Acrel

PZ Series Intelligent DC Energy Meter

Installation and operation manual V1.9

Acrel Co.,Ltd.

Statement

We reserve the right to change the specification of the products in the manual, which will not be informed for you, therefore, please contact us and know about the new specifications before you order the products .

Time	Revision	Journal	Remarks
2021.05.08	V1.1	the first edition.	
2021.06.07	V1.2	1. Update technical parameters:DC current input range is 0-9999A. 2. Update diverter sampling remarks:external short circuit is required when using 3-wire connection method.	
2022.02.25	V1.3	1. When the supplementary current input is hall element(4~20mA output),the current and electric energy only support unipolar metering； 2. Update input range of DC voltage:1500V(only PZ96(L))	
2022.05.16	V1.4	1、Update communication address table； 2、Increase auxiliary power supply DC12V.	
2022.07.06	V1.5	1. Increase shunt output to support 50mV; 2. Update installation diagram of PZ series DC meter	
2022.12.23	V1.6	1、Add the setting of DO associated alarm items； 2、Modify menu setting description and communication address table	
2023.4.17	V1.7	1、delete ZD model	
2024.04.01	V1.8	1、Delete 4-20mA signal input 2、Modify 645 address setting instructions	
2025.07.01	V1.9	1、The startup display distinguishes between LCD and LED 2、Hall wiring diagram, model changed to PZ72(96)L-DE/VC	

Catalogue

1 Summary

PZ Series Intelligent DC energy meter is designed for DC panel, solar power supply, telecom base station, charging pile and other applications. This series of instruments can measure the voltage, current, power, forward and reverse energy in DC system. It can not only be used for local display, but also be connected with industrial control equipment and computer to form a measurement and control system. At the same time, it has a variety of peripheral interface functions for users to choose: with RS-485 communication interface, using Modbus-RTU protocol; It can be equipped with relay alarm output and switch input / output. According to different requirements, through the instrument panel buttons, the transformation ratio and communication are set and controlled.

2 Type and specification

Table 1   Model and function

Model	display	contour	Basic functions	Optional functions
PZ72L-DE	LCD display	72 Square	DC voltage, current, power and energy;	1、RS485 communication (/C)
PZ72-DE	LED display			2、12V power output① (/V)
				3、RS485 communication+switch 2DO (/KC)
				4、RS485 communication+switch 2DI2DO (/KC)
PZ96L-DE	LCD display	96 Square		5、RS485 communication+switch 4DI2DO ② (/KC)
				6、RS485 communication+switch 2DO+12V power output (/KVC)
PZ96-DE	LED display			7、RS485 communication+12V power output (/VC)
				8、Compound rate (/F)

Note：①Switch input function and 12V power supply function choose one from the other.
②Only PZ96（L）-DE has the function of switch 4DI2DO.

3 Technical parameter

Table 2   Main technical parameters

Technical parameter			index
Signal	DC voltage	input range	0～5V,0～100V,0～500V,0～1000V,0～1500V(only PZ96(L))
		Input impedance	≥6kΩ/V
	DC current	input range	0～9999A(External shunt or Hall element, programmable range)
		Diverter	The support output are 50mV and 75mV
		Hall sensor	The support output are 0～20mA, 0～5V
		Consumption	≤1mW
	Overload		1.2 times continuous normal operation, 2 times continuous 1 second
Accuracy class			0.5 class
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
Functions		Measurement	measure DC voltage U, current I and power P.
		Metering	measure current combined energy, forward energy and reverse energy.
		Time sharing function	Each year can be divided into 4 time zones. Each time zone table can be set with 12 daily time periods and 4 rates (F1, F2, F3, F4 are SHARP,PEAK,SHOULDER and OFF-PEAK). The minimum interval of time periods is 15 minutes. Time periods can be set across zero（LCD Meter only)
		Historical data statistics function	Count historical energy of last 12 months (energy of each rate)（LCD Meter only)
		Switch input/ output function	PZ72 has two switch output and two switch input. PZ96 has two switch output and four switch input. The switch output is relay output, which can realize remote control and alarm output. The switch input can not only collect and display the local switch status information, but also realize the remote transmission function through the RS485 of the instrument, namely the remote signaling function.
		Display	LCD（backlight delay time adjustable）or LED
		Communication	RS485 interface; half duplex, photoelectric isolation; Modbus-RTU protocol; baud rate 1200, 2400, 4800, 9600, 19200, 38400bps optional, modulation infrared fixed 1200bps.
		Switch input/ output	DI	Dry contact input, built-in power supply, photoelectric isolation
			DO	Two relay output, normally open contact, capacity 2A /30VDC or 2A/250VAC
Operating voltage		Voltage range	85～265VAC、50/60Hz; 20～60VDC; 12VDC; 100～350VDC(declare in order)
		Consumption	≤2W
Insulation resistance			≥100MΩ
Withstand voltage			3KV / 1min between power supply terminal group and signal input / output terminal group（RMS）
Environment		Temperature	Operating temperature：-40℃～+60℃；Storage temperature：-40℃～+70℃
		Humidity	≤ 93%RH，no condensation，no corrosive gas
		Altitude	≤ 2500m

Note：It is recommended to select LED display instrument when the temperature is lower than－20 ℃.

4 Installation guide

4.1 Outline and installation hole size

Table 3 Appearance and opening size of PZ series DC meter

appearance of instrument	face frame size		housing size (tolerance ±0.5mm)			hole size	
unit：mm	width	height	width	height	depth	width	height
72 square	75	75	66	66	98	67	67
96 square	96	96	86	86	92	88	88

4.2 Instrument and opening diagram

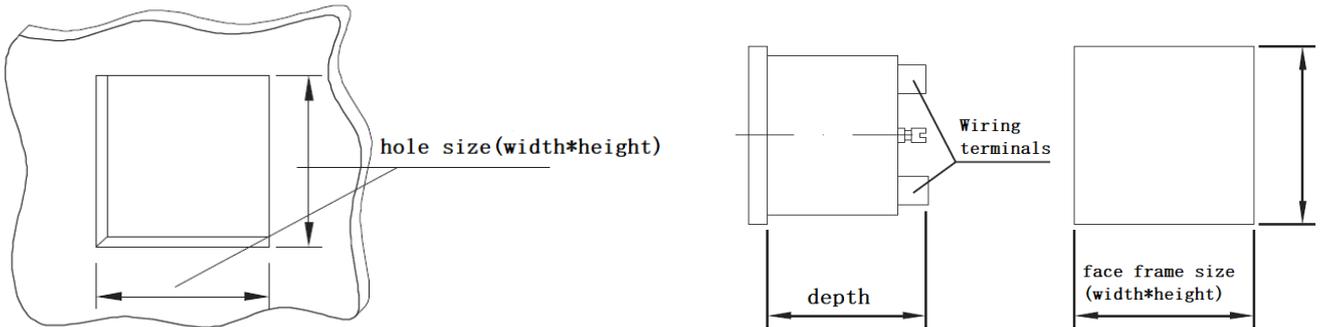
Figure 1   Opening diagram of PZ series DC meter

4.3 Installation diagram
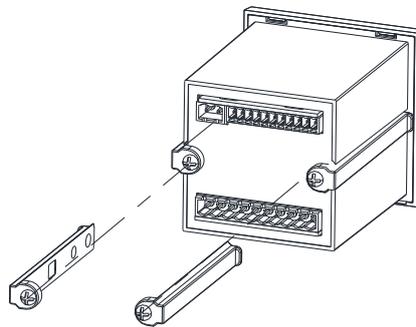
Figure 2   Installation diagram of PZ series DC meter

4.4 Installation instructions

When installing, insert the instrument into the mounting hole, install the fixing bracket, and tighten the screws to make the instrument firmly installed without loosening.

4.5 Terminals and wiring
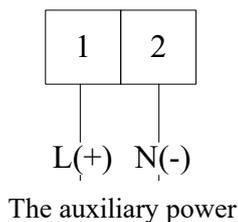
4.5.1 Instrument's auxiliary power terminal

1	2

L(+) N(-)

The auxiliary power

Figure 3   Instrument's auxiliary power terminal

4.5.2 Signal input terminal

Shielded twisted pair shall be used for current signal sampling line.

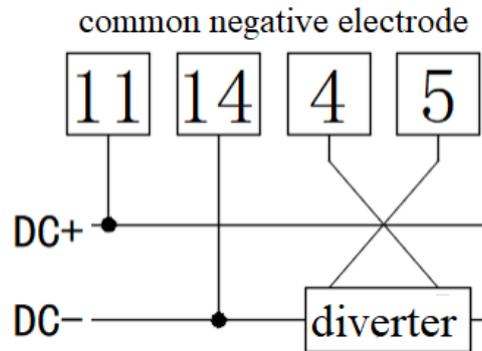（一）When using the shunt to sample the current, the wiring between the shunt and the instrument is shown in Figure 4：

Figure 4　Wiring diagram of external shunt

Note：1.If the diverter is installed in DC +, the order remarks before ordering are positive connection method, and the wiring method is subject to the actual wiring diagram.

2.When using 3-wire connection method,if the common positive connection method is adopted,terminals 11 and 4 shall be short circuited externally;in case of common negative connection,external short circuit terminal 14 and 5 is required.

（二）When the Hall current sensor is used to sample the current, the wiring between the Hall current sensor (powered separately) and the instrument is shown in Figure 5:
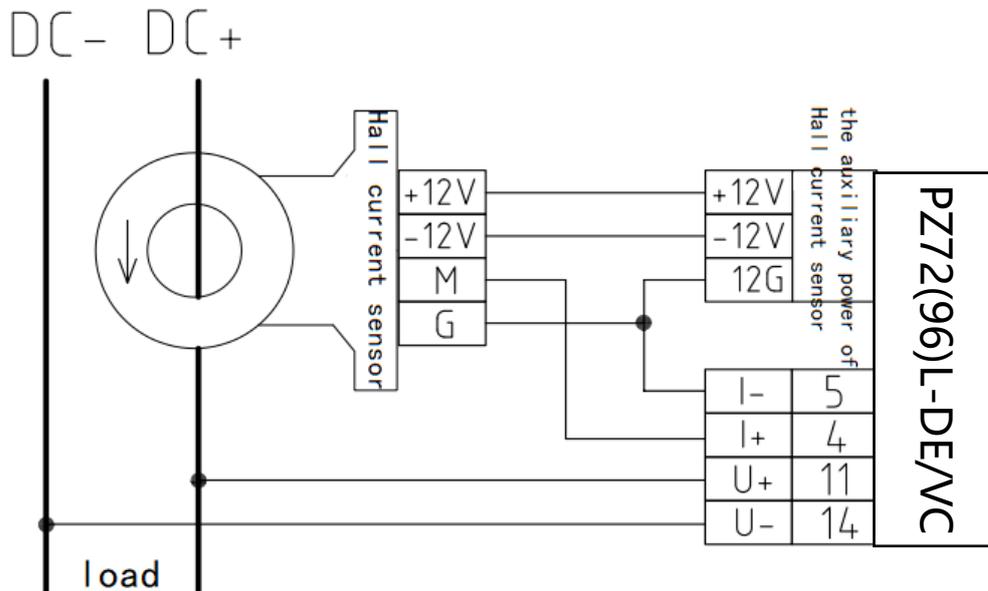

Figure 5 Typical wiring diagram of Hall current sensor

Note：Figure 5 is a typical wiring diagram of the Hall current sensor for reference only. If it is inconsistent with the actual wiring diagram of the Hall current sensor, please refer to the wiring diagram shown in the manual of the actual Hall current sensor.

（三）When the Hall current sensor is used to sample the current, the wiring between the Hall current sensor (supplied by the optional function of the instrument: 12V power output) and the instrument is shown in Figure 6：The wiring shown in Figure 6 is only applicable to the power supply ± 12V Hall current sensor.
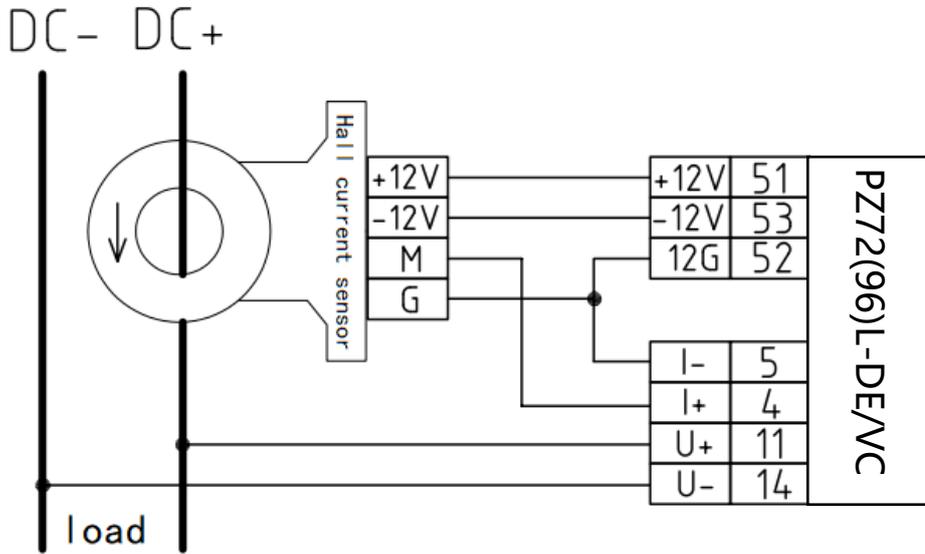
Figure 6　Typical wiring diagram of Hall current sensor (supplied by 12V power output of optional function of instrument)

Note：In actual use, when the voltage and current signals are all positive or negative, the power will be expressed as positive, and the energy will be expressed as kWh; When the voltage and current are positive and negative, the power will be negative, and the electric energy will be expressed in kWh. The positive and negative electric energy is measured separately,which has no influence on each other.

4.5.3 Additional function terminal
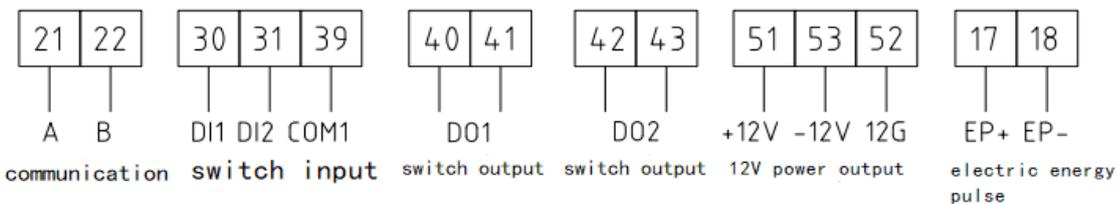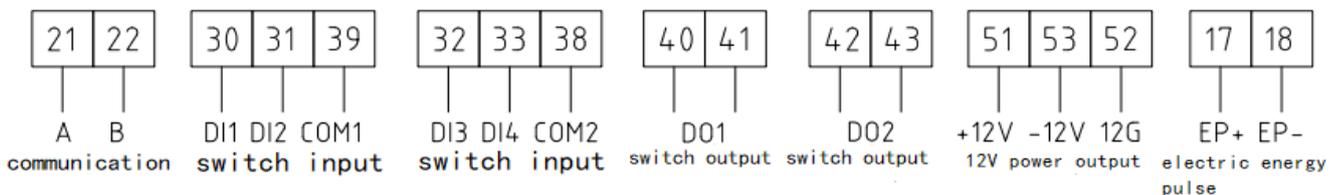
Figure 8 Additional function terminal

Note：The wiring is for reference only, and the specific wiring diagram on the instrument shall prevail;

Switch input function and 12V power supply function choose one from the other;

4.6 Notes

1. The input voltage shall not be higher than 120% of the rated input voltage of the product. 3A fuse shall be installed at the voltage input;

2. External diverter or Hall current sensor shall be used for current input.

5 Operation and display

5.1 Key function description

Table 4   Key function description

Key Icon	Name	Function
SET	Menu	Enter / Exit menu
◀	Left	View power parameters、 left shift in programming interface
▶	Right arrow	View power parameters、 Right shift in programming interface
↵	Programming/ Enter key	Programming interface to save the settings

5.2 Display interface

5.2.1 LCD display interface

After power on, the current positive total power is displayed. The screen can be flipped through the left and right buttons. The sequence of various display interfaces is as follows:

Table 5   Display interface description

◀ ▶	Current forward total power, current forward total sharp power, current forward total peak power, current forward total shoulder power, current forward total off-peak power,current reverse total power, current reverse total sharp power, current reverse total peak power, current reverse total shoulder power, current reverse total off-peak power, current time (year,month and day), current time (hour,minute and second), voltage, current, power Version number.

Directions：

1、The above list is the name of all display interfaces of PZ series DC energy meter. The left and right buttons can switch different types of display contents, and the switching order is as described above;

2、For the meter without multi rate function, it does not display the date, time and all kinds of time-sharing energy (They are sharp, peak, shoulder and off-peak energy).

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

5.2.2 LED display interface

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

Press the left and right key to cycle the display
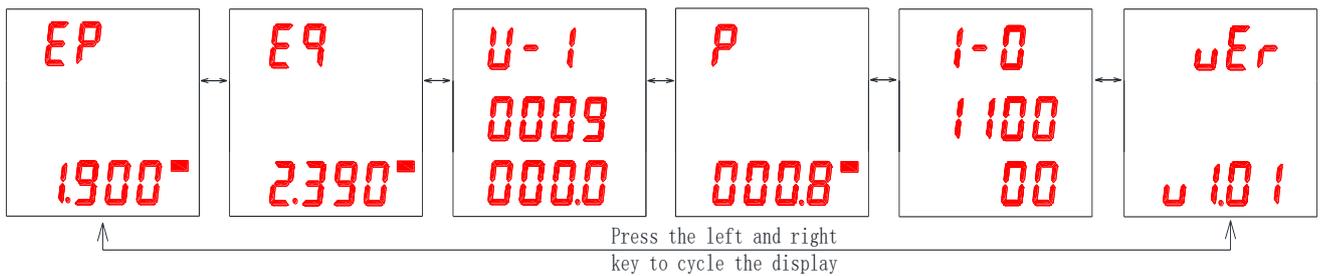
Directions：

The second line of U-I interface：voltage value (primary), unit ：Volt(V)

The third line of U-I interface：current value (primary),unit：Ampere(A)

P：power (primary),unit：kW/MW

Ep：positive energy (primary),unit：kWh/MWh

Eq：reverse energy (primary),unit：kWh/MWh

vEr：the software version

I- O：DI、DO status，the second line represents the status of DI1-DI4,the third line represents DO1-DO2
(PZ72 only displays DI1 and DI2 status), 0 represents on, 1 represents off

5.3 Menu programming interface (LCD, LED)

Under any display interface in the measurement display menu, press SET to enter the "PASS" interface, then press ↵ to display "0000",when prompted to enter the password, press ↵ ， If the password is entered incorrectly, return to "0000" to re-enter; If the password is entered correctly, the parameter can be set.After setting, press SET to enter "SAvE" interface,then press ↵ under "YES"to save and exit ,otherwise pressing ↵ under "no"to exit without saving.

5.4 Settable data item

Table 6   Setup menu description

Serial number	first level menu		Second level menu		
	Symbol	meaning	Symbol	meaning	Range
1	In	Ratio settings	Pt	Voltage ratio	1-9999
			Ct	Current ratio	1-9999
			Ue	Voltage rating	1-9999
2	BUS	Communication settings	Addr	address	1-247
			Buad	Baud rate	38400、19200、9600、4800、2400、1200
			Parity	Check bit	nonE、EvEn、odd
			Stop	Stop bit	1、2
			Id1	DL/T645-2007 protocol high 6 bits(LCD)/high 4 bits(LED)	000000-999999(LCD)/ 0000-9999(LED)
			Id2	DL/T645-2007 protocol low 6 bits(LCD)/middle 4 bits(LED)	000000-999999(LCD)/ 0000-9999(LED)
			Id3	DL/T645-2007 protocol low4 bits(LED)	0000-9999(LED)
3	SYS	System settings	EF.E	Multi-rated selection	EF:Multiple rate E:non compound rate
			Code	Password	0000-9999
			Clr.e	Electric energy clearing	N：cancel power clearing Y：define power clearing
			Language	Choose language	Chinese/English
			Uishield	Voltage and current shielding value	The first two are voltage shielding values; The last two digits are current shielding values;
			Ep1	Pulse light signal selection	Ep：pulse output 1kwh：one pulse per kWh
			Ep2	Pulse light signal selection	EP1：the signal output is the same as EP1 Sec：pulse per second
			Puls	Pulse constant	0-9999（0 means self-adaption）
			Neg.i	Reverse current connection	0：direct connection 1：inversed connection

			Neg.u	Reverse voltage connection	0：direct connection 1：inversed connection
			In.tp	Signal input selection	75:75mV 0-5:0-5V 0-20:0-20mA 4-20:4-20mA
4	Alarm	Alarm settings	U.H	High voltage alarm(unit 0.1%)	5-2000
			U.H.B	High voltage alarm hysteresis (unit 0.1%)	5-2000
			U.L	Low voltage alarm (unit 0.1%)	5-2000
			U.L.B	Low voltage alarm hysteresis (unit 0.1%)	5-2000
			A.H	High current alarm (unit 0.1%)	5-2000
			A.H.B	High current alarm hysteresis (unit 0.1%)	5-2000
			A.L	Low current alarm(unit 0.1%)	5-2000
			A.L.B	Low current alarm hysteresis (unit 0.1%)	5-2000
			P.H	High power alarm(unit 0.1%)	5-2000
			P.H.B	High power alarm hysteresis (unit 0.1%)	5-2000
			P.L	Low power alarm(unit 0.1%)	5-2000
			P.L.B	Low power alarm hysteresis (unit 0.1%)	5-2000
			AL.T	Alarm delay (unit 0.01S)	5-999
5	DIDO	DIDO settings	DI1 State	DI1 status	Open、Close
			DI1 Kind	DI1 programming content	Normal:common DI、 Link1:linkage 1、Link2:linkage 2
			DI2 State	DI2 status	Open、Close
			DI2 Kind	DI2 programming content	Normal:common DI、 Link1:linkage 1、Link2:linkage 2
			DI3 State	DI3 status	Open、Close
			DI3 Kind	DI3 programming content	Normal:common DI、 Link1:linkage 1、Link2:linkage 2
			DI4 State	DI4 status	Open、Close
			DI4 Kind	DI4 programming content	Normal:common DI、 Link1:linkage 1、Link2:linkage 2
			DO1 Mode	DO1 pattern	Level、Pulse、Block
			DO1 Kind	DO1 configuration content	Normal:common DO; all:general faults; alldi12:general faults+DI1+DI2; di1:DI1; di2:DI2;

|						di12:DI1+DI2; U.H:high voltage alarm; I.H:high current alarm; P.H:high power alarm; U.L:low voltage alarm; I.L:low current alarm; P.L:low power alarm;
				DO1 Time	DO1 pulse width(unit:S)	1-5
				DO2 Mode	DO2 pattern	Level、Pulse、Block
				DO2 Kind	DO2 configuration content	Normal:common DO; all:general faults; alldi12:general faults+DI1+DI2; di1:DI1; di2:DI2; di12:DI1+DI2; U.H:high voltage alarm; I.H:high current alarm; P.H:high power alarm; U.L:low voltage alarm; I.L:low current alarm; P.L:low power alarm;
				DO2 Time	DO2 pulse width(unit:S)	1-5
				Do1 Alm	reserve	
				Do2 Alm	reserve	
6	DISP	Rotation display setting		Blcd	Backlight time(unit:10S)	0：Light 1-99
				Def	Initial interface	0-23(LCD)、0-6(LED) 0: AutoPager
7	Dot	decimals		D.i	Current decimal places	Auto：automatic 0-4
				D.U	Voltage decimal places	Auto：automatic 0-4
				D.P	Power decimal places	Auto：automatic 0-4
				D.EP	Decimal places of electric energy	Auto：automatic 0-3
				C.i	Modbus communication（register address 1002-1003）current decimal places	0-4，default 1
				C.U	Modbus communication（register address 1000-1001）voltage decimal place	0-4，default 3
				C.P	Modbus communication（register address 1004-1005）power decimal	0-4，default 3
				C.EP	Modbus communication	0-4，default 3

				(register address 1006-1009) decimal place of electric energy	
8	His	Historical electric energy （LCD display）	Combined electricity consumption of last January to December	Combined electricity consumption of last January to December	/
9	Timeset	Set time	Date	Set date	Year.Month.Day
			Time	Set time	Hour：Minute：Second

Note：The settable items of DI3 and DI4 of PZ96(L)-DE are the same as those of DI1 and DI2.

5.5 Programming examples

The programming example introduces how to change some options in the programming menu, such as current multiple, in the form of flow chart.
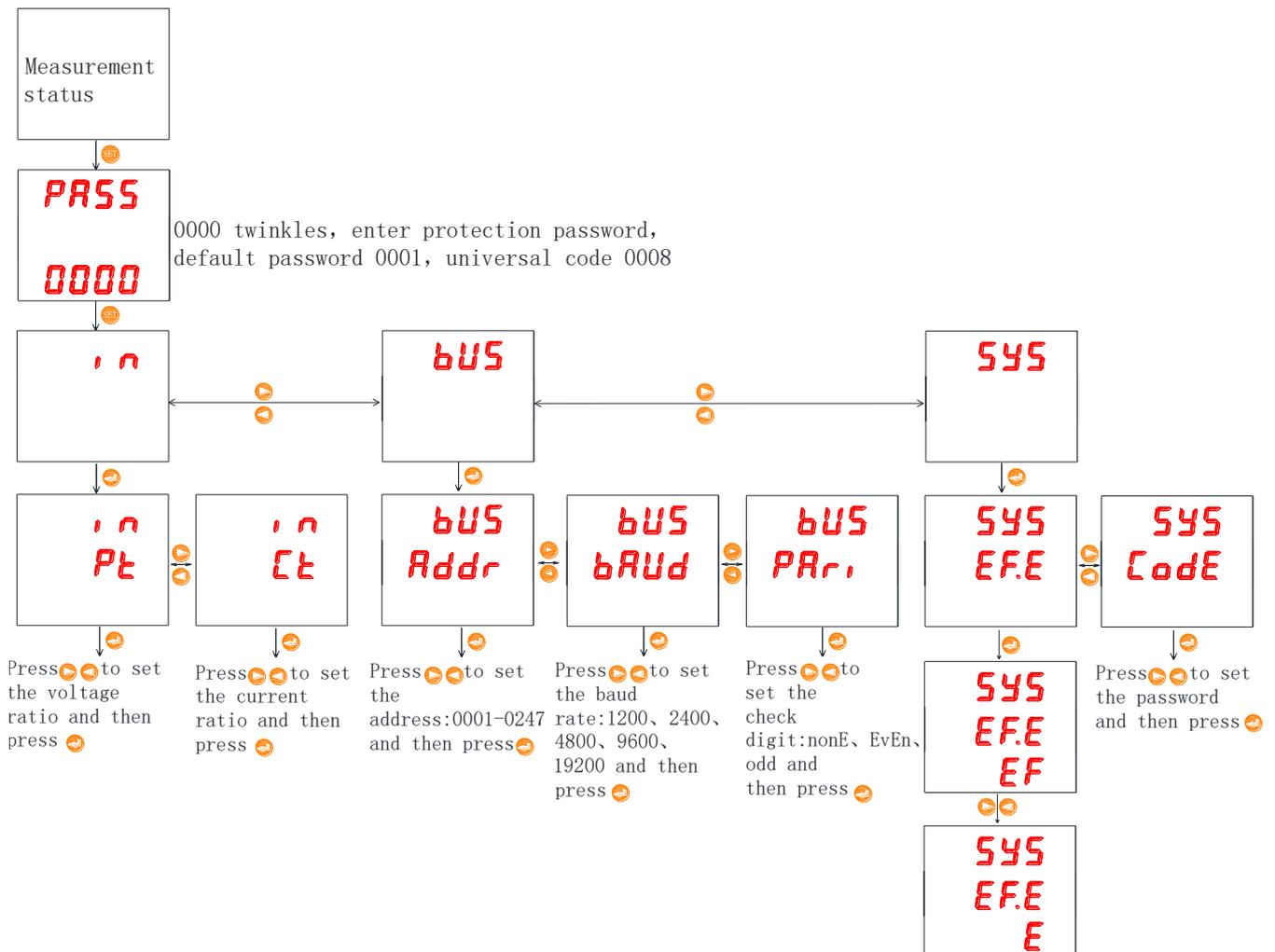
Note：After setting or selecting, you need to press enter to confirm. After confirmation, press SET key continuously until SAVE page appears. At this time, you must press enter to display YES/No interface, press right (the second key) or left (the third key) to switch to display YES, and then press enter (the first key) to save the modification, otherwise the setting is invalid.

6 Communication instructions

The RS485 communication interface of the instrument supports MODBUS-RTU communication protocol .The baud rate of the communication interface can be set between 1200bps, 2400bps, 4800bps, 9600bps, 19200bps and 38400bps.

The RS485 communication port of the instrument is required to be connected with shielded twisted pair. When wiring, the layout of the whole network should be considered, such as the length and direction of the communication cable, the position of the upper computer, the matching resistance at the end of the network, the communication converter, the network scalability, the network coverage, the electromagnetic interference of the environment and other factors.

Note：

1、 The wiring engineering should be constructed in strict accordance with the requirements；

2、 For the instruments that do not need communication temporarily, they should be connected to RS-485 network to facilitate diagnosis and testing；

3、 When connecting RS-485 cable, double color twisted pair should be used as far as possible. 485 communication port "A" is connected with the same color, and "B" is connected with another color.

4、 The length of RS-485 bus (from the communication port of upper computer to the communication port of instrument terminal connected at the end) shall not exceed 1200 meters.

6.1 Modbus protocol communication address table

The instrument supports 03h and 10h commands in MODBUS-RTU protocol. 03h is to read multiple registers and 10h is to write multiple registers. Please check the protocol data format by yourself. The following table is the register address table of the instrument:

Table 8   Communication address table

Addr	Name	Attribute	Remarks
0000	Voltage RMS	R	Calculation method of voltage, current and power data：registration = effective value×10（Index level-3）
0001	Voltage index	R	
0002	Current RMS	R	
0003	Current index	R	
0004	Reserve	R	
0005	Reserve	R	
0006	Reserve	R	
0007	Reserve	R	
0008	Effective value of power	R	
0009	Power index	R	
000A	Reserve	R	
000B	Reserve	R	
000C	Current positive total active energy[1]	R	After splicing the data of [1] and [0] in hexadecimal form ([1] in high order and [0] in low order), divide it by 1000 in decimal form to get the actual power, unit: kWh
000D	Current positive total active energy[0]	R	
000E	Current reverse total active energy[1]	R	
000F	Current reverse total active energy[0]	R	
0010	Voltage ratio	R/W	

0011	Current ratio	R/W	
0012	Alarm and I/O	R	See below for details
0013-001D reserve			
001E	Minute and second	R/W	High：minute，Low：second；the data is in BCD format and can only be issued with 06H command
001F	Day and hour	R/W	High：day，Low：hour；the data is in BCD format and can only be issued with 06H command
0020	Year and month	R/W	High：year，Low：month；the data is in BCD format and can only be issued with 06H command
0021-0024 reserve			
0025	High power alarm threshold	R/W	Default：200%
0026	High power alarm delay time	R/W	Default：5s
0027	Low power alarm threshold	R/W	Default：5s
0028	Low power alarm delay time	R/W	Default：5s
0029	Password	R/W	
002A	Communication address and baud rate	R/W	High-order：1-247 Low position：baud rate 0：1200，1：2400，2：4800，3：9600，4：19200，5：38400；Default：0x0103
002B	Check bit, stop bit	R/W	High-order：0-no check，1-Odd check，2-Even check；Low position：0-1 stop bit，1-2 stop bit；Default：0x0200
002C	Voltage ratio		
002D	Current ratio		
002E	Pulse constant EC	R	
002F	LCD backlight setting	R/W	Default：light
0030	Rated voltage	R/W	
0031	Rated current	R/W	
0032	Alarm allowed 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	Default：120%
0034	High voltage alarm delay time	R/W	Default：5s
0035	Low voltage alarm threshold	R/W	Default：80%
0036	Low voltage alarm delay time	R/W	Default：5s
0037	Current high alarm threshold	R/W	Default：200%
0038	High current alarm delay time	R/W	Default：5s
0039	Current low alarm threshold	R/W	Default：50%
003A	Low current alarm delay time	R/W	Default：5s
003B			
003C			
003D	DI1 status	R/W	0：open；1：close

003E	DI1 programming content	R/W	
003F	DI2 status	R/W	0：open；1：close
0040	DI2 programming content	R/W	
0041	DO1 mode	R/W	0：level；1：pulse；2:block
0042	DO1 configuration content	R/W	0-common DO； 1-general fault； 2-general fault+DI1+DI2； 3-DI1； 4-DI2； 5-DI1+DI2； 6-U.H:high voltage alarm； 7-I.H:high current alarm； 8-P.H:high power alarm； 9-U.L:low voltage alarm； 10-I.L:low current alarm； 11-P.L:low power alarm；
0043	DO1 pulse width	R/W	1-5S
0044	DO2 mode	R/W	0：level；1：pulse；2:block
0045	DO2 configuration content	R/W	1-common DO； 1-general fault； 2-general fault+DI1+DI2； 3-DI1； 4-DI2； 5-DI1+DI2； 6-U.H:high voltage alarm； 7-I.H:high current alarm； 8-P.H:high power alarm； 9-U.L:low voltage alarm； 10-I.L:low current alarm； 11-P.L:low power alarm；
0046	DO2 pulse width	R/W	1-5S
0047	DI3 status	R/W	0：open；1：close
0048	DI3 programming content	R/W	
0049	DI4 status	R/W	0：open；1：close
004A	DI4 programming content	R/W	
004B			
004C	Additional functions	R/W	Bit0-Bit1:0-3，decimal places； Bit2:0-Modbus； Bit3:0-Single rate，1-Multiple rate； Bit4:0-no DI，1-DI； Bit5:0-no DO，1-DO； Bit6:0-Chinese display，1-English display
004D	Meter reading day	R/W	Day-hour
004E-0054 reserve			
0055	Time zone 1 time zone table number / time zone 1 start date: day	R/W	Time zone table
0056	Time zone 1 start date: month / time zone	R/W	

	2 time period table number		
0057	Time zone 2 start date: day / time zone 2 start date: month	R/W	
0058	Time zone 3 time zone table number / time zone 3 start date: day	R/W	
0059	Time zone 3 start date: month / time zone 4 time period table number	R/W	
005A	Time zone 4 start date: day / time zone 4 start date: month	R/W	
005B	Rate no. of period 1 / start of period 1: minute	R/W	First time table
005C	Start of the first period: hour / rate number of the second period	R/W	
005D	The beginning of the second period: minutes / the beginning of the second period: hour	R/W	
005E	Period 3 rate No. / period 3 start: minute	R/W	
005F	Start of the third period: hour / rate no. of the fourth period	R/W	
0060	The beginning of the fourth period: minute / the beginning of the fourth period: hour	R/W	
0061	Period 5 rate No. / period 5 start: minute	R/W	
0062	Start of period 5: hour / rate no. of period 6	R/W	
0063	Start of period 6: minute / start of period 6: hour	R/W	
0064	Period 7 rate No. / period 7 start: minute	R/W	
0065	Start of period 7: hour / rate no. of period 8	R/W	
0066	The beginning of the 8th period: minute / the beginning of the 8th period: hour	R/W	
0067	Period 9 rate No. / period 9 start: minute	R/W	
0068	Start of the 9th period: hour / rate no. of the 10th period	R/W	
0069	Beginning of the 10th period: minute / beginning of the 10th period: hour	R/W	
006A	Period 11 rate No. / period 11 start: minute	R/W	
006B	Start of the 11th period: hour / rate no. of the 12th period	R/W	
006C	Beginning of the 12th period: minute / beginning of the 12th period: hour	R/W	
006D	Period 13 rate No. / period 13 start: minute	R/W	
006E	Start of period 13: hour / rate no. of period 14	R/W	

006F	Start of the 14th period: minute/ start of the 14th period: hour	R/W	
0070	Rate no. of period 1 / start of period 1: minute	R/W	Second time table
0071	Start of the first period: hour / rate number of the second period	R/W	
0072	The beginning of the second period: minute / the beginning of the second period: hour	R/W	
0073	Period 3 rate No. / period 3 start: minute	R/W	
0074	Start of the third period: hour / rate no. of the fourth period	R/W	
0075	The beginning of the fourth period: minute / the beginning of the fourth period: hour	R/W	
0076	Period 5 rate No. / period 5 start: minute	R/W	
0077	Start of period 5: hour / rate no. of period 6	R/W	
0078	Start of period 6: minute / start of period 6: hour	R/W	
0079	Period 7 rate No. / period 7 start: minute	R/W	
007A	Start of period 7: hour / rate no. of period 8	R/W	
007B	The beginning of the 8th period: minute / the beginning of the 8th period: hour	R/W	
007C	Period 9 rate No. / period 9 start: minute	R/W	
007D	Start of the 9th period: hour / rate no. of the 10th period	R/W	
007E	Beginning of the 10th period: minute / beginning of the 10th period: hour	R/W	
007F	Period 11 rate No. / period 11 start: minute	R/W	
0080	Start of the 11th period: hour / rate no. of the 12th period	R/W	
0081	Beginning of the 12th period: minute / beginning of the 12th period: hour	R/W	
0082	Period 13 rate No. / period 13 start: minute	R/W	
0083	Start of period 13: hour / rate no. of period 14	R/W	
0084	Start of the 14th period: minute / start of the 14th period: hour	R/W	
0085			
0086			
0087	user's code[0][1]	R/W	
0088	user's code[2][3]	R/W	
0089	user's code[4][5]	R/W	

008A	meter number[0][1]	R/W	
008B	meter number[2][3]	R/W	
008C	meter number[4][5]	R/W	
03E8-03E9	Voltage RMS	R	32-bit signed integer, unit：V，decimal reference 0x0450，default 1
03EA-03EB	Current RMS	R	32-bit signed integer, unit：A，decimal reference 0x0451，default 3
03EC-03ED	Effective value of power	R	32-bit signed integer, unit：W，decimal reference 0x0452，default 3
03EE-03EF	Positive active energy	R	32-bit unsigned integer, unit：kWh，decimal reference 0x0453，default 3
03F0-03F1	Reverse active energy	R	32-bit unsigned integer, unit：kWh，decimal reference 0x0453，default 3
03F2	Positive power overflow times	R	Add 1 to this register for every 400 million wh of forward power
03F3	Reverse power overflow times	R	Add 1 to this register for every 400 million wh of forward power
044C	LCD display voltage decimal	R/W	0-5, 5 is automatic, the default is automatic
044D	LCD current decimal	R/W	0-5, 5 is automatic, the default is automatic
044E	LCD power decimal	R/W	0-5, 5 is automatic, the default is automatic
044F	LCD display power decimal	R/W	0-3, default 3
0450	Modbus communication（register address 1000-1001）voltage decimal place	R/W	0-4，default 1
0451	Modbus communication（register address 1002-1003）current decimal places	R/W	0-4，default 3
0452	Modbus communication（register address 1004-1005）Power decimal	R/W	0-4，default 3
0453	Modbus communication（register address 1006-1009）Decimal place of electric energy	R/W	0-4，default 3
0457	Current shielding value	R/W	Default 3，that's three thousandths
0458	Voltage shielding value	R/W	Default 3，that's three thousandths
045A	Reverse current connection	R/W	0：Direct connection 1：Reverse connection default 0
045B	Reverse voltage connection	R/W	0：Direct connection 1：Reverse connection default 0
045C	Pulse output selection	R/W	Bit0：Pulse lamp output selection　0：Electric energy pulse output　1：1kwh one pulse Bit1：Terminal pulse output selection 0：The setting is the same as bit0　1：pps
045D	Pulse constant	R/W	0-9999，0 is adaptive
045E	Signal input selection	R/W	0： 75mV 1： 0-5V 2： 0-20mA 3： 4-20mA

0012H:Alarm and switch input / output 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
Reserve		High and low current alarm		High and low voltage alarm		Switch input					Switch output	

Instructions：

① **"-" means reserved word or reserved bit.**

② **Alarm flag bit: 1 for alarm, 0 for no alarm.**

7 Diagnosis and troubleshooting of common faults

● **Inaccurate measurement of instrument**

Check whether the polarity direction of input voltage and current wiring is correct.

● **The voltage and current measurement are correct, but the power measurement is inaccurate**

Check whether the current input direction is correct；

Check whether the corresponding phase of each current circuit is correct.

● **Abnormal communication**

Check whether the communication cable is connected normally；

Check whether terminals A and B of communication are staggered；

Check whether the address of the instrument is set correctly and whether the baud rate of communication is set correctly；

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