

REN-220 Series Single Phase Din Rail Energy Meter



- Features:
- Multiple active energy accuracy options are available.
  - When the load current is ≤80A, no external current transformer is needed (10 (80) A current range).
  - One active energy pulse (conforming to Class A pulse output standard).
  - One RS485 communication interface, MODBUS-RTU or DL/T645-2007 protocol optional.
  - Industrial-grade segment code LCD with white backlight. Divided into two rows to display electrical parameters and Energy information.
  - True effective value measurement, electrical parameters and energy information can be fixedly displayed and automatically cycled display or switch the display through the panel keys.
  - Comply with relevant technical requirements for electronic energy meters in DL/T 614 and GB/T 17215.

Technical Specifications

Item	Specifications
Accuracy class	Active power: 1.0S, Reactive: 2.0S
Energy measurement range	Display 0.1-9999999.9kWh, communication 0.001-999999.999kWh
Reference voltage	Single phase 220V
Current specification	10 (80)A
Measurement network	Single phase two wire
Reference frequency	50Hz or 60Hz
Operating Voltage	Normal working voltage range: 0.9Un-1.1Un, extreme working voltage range: 0.7Un-1.2Un
Starting current	0.001In (0.5S)
Power consumption	Voltage Line: < 10VA, Current Line: < 1VA
Energy pulse output	Active energy pulses. Photoelectric isolation, open collector output (according to Class A pulse output standard). Pulse width = 80ms±20ms.
Digital communications	RS485: MODBUS-RTU (default) or DL/T645-2007 (need to be customized)
Clock error	≤0.5s/d
Withstand voltage	Power supply and voltage measurement circuit: common ground, between two terminals of current measurement circuit, communication, pulse output and power supply: >2000VAC/1min
Anti-static electricity	Contact discharge>6KV, air gap discharge>8KV
Lightning surge	Power terminal ±4000V
Anti-jamming	Generated by noise simulation device (pulse width 100ns/1us), power supply terminal, voltage and current measurement input terminal ±4000V
Temperature range	Normal working temperature: -10~+45°C Extreme working temperature: -20~+55°C Storage temperature: -40~+70°C
Relative humidity	≤95% (no condensation)
Dimensions(mm)	76L×88W×60H (mm)

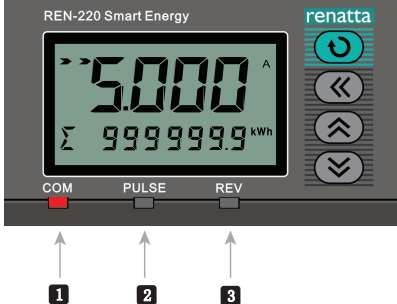
Function

Item	Function
Measurement	With function of automatic recognition and indication of power direction (the reverse electric energy is added to the total electric energy)
	Electric energy is accumulated and stored according to total, sharp, peak, peak, flat and valley respectively
	Power failure memory: more than 10 years.
Clock and time period rates	Clock has calendar, timing and leap year shift function, clock error is within 0.5s/day.
	Programmable setting of peak, peak, flat and trough 4 rates, 12 time periods can be set every day, and the time interval is 15 minutes
Display	Wide temperature range LCD display, black characters, yellow-green backlight. The upper row displays electrical parameters, and the lower row displays each electric energy value and time
	3 LED indicate communication status, active power pulse output, power reverse separately.
Energy pulse output	1 active c. Used for meter calibration or external power collection
Communication	Can be used for instrument setting, remote meter reading, data acquisition, etc.
	Communication port: RS485
	Communication protocol: MODBUS-RTU (default) or DL/T645-2007 (customized)
	Communication rate: 4800bps, 9600bps
Program	Time, date setting
	Communication address setting
	Tariff rate period setting
	Energy reset setting
	The meter programming can also be set remotely through the communication interface

Model Illustration

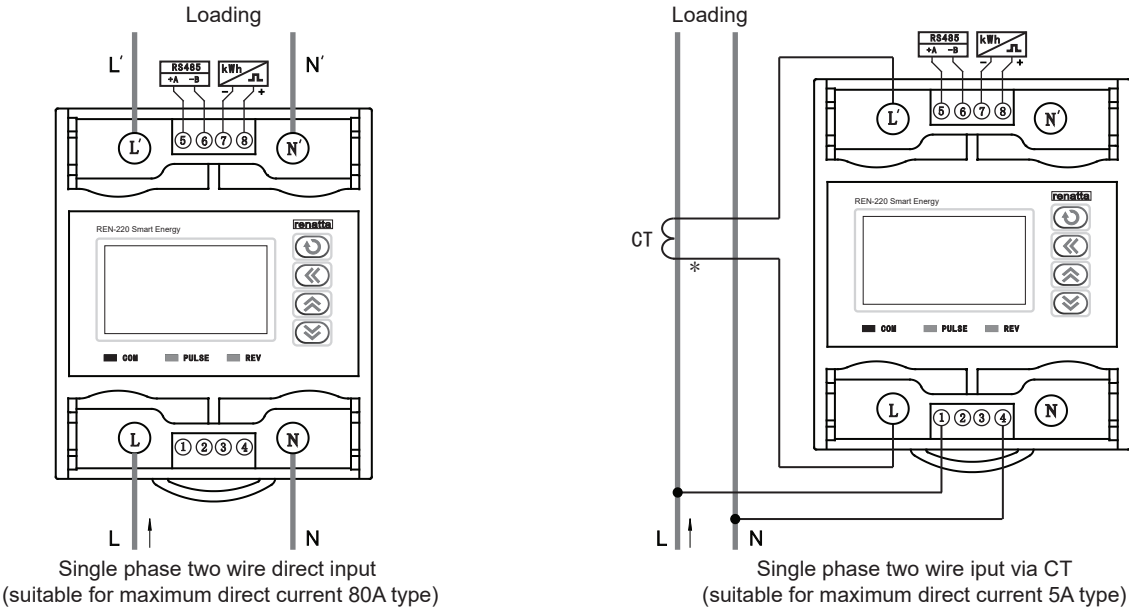
Model Number	Accuracy	Rated Voltage	Current	Input type	Multi Tariff Rate	Communication	Pulse constant
REN-220-DS	1.0 Class	220V	10(80)A	Direct input	No	MODBUS-RTU or DL/T645-2007	2400 imp/kWh

Panel Illustration



No.	Symbol	Name	Illustration
1	COM	Communication LED	The LED will flash during communication
2	PULSE	Pulse output LED	The LED will flash during pulse output
3	REV	Status indicator	Power reverse indication
4		Decrease key	The first line display switch key / decrease key
5		Increase key	The first line display switch key / increase key
6		Shift key	The second line display switch/modify/shift/return
7		Menu key	The second line display switch/menu/confirm/exit
8		LCD display screen	Upper line display parameters, lower line display Kwh

Connection



To be continue

Reserve extension						
49	0x4806	CT secondary current	2	long	R/W	0x1388 = 5.000A
50	0x4A01	Communication address	1	int	R/W	1~247 1~247
51	0x4A02	Communication baud rate	1	int	R/W	0=9600、1=4800(kbS)
52	0x4A07	Upper row cycle display the time interval	1	int	R/W	0 = fixed display
53	0x4A08	Lower row cycle display the time interval	1	int	R/W	4~9 = display interval(s)
54	0x4A80	1st period rate	1	int	R/W	0 = Sharp rate 1 = Peak rate 2 = Flat rate 3 = Valley rate
55	0x4A81	2nd period rate	1	int	R/W	
56	0x4A82	3rd period rate	1	int	R/W	
57	0x4A83	4th period rate	1	int	R/W	
58	0x4A84	5th period rate	1	int	R/W	
59	0x4A85	6th period rate	1	int	R/W	
60	0x4A86	7th period rate	1	int	R/W	
61	0x4A87	8th period rate	1	int	R/W	
62	0x4A88	9th period rate	1	int	R/W	
63	0x4A89	10th period rate	1	int	R/W	
64	0x4A8A	11th period rate	1	int	R/W	
65	0x4A8B	12th period rate	1	int	R/W	
66	0x4A8C	Period 1 start time	1	int	R/W	0~96
67	0x4A8D	Period 2 start time	1	int	R/W	
68	0x4A8E	Period 3 start time	1	int	R/W	
69	0x4A8F	Period 4 start time	1	int	R/W	
70	0x4A90	Period 5 start time	1	int	R/W	
71	0x4A91	Period 6 start time	1	int	R/W	
72	0x4A92	Period 7 start time	1	int	R/W	
73	0x4A93	Period 8 start time	1	int	R/W	
74	0x4A94	Period 9 start time	1	int	R/W	
75	0x4A95	Period 10 start time	1	int	R/W	
76	0x4A96	Period 11 start time	1	int	R/W	
77	0x4A97	Period 12 start time	1	int	R/W	
78	0x4A98	Current rate	1	int	R	0-3
79	0x4A99	Total numbers of active energy overflows	1	int	R	0-255
Reserve rate extension						

The program of achieving 16 bit CRC check code

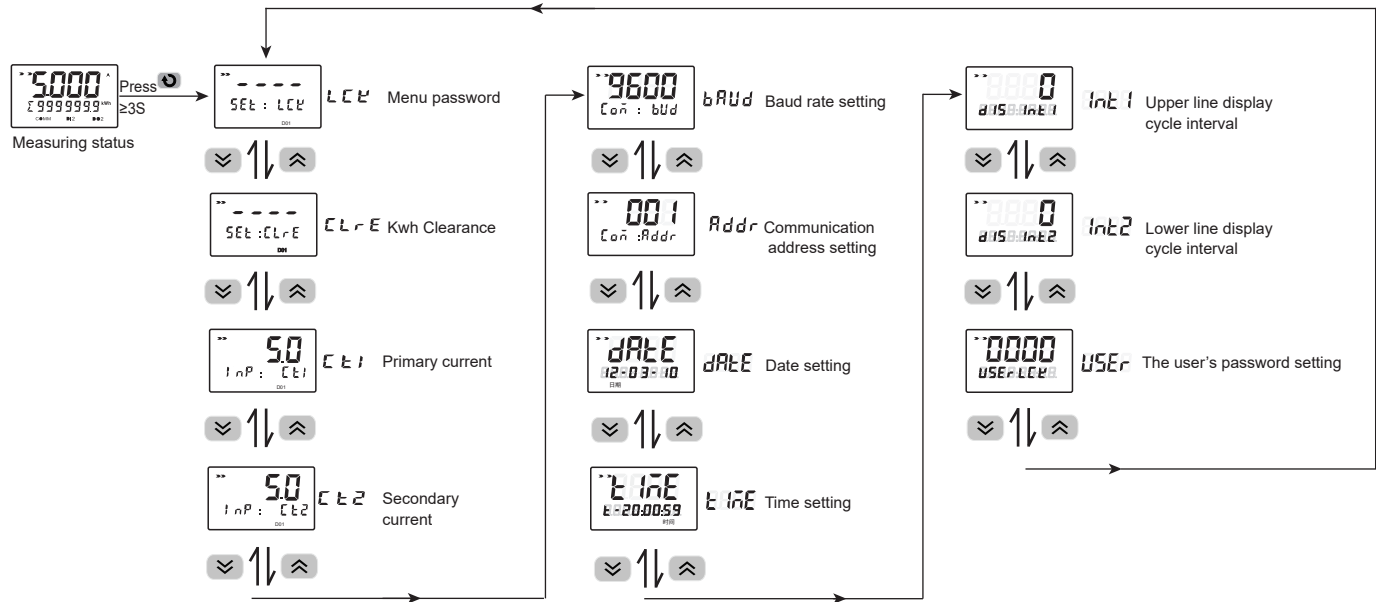
```
unsigned int Get_CRC (uchar*pBuf,uchar num)
{
    unsigned i,j;
    unsigned int wCrc=0xFFFF;
    for(i=0;i<num;i++)
    {
        wCrc^=(unsigned int)(pBuf[i]);
        for(j=0;j<8;j++)
        {
            if(wCrc &1) { wCrc>>=1;  wCrc=0xA001; }
            else wCrc>>=1;
        }
    }
    return wCrc;
}
```

No.	Register address	Register name	Byte length	Value range	Variable attributes	Remarks
1	0x0080	The current date-year	1	int	R	1. The returned data is in BCD format. 2. The year data starts from 2000 3. Eg: Read year return datasheet 0X0012 ,means present year is 2012 . 4. Eg.: Read minute return 0X0056, it means present minute is 56 minutes.
2	0x0081	The current date-month	1	int	R	
3	0x0082	The current date-day	1	int	R	
4	0x0083	The current time-hour	1	int	R	
5	0x0084	The current time-minute	1	int	R	
6	0x0085	The current time-second	1	int	R	
7	0x4000	Voltage	2	long	R	0x01 = 0.001V
8	0x400C	Current	2	long	R	0x01 = 0.001A
9	0x4012	Active power	2	long	R	0x01 = 0.001kW
10	0x401A	Reactive power	2	long	R	0x01 = 0.001kvar
11	0x4022	Apparent power	2	long	R	0x01 = 0.001kVA
12	0x402A	Power factor	2	long	R	0xC8 = 0.2PF
13	0x4032	Frequency	2	long	R	0xC350 = 50HZ
14	0x4034	Total active energy Kwh	2	long	R	0x01 = 0.001kWh
15	0x4036	Total active energy Kwarh	2	long	R	0x01 = 0.001kvarh
16	0x4102	Total sharp Kwh	2	long	R	0x01 = 0.001kWh
17	0x4104	Total peak Kwh	2	long	R	
18	0x4106	Total flat Kwh	2	long	R	
19	0x4108	Total valley kwh	2	long	R	
20	0x410A	Total Kwh this month	2	long	R	
21	0x410C	Total sharp Kwh this month	2	long	R	
22	0x410E	Total peak Kwh this month	2	long	R	
23	0x4110	Total flat Kwh this month	2	long	R	
24	0x4112	Total valley Kwh this month	2	long	R	
25	0x4114	Total Kwh last month	2	long	R	
26	0x4116	Total sharp Kwh last month	2	long	R	
27	0x4118	Total peak Kwh last month	2	long	R	
28	0x411A	Total flat Kwh last month	2	long	R	
29	0x411C	Total valley Kwh last month	2	long	R	
30	0x411E	Total Kwh the month before last	2	long	R	
31	0x4120	Total sharp Kwh the month before last	2	long	R	
32	0x4122	Total peak Kwh the month before last	2	long	R	
33	0x4124	Total flat Kwh the month before last	2	long	R	
34	0x4126	Total valley Kwh the month before last	2	long	R	
35	0x4200	Total programming times of tariff rate	2	long	R	0-255
36	0x4202	The 1st time tariff rate programming date recently	2	long	R	0x00YYMMDD(BCD)
37	0x4204	The 1st time tariff rate programming time recently	2	long	R	0x00HHMMSS(BCD)
38	0x4206	Total Kwh value of 1st time kwh clearance recently	2	long	R	0x01=0.001kWh
39	0x4208	The date of 1st time to clear Kwh recently	2	long	R	0x00YYMMDD(BCD)
40	0x420A	Total Kwh value of 2nd time kwh clearance recently	2	long	R	0x01=0.001kWh
41	0x420C	The date of 2nd time to clear Kwh recently	2	long	R	0x00YYMMDD(BCD)
42	0x420E	Total Kwh value of 3rd time kwh clearance recently	2	long	R	0x01=0.001kWh
43	0x4210	The date of 3rd time to clear Kwh recently	2	long	R	0x00YYMMDD(BCD)
44	0x4212	Total Kwh value of 4th time kwh clearance recently	2	long	R	0x01=0.001kWh
45	0x4214	The date of 4th time to clear Kwh recently	2	long	R	0x00YYMMDD(BCD)
46	0x4216	Total Kwh value of 5th time kwh clearance recently	2	long	R	0x01=0.001kWh
47	0x4218	The date of 5th time to clear Kwh recently	2	long	R	0x00YYMMDD(BCD)
48	0x4804	CT primary current	2	long	R/W	0x1388 = 5.000A

#### ■ Operation Illustration

- In the measurement state, press "⏪" and "🔍" respectively to switch the cycle display of the total active energy, reactive energy, sharp energy, peak energy, flat energy, valley energy; total Kwh this month, total sharp Kwh this month, total peak Kwh this month, total flat Kwh this month, total valley Kwh this month; total Kwh last month, total sharp Kwh last month, total peak Kwh last month, total flat Kwh last month, total valley Kwh last month; total Kwh the month before last, total sharp Kwh the month before last, total peak Kwh the month before last, total flat Kwh the month before last, total valley Kwh the month before last; current date, time. The display state switched by the user remains unchanged when the power is turned on again after a power outage.
- In the measurement state, press "⏵" "⏴" to switch to cycle display of voltage effective value, current effective value, active power, reactive power, power factor, and grid frequency. The display state switched by the user remains unchanged when the power is turned on again after a power outage.
- Enter the menu, press "🔍" for about 3 seconds to enter the setting menu, press "⏴" to cycle forward through each menu, and press "⏵" to cycle through each menu backward.
- Modify the parameter settings in the menu: After entering the menu, press "⏵" or "⏴" to find the menu that needs to be modified, then press "⏪" and the second row of parameter values will start to flash, indicating that it has entered the modification state. Press the "⏪" key again to cycle through each parameter setting. One digit of the value flashes, press "⏴" to increase the value, press "⏵" to decrease the value. After the modification is completed, press "🔍" to confirm the modification is successful, stop flashing, and repeat the above operations to modify other parameters.
- Enter the tariff rate menu. In the measurement state, long press the "⏪" key for 3s to enter the tariff rate setting menu. Short press "⏪" to flash the modification. Press the "⏵" or "⏴" key to switch the menu. Press "🔍" to confirm and save. Long press "🔍" for 3 seconds to exit the menu.
- Exit the menu: Press the "🔍" key in the menu state for about 3s to exit the menu and return to the normal measurement state. If the menu was not operated for a long time (about 40 seconds), the meter would automatically exit the menu and return to the normal measurement state.  
Note: If the meter automatically exits the menu, the modifications will not be saved.

#### ■ Menu Operation

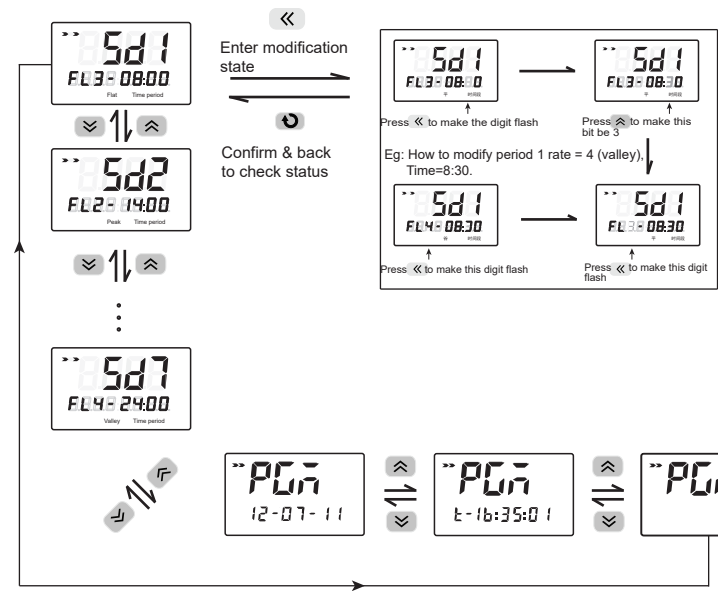


#### ■ Menu Setup

No.	Code	Parameter Range	Illustration	Default value	
1	5555	User's password	0-9999	The menu can only be modified when the correct menu password is entered, otherwise the menu is read-only.	0000
2	5555	Clear energy	0-9999	Only when the correct clearing password is entered can the energy be cleared.	2607
3	50	CT primary current	0.1-999.9	Primary current of current transformer	885.0
4	50	CT secondary current	0.1-999.9	Secondary current of current transformer	885.0
5	600	Communication baud rate setting	4800/9600	4800 or 9600 baud rate	9600
6	000	Communication addr. setting	0-247	Meter address range	8888
7	2023-10	Date setting	2023-10	Set the current date of the meter,format:20XX year-XX month-XX day	Present date
8	20:00:59	Time setting	20:00:59	Set the current time of the meter,format:20XX hour-XX minute-XX second	Present time
9	0-9	Upper line display cycle interval	0-9	0 fixed display, 4-9 cycle display time interval (unit: second)	8880
10	0-9	Upper line display cycle interval	0-9	0 fixed display, 4-9 cycle display time interval (unit: second)	8880
11	0000	Menu password setting	0-9999	Users can modify the menu password through this page (please remember the password after modification)	0000

■ Operation instructions for the tariff rate menu (models without the tariff rate function do not have this menu)

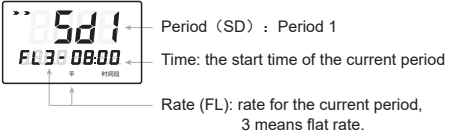
Operation: In the measurement state, long press the "⏮" key to enter the tariff rate time table setting. Long press the "⏭" key to exit after setting.



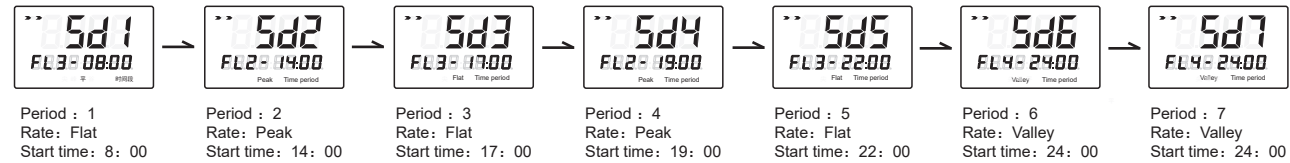
Illustratration:

1. The meter can set up to 12 time periods in a day, corresponding to four rates: sharp, peak, flat and valley.
2. Rate: 1 means sharp rate, 2 means peak rate, 3 means flat rate, 4 means valley rate.
3. The minimum unit of the time period is 15 minutes.
4. Starting from the SD1 period, the start time of all periods must be set according to the principle of SD1<SD2<SD3<SD4...
5. When the setting parameters of the 2 time periods are completely consistent, the meter will automatically block all time period setting menus and parameters after these 2 time periods. Eg: A user divides a day into 6 periods, and the start time of the last period SD6 is 23:00. If the start time of the next period SD7 is also set to 23:00, then the menu and setting parameters of the SD8-SD12 periods start will be automatically blocked.
6. The "PGM" page displays the date, time and total number of historical programming times of the last programming time.

Example 2: The picture below shows the setting menu page for the 1st period. The rate is the flat rate, and the start time of the current period is 8:00 am.



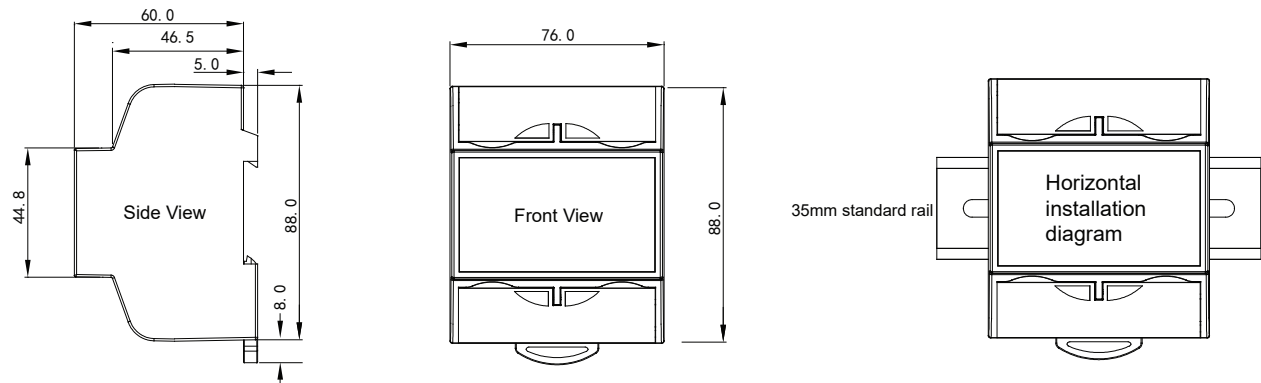
Example 1: If a user divides a day into 6 periods, the start time of the 1st period is 8:00 flat rate, the start time of the 2nd period is 14:00 peak rate, the start time of the 3rd period is 17:00 flat rate. The start time of 4th period is 19:00 peak rate, the start time of 5th period is 22:00 flat rate, the start time of 6th period is 24:00 valley rate. Then the meter's tariff rate menu should be set according to the following page.



■ Parameter Illustration

Total accumulated Kwh	Total accumulated Kwh since meter is power on	Total accumulated sharp Kwh	Total accumulated sharp Kwh since meter is power on
Total sharp Kwh	Total sharp Kwh since meter is power on	Total accumulated flat Kwh	Total accumulated flat Kwh since meter is power on
Total peak Kwh	Total peak Kwh since meter is power on	Total Kwh this month	Total accumulated Kwh this month
Total flat Kwh	Total flat Kwh since meter is power on	Total accumulated peak Kwh	Total accumulated peak Kwh this month
Total valley Kwh	Total valley Kwh since meter is power on	Total accumulated valley Kwh	Total accumulated valley Kwh this month
Accumulated Kwh last month	Total accumulated Kwh last month	Sharp Kwh last month	Total sharp Kwh last month
Accumulated sharp Kwh last month	Total accumulated sharp Kwh last month	Flat Kwh last month	Total flat Kwh last month
Accumulated peak Kwh last month	Total accumulated peak Kwh last month	Total Kwh the month before last	Total accumulated Kwh the month before last
Accumulated flat Kwh last month	Total accumulated flat Kwh last month	Peak Kwh the month before last	Total accumulated peak Kwh the month before last
Accumulated valley Kwh last month	Total accumulated valley Kwh last month	Valley Kwh the month before last	Total accumulated valley Kwh the month before last

■ Dimension (Unit: mm)



■ Communication protocol

This series of energy meters uses the Modbus RTU communication protocol for RS485 half-duplex communication, reading function number 0x03, writing function number 0x10, using 16-bit CRC verification, and the meter does not return verification errors. Data frame format:

Start bit	Data bit	Stop bit	Check bit
1	8	1	No

Communication abnormal handling:

During abnormal responding, set the highest position of the function number to 1. For example: if the function requested by the host is 0x04, then the corresponding function number returned by the slave is 0x84. Error type code 0x01---Illegal function code: The meter does not support the received function number. 0x02---Illegal data location: The data location specified by the host exceeds the range of the meter. 0x03---Illegal data value: The data value sent by the host exceeds the corresponding data range of the meter.

1. Read multiple registers

Example: The host reads the fixed-point number U (voltage is 220.0V)

The address encoding of Ua is 0x4000, because U is a double word (4 bytes) and occupies 2 data registers.

The decimal value of 220.0V corresponds to 0X00035B60.

Mster request (read multiple register)							
1	2	3	4	5	6	7	8
Meter addr.	Function code	Start addr. high bit	Start addr. low bit	Data byte length high bit	Data byte length low bit	CRC code low bit	CRC code high bit
0x01	0x03	0x40	0x00	0x00	0x02	0xD1	0xCB

Slave normal response (read multiple register)								
1	2	3	4	5	6	7	8	9
Meter addr.	Function code	Data bytes	Data low high byte	Data low low byte	Data high high byte	Data high low byte	CRC code low bit	CRC code high bit
0x01	0x03	0x04	0x5B	0x60	0x00	0x03	0xA9	0x08

Function number abnormal response: (for example, the host requested the function number to be 0x04)

Slave abormal response (read multiple register)				
1	2	3	8	9
Meter addr.	Function code	Error code	CRC code low bit	CRC code high bit
0x01	0x84	0x01	0x82	0xC0

2. Write multiple registers

Example: The host writes CT1 = 100.0A

The address code of CT1 is 0X4804, the data format is double word (4 bytes), occupying 2 data registers, and 100.0A in decimal corresponds to 0X000186A0.

Host request (write multiple register)												
1	2	3	4	5	6	7	8	9	10	11	12	13
Meter addr.	Function code	Start addr. high bit	Start addr. low bit	Data byte length high bit	Data byte length low bit	Data byte length	Data 1 high bit	Data 1 low bit	Data 2 high bit	Data 2 low bit	CRC code low bit	CRC code high bit
0x01	0x10	0x48	0x04	0x00	0x02	0x04	0x86	0xA0	0x00	0x01	0x4C	0xF5

Slave normal response (write multiple register)							
1	2	3	4	5	6	7	8
Meter addr.	Function code	Start addr. high 8 bit	Start addr. low 8 bit	Data length high bit	Data length low bit	CRC code low bit	CRC code high bit
0x01	0x10	0x48	0x04	0x00	0x02	0x17	0xA9

Data location error response: (for example, the host request write address index is 0x0050)

Slave abnormal response (write multiple register)				
1	2	3	4	5
Meter addr.	Function code	Error code	CRC code low bit	CRC code high bit
0x01	0x90	0x02	0xCD	0xC1