

## PZ Series Intelligent DC Energy Meter

Installation Instructions V1.9

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## DECLARATION

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## 1. General

PZ series intelligent DC energy meter is designed for applications such as DC panels, solar power, telecommunications base stations, and charging posts. This series of instruments can measure voltage, current, power, forward and reverse power in DC system. It can be used for local display, and connected with industrial control equipment, computers, form a measurement and control system. And it has a variety of external excuse functions for the user to choose: RS485 communication interface, Modbus-RTU protocol, relay alarm output, digital input/output. According to different requirements, through the instrument panel keys, you can set the ratio, communication parameters.

The product meets the relevant technical requirements of the standard Q/GDW1825-2013 DC power meter specification, GB/T29318-2012 Non-vehicle charging electric energy metering for electric vehicles, Q/GDW364-2009 Single-phase energy meter specification.

## 2. Type and Function

Table 1 Product model and function

Type	Display	shape	Basic Function	Optional Function
PZ72L-DE	LCD display	72 Square	DC: voltage、 current、 power、 energy	1、RS485 (/C)
PZ72-DE	LED display			2、12V power output① (/V)
		3、RS485 + 2DO (/KC)		
PZ96L-DE	LCD display	96 Square		4、RS485 + 2DI2DO (/KC)
			5、RS485 + 4DI2DO② (/KC)	
PZ96-DE	LED display		6、RS485 + 2DO + 12V power output (/KVC)	
			7、RS485 + 12V power output (VC)	
				8、RS485 + 0.001kWh (/EC)
				The above functions can have the following two optional functions at the same time:
				9、Auxiliary power 20-60V (/ZD)
				10、Multiple rate (F)

Note: ①The function of 12V power output and DI can't be selected at the same time;

②Only PZ96 (L) -DE has 4DI2DO function.

## 3. Technical Parameters

Table 2 The main technical parameters

Technical Parameters		Indicators	
Input	DC voltage	Input range	Direct access: 0~100V,0~500V,0~1000V
		Input resistance	≥6kΩ/V
	DC current	Input range	Indirect access: 0-2500A(External Shunt or Hall Current Sensor, the range can be set)
		Shunt	75mV
		Hall Current Sensor	0~20mA、0~5V
Power consumption	≤1mW		

	Overload	It can work at normal status at 1.2 times of full load, and can continued work 1 second at 2 times of full load.					
Accuracy class		0.5class					
Pulse constant		Voltage and current specifications: 750V、300A, Default pulse constant: 100imp/kWh					
		Voltage and current specifications: 1000V、300A, Default pulse constant: 100imp/kWh					
		Voltage and current specifications: 1000V、200A, Default pulse constant: 100imp/kWh					
Function	Measuring	Voltage、 Current、 Power					
	Calculate	Current total electricity、 Current positive energy、 Current reverse power					
	Multiple rate	Four time zones、 two time table、 fourteen time points、 four multiple rates. (PZ72L-DE support only)					
	Historical data statistics	Last 12 months of historical electricity(multiple rate electricity).(PZ72L-DE support only)					
	DI、 DO	PZ72 has two digital outputs and two digital inputs, PZ96 has two digital outputs and four digital inputs. DI(Collect and display local switch status information、 Realize remote transmission by RS485)、 DO(Relay output, can achieve "remote control" and alarm output)					
	Display	LCD(the backlight delay time can be adjusted) or LED					
	Communication	RS485、 Half duplex、 Photoelectric isolation、 Modbus-RTU / DL/T645-07、 Band:1200/2400/4800/9600、 Infrared: 1200					
	DI、 DO	DI	Dry contact input, Meter built-in power supply, photoelectric isolation				
	DO	Two relay outputs, Normally open contact, capacity:2A/30VDC or 2A/250VAC					
Working power	Voltage range	85~265VAC/DC、 50/60Hz; 20~60VDC;100~350VDC(Indicate when placing an order)					
	Power consumption	≤2W					
Insulation resistance		≥100MΩ					
Power frequency withstand voltage		3kV/1min (RMS) (between the power supply binding post and the signal binding post)					
Environment	Temperature	Working temperature: -25°C~+60°C; storage temperature: -20°C~+70°C					
	Humidity	≤ 93%RH, No condensation, no corrosive gases					
	Altitude	≤ 2500m					

#### 4. The installation guide

##### 4.1 Shape and hole size

Table 3 shape and hole size

Shape	panel		shell			aperture	
	Wide	High	Wide	High	Deep	Wide	High
72 square	75±0.2	75±0.2	66±0.2	66±0.2	98+2	67+0.5	67+0.5
96 square	96±0.2	96±0.2	86±0.2	86±0.2	92±1	88±0.2	88±0.2

##### 4.2 Opening schematic diagram

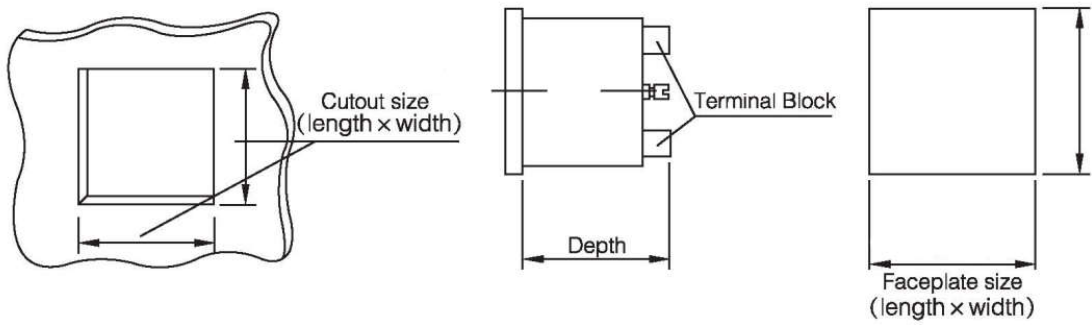


Figure 1 Opening schematic diagram

### 4.3 Installation diagram

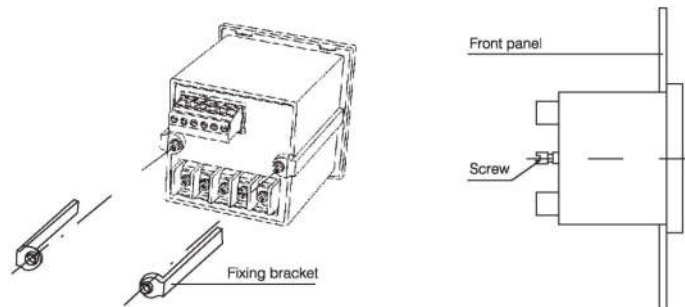


Figure 2 Installation diagram

### 4.4 Installation instructions

Insert the instrument into the mounting hole, install the fixing bracket and tighten the screw, make instrumentation firm and not loose.

### 4.5 Terminal and wiring

#### 4.5.1 Instrument auxiliary power terminal

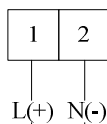


Figure 3 Instrument auxiliary power terminal

#### 4.5.2 Signal input terminal

**The current signal sampling line must use shielded twisted pair.**

1) Sampling current with shunt, connection between shunt and instrument as shown in figure 4:

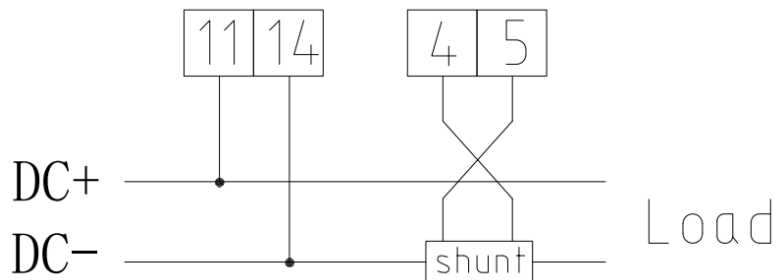


Figure 4 outside shunt wiring diagram

Note:

If the shunt is installed in DC+, you need to note the common positive connection method in the order

before ordering.

- 2) Sampling current with Hall Current Sensor, connection between Hall current sensor(Powered separately) and instrument as shown in figure 5:

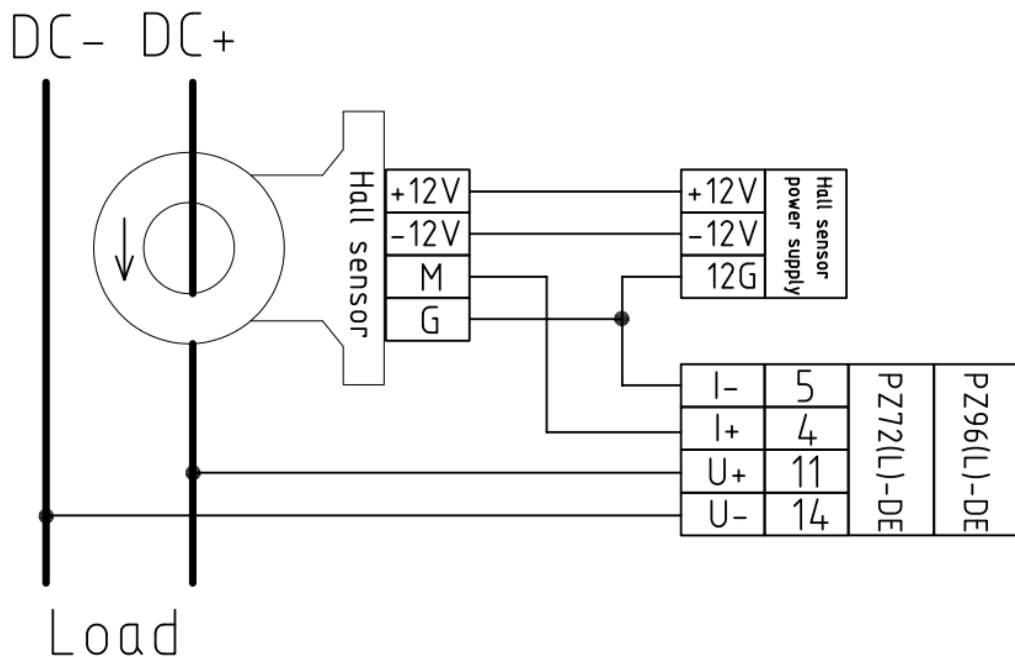


Fig 5 Typical wiring diagram of using Hall current sensor

Notes:

Figure 5 is typical wiring diagram using hall current sensor, figure is only for reference ,if not accordance with the actual wiring diagram of Hall current sensor, please refer to the wiring diagram shown in the instructions of Hall current transducers that are actually needed.

- 3) Sampling current with Hall current sensor, connection with Hall current sensor (selection function of instrument : 12V power supply output power supply) and instrument as shown in figure 6:

The wiring shown in the figure is only applicable to Hall current sensors with a power supply range of  $\pm 12V$ .

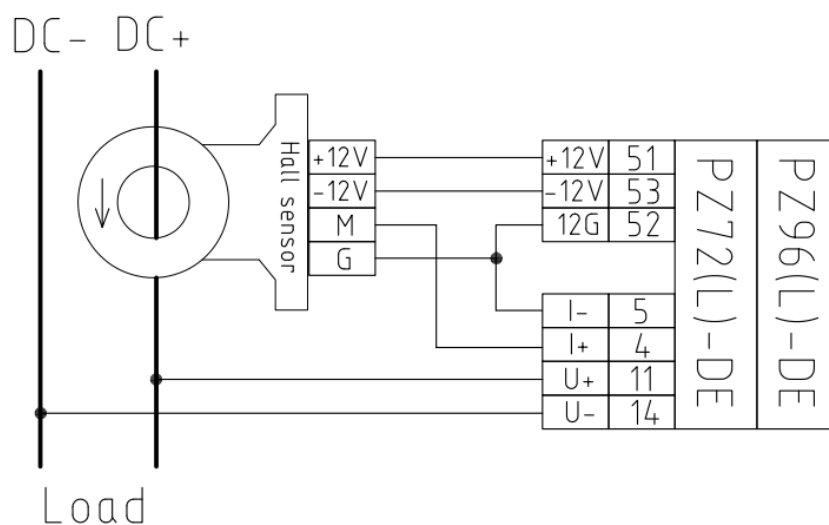


Figure 6 Typical wiring diagram of using Hall current sensor  
(Powered by the optional function "12V power output" of the meter)

Note:

In actual use, when the voltage and current signals are all positive or negative, the power will be expressed as positive, and the electric energy will be expressed as kWh; when the voltage and current are positive and negative, the power will be expressed as negative, and the electric energy will be expressed as kWh. The electric energy is measured by positive and negative separately, and does not affect each other.

#### 4.5.3 Additional functional terminals

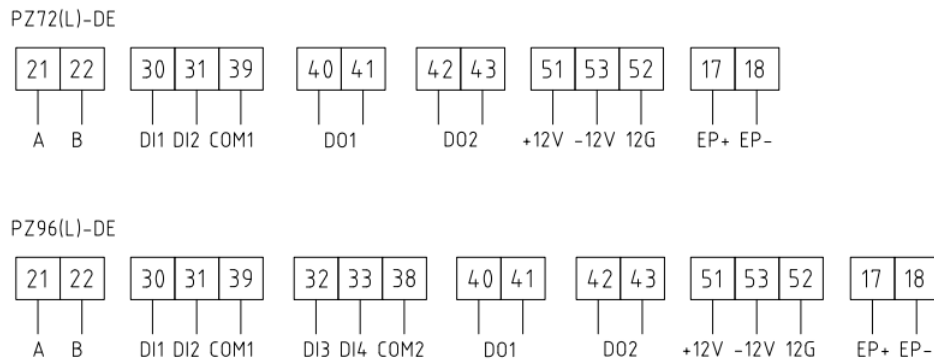


Figure 8 additional functional terminals

Note:

- This wiring is only for reference , the specific wiring shall be based on the wiring diagram on the instrument;
- Can choose either switching input function or 12V power supply function;





#### 4.6 Matters need attention

1. The input voltage shall not exceed 120% of the rated input voltage of the product;
2. External shunt or Hall current sensor should be used for current input.

## 5. Operation and Display

### 5.1 key function description

Table 4 key function description



Button icon	Key name	Key function
	Menu key	Entry/exit menu
	Left arrow key	Check power parameters、 Left shift and scintillation shift in programming interface
	Right arrow key	Check power parameters、 Left shift and scintillation shift in programming interface
	Programming definition key	Check power parameters、 Left shift and scintillation shift in programming interface

### 5.2 Display Tab

### 5.2.1 LCD interface

The meter display Current positive total energy after power-on. The screen display can be realized by the left and right keys. The order of various display interfaces is explained as follows:

Table 5 display interfaces

	Current positive total energy, Current positive total sharp energy, Current positive total peak energy, Current positive total day energy, Current positive total low energy, Current reverse total energy, Current reverse total sharp energy, Current reverse total peak energy, Current reverse total day energy, Current reverse total low energy, date, time, voltage, current, power, version number.
	

Note:

- 1、 All display interface names of PZ series DC watt-hour meters listed above.
- 2、 For instruments without the multi-rate function, the date and time and multi-rate energy are not displayed.



Note: The display meaning can be judged by the information displayed in the interface.

### 5.2.2 Digital Tube Display Interface

In the normal measurement state, you can press the left and right buttons to view the measured electric parameters.



Description

U: Voltage value(primary side), Unit: V

A: Current value(primary side), Unit: A

P: Power(primary side), Unit: kW

Ep: Positive energy(primary side), Unit: kWh

Eq: Reverse energy(primary side), Unit: kWh

### 5.3 Button setting parameters

In the normal display interface, press **SET** to enter the **PASS** interface. Press **ENTER** to display 0000, Enter the correct password and press **ENTER**, If the password is wrong, the display will return to the normal interface and you will need to re-enter the password. If the password is correct, the setup menu will be displayed. Press **SET** after the parameter setting is completed until **SAVE** is displayed. **N** is displayed after pressing the **ENTER** key, After pressing the right button, **Y** will be displayed, then press **ENTER**, and the parameter setting is successful.



5.4 Data that can be set

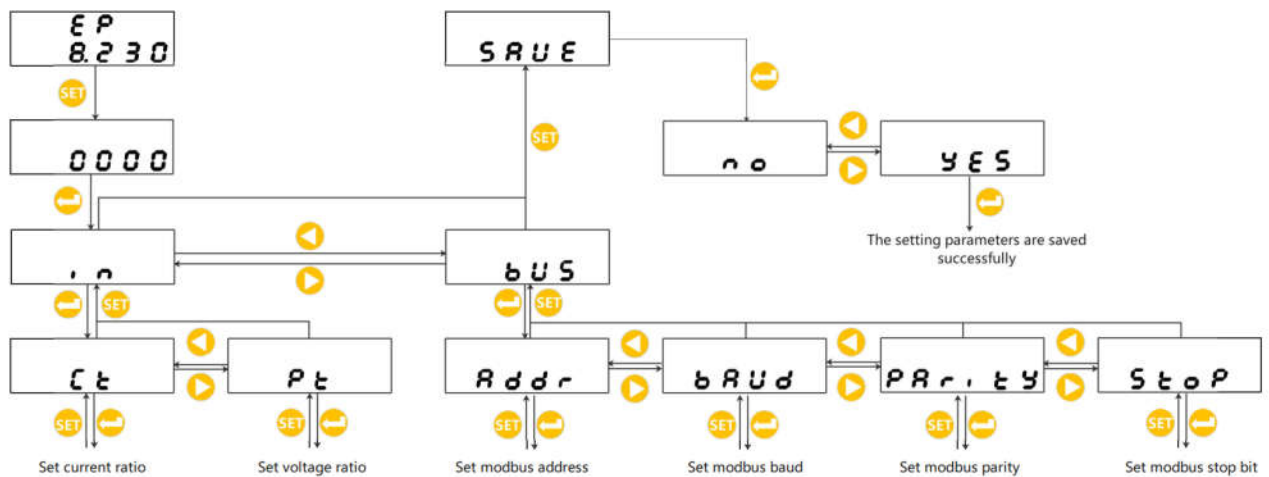
Table 6 setting menu

Serial number	First class menu		Second class menu		
	Symbol	Meaning	Symbol	Meaning	Range
1	In	Variable ratio setting	Pt	Voltage ratio	1-1000(Cannot be changed in case of direct access)
			Ct	Current ratio	1-2500
2	BUS	Communication settings	Addr	Modbus addr	1-247
			Buad	Buad	38400、19200、9600、4800、2400、1200
			Parity	Parity bit	nonE、EvEn、odd
			Stop	Stop bit	1、2
			Id1	Id1	000000-999999
			Id2	Id2	000000-999999
3	SyS	System set up	EF.E	Multi-rate selection	EF: Multi-rate E: non- Multi-rate
			Code	Code setting	0000-9999
			Lcd	Light setting	00-99
			Language	Language	Chinese English
4	HiS	History energy	/	/	/
5	Alarm	Set alarm	U.H	High voltage alarm	5-2000(unit 0.1%)
			U.L	Low voltage alarm	5-2000(unit 0.1%)
			A.H	High current alarm	5-2000(unit 0.1%)
			A.L	Low current alarm	5-2000(unit 0.1%)
			P.H	High power alarm	5-2000(unit 0.1%)
			P.L	Low power alarm	5-2000(unit 0.1%)
			AL.T	Alarm delay	5-999(unit 0.01S)
6	DIDO	DIDO set	DI1 State	DI1 State	Open:、 Close:
			DI1 Kind	DI1 programming content	Normal: normal DI、 Link1:link DO1、 Link2:link DO2
			DI2 State	DI2 State	Open:、 Close:
			DI2 Kind	DI2 programming content	Normal: normal DI、 Link1:link DO1、 Link2:link DO2
			DO1 Mode	DO1 Mode	Level:、 Pulse:

			DO1 Kind	DO1 configuration content	Normal: normal DO、 all: all alarm alldi12: all alarm +DI1+DI2、 di1:DI1、 di2:DI2、 di12:DI1+DI2
			DO1 Time	DO1 pulse width	1-5
			DO2 Mode	DO2 Mode	Level:、 Pulse:
			DO2 Kind	DO2 configuration content	Normal: normal DO、 all: all alarm alldi12: all alarm +DI1+DI2、 di1:DI1、 di2:DI2、 di12:DI1+DI2
			DO2 Time	DO2 pulse width	1-5

### 5.5 Programming example

Programming examples introduce some options in changing the programming menu in the form of flow charts , such as current multiples, etc.



Note:

1. Electric meter with LCD display and Multi-rate adds 12 months of historical energy menu.
2. After setting or selecting, you need to press the enter key to confirm it ,and then press the set key continuously until the save page appears.at the same time, you must press the enter key to display the Yes/No interface , press the right key or left key to switch to display Yes, and then press set key to save the modification ,otherwise it will be invalid.

## 6. Communication instructions

Instrument RS485 communication interface supports MODBUS-RTU communication protocol and DL/T 645-2007 communication protocol. which protocol appearance adopt after receiving data then self-adaption .

Communication port baud rate can be set between 1200 bps, 4800 bps, 9600 bps, 19200 BPS and 38400 bps.

The RS485 communication port of the instrument require to use the screen twisted pair connection. when wiring ,the layout of the hole network should be taken into account ,such as the length of the communication cable, the direction, the position of the host computer, the matching resistance at the end of the network, the communication converter, the network scalability ,the coverage of the network and the environment, etc, all of them should be considered comprehensively.

Note:

- 1、 Strictly comply with the requirements of construction in wiring engineering;
- 2、 Instruments that do not need communication should be connected to RS-485 network for diagnosis and testing;
- 3、 When connecting RS-485 cable, try to use double-color twisted pair ,485 communication port “A” terminal connects the same color ,and “B” terminal connects another color.
- 4、 RS-485 bus does not exceed 1200 meters.(Line length from pc communication port to the end of instrument terminal communication port connected ).

#### 6.1 Modbus protocol communication address table

The meter supports 03H command and 10H command in Modbus-RTU protocol. 03H command reads multiple registers, and 10H command writes multiple registers. Please check the protocol data format by yourself. The following table shows the register address table of the meter.

Table 8 Modbus address table

addr	name	R/W	note
0000	Voltage rms	R	
0001	Voltage index bit	R	
0002	Current rms	R	
0003	Current index bit	R	
0004	/	R	
0005	/	R	
0006	/	R	
0007	/	R	
0008	Power rms	R	
0009	Power index bit	R	
000A	/	R	
000B	/	R	
000C	Total forward active energy[1]	R	The data of [1] and [0] ([1] in high position, [0] in low position) are concatenated in hexadecimal form and then divided by 1000 in decimal form to obtain the actual electric
000D	Total forward active energy[0]	R	
000E	Current total reverse active energy[1]	R	
000F	Current total reverse active energy[0]	R	

			quantity in kWh
0010	Voltage ratio	R/W	
0011	Current ratio	R/W	
0012	Alarm and I/O	R	See below for details
001E	Minute second	R/W	High byte: minute、 Low byte: second、 BCD code、 Only available with the 06H command
001F	Day hour	R/W	High byte: day、 Low byte: hour、 BCD code、 Only available with the 06H command
0020	Year month	R/W	High byte: year、 Low byte: month、 BCD code、 Only available with the 06H command
0025	High power alarm threshold	R/W	/
0026	High power alarm time	R/W	Defaults:5s
0027	Low power alarm threshold	R/W	/
0028	Low power alarm time	R/W	Defaults:5s
0029	password	R/W	Defaults: 0000
002A	Addr、 baud	R/W	Defaults:addr:1、 baud:9600
002B	Parity、 stop	R/W	High byte:0-none,1-even,2-odd Low byte:0-stop bit=1,1-stop bit=2. Defaults:0x0200
002C	Voltage ratio		
002D	Current ratio		
002E	Pulse constant	R	
002F	LCD backlight settings	R/W	Defaults: light
0030	Rated voltage	R/W	
0031	Rated current	R/W	
0032	Alarm enable bit setting	R/W	Bit0: High voltage alarm; Bit1: Low voltage alarm; Bit2: High current alarm; Bit3: Low current alarm; Bit4: High Power alarm; Bit5: Low Power alarm;
0033	High voltage alarm threshold	R/W	Defaults:120%

0034	High voltage alarm delay time	R/W	Defaults:5s
0035	Low voltage alarm threshold	R/W	Defaults:80%
0036	Low voltage alarm delay time	R/W	Defaults:5s
0037	High current alarm threshold	R/W	Defaults:200%
0038	High current alarm delay time	R/W	Defaults:5s
0039	Low current alarm threshold	R/W	Defaults:50%
003A	Low current alarm delay time	R/W	Defaults:5s
003B			
003C			
003D	DI1 state	R/W	0:open; 1:close
003E	DI1 programming content	R/W	
003F	DI1 state	R/W	0:open; 1:close
0040	DI2 programming content	R/W	
0041	DO1 mode	R/W	0:level; 1:pulse
0042	DO1 configuration content	R/W	0- normal DO; 1- total error; 2- total error+DI1+DI2; 3- DI1; 4- DI2; 5- DI1+DI2;
0043	DO1 pulse width	R/W	1-5S
0044	DO1 mode	R/W	0:level; 1:pulse
0045	DO2 configuration content	R/W	0- normal DO; 1- total error; 2- total error+DI1+DI2; 3- DI1; 4- DI2; 5- DI1+DI2;
0046	DO2 pulse width	R/W	1-5S
0047	DI3 state	R/W	0:open; 1:close
0048	DI3 programming content	R/W	
0049	DI4 state	R/W	0:open; 1:close
004A	DI4 programming content	R/W	
004B			
004C	Additional features	R/W	Bit0-Bit1:0-3, Decimal point; Bit2:0-Modbus, 1-DLT645; Bit3:0- single rate, 1- Multiple rate; Bit4:0- DI disable, 1- DI enable;

			Bit5:0- DO disable, 1- DO enable; Bit6:0- Chinese, 1- English
004D	Settlement date	R/W	Day-hour
0055	Timetable number for time zone 1/Start date of time zone 1:day	R/W	time zone
0056	Start date of time zone 1:month/Timetable number for time zone 2	R/W	
0057	Start date of time zone 2:day/Start date of time zone 2:month	R/W	
0058	Timetable number for time zone 3/Start date of time zone 3:day	R/W	
0059	Start date of time zone 3:month/Timetable number for time zone 4	R/W	
005A	Start date of time zone 4:day/Start date of time zone 4:month	R/W	
005B	Rate number for period 1/Start of period 1: minutes	R/W	Timetable 1
005C	Start of period 1: hour/Rate number for period 2	R/W	
005D	Start of period 2: minutes/Start of period 2: hour	R/W	
005E	Rate number for period 3/Start of period 3: minutes	R/W	
005F	Start of period 3: hour/Rate number for period 4	R/W	
0060	Start of period 4: minutes/Start of period 4: hour	R/W	
0061	Rate number for period 5/Start of period 5: minutes	R/W	
0062	Start of period 5: hour/Rate number for period 6	R/W	
0063	Start of period 6: minutes/Start of period 6: hour	R/W	
0064	Rate number for period 7/Start of period 7: minutes	R/W	
0065	Start of period 7: hour/Rate number for period 8	R/W	
0066	Start of period 8: minutes/Start of period 8: hour	R/W	
0067	Rate number for period 9/Start of period 9: minutes	R/W	
0068	Start of period 9: hour/Rate number for period 10	R/W	
0069	Start of period 10: minutes/Start of period 10: hour	R/W	
006A	Rate number for period 11/Start of period 11: minutes	R/W	

006B	Start of period 11: hour/Rate number for period 12	R/W	
006C	Start of period 12: minutes/Start of period 12: hour	R/W	
006D	Rate number for period 13/Start of period 13: minutes	R/W	
006E	Start of period 13: hour/Rate number for period 14	R/W	
006F	Start of period 14: minutes/Start of period 14: hour	R/W	
0070	Rate number for period 1/Start of period 1: minutes	R/W	Timetable 2
0071	Start of period 1: hour/Rate number for period 2	R/W	
0072	Start of period 2: minutes/Start of period 2: hour	R/W	
0073	Rate number for period 3/Start of period 3: minutes	R/W	
0074	Start of period 3: hour/Rate number for period 4	R/W	
0075	Start of period 4: minutes/Start of period 4: hour	R/W	
0076	Rate number for period 5/Start of period 5: minutes	R/W	
0077	Start of period 5: hour/Rate number for period 6	R/W	
0078	Start of period 6: minutes/Start of period 6: hour	R/W	
0079	Rate number for period 7/Start of period 7: minutes	R/W	
007A	Start of period 7: hour/Rate number for period 8	R/W	
007B	Start of period 8: minutes/Start of period 8: hour	R/W	
007C	Rate number for period 9/Start of period 9: minutes	R/W	
007D	Start of period 9: hour/Rate number for period 10	R/W	
007E	Start of period 10: minutes/Start of period 10: hour	R/W	
007F	Rate number for period 11/Start of period 11: minutes	R/W	
0080	Start of period 11: hour/Rate number for period 12	R/W	
0081	Start of period 12: minutes/Start of period 12: hour	R/W	
0082	Rate number for period 13/Start of period 13:	R/W	

	minutes		
0083	Start of period 13: hour/Rate number for period 14	R/W	
0084	Start of period 14: minutes/Start of period 14: hour	R/W	

Description:

Calculation of voltage, current and power data:  $\text{Actual value} = \text{rms value} \times 10^{\text{index bit} - 3}$

0012H: Alarm and I/O status word:

15	...	11	10	9	8	7	6	5	4	...	1	0
—		A.-H	A.-L	U.-H	U.-L	DI1	DI2	DI3	DI4	—	DO1	DO2
-		Current high / low alarm		Voltage high / low alarm		DI					DO	

Description:

- ① “—”Reserved word or reserved bit.
- ②Alarm flag:1 is alarm, 0 is no alarm.

## 7 Diagnosis and troubleshooting of common faults

- Inaccurate meter measurement

Check the voltage and current wiring polarity.

- Voltage and current measurements are correct, but power measurements are incorrect.

Check if the current input direction is correct.

- Communication is abnormal

Check if the communication line is connected properly.

Check if the A and B terminals of communication are wrong.

Check if the address and baud rate settings of the meter are correct.

When the communication of multiple devices is abnormal, test whether the communication of single device is normal.



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