DIN-rail Mounted DC Energy Meter

User Manual

Applied to
PD195Z-E31

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!

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1. Product introduction

PD195Z-E31 can measure basic electrical variables such as voltage, current and power, energy, demand and Max./Min. values of one DC circuit. It also has energy metering and tariff energy functions. Extension module EK1 has digital input and relay output functions. Communication interface on the meter makes it simple to connect the meter to smart distribution system and energy management system to share monitoring data and energy quality data.

2. Technical specification

2.1 Technical parameters

Overview	
Net weight	About 300g
Dimension	About 72*90*63.5mm（main module）
Display mode	Segment LCD
Working environment	
Working temperature	-25°C ~ 70°C
Storage temperature	-40°C ~ 85°C
Relative humidity	≤93%RH， no condensation
Working altitude	Altitude≤2500m
Anti-pollution degree	No corrosive gas
Protection degree	Front case IP64, rear case IP20
Insulation	Signal, power supply, output terminals to case resistance>100MΩ
Working power supply	
Rated range	AC/DC：80～270V or DC：24V
Power consumption	<5VA
Withstand voltage	>2kV
Voltage input	
Range	DC:0~100V，0~300V，0~1000V，（max. over voltage 1200V）
Resolution	0.1 V

Impedance	1.6 MΩ/phase
Power consumption	About 0.1 VA /phase
Over voltage	Instantaneous: 2Un/10s
Current input	
Range	Hall transformer DC-4V
Resolution	1 mA
Impedance	≤200kΩ/phase
Power consumption	≤0.01 VA/phase
Over current	Instantaneous：10In/5s
One energy pulse output	
Pulse width	80ms±20%
Max. terminal voltage	35V
Max. terminal current	10mA
Pulse frequency	<10Hz
One communication interface	
Physical interface	RS-485 (optocoupler)
Speed	1.2-9.6 kbps
Protocol	Modbus RTU
Isolation voltage	2000 VAC (1 min)
Two relay outputs	
Capacity	5A/250 VAC; 5A/30 VDC
Isolation voltage	Between coil and contact: 3000 VAC / min
Actuation time	10 ms max
Release time	5 ms max
Mechanical life	10^6 times
Four digital inputs	
Terminal feature	Passive node, DC 15V power supply inside
Isolation voltage	2000 VAC (1 min)
Scanning time	1 ms

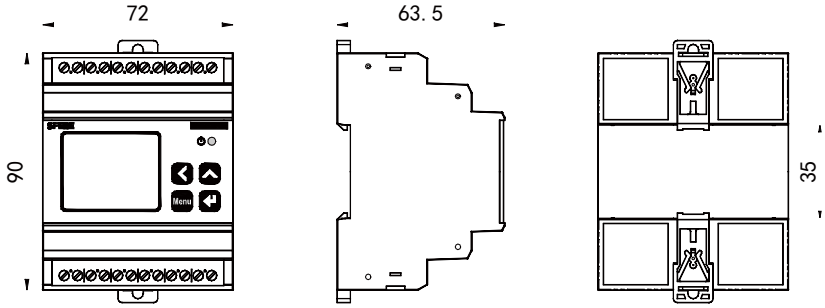
Filtering time	30 ms
Real-time clock	
Time clock	Error<0.5s/d
EMC	
Electrostatic discharge immunity IEC 61000-4-2-III	
Radiated, radio-frequency, electromagnetic field immunity IEC 61000-4-3-III	
Electrical fast transient/burst immunity IEC 61000-4-4-IV	
Surge immunity IEC 61000-4-5-IV	
Immunity to conducted disturbances, induced by radio-frequency fields IEC 61000-4-6-III	
Power frequency magnetic field immunity IEC 61000-4-8-III	
Voltage dips, short interruptions and voltage variations immunity IEC 61000-4-11-III	

2.2 Function parameter

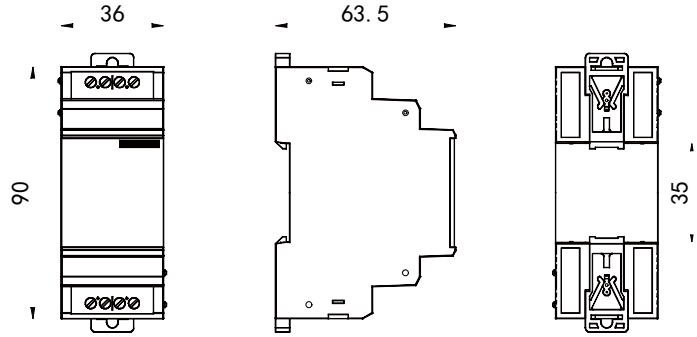
Function	Sign	Accuracy
Voltage	U	0.5
Current	I	0.5
Active power	P	0.5
Max./Min. value	Max/Min	0.5
Demand	--	0.5
Active energy	EP	1

3. Installation and wiring

3.1 Meter size

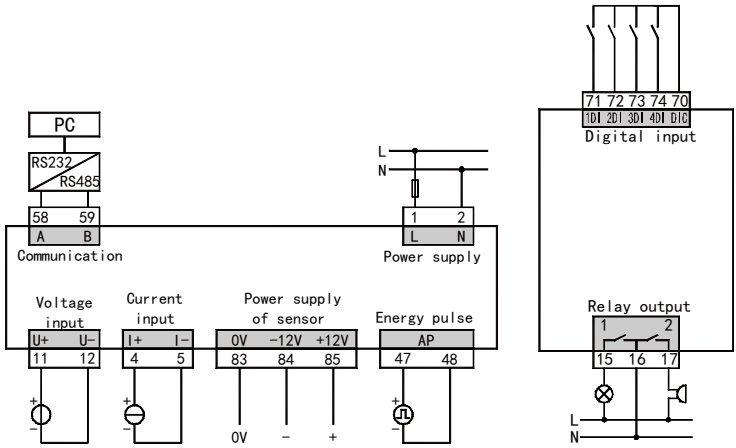


Main part size



EK1 size

3.2 Wiring



Note:

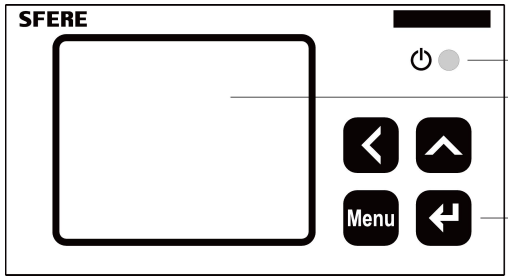
1. Auxiliary power supply：AC/DC：80～270V or DC：24V
2. Rated current of fuse：0.5A

Definition of wiring terminals is as follows,

Power supply	1,2	AC/DC
Current signal	4,5	Current input
Voltage signal	11,12	Voltage input
Hall sensor power supply	83,84,85	Hall sensor power supply
Energy pulse output	47,48	Active energy pulse output
RS485 communication	58,59	Corresponding to A, B and S severally
Relay output	15—17	Two relay outputs, 16 is common end
Digital input	70—74	Four digital inputs, 70 is common end

4. Display

4.1 Panel description



: to move upward/switch to former page/modify parameter/increase value at selected bit

: to move downward/switch to the next page/modify parameter

Menu: to revert to upper level of menu/change display item

: to enter the page of a selected item

4.2 Electrical parameter display

Meter measures and shows data of different types which are basic electrical parameter, bi-direction energy, tariff energy and time. Press "◄ " or " ►" to check the data of one type in cyclic sequence. Press "Menu" to switch display between different types of data.

4.2.1 Electrical parameter display

Electrical parameter display pages show voltage, current and active power. The detailed instruction is shown as follows.

Table 4-1 Electrical parameters display pages

Electrical parameter display	Instruction
	Three-phase voltage U＝220.7V。
	Three-phase current I＝5.012A。
	Total active power P＝5700W。

4.2.2 Energy display

Energy display pages show bi-direction active energy. The detailed instruction is shown as follows,

Table 4-2 Energy display pages

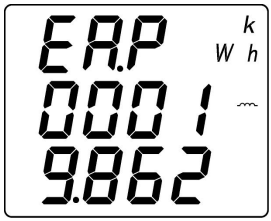
Energy display	Instruction
	Total import active energy EP＝38866.77kWh。
	Total export active energy EP-＝162003kWh。

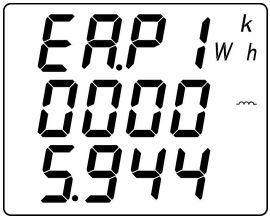
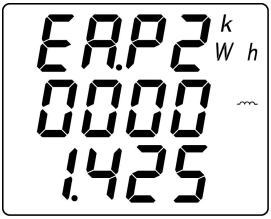
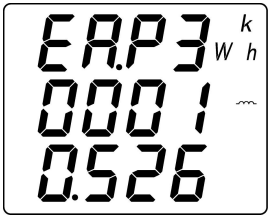
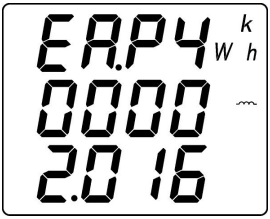
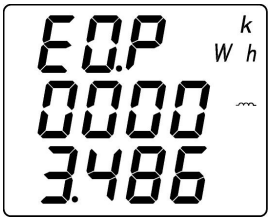
4.2.3 Tariff energy display pages

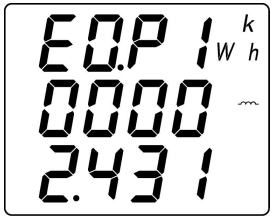
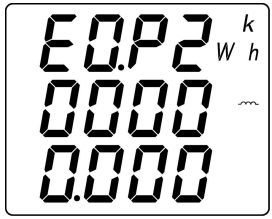
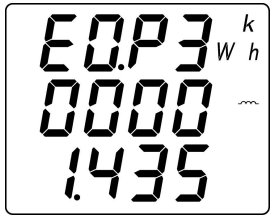
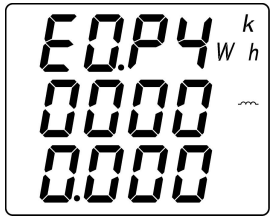
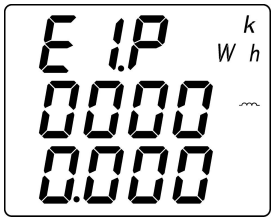
The meter can measure the energy of four types of tariffs in twelve time zones.

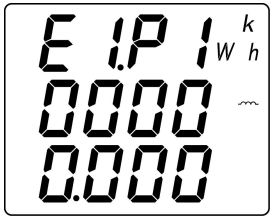
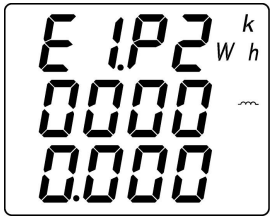
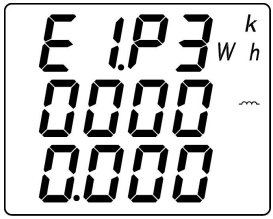
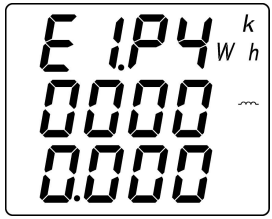
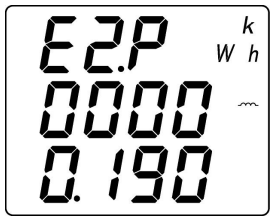
The detailed instruction of display pages is shown as follows,

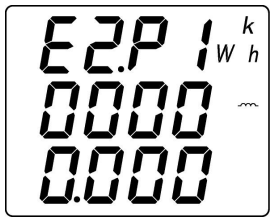
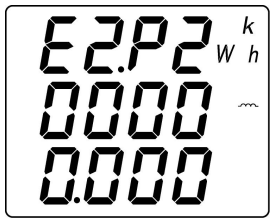
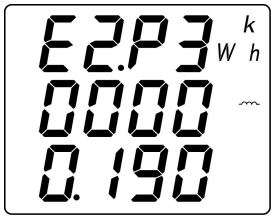
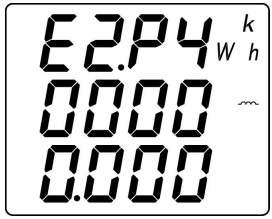
Table 4-3 Tariff display pages

Energy display	Instruction
	Import total active energy EA.P= 19.862kWh

	Import total active energy of P1 EA.P 1= 5.944kWh
	Import total active energy of P2 EA.P 2= 1.425kWh
	Import total active energy of P3 EA.P 2= 10.526kWh
	Import total active energy of P4 EA.P 4= 2.016kWh
	Total energy of present month E0.P = 3.486kWh

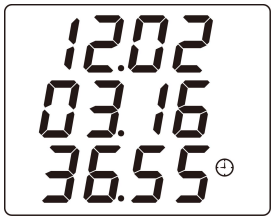
	Energy of P1 of present month E0.P1 =2.431kWh
	Energy of P2 of present month E0.P 2= 0.000kWh
	Energy of P3 of present month E0.P3 = 1.435kWh
	Energy of P4 of present month E0.P 4=0.000kWh
	Total energy of last month E1.P =0.000kWh

	Energy of P1 of last month E1.P 1=0.000kWh
	Energy of P2 of last month E1.P 2=0.000kWh
	Energy of P3 of last month E1.P3 =0.000kWh
	Energy of P4 of last month E1.P 4=0.000kWh
	Total energy of the month before last E2.P =0.190kWh

	Energy of P1 of the month before last E2.P 1=0.000kWh
	Energy of P2 of the month before last E2.P 2=0.000kWh
	Energy of P3 of the month before last E2.P 3=0.190kWh
	Energy of P4 of the month before last E2.P 4=0.000kWh

4.2.4 Time display

Table 4-6 Time display page

Time display	Instruction
	The left picture shows 12(year), 02(month), 03(day), 16(hour), 36(minute),55(second)

4.2.6 Parameter setting menu structure

Parameter setting menu adopts hierarchical structure. Three rows of LED from up to down corresponds to first, second and third levels of menu severally. The menu structure diagram is as follow,

First level	Second level	Third level	Instruction
System setting SYS	Password CodE	0000~9999	User password
	Cyclic display CYC	no or YES	NO：no cyclic display YES：cyclic display, three-second interval time
	Clear energy CLr.E	no or YES	NO：not clear enegy YES：clear energy
	Clear demand CLr.d	no or YES	NO：not clear demand YES：clear demand
Signal input InPt	Voltage range U.Sn	0～1000 V	Voltage range (fixed value, can not be changed)
	Current range I.Sn	4V/75mV	Current range (fixed value, can not be changed)
	Primary	0～1000A	Primary current value

	current CT.01		
First communication Con1	Meter address Addr	0001~0247	Meter address range: 1～247
	Baud rate bAUd	1200~9600	Select baud rate：2400, 4800, 9600
	Data format dAtA	n.8.1 o.8.1 E.8.1 n.8.2	n.8.1：no check, one stop bit o.8.1：odd check E.8.1：even check n.8.2：no check, two stop bits
	Communication protocol Con5	rtU dLt	rtU：Modbus-RTU dLt：DLT645
Demand dEn	Demand item ItEn	I. P.	Current, active power (fixed)
	Calculation mode nodE	SLIP FIX	SLIP：slip FIX：fixed
	Calculation time t	0000~9999	1-9999
	Slip or fixed time zone nt	0000~9999	1-30
Relay output do-1 do-2	Work mode nodE	oFF rEn ALr	oFF：off rEn：remote control ALr：alarm
	Pulse width tIME	0～99.99s	Pulse width

	Item ITEM	UL. H...	Alarm item
	Alarm value uAL	0～9999	Alarm value
	Hysteresis value HYS	0～9999	Hysteresis value
	Delay time dELY	0～99.99s	Response time
F1.01 / F2.01 ... F1.12 / F2.12 Tariffs for different time zones	00.00 Time	P1~P4 tariffs	Select time zone and corresponding tariff
F.non Month tariff	n.01... n.12	F1...F2	Select tariff mode for every month
CoPY Meter reading	d. H Day, hour	00～31	Select meter reading time, day and hour of every month
tIME Time	Year. month Day. hour Minute. second	00～99	Set time

4.3 Function of keys

Enter program mode:

Press "Menu" for 3s（minimum）and then release it, the display will show "rEAd". Press "◄ " or " ►" once, the display shows "Pr". Press "◄ ", enter your password (defaulted as 0001) through pressing "◄ " or " ►", and then press "◄ ". If the password is correct, you can enter the programming menu, however, if the display does not change, it means that you have failed to enter programming menu. Please try again. Be careful if the password is changed, and no not forget it, as no programming is allowed if the correct password is not entered.

Function of four keys in programming mode. Press "◄ " or " ►" to switch to different programming menus or change values; Press "Menu" key to revert to upper level of menu; Press "◄ " key to enter programming menu and confirm modification.

To change values, press "◄ " key to select a bit, and press " ►" key to change the number at the selected bit.

After the value or item of third-level menu is changed, press "◄ " key to confirm the modification and revert to second-level menu. However, if "Menu" key is pressed, the modification will not be effective.

Exit programming mode:

To exit programming mode, please revert to first-level of menu at first, and then press "Menu", the meter will display "SAVE--YES". Below are three kinds of operations optional.

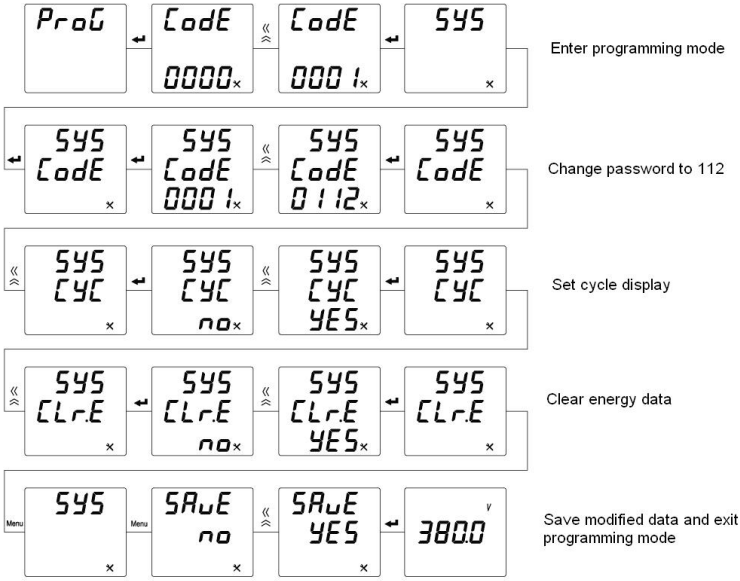
1) Saving the edited settings: Press "◄ ";

2) Not saving the edited settings: Press "◄ " or " ►", the display will show "SAVE--no", and then press "◄ ";

3) Staying in the programming mode: Press "Menu".

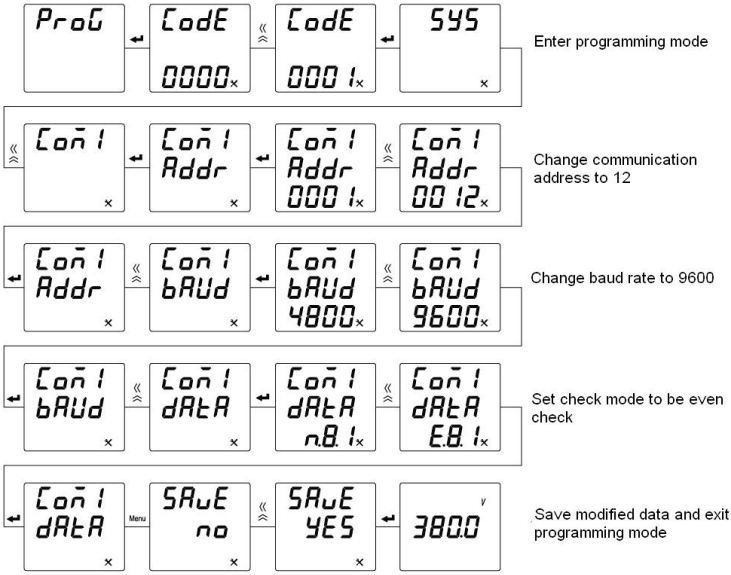
4.3.1 System setting

To change password to 112, set cyclic display, and to clear energy data, the operation process is as follows,



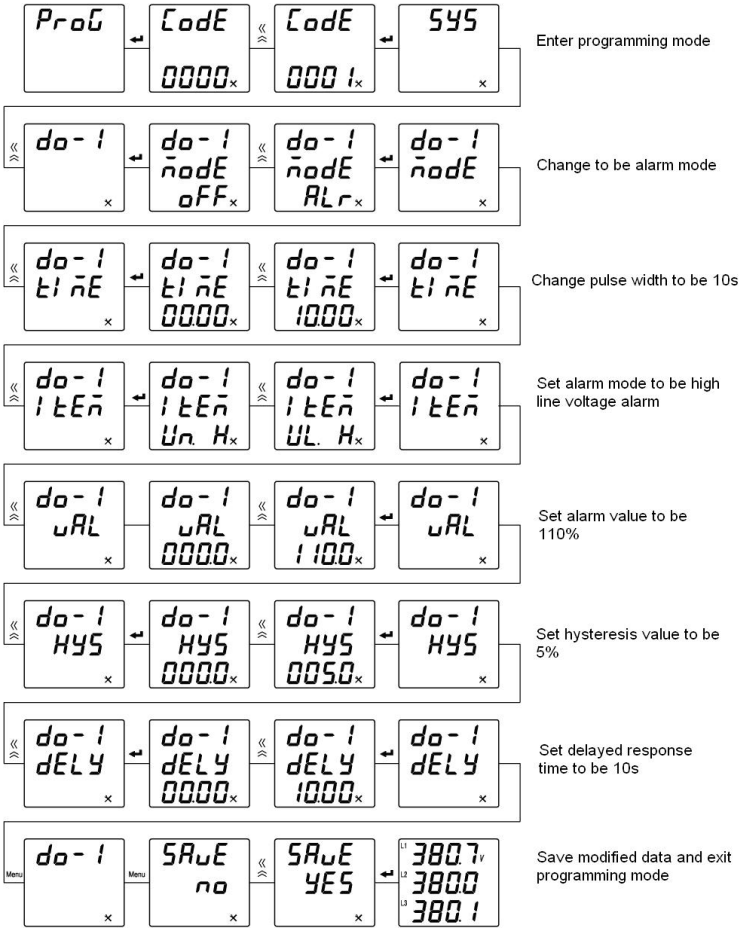
4.3.2 Communication setting

To change communication address to 12, to set baud rate as 9600, to select data format as E81, the operation process is as follows,



4.3.3 Relay output setting

To set relay as alarm mode, pulse width 10s, line voltage high alarm output, alarm value 110V, hysteresis 5%, delay time 10s, the operation instruction is as follows,



5. Function Module

5.1 Communication

5.1.1 Physical Layer

1) RS485 communication port, asynchronous half two-way pattern；

2) Speed 2400～9600bps settable, default as 9600 bps；

3）Bytes transmission format (N81, E81, O81):1 initial byte, 8 data bytes (1 odd and even check bytes), and 1 stop byte.

5.1.2 MODBUS-RTU

Meter supports standard Modbus-RTU protocol.

Structure of Data Frame: Text Format.

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

Address Code: The beginning part of the frame consists of a byte (8 bit binary code), decimal is 0~255, only 1~247 are used in our system while other addresses are reserved. These bits mark the addresses of the terminals defined by the users，The defined terminals will accept the data from the host connected with them. The address of each terminal must be unique, only the terminal is addressed will respond to the query from the host. When the terminal sends out a response, the client data address in a response tells the host which terminal is in communication with it.

Function Code: It shows which functions the terminal which addressed to carry out. The following table lists function codes and their definitions and functions that H series meters support.

Code	Meaning
0x03/0x04	Read data register values
0x10	Write setting register orders

Data Code: It contains the data for a specific function which the terminal carries or the collected data that the terminal responds the query to the host computer. The

contents of these data may be numerical value, reference address or the set value. For example: The function code instructs the terminal to read a register, the data code indicates from which register start and how much data to be read. While the contents of client returned include the data length and the relating data.

Check Code: The error check code (CRC) takes up two bytes, including 16 bits binary value. The CRC value is calculated by the transmitting device, and then added to the data frame. While the receiving devices calculate the CRC value again and compare with the value in CRC, if the two values are not equal, then the CRC makes an error.

5.1.3 Report Command Format

（1）Read Data Register Value (Functional Code: 0x03/0x04）

Host request	Frame structure	Address Code	Function Code	Data Code		Check Code
				Initial Register Address	Number of registers	
	Bytes	1 byte	1 byte	2 bytes	2 bytes	2 bytes
	Data Range	1～247	0x03/ 0x04	0x0000	At most 100	CRC16
	Report Example	0x01	0x03	0x00 0x06	0x00 0x08	0XE4 0x36
Client Response	Frame structure	Address Code	Function Code	Data Code		Check Code
				Number of bytes of register	Register Value	
	Bytes	1 byte	1 byte	1 byte	12 bytes	2 bytes
	Report Example	0x01	0x03	0x0C	(12 bytes data)	(CRC16)

Remark: The Initial register address which the host requests is the beginning data address of once power grid or second power grid data, the number of registers is the data length in query, the above example which the initial register address “0x00

06” means the beginning address of 3 phase voltage float data, the register number “0x00 0x06” means the data length is 6 Word data.

（2）Write setting register order (Function code: 0x10)

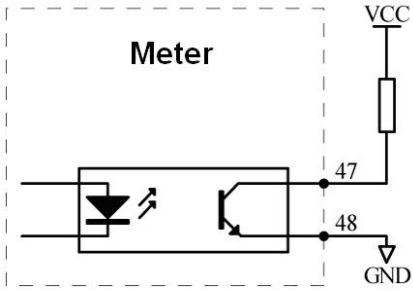
Host Request	Frame structure	Address Code	Function Code	Data code				Check code
				Initial register address	Register numbers	Data bytes	Write in data	
	Bytes	1 byte	1 byte	2 bytes	2 bytes	1 byte	2N bytes	2 bytes
	Data range	1~247	0x10	0x080A	0x0001	N		CRC16
	Report Example	0x01	0x10	0x08 0x0A	0x00 0x01	0x02	0x00 0x64	0x2ED1
Client Response	Frame structure	Address Code	Function Code	Data code				Check code
				Initial register address		Register numbers		
	Bytes	1 byte	1 byte	2 bytes		2 bytes		2 bytes
	Report Example	0x01	0x10	0x08 0x0A		0x00 0x01		0x2ED1

Remark: In order to maintain normal communication, please write register according to setting information list.

5.2 Energy Pulse Output

Meter provides one active energy pulse to complete the distant transmission of energy data. Energy pulse of photo couple relay at open-class collector realizes active energy distant transmitting, adopting by distant pc terminals, PLC, DI switching collecting module to get the total pulse quantity of meters to realize the

accumulated energy calculation. The output mode is accurate check mode (national metering rule: standard meter's pulse error comparison).



Power Pulse Output

A. Electrical features：VCC≤35V, Iz≤10mA;

B. Pulse constant： 75mV(120000/In)imp/kWh, 4V:(160000/In) imp/kWh. The meaning is when the meter accumulates 1kWh, the number of output pulse is 5000.

5.4 Digital Input

EK1 module is equipped with four digital inputs. Digital input module adopts dry node resistance switching signal input mode. The meter is in-built with +15V power supply, no need with external power supply available for monitoring fault alarm node, open and close state, hand-cart position, capacitance compensation cabinet start state. The information can be sent through communication port to distant smart monitoring system, to realize easily the automatic open or close with remote control or by alarming relay functions.

5.5 Relay output

EK1 module has two relay outputs. Relay capacity:AC250V/5A，DC30V/5A.

The relay output has two work modes: remote control mode and alarm mode.

(a) Remote control mode

Under this mode, relay action and reset are controlled through communication. Delay is set as electrical level mode or delay time N * 100ms.

(b) Alarm mode

Under this mode, the relay actuates when the measurement meets the alarm requirements, or the relay resets.

6. Common problems and solutions

6.1 Communication

1) *No return data from the meter*

First ensure that the meter communication setting information such as slave address, baud rate and checkout mode is consistent with the host computer; if there is no data return for communication of many meters at field, please check whether the field communication bus is connected accurately and reliably and whether the RS485 converter works normally.

Even if there is only single or a few meters have the abnormal communication, the corresponding communication line shall be checked, which can be tested by modifying the exchange of abnormal and normal meter slave addresses, to exclude or confirm the host computer software issue, or by exchanging the mounting positions of abnormal and normal meters, to exclude or confirm the meter malfunction.

6.2 Inaccurate measurement

Ensure that the correct voltage and current signals have been connected with the meter; you can use a multi-meter to measure the voltage signal and can use a clamp meter to measure the current signal if necessary.

Ensure that the signal line is properly connected, such as do not make a mistake for dotted terminals of current signals or phase sequence. This meter can be used to observe the power interface display. Only in case of the generation situation, the active power is negative and under normal situation the active power sign is positive. If the active power sign is negative, it is possible that current inlet and outlet wires may be connected wrongly, but the wrong phase sequence may cause abnormal power display. This series of meters support software to modify the current dotted terminal direction. Also, the current reverse setting can be modified on line in the setup menu.

The energy displayed in the meter is a primary power network value. If the ratio value of the voltage current transformer embedded in the meter is inconsistent

with the actual transformer ratio, this will also cause the inaccurate energy display on the meter. The voltage and current ranges of meter and wiring network can be modified according to the actual field wiring, because the wrong setting can also lead to the wrong display.

6.3 Inaccurate energy metering

The meter's energy accumulation is based on the measurement of power. First observe whether the meter power value is consistent with the actual load. The meter supports the bi-directional electric energy metering. Under the situation of wrong wiring and negative total active power, electric energy will be accumulated to the reverse active electric energy rather than positive active electric energy.
The most common problem is a reversed current transformer incoming and outgoing lines. For this, please check the active power with sign of the split-phase. If the power is negative, the wiring may be wrong, but the wrong phase sequence may also cause the wrong electric energy reading on the meter.

Ensure that the proper auxiliary power supply has been connected with the auxiliary power terminal of the meter, because the auxiliary power voltage out of the limit may cause damage to the meter and this can not be recovered. You can use a multi-meter to measure the voltage of the auxiliary power supply. If the power voltage is normal but no any display is shown on the meter, please re-power on the meter.

6.4 **Meter is not on**

Ensure that the proper auxiliary power supply has been connected with the auxiliary power terminal of the meter, because the auxiliary power voltage out of the limit may cause damage to the meter and this can not be recovered. You can use a multi-meter to measure the voltage of the auxiliary power supply. If the power voltage is normal but no any display is shown on the meter, please re-power on the meter.

6.5 Other abnormal situations

For other abnormal situations, please timely contact our technical service department. The user shall give details for field situation, so our technical staff will analyze possible causes according to the feedback from the field. For the problem that can not be resolved through communication, our company will arrange technical personnel to the field as soon as a problem for settlement.

Appendix MODBUS-RTU communication address information table

03/04 command set register address

Address (HEX)	Format	Data content	Explain	R/W
0006-0007	Float	Voltage value	V	R
0008-0009	Float	Current value	A	R
000A-000B	Float	Power value	kW	R
000C-000D	Float	Forward total complex rate electric energy	kWh	R
000E-000F	Float	Forward spike rate electric energy	kWh	R
0010-0011	Float	Forward peak complex rate electric energy	kWh	R
0012-0013	Float	Forward flat rate electric energy	kWh	R
0014-0015	Float	Forward valley complex rate electric energy	kWh	R
0016-0017	Float	Reverse total complex rate electric energy	kWh	R
0018-0019	Float	Reverse spike rate electric energy	kWh	R
001A-001B	Float	Reverse peak complex rate electric energy	kWh	R
001C-001D	Float	Reverse flat rate electric	kWh	R

		energy		
001E-001F	Float	Reverse valley complex rate electric energy	kWh	R
0020-0033	Float	Multi rate electric energy of this month, the same as above	kWh	R
0034-0047	Float	The rate of electric energy of last January, the same as above	kWh	R
0048-005B	Float	The rate of electric energy in last February, the same as above	kWh	R
005C-006F	Float	The rate of electric energy in last March, the same as above	kWh	R
0070-0083	Float	The rate of electric energy in last April, the same as above	kWh	R
0084-0097	Float	The electric energy rate of last May, the same as above	kWh	R
0098-00AB	Float	The rate of electric energy in last June, the same as above	kWh	R
00AC-00BF	Float	The rate of electric energy in last July, the same as above	kWh	R
00C0-00D3	Float	The rate of electric energy in last August, the same as above	kWh	R
00D4-00E7	Float	The rate of electric energy in last September, the same as above	kWh	R
00E8-00FB	Float	The rate of electric energy in	kWh	R

		last October, the same as above		
00FC-010F	Float	The rate of electric energy in last November, the same as above	kWh	R
0110-0123	Float	The electric energy rate of last December, the same as above	kWh	R
0124-0125	Float	Today's forward total complex rate electric energy	kWh	R
0126-0127	Float	Today's forward spike complex rate electric energy	kWh	R
0128-0129	Float	Today's forward peak complex rate electric energy	kWh	R
012A-012B	Float	Today's forward flat rate electric energy	kWh	R
012C-012D	Float	Today's forward valley compound rate electric energy	kWh	R
012E-012F	Float	Reverse total complex rate electric energy today	kWh	R
0130-0131	Float	Today's reverse spike rate electric energy	kWh	R
0132-0133	Float	Today's reverse peak complex rate electric energy	kWh	R
0134-0135	Float	Today's reverse flat rate electric energy	kWh	R
0136-0137	Float	Today's reverse valley complex rate electric energy	kWh	R
0138-014B	Float	Complex rate electric energy	kWh	R

		of the last day		
014C-015F	Float	Complex rate electric energy of the last 2 days	kWh	R
0160-0173	Float	Compound rate electric energy of the last 3 days	kWh	R
0174-0187	Float	Compound rate electric energy of the last 4 days	kWh	R
0188-019B	Float	Compound rate electric energy of the last 5 days	kWh	R
019C-01AF	Float	Compound rate electric energy of the last 6 days	kWh	R
01B0-01C3	Float	Compound rate electric energy of the last 7 days	kWh	R
01C4-01D7	Float	Compound rate electric energy of the last 8 days	kWh	R
01D8-01EB	Float	Complex rate electric energy of the last 9 days	kWh	R
01EC-01FF	Float	Compound rate electric energy of the last 10 days	kWh	R

Address (HEX)	**Format**	**Data content**	**Explain**	**R/W**
0500-0501	Float	Voltage history maximum	V	
0502-0503	Float	Current history maximum value	A	
0504-0505	Float	Power history maximum	kW	
0506-0507	Float	Voltage history minimum	V	
0508-0509	Float	Current history minimum	A	
050A-050B	Float	Power historical minimum	kW	

050C-0517	Float	The historical extreme value of this month, same as above		
0518-0523	Float	Last month's historical extreme value, same as above		
0524-052F	Float	Last two months' historical extreme value, same as above		
0530-053B	Float	Today's historical extreme value, ibid.		
053C-053D	Float	Current demand	A	
053E-053F	Float	Current power demand	kW	
0540-0541	Float	Current demand of last cycle	A	
0542-0543	Float	Power demand of last cycle	kW	
0544-0545	Float	Current demand extreme value	A	
0546-0547	Float	Power demand extreme value	kW	
0548-054B	Float	The extreme demand of this month, same as above		
054C-054F	Float	Last month's demand extreme value, same as above		
0550-0553	Float	The extreme demand of last two months, same as above		
0554-0557	Float	Today's demand extreme value, same as above		
0558-05FF	Reserve			

Address	Format	Data content	Explain	R/W

(HEX)				
0780	char	High byte: year; Low byte: month	V	R
0781	char	High byte: day; Low byte: hour	A	R
0782	char	High byte: minute; Low byte: Second	A	R
0783	char	High byte: week; Low byte: reserved	A	R

0x10 Command set register address：

Address (HEX)	Format	Data content	Explain	R/W
0800-0801	keep unused			
0802	Int	High byte: cyclic display	0x01: cyclic display, ! (0x01): no cyclic display	R/W
		Low byte: reserved		
0803	Int	Reserve		
0804	Int	High byte: #1 meter address	1-247	R/W
		Low byte: #1 baud rate	0：1200bps 1：2400bps 2：4800bps 3：9600bps 4：19200bps	
0805	Int	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	Reserve			
0808	Int	High byte: voltage range	40-1000v, instructions when ordering	R
		Current channel signal type (shunt or sensor type)	0: 4V 1:75mV instructions when ordering	R
0809	Reserve			
080A	Int	1# Current channel rating	0 ～ 9999 A	R/W
080B-0819	Reserve			
081A	Int	#1 relay operating mode	0: Off 1: Alarm 2: Remote control	R/W
081B	Int	#1 pulse width	0.00: Level mode 0.1～99.99s	R/W
081C	Int	#1 alarm items	0: Overvoltage 1: Undervoltage 2: Overcurrent 3: Undercurrent 4: The first switch input is linked, the switch input is closed, and the relay output acts; 5: The first channel switch input is linked; the switch input is disconnected, and the relay output acts; 6/7: Linkage of the second switch input 8/9: Linkage of the third	R/W

			switch input 10/11: The fourth switch input linkage	
081D	Int	#1 Alarm value	Numerical scale factor: Voltage unit: V Current unit: A	R/W
081E	Int	#1 Hysteresis	Numerical scale factor	R/W
081F	Int	#1 Alarm Delay Time	0.0～99.99s	R/W
0820-0825	Int	#2 Relay Setup	Same as #1 relay setting	R/W
0826-033	Reserve			
0834	Int	Demand items	Default to current, power	R
0835	Int	#1 Demand Work Mode	0: Slip block 1: Fixed block	R/W
0836	Int	#1 Demand slip time (t)	1～9999s	R/W
0837	Int	#1 Demand calculation period (T)	1～30t	R/W
0838-083A	Char	Meter DLT645 address[6]		R/W
0838-0843	Reserve			
0844-084F	Char	First set of rate period settings	Hours and minutes of 12 sets of time periods, The first period is fixed at 00:00	R/W
0850-085B	Char	Second set of rate period settings	Hours and minutes of 12 sets of time periods, The first period is fixed at	R/W

			00:00	
085C-0861	Char	First set of rate settings	The rate types corresponding to the first set of rate periods: 0-sharp, 1-peak, 2-flat and 3-valley	R/W
0862-0867	Char	Second set of rate settings	The rate types corresponding to the second set of rate periods: 0-sharp, 1-peak, 2-flat and 3-valley	R/W
0868-086D	Char	Monthly rate selection:	0: the first set of rates 1: the second set of rates	R/W
086E	Char	Meter reading day setting	Automatic meter reading: day and hour	R/W
086F-08FF	Reserve			

Appendix 2
DL / T 645-1997 communication protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
9010	XXXXXX.XX	4	kWh	*		Forward total electric energy
9011	XXXXXX.XX	4	kWh	*		Forward spike electric energy
9012	XXXXXX.XX	4	kWh	*		Forward peak electric energy
9013	XXXXXX.XX	4	kWh	*		Forward flat electric energy

9014	XXXXXX.XX	4	kWh	*		Positive valley electric energy
901F		20	kWh	*		Forward electric energy packet
9020	XXXXXX.XX	4	kWh	*		Reverse total electric energy
9021	XXXXXX.XX	4	kWh	*		Reverse spike electric energy
9022	XXXXXX.XX	4	kWh	*		Reverse peak energy
9023	XXXXXX.XX	4	kWh	*		Reverse flat electric energy
9024	XXXXXX.XX	4	kWh	*		Reverse valley electric energy
902F		20	kWh	*		Reverse electric energy packet
9040	XXXXXX.XX	4	kWh	*		Total positive electric energy of last month
9041	XXXXXX.XX	4	kWh	*		Positive spike electric energy of last month
9042	XXXXXX.XX	4	kWh	*		Positive peak electric energy of last month
9043	XXXXXX.XX	4	kWh	*		Positive flat electric energy of last month
9044	XXXXXX.XX	4	kWh	*		Positive valley electric energy last month
904F		20	kWh	*		Forward electric energy data packet of last month
9080	XXXXXX.XX	4	kWh	*		Total positive electric energy of last month
9081	XXXXXX.XX	4	kWh	*		Positive spike electric energy of last month
9082	XXXXXX.XX	4	kWh	*		Positive peak electric energy of last month
9083	XXXXXX.XX	4	kWh	*		Positive flat electric energy of last month
9084	XXXXXX.XX	4	kWh	*		Positive valley electric energy last month

908F		20	kWh	*		Forward electric energy data packet of last month

10.2.1. Electric energy communication protocol

10.2.2.Instantaneous electric quantity communication protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
B611	XXXX	2	V	*		#1 voltage
B621	XX.XX	2	A	*		#1 current
B630	XX.XXXX	3	kW	*		Total power

10.2.4 Communication parameter protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
C032	NNNNNNNNNNNN	6		*	*	Table number (table number data is less than 247)

DL/T 645-2007 Communication protocol

Electric energy communication protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
00010000	XXXXXX.XX	4	kWh	*		Forward total electric energy

00010100	XXXXXX.XX	**4**	kWh	*		Forward spike electric energy
00010200	XXXXXX.XX	4	kWh	*		Forward peak electric energy
00010300	XXXXXX.XX	4	kWh	*		Forward flat electric energy
00010400	XXXXXX.XX	4	kWh	*		Positive valley electric energy
0001ff00		20	kWh	*		Forward electric energy packet
00020000	XXXXXX.XX	4	kWh	*		Reverse total electric energy
00020100	XXXXXX.XX	4	kWh	*		Reverse spike electric energy
00020200	XXXXXX.XX	4	kWh	*		Reverse peak energy
00020300	XXXXXX.XX	4	kWh	*		Reverse flat electric energy
00020400	XXXXXX.XX	4	kWh	*		Reverse valley electric energy
0002ff00	XXXXXX.XX	4	kWh	*		Reverse electric energy packet
00010001	XXXXXX.XX	4	kWh	*		Total positive electric energy of last month
00010101	XXXXXX.XX	4	kWh	*		Positive spike electric energy of last month
00010201	XXXXXX.XX	4	kWh	*		Positive peak electric energy of last month
00010301	XXXXXX.XX	4	kWh	*		Positive flat electric energy of last month
00010401	XXXXXX.XX	4	kWh	*		Positive valley electric energy last month
0001ff01		20	kWh	*		Forward electric energy data packet of last month
00010002	XXXXXX.XX	4	kWh	*		Total positive electric energy of last month
00010102	XXXXXX.XX	4	kWh	*		Positive spike electric energy of last month

00010202	XXXXXX.XX	4	kWh	*		Positive peak electric energy of last month
00010302	XXXXXX.XX	4	kWh	*		Positive flat electric energy of last month
00010402	XXXXXX.XX	4	kWh	*		Positive valley electric energy last month
0001ff02		20	kWh	*		Forward electric energy data packet of last two months

10.4.2.Instantaneous electric quantity communication protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
02010100	XXX.X	2	V	*		Voltage
02020100	XXX.XXX	3	A	*		Current
02030000	XX.XXXX	3	kW	*		Power

Communication parameter protocol

Identification code	Data format	Length	Unit	Read	Write	Data Item Name
04000501	XXXX	2		*		Meter operation status word 2 (see note)
04000409	NNNNNN	3	imp/ kWh	*		Electric energy pulse constant
04000401	NNNNNN NNNNNN	6		*	*	Communication address (data less than 247)

Note:

① The writing of communication address and broadcast timing shall comply with DL/T645-2007 "Multi-function Energy Meter Communication Protocol".

② When changing communication parameters, 4 Byte (password) + 4 Byte (operator code) shall be placed behind the identification code. The default password and operator code are 0101010102020202.

③ Meter operation status word 2 [04000502] (1: reverse, 0: forward)

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
--	--	--	--	Power direction	--	--	--

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