DIN-rail Mounted DC Energy Meter

User Manual

Applied to：
PD195Z-CD32F

JIANGSU SFERE ELECTRIC CO., LTD.

Safety instructions

⚡	**Danger sign is used to warn operation personnel that there is a danger. If this danger is neglected, injury or death will occur to personnel, and equipment will be damaged.**
⚠	**Warning sign is used to call operation personnel's attention to take appropriate care measures, otherwise injury or death will occur to personnel.**

CAUTION:

◆Make sure only the qualified technicians perform the installation and maintenance;

◆Before performing wiring operation to the meter, make sure the input signal and the power supply are switched off;

◆The proper voltage detecting device should be used to guarantee no voltage in any part of the meter;

◆The electrical parameters supplied should be within the rated range;

The following situations may result in damages to the meter or cause mistakes in the operation of the meter.

◆The voltage of the auxiliary power supply goes beyond the rated range.

◆The frequency of the power distribution system goes beyond the rated range.

◆The input polarity of the voltage or the current is incorrect.

◆Remove or connect the communication plugs without powering off.

◆Connect the terminal wires against the related instructions.

⚡ Please don't touch the terminals when the meter is in operation!

Content

1. Product introduction

1.1 Overview

This DC watt hour meter is applicable to DC charging pile and can (support) measure the voltage, current, power, electric energy and other parameters of two DC circuits. It has RS485 communication interface to realize remote data transmission.

1.2 Model selection

Model	Measurements (2 channel)				COMM	Energy Pulse
	U	I	P	E		
PD195Z-CD32F	DC 1000V	DC 75mV	●	●	1 loop	2 loops

2. Technical specifications

Electrical character			
Accuracy	Active energy Class 1		
Data refresh frequency	1s		
Measuring	Voltage	Input range	DC 1000V
		Measurement range	50V～1200V
		Accuracy	0.2%
		Characteristic	consumption<1W, impedance >1MΩ
	Current	Input	DC 75mV
		Measurement range	0.002In～1.2In
		Accuracy	0.2%
	Power	Accuracy：0.5%	
Power supply	Working range	DC20V～36V	
	Power consumption	≤1W	
Communication		RS485interface, Modbus-RTU	

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	Baud rate 1200～38400bps
Mechanical character	
Protection	IP20
Environmental characteristics	
Working temperature	-25～70℃
Storage temperature	-30～70℃
Relative humidity	≤95%RH
Pollution degree	2
Altitude	2000m
Electromagnetic compatibility characteristics	
Electrostatic discharge immunity	GB/T 17626.2 IV class
Radio frequency electromagnetic field radiation immunity	GB/T 17626.3 IV class
Electrical fast transient burst immunity	GB/T 17626.4 IV class
Surge (impact) immunity	GB/T 17626.5 IV class
Radio interference	GB 9254 B class

3 Installation and Wiring

3.1 Dimension
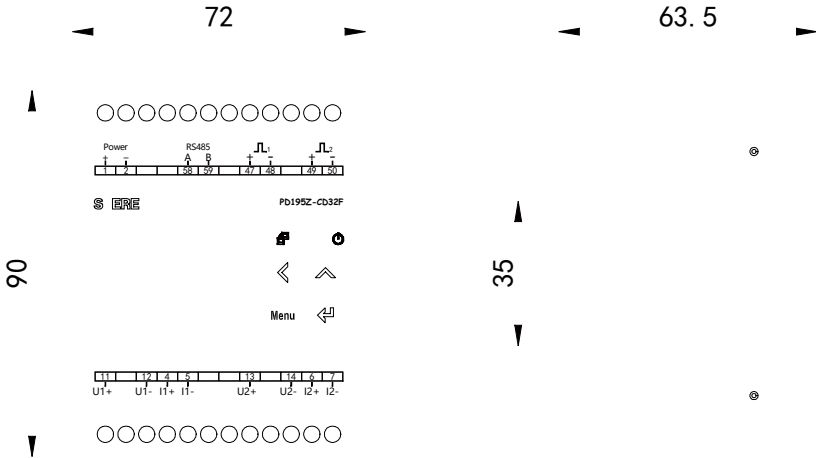
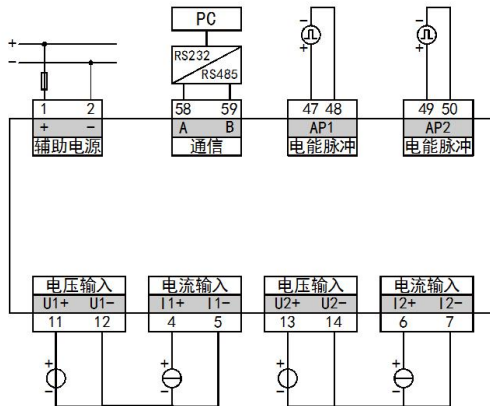Figure 3-2 PD195Z-CD32F Dimensions

3.2 Wiring

Figure 3-3 PD195Z-CD32F wiring

The terminals of the CD32F DC metering module are numbered uniformly, as shown in the table below:

Power supply	1，2	Auxiliary working power supply
Current signal	4，5，6，7	75mV input
Voltage signal	11，12，13，14	DC voltage input
Energy pulse	47，48，49，50	47 and 49 are the positive terminal of passive output, which is connected to the positive terminal of the external power supply.
RS485	58，59	A+, B-

Instructions：

(1) 1 and 2 are the auxiliary power supply of the instrument, please ensure that the power supply is suitable for this series of products to prevent damage to the product.

(2) For the use of the detailed wiring terminals, please connect according to the wiring diagram on the specific product shell.

(3) The terminal of the current must not be suspended to prevent the wrong value from being displayed.

(4) Connect the negative terminal of the voltage input to the negative terminal of the corresponding current shunt.

4 Operation

4.1 Panel

SFERE   PD195Z-CD32F

Menu

Figure 4-1 PD195Z-CD32F panel diagram
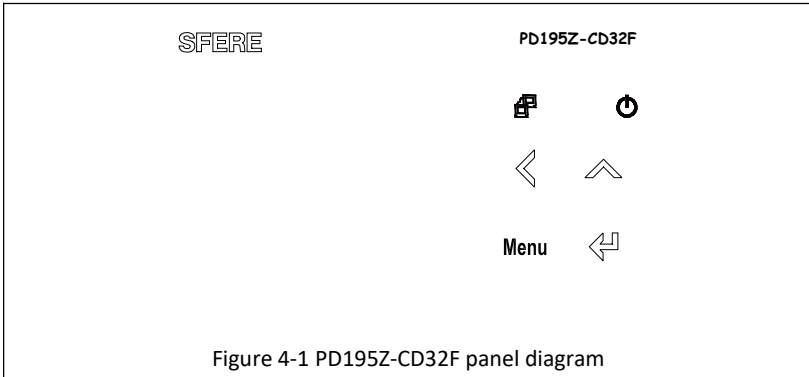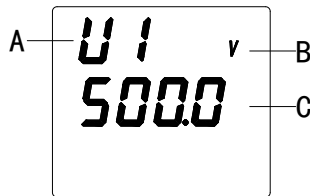
4.2 Display

A: Data (parameter) indication   B: Data unit and order of magnitude

C: Data value

The meter uses segment code LCD to display meter information. Contains information such as the unit, magnitude, type, phase, etc. of the data, as well as communication instructions.

4.3 Basic electricity measurement

The meter measures electrical parameters such as voltage, current, power, and electrical energy, which can be viewed on the meter screen, but some parameters can only be read through communication.

The following table is an example of the display of basic electricity.

U1 v **500.0**	Voltage U1＝500.0V Note: When the voltage value is greater than 21.47MV, it is displayed as FFFF
I1 A **100.0**	Current I1＝100.0A
P1 k W **50.00**	Power P1=50kW
EP1 k W h **0010** **00.00**	Positive energy EP1=1000kwh
En1 k W h **0005** **50.00**	Negative energy EN1=550kwh

4.4 Key icon and function description

The user can set the parameters of the instrument by pressing the keys.

Key icon	Key function description
≪	Move options up / page forward / modify parameters / add

	selected data bits
$\hat{\ll}$	Move options down / page back / modify parameters
Menu	Return to the previous menu / show options to jump directly
◄┘	Enter selected options

Value modification method

Press "《" to move and modify the data bit, and press "❖" to increase the current data bit cyclically.

Enter programming mode

In the measurement display interface, long press the "Menu" key for more than 3 seconds, the meter will display "$rEAd$", click the "《" or "❖" key to select "$ProG$"; press the "◄┘" key to enter the password input interface, and enter the password through the "《" or "❖" key password (the default password is 0001), and then press the "◄┘" key, if the password is correct, you can enter the setting interface.

Exit programming mode

After the data (or options) of the third-level menu is changed, press the "◄┘" key to confirm the change, and press the "Menu" key to exit the change. Press the "Menu" key to return to the first-level menu, and then press the "Menu" key, the meter will prompt "save--no", at this time, there are two options:

1) Do not save the setting parameters: press the "◄┘" key;

2) Save the setting parameters: press the "《" or "❖" key to select "save--yes", and then press the "◄┘" key;

3) Return to the programming menu: press the "Menu" key

In setting operation: "《" key is used for menu switch key and numerical value left shift, "❖" key is used for menu switch key, numerical addition and subtraction and movement of decimal point, "Menu" key is used to return, "◄┘" key is used to enter menu and confirmation after modifying the value.

4.5 Settings menu overview

SYS ×
系统
    SYS CodE ×
        SYS CodE 000 1× → SYS CodE 0002×   密码
    SYS CLr.E ×
        SYS CLr.E no× → SYS CLr.E YES×   电能清零

InPt ×
信号
    InPt ᵏ Pt l.l → InPt ᵏ Pt l.l 1.000 → InPt ᵏ Pt l.l 2.000   PT1.1
    InPt ᵏ Pt l.2 → InPt ᵏ Pt l.2 1.000 → InPt ᵏ Pt l.2 2.000   PT1.2
    InPt ᵏ Ct l.l → InPt ᵏ Ct l.l 0.100 → InPt ᵏ Ct l.l 0.700   CT1.1
    InPt ᵏ Ct l.2 → InPt ᵛ Ct l.2 0.075 → InPt ᵛ Ct l.2 0.075   CT1.2

Con1 ×
通信
    Con1 Addr × → Con1 Addr 000 1× → Con1 Addr 0247×   仪表地址
    Con1 bAUd × → Con1ᵏ bAUd 4.8× → Con1ᵏ bAUd 9.6×   波特率
    Con1 dAtA × → Con1 dAtA n.8. 1× → Con1 dAtA n.8.2× → Con1 dAtA o.8. 1× → Con1 dAtA E.8. 1×   校验方式

For the detailed description of the setting menu, please refer to the following
description of the character code of the setting menu

First level		Second level		Third level	
Code	Description	Code	Description	Character code / value	Description

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5Y5	System parameters	CodE	Password	0000~9999	Set user password
		CLr.E	Clean energy	no	Invalid
				YE5	Valid
inpt	Input settings	pt1-1	Circuit 1 primary voltage	000001~999999	V
		pt1-2	Circuit 1 secondary voltage	000001~999999	V
		ct1-1	Circuit 1 primary current	000001~009999	A
		pt2-1	Circuit 2 primary voltage	000001~999999	V
		pt2-2	Circuit 2 secondary voltage	000001~999999	V
		ct2-1	Circuit 2 primary current	000001~009999	A
Con1	Comunication	Addr	Meter address	0001~0247	1~247
		bAUd	Baud rate	1200~38400	1200~38400bps
		dAtA	Data format	N81	n.8.1
				O81	o.8.1
				E81	e.8.1
				N82	n.8.2

Basic parameter settings

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Example: Set the Modbus address to 12, modify the baud rate to 9600, and modify the data parity format to even parity. The operations are as follows:

进入编程设置

修改从站地址为12

波特率改为9600

校验方式改为偶校验

保存退出

5 Function

5.1 Energy pulse output

The instrument provides 2-way energy pulse output to realize the verification and remote transmission of power data. The pulse output is a collector-level open-circuit optocoupler, and a remote computer terminal, PLC, and DI switch acquisition module can be used to collect the total number of pulses of the instrument to realize the cumulative measurement of electric energy. The output

method used is the method of accuracy inspection of electric energy (National Metrology Regulations: Pulse Error Comparison Method of Standard Meter).
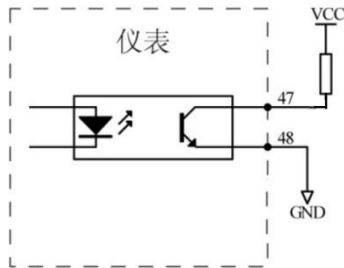
6 Communication

The instrument has one communication interface by default, and some instruments can add one communication interface. The communication protocol is Modbus-RTU

6.1 Physical layer

1) RS485 communication interface, asynchronous half-duplex mode;

2) The communication speed can be set from 2400 to 38400 bps, and the factory default is 9600 bps;

3) Byte transmission format (N81, E81, O81, N82): 1 start bit, 8 data bits, (1 parity bit), 1/2 stop bit.

6.2 Communication protocol

The instrument supports the standard Modbus-RTU communication protocol.

Structure of the data frame: message format.

Address code	Function code	Data code	Check code
1 byte	1 byte	N bytes	2 bytes

Address code: Slave address, address range 1-247, other addresses are reserved.

Function code: Indicates what function the addressed terminal performs. The following table lists the function codes supported by the meter, as well as their meanings and functions.

Code (hexadecimal)	Significance
03/04	Read data register value
10	Write set register instruction

Data code: It contains the data required by the terminal to perform a specific function or the data collected when the terminal responds to a query. The contents of these data may be numerical values, reference addresses or setting values. For example, the function code tells the terminal to read a register, the data field needs to indicate which register to start from and how many data to read, and the returned content of the slave data code includes the data length and corresponding data.

Check code: The error check (CRC16) field occupies two bytes and contains a 16-bit binary value. The CRC value is calculated by the transmitting device, and then appended to the data frame. The receiving device recalculates the CRC value when receiving the data, and then compares it with the received CRC value. If the two values are not equal, it indicates that an error occurred in the communication .

6.3 Message command format

(1) Read data register value (function code 0x03/0x04)

Request					
Frame structure	Address code	Function code	Data code		Check code
			Start register address	Number of registers	
Occupied bytes	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Data range	1～247	0x03/0x04	0x0000～0xFFFF	Maximum 125	CRC16
Message example	0x01	0x03	0x00 0x06	0x00 0x06	0x25C9
Response					

Frame structure	Address code	Function code	Data code		Check code
			Register bytes	Register value	
Occupied bytes	1 byte	1 byte	1 byte	12 bytes	2 bytes
Message example	0x01	0x03	0x0C	12 bytes of data	CRC16

Note：

The starting register address requested by the host is the first data address of the primary grid or secondary grid to be queried, and the number of registers is the length of the query data. For example, the starting register address "0x00 0x06" represents the three-phase phase voltage float type data address. The number of registers "0x00 0x06" means the data length is 6 (3 float data occupies 6 registers).

(2) Write setting register instruction (function code 0x10)

Request							
			Data code				
Frame structure	Address code	Function code	Register start address	Register length	Register bytes	Write value	Check code
Occupied bytes	1 byte	1 byte	2 bytes	2 bytes	1 byte	2N bytes	2 bytes
Data range	1～247	0x10	0x080A	0x0001	N		CRC16
Message example	0x01	0x10	0x08 0x0A	0x00 0x01	0x02	0x0064	0x2ED1
Response							
Frame structure	Address code	Function code	Data code				Check code
			Register start address		Register length		code
Occupied bytes	1 byte	1 byte	2 bytes		2 bytes		2 bytes
Message example	0x01	0x10	0x08 0x0A		0x00 0x01		0x23AB

Note：

When writing the setting register, please strictly follow the meter setting information address table in the meter appendix. Wrong writing to the setting register may cause the instrument to work abnormally, please operate with caution.

6.4 Data format

Some measurement data of the meter provides primary data and secondary data, such as voltage, current, power, electric energy, etc. There is a proportional relationship between the two data. For example, the secondary data of voltage multiplied by the ratio of the voltage transformer equals the primary data, the secondary data of the current multiplied by the ratio of the current transformer equals the primary data, and for the power and electric energy data, it needs to be multiplied by The ratio of voltage and current transformers is equal to the primary data.

(1) 32bit floating point format

32bit floating point format data follows the IEEE-754 format. The byte order of the data adopts the big endian method, with the high byte first and the low byte last.

Address (Hex)	Data (Hex)	Description
0000-0001	435C-8000	0x435C8000 = 220.5
0002-0003	4360-4CCD	0x43604CCD = 224.3
0004-0005	435E-B333	0x435EB333 = 222.7

(2) 16bit integer format

The 16bit integer format data adopts the complement storage method. The byte order of the data adopts the big endian method, with the high byte first and the low byte last.

Address (Hex)	Data (Hex)	Description
0000	0230	0x0230 = 560
0001	0172	0x0172 = 370
0002	0096	0x0096 = 150

(3) 32bit integer format

The 32bit integer format data adopts the complement storage method. The

byte order of the data adopts the big endian method, with the high byte first and the low byte last.

Address (Hex)	Data (Hex)	Description
0000-0001	0007-A120	0x0007A120 = 500000
0002-0003	0000-07D0	0x000007D0 = 2000
0004-0005	FFFF-FDF0	0xFFFFFDF0 = -528

Appendix MODBUS-RTU Communication Register Information Table

Operating data

Address-HEX	Address-DEC	Format	Data description	Unit	R/W
0006-0007	6-7	Int32	Circuit 1 voltage	0.1V	R
0008-0009	8-9	Int32	Circuit 1 current	0.1A	R
000A-000B	10-11	Int32	Circuit 1 power	0.1kw	R
000C-000F	12-15	Int64	Circuit 1 positive energy	10wh	R
0010-0013	16-19	Int64	Circuit 1 negative energy	10wh	R
0014-0015	20-21	Int32	Circuit 2 voltage	0.1V	R
0016-0017	22-23	Int32	Circuit 2 current	0.1A	R
0018-0019	24-25	Int32	Circuit 2 power	0.1kw	R
001A-001D	26-29	Int64	Circuit 2 positive energy	10wh	R
001E-0021	30-33	Int64	Circuit 2 negative energy	10wh	R

Parameter settings

Address-HEX	Address-DEC	Format	Data content	Data description	R/W
0801	2049	Int16	Instrument setting password	0000-9999	R/W
0804	2052	Int16	High byte: #1 meter address	1-247	R/W
			Low byte: #1 baud rate	0：1200bps， 1：2400bps， 2：4800bps， 3：9600bps， 4：19200bps， 5：38400bps	
0805	2053	Int16	High byte: #1 check format	0：N,8,1， 1：E,8,1 2：O,8,1， 3：N,8,2	R/W

0806-0807	2054-2055	Int32	Circuit 1 primary voltage value	1-999999	R/W
0808-0809	2056-2057	Int32	Circuit 1 secondary voltage value	1-999999	R/W
080A-080B	2058-2059	Int32	Circuit 1 primary current value	1～9999	R/W
080C-080D	2060-2061	Int32	Circuit 2 primary voltage value	1-999999	R/W
080E-080F	2062-2063	Int32	Circuit 2 secondary voltage value	1-999999	R/W
0810-0811	2064-2065	Int32	Circuit 2 primary current value	1～9999	R/W

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