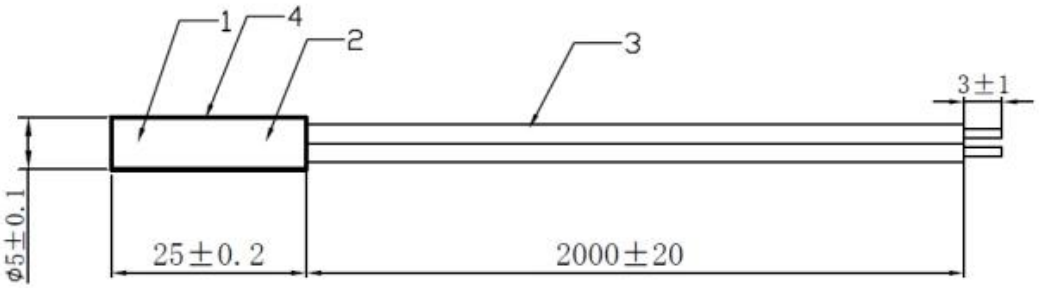
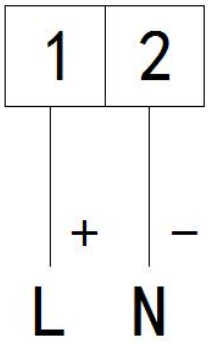
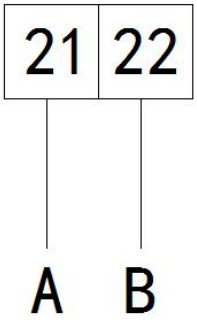


Figure 5 Dimension of K-Type

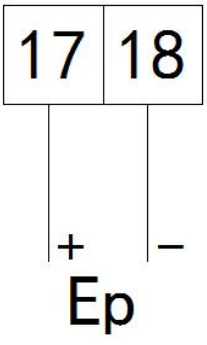
4.2 Interfaces of Auxiliary power supply, Communication and Pulse



Auxiliary power supply Interface



Communication Interface

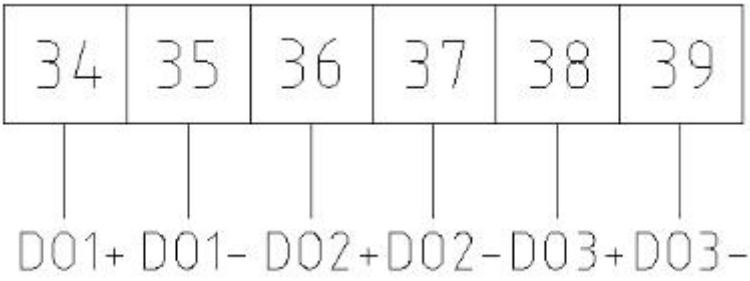


Pulse Interface

4.3 Interfaces of DI and DO

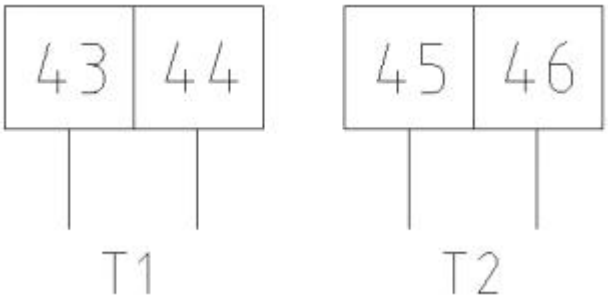
The digital output is realized by relay for remote control and alarm output.

The digital input is realized by digital signal input. The meter has a built-in +12V working power supply so that it does not require external power supply. The meter collects the external break-make information with digital input module and displays it locally. The digital input not only collects and displays the local break-time information but also provides the remote transmission, i.e. remote communication, with RS485.



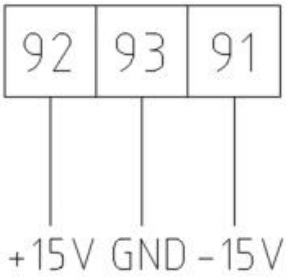
Digital output

4.4 Interfaces of Temperature



Temperature input

4.5 Interfaces of Hall current sensor

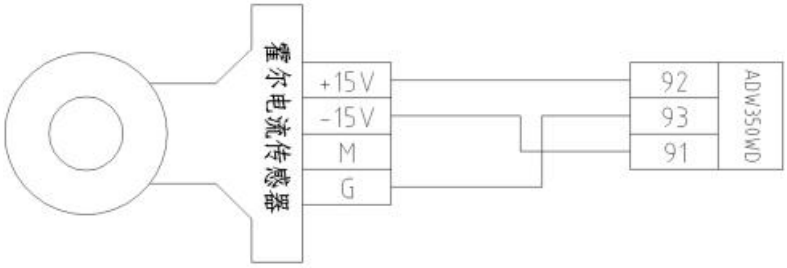


Auxiliary Power

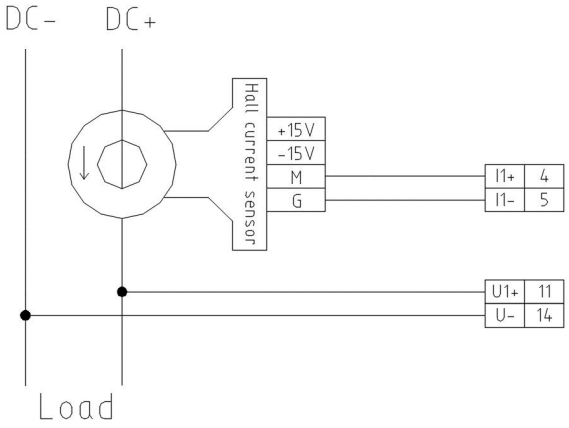
4.5.1 ADW350WD

Three single-phase DC can be connected.

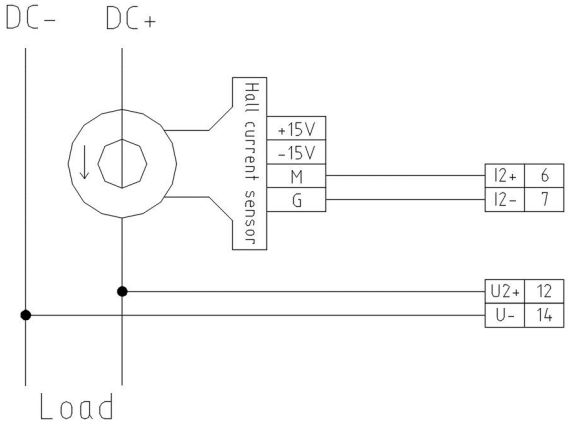
Connection method of Hall current sensor and auxiliary power terminal:



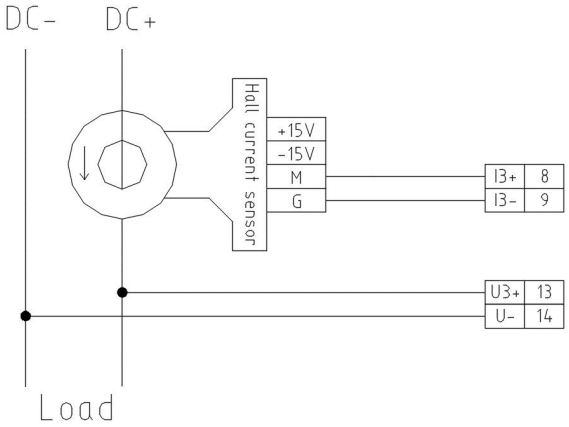
Loop 1st:



Loop 2nd:



Loop 3rd:



5 Main functions and features

5.1 Measurement

Measure all electrical parameters, including voltage U, current I, active power P, reactive power Q, apparent power S, power factor PF, Voltage imbalance, Current imbalance, frequency, 31st harmonic content and total harmonic content . The measured voltage U keeps one decimal place, the measured frequency F keeps two decimal places, the measured current I keeps three decimal places and the measured power P keeps four decimal places. Voltage imbalance and Current imbalance keeps four decimal places.

Example: U = 220.1V, f = 49.98HZ, I = 1.999A, P = 0.2199KW, △=0.00%

Supporting 4-way temperature measurement，range：-40～99℃，accuracy：±2℃

Supporting aftercurrent measurement，The initial range：0～1000mA，Range multiples can be set（1～60）.

5.2 Metering

It can measure the current combined active power, positive active power, reverse active power, inductive reactive power, capacitive reactive power, as seen in the electric power.

5.3 Demand

Demand-related concepts are listed as follows:

Demand	Average power measured during the demand period
Max. demand	Maximum amount of demand during a specified period of time
Sliding window time	A recurrence method to measure the demand from any time point during a period shorter than the demand period. The demand measured by this means is called sliding demand. The recurrence time is sliding window time.
Demand period	Time interval when the same average power is measured continuously, also known as window time

Measure eight maximum demands, i.e. A/B/C three-phase current ,positive active, negative active, inductive reactive , capacitive reactive and apparent power demands and the time of maximum demand.

5.4 Historical data

Record the historical data on electricity consumption covering previous 12 months (including four quadrant and multi-rate tariff).

5.5 Digital input/ output

There are three -way Digital output. The Digital output is realized by relay for remote control and alarm output. i.e. remote communication, with RS485.

5.6 Wireless Communication Function

The ADW350 supports NB and 4G communications. Specific agreements on NB and 4G communications can be obtained by contacting relevant personnel of our company.

6 Communication description

6.1 Protocol

The meters adapt Modbus protocol. Please refer to the relevant standards for more information.

6.2 MODBUS

MODBUS-RTU protocol has 03H and 10H command to read and write registers respectively. The following chart is registers' address list:

Start Address（Hexadecimal）	Variable	Length	R/W	Notes
0000H	Address	2	R/W	1～247
0001H	Baud rate	2	R/W	1：1200bps 2：3400bps 3：4800bps 4：9600bps
0002H~0003H	Reserved			
0004H	High byte: parity mode, low byte: stop Bit	2	R/W	High byte: 0-none, 1-even, 2-odd; low byte: 0- 1 stop Bit, 1- 2 stop Bit
0005H	Reserved			
0006H	Pulse constant			
0007H	Backlight Time			
0008H	Code			
0009H~000CH	Reserved			
000DH	Current specification			
000EH	PT			
000FH	CT			
0010H	Reserved			
0011H~0013H	Time, date (second, minute, hour, day, month, year)			
0014H	Voltage of A phase	2	R	Int Keep 1 decimal places (The real value is the showed value divide 10.The following data all in this rule.)
0015H	Voltage of B phase	2	R	
0016H	Voltage of C phase	2	R	
0017H	Voltage between A-B	2	R	
0018H	Voltage between B-C	2	R	
0019H	Voltage between C-A	2	R	
001AH	Electricity of A phase	2	R	Int

001BH	Electricity of B phase	2	R	unit A Keep 2 decimal places
001CH	Electricity of C phase	2	R	
001DH	Vector sum of 3-phase current	2	R	
001EH	Active power of A phase	4	R	Int unit kW Keep 3 decimal places
0020H	Active power of B phase	4	R	
0022H	Active power of C phase	4	R	
0024H	Total active power	4	R	
0026H	Reactive power of A phase	4	R	Int unit kVar Keep 3 decimal places
0028H	Reactive power of B phase	4	R	
002AH	Reactive power of C phase	4	R	
002CH	Total reactive power	4	R	
002EH	Apparent power of A phase	4	R	Int unit kVA Keep 3 decimal places
0030H	Apparent power of B phase	4	R	
0032H	Apparent power of C phase	4	R	
0034H	Total apparent power	4	R	
0036H	Power factor of A phase	2	R	Int Keep 3 decimal places
0037H	Power factor of B phase	2	R	
0038H	Power factor of C phase	2	R	
0039H	Total power factor	2	R	
003AH	Reserved			
003BH	Frequency of power	2	R	Int Keep 2 decimal places
003CH	Total energy consumption	4	R	Int unit kWh Keep 2 decimal places
003EH	Forward active energy consumption	4	R	
0040H	Reversing active energy consumption	4	R	
0042H	Forward reactive energy consumption	4	R	Int unit kVarh Keep 2 decimal places
0044H	Reversing reactive energy consumption	4	R	
0046H	Total energy consumption on A phase	4	R	Int unit kWh Keep 2 decimal places
0048H	Forward active energy consumption on A phase	4	R	
004AH	Reversing active energy consumption on A phase	4	R	
004CH	Forward reactive energy consumption on A phase	4	R	Int unit kVarh

004EH	Reversing reactive energy consumption on A phase	4	R	Keep 2 decimal places
0050H	Total energy consumption on B phase	4	R	Int unit kWh Keep 2 decimal places
0052H	Forward active energy consumption on B phase	4	R	
0054H	Reversing active energy consumption on B phase	4	R	
0056H	Forward reactive energy consumption on B phase	4	R	Int unit kVarh Keep 2 decimal places
0058H	Reversing reactive energy consumption on B phase	4	R	
005AH	Total energy consumption on C phase	4	R	Int unit kWh Keep 2 decimal places
005CH	Forward active energy consumption on C phase	4	R	
005EH	Reversing active energy consumption on C phase	4	R	
0060H	Forward reactive energy consumption on C phase	4	R	Int unit kVarh Keep 2 decimal places
0062H	Reversing reactive energy consumption on C phase	4	R	
0064H	Maximum forward active demand in current month	4	R	Int unit KW Keep 3 decimal places
0066H~0067H	Occur time	4	R	Minute, hour, day, month
0068H	Maximum reversing active demand in current month	4	R	Int unit kVar Keep 3 decimal places
006AH~006BH	Occur time	4	R	Minute, hour, day, month
006CH	Maximum forward reactive demand in current month	4	R	Int unit kVar Keep 3 decimal places
006EH~006FH	Occur time	4	R	Minute, hour, day, month
0070H	Maximum reversing reactive demand in current month	4	R	Int unit kVar Keep 3 decimal places
0072H~0073H	Occur time	4	R	Minute, hour, day, month
0074H	THDUa	2	R	Total distortion rate of voltage and current on each phase Int Keep 2 decimal places
0075H	THDUb	2	R	
0076H	THDUc	2	R	
0077H	THDIa	2	R	
0078H	THDIb	2	R	
0079H	THDIc	2	R	

007AH	THUa(Harmonic on 2nd-31st)	2×30	R	Harmonic voltage on 2nd-31st Int Keep 2 decimal places
0098H	THUa(Harmonic on 2nd-31st)	2×30	R	
00B6H	THUb(Harmonic on 2nd-31st)	2×30	R	
00D4H	THUc(Harmonic on 2nd-31st)	2×30	R	Harmonic current on 2nd-31st Int Keep 2 decimal places
00F2H	THIa(Harmonic on 2nd-31st)	2×30	R	
0110H	THIb(Harmonic on 2nd-31st)	2×30	R	
012EH	Fundamental voltage on A phase	2	R	Int unit V Keep 1 decimal places
012FH	Fundamental voltage on B phase	2	R	
0130H	Fundamental voltage on C phase	2	R	
0131H	Harmonic voltage on A phase	2	R	
0132H	Harmonic voltage on B phase	2	R	
0133H	Harmonic voltage on C phase	2	R	
0134H	Fundamental current on A phase	2	R	Int unit A Keep 2 decimal places
0135H	Fundamental current on B phase	2	R	
0136H	Fundamental current on C phase	2	R	
0137H	Harmonic current on A phase	2	R	
0138H	Harmonic current on B phase	2	R	
0139H	Harmonic current on C phase	2	R	
013AH	Fundamental active power on A phase	4	R	Int unit kW Keep 3 decimal places
013CH	Fundamental active power on B phase	4	R	
013EH	Fundamental active power on C phase	4	R	
0140H	Fundamental active power	4	R	
0142H	Fundamental reactive power	4	R	Int

	on A phase			unit kVar Keep 3 decimal places
0144H	Fundamental reactive power on B phase	4	R	
0146H	Fundamental reactive power on C phase	4	R	
0148H	Fundamental reactive power	4	R	
014AH	Harmonic active power on A phase	4	R	Int unit kW Keep 3 decimal places
014CH	Harmonic active power on B phase	4	R	
014EH	Harmonic active power on C phase	4	R	
0150H	Harmonic active power	4	R	
0152H	Harmonic reactive power on A phase	4	R	Int unit kVar Keep 3 decimal places
0154H	Harmonic reactive power on B phase	4	R	
0156H	Harmonic reactive power on C phase	4	R	
0158H	Harmonic reactive power	4	R	
015AH	Current forward active demand	4	R	Int unit kW Keep 3 decimal places
015CH	Current reversing active demand	4	R	
015EH	Current forward reactive demand	4	R	Int unit kVar Keep 3 decimal places
0160H	Current reversing reactive demand	4	R	
0162H	Voltage imbalance	2	R	Int unit 0.01%
0163H	Current imbalance	2	R	
0164H	Temperature on A phase	2	R	Int unit 0.1℃
0165H	Temperature on B phase	2	R	
0166H	Temperature on C phase	2	R	
0167H~01BDH	Reserved			
01BFH	wireless signal strength	2	R	Int
01C1H	Reserved			
01C2H	DO1	2	R/W	Int Bit0 effective
01C3H	DO2	2	R/W	Int Bit0 effective
01E1H	DO3	2	R/W	Int

				Bit0 effective

6.3 Settings of Alarm

Start Address（Hexadecimal）	Variable	Length	R/W	Notes
01DOH	Alarm permission bits	2	R/W	Bit0: overvoltage alarm permission bits Bit1: undervoltage alarm permission bits Bit2: overcurrent alarm permission bits Bit3: undercurrent alarm permission bits Bit4: overpower alarm permission bits Bit5: underpower alarm permission bits
01D1H	overvoltage alarm threshold	2	R/W	Int unit 0.1V
01D2H	overvoltage alarm time-delay	2	R/W	Int unit 0.01S
01D3H	undervoltage alarm threshold	2	R/W	Int unit 0.1V
01D4H	undervoltage alarm time-delay	2	R/W	Int unit 0.01S
01D5H	overcurrent alarm threshold	2	R/W	Int unit 0.01A
01D6H	Overcurrent alarm time-delay	2	R/W	Int unit 0.01S
01D7H	undercurrent alarm threshold	2	R/W	Int unit 0.01A
01D8H	undercurrent alarm time-delay	2	R/W	Int unit 0.01S
01D9H	overpower alarm threshold	2	R/W	Int unit 0.001kw
01DAH	overpower alarm time-delay	2	R/W	Int unit 0.01S
01DBH	underpower alarm threshold	2	R/W	Int unit 0.001kw
01DCH	underpower alarm time-delay	2	R/W	Int unit 0.01S
01DDH~01E0H	Reserved			
01E2H	DO3 Output mode	2	R/W	0:Electrical level

				1:Purse
01E3H	DO3 Related content	2	R/W	0:DO 1: Total failure
01E4H	DO3 Output pulse width	2	R/W	0:None 1:1S 2:2S 3:3S 4:4S 5:5S
01E5H	DO1 Output mode	2	R/W	0:Electrical level 1:Purse
01E6H	DO1 Related content	2	R/W	0:DO 1: Total failure
01E7H	DO1 Output pulse width	2	R/W	0:None 1:1S 2:2S 3:3S 4:4S 5:5S
01E8H	DO2 Output mode	2	R/W	0: Electrical level 1:Purse
01E9H	DO2 Related content	2	R/W	0:DO 1:Total failure
01EAH	DO2 Output pulse width	2	R/W	0:None 1:1S 2:2S 3:3S 4:4S 5:5S

6.4 Historical Data Memory

Start address (high byte)	Data type
48-53H	Last 1 month-last 12 months

Start address (low byte)	Data type
00H	Record date and time
03H	History total active energy
05H	History total forward active energy
07H	History total reversing active energy
09H	History total forward reactive energy
0BH	History total reversing reactive energy
0DH	Total active energy on A phase
0FH	Total forward active energy on A phase
11H	Total reversing active energy on A phase
13H	Total forward reactive energy on A phase

15H	Total reversing reactive energy on A phase
17H	Total active energy on B phase
19H	Total forward active energy on B phase
1BH	Total reversing active energy on B phase
1DH	Total forward reactive energy on B phase
1FH	Total reversing reactive energy on B phase
21H	Total active energy on C phase
23H	Total forward active energy on C phase
25H	Total reversing active energy on C phase
27H	Total forward reactive energy on C phase
29H	Total reversing reactive energy on C phase
2BH	Current spike electric energy
2DH	Current peak electric energy
2FH	Current flat electric energy
31H	Current valley electric energy
33H	Current forward active spike electric energy
35H	Current forward active peak electric energy
37H	Current forward active flat electric energy
39H	Current forward active valley electric energy
3BH	Current reversing active spike electric energy
3DH	Current reversing Active peak electric energy
3FH	Current reversing active flat electric energy
41H	Current reversing Active valley electric energy
43H	Current forward reactive spike electric energy
45H	Current forward reactive spike electric energy
47H	Current forward reactive flat electric energy
49H	Current forward reactive valley electric energy
4BH	Current reversing reactive spike electric energy
4DH	Current reversing reactive peak electric energy
4FH	Current reversing reactive flat electric energy
51H	Current reversing reactive valley electric energy

6.5 Record of extreme value and occurrence time

1） Maximum records：

Starting address of interval (high byte)	Type of historical data
04	Extremum of the month and Occurrence time
05	Extremum of last 1 month and Occurrence time
06	Extremum of last 2 month and Occurrence time
07	Extremum of last 3 month and Occurrence time

Offset address of interval (low byte)）	Data type
00	Voltage of A phase maximum value and occurrence time
03	Voltage of B phase maximum value and occurrence time
06	Voltage of C phase maximum value and occurrence time
09	Voltage between A-B maximum value and occurrence time
0C	Voltage between A-B maximum value and occurrence time
0F	Voltage between A-B maximum value and occurrence time
12	Electricity of A phase maximum value and occurrence time
15	Electricity of B phase maximum value and occurrence time
18	Electricity of C phase maximum value and occurrence time
1B	Three phase current vector sum maximum value and occurrence time
1E	Active power of A phase maximum value and occurrence time
22	Active power of B phase maximum value and occurrence time
26	Active power of C phase maximum value and occurrence time
2A	Total active power maximum value and occurrence time
2E	Reactive power of A phase maximum value and occurrence time
32	Reactive power of B phase maximum value and occurrence time
36	Reactive power of C phase maximum value and occurrence time
3A	Total reactive power maximum value

	and occurrence time
3E	Apparent power of A phase maximum value and occurrence time
42	Apparent power of B phase maximum value and occurrence time
46	Apparent power of C phase maximum value and occurrence time
4A	Total apparent power maximum value and occurrence time

2） **Minimum record:**

Starting address of interval (high byte)	Type of historical data
04	Extremum of the month and Occurrence time
05	Extremum of last 1 month and Occurrence time
06	Extremum of last 2 month and Occurrence time
07	Extremum of last 3 month and Occurrence time

Offset address of interval (low byte)）	Data type
4E	Voltage of A phase Minimum Value and occurrence time
51	Voltage of B phase Minimum Value and occurrence time
54	Voltage of C phase Minimum Value and occurrence time
57	Voltage between A-B Minimum Value and occurrence time
5A	Voltage between B-C Minimum value and occurrence time
5D	Voltage between C-A Minimum value and occurrence time
60	Electricity of A phase Minimum value and occurrence time
63	Electricity of B phase Minimum value and occurrence time
66	Electricity of C phase Minimum value and occurrence time
69	Three phase current vector sum Minimum value and occurrence time
6C	Active power of A phase Minimum value and occurrence time
70	Active power of B phase Minimum value and occurrence time
74	Active power of C phase Minimum value and occurrence time

78	Total active power Minimum value and occurrence time
7C	Reactive power of A phase Minimum value and occurrence time
80	Reactive power of B phase Minimum value and occurrence time
84	Reactive power of C phase Minimum value and occurrence time
88	Total reactive power Minimum value and occurrence time
8C	Apparent power of A phase Minimum value and occurrence time
90	Apparent power of B phase Minimum value and occurrence time
94	Apparent power of C phase Minimum value and occurrence time
98	Total apparent power Minimum value and occurrence time

Note：The record of every extreme value and occurrence time is 6 bits, and the data configuration can be refered as below:

ADDRH ADDRL	Event names	Data type	Note
0400H	Maximum voltage of A phase and occurrence time	The data of Maximum voltage of A phase	data and decimal place refer to address table 6.2
0401H		Occurrence time of minutes and hours	high byte : minutes
0402H		Occurrence time of Days and months	high byte : Days

7 Common troubleshooting

7.1 RS485 networking communication failure

Suggestion: Please first confirm whether the RS485 wiring is loose, AB connection reverse and other problems, and then check the table through the button to see if the general selection parameters, such as address, baud rate, check digit, etc., are set correctly.

7.2 Wireless communication failure of instrumentation

Suggestion: Please connect RS485 interface on the meter and USB convert to 485 serial port to read the parameters, and confirm whether the parameters are the same as the

upper terminal wireless configuration (channel and spread spectrum factor). If different, please modify the meter's wireless parameters and retest the master terminal after the same, and if the same, it may be the meter and master terminal are in a relative long distance. It is too far to communicate or the scene is seriously disturbed. We can try to use the external antenna at the same time, or consider the newly added wireless master terminals, and then test it.