T232

Manual of PM Series intelligent power collection and monitoring device

Installation and Operation Instruction V4.2

Tecom Co., Ltd.

DECLARATION

This company reserve power of revision of product specification described in this manual, without notice. Before ordering, please consult local agent for the latest specification of product.

CONTENTS

1.General

PM series intelligent power collection and monitoring device is a smart meter designed for power moni toring needs of power systems, industrial and mining enterprises, utilities, and intelligent buildings. It integrates measurement of power parameters (such as single-phase or three-phase current, voltage, and active power). Power, reactive power, apparent power, frequency, power factor) and power monitoring and assessment management. At the same time, it has a variety of peripheral interface functions for users to choose: with RS485 communication interface, MODBUS-RTU protocol can meet the needs of communication network management; 4-20mA analog output can correspond to measured electrical parameters, meet DCS Such interface requirements; with switch input and relay output can realize the function of "remote signal" and "remote control" of circuit breaker switch. High-brightness LCD display interface, parameter setting and control through buttons, ideal for real-time power monitoring systems. Can directly replace conventional power transmitters and measuring instruments. As an intelligent, digital front-end acquisition component, the instrument has been widely used in various control systems, SCADA systems and energy management systems.

2.Type and specification of products

Picture 1

Meter type	Function	Faceplate Size
PM-310	Three phase voltage, Zero sequence voltage Three phase current, Zero sequence current Three phase active power, Total active power Three phase reactive power, Total reactive power Three phase apparent power, Total apparent power Three phase Power factor, Total power factor Frequency, Voltage phase angle, Voltage and current imbalance,Forward and reverse power Four quadrant energy metering,System time display 1 channel RS485 interface / Modbus-RTU protocol and the statute DLT645 2DI - 2 channel switching input 2DO - 2 channel switching output 1 Ep - 1 channel electric energy pulse	75*75mm
PM-320		96*96mm

3. Technical parameters

Picture 2

Technical parameters		Value
Input	Connection	3-phase-3-wire, 3-phase-4-wire
	Frequency	45-65Hz
	Voltage	Rating: Three-phase: AC 3×57.7V/100V(100V)、3×220V/380V(400V)、 3×380V/660V(660V)(PM-320 only)
		Overload:1.2 fold rating {continuous) : 2 fold rating for 1 second
		Power consumption:< 0.5VA
	Current	Rating: AC 1A、5A
		Overload:1.2 fold rating(continuous);10fold rating for 1 second
		Power consumption:< 0.5VA
Output	Electric energy	Output mode:open-collector photo-coupler pulse
		Pulse constant: 10000imp/kWh(settable)，see wiring diagram for details；
	Communication	RS485port, Modbus -RTU protocol,DLT645 protocol(versions 07 and 97)， baud rate 1200 ~ 38400
Function	Switching input	Dry contact input, built-in power supply
	Switching output	Output mode: Relay normally open contact output
		Contact capacity: AC 250V/3A、 DC 30V/3A
Accuracy class		Frequency:0.05Hz,Current、Voltage:0.2 class,Reactive power:l .0class,Reactive Electric energy:l .0class, active power:0.5class,active electric energy: 0.5class
Power supply		AC/DC 85-265V power consumption≤10VA
Security	Power frequency withstand voltage	Between Power supply//Switching Output// Current Input//voltage Input// Communication //Pulse Output//switching input AC 2 kV 1min; Between Power supply、switching output、Current Input、voltage Input AC 2 kV 1min; Between Communication、Pulse Output、switching input AC 1kV 1 min;
	Insulation resistance	Input、Output end to machine enclosure >100MΩ
Environment	Temperature	work: -25°C~+65°C storage: -40°C ~+80°C
	Humidity	≤93%RH Non-condensing
	Altitude	≤2500m

Note: The instrument Modbus RTU is compatible with dlt645 and only needs to set the corresponding address. See Chapter 6.4 for details.

4 Installation wiring instructions

4.1 Outline and mounting cutout size

Picture 3

Outline	faceplate size(mm)		housing size(mm)			cutout size(mm)	
	width	height	width	height	depth	width	height
PM-310	75	75	66.5	66.5	94.3	67	67
PM-320	96	96	86.5	86.5	77.8	88	88

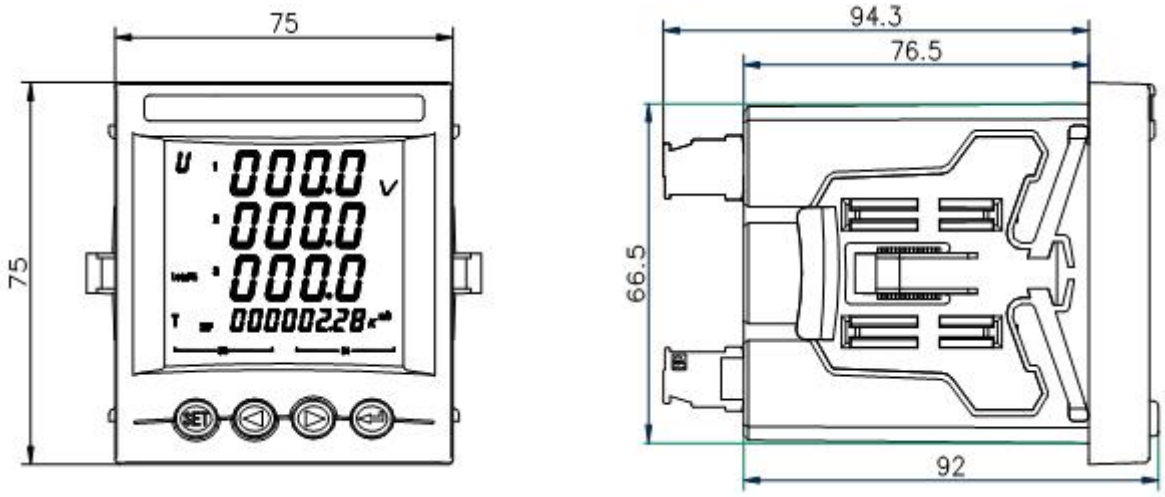


Figure 1 PM-310 appearance size

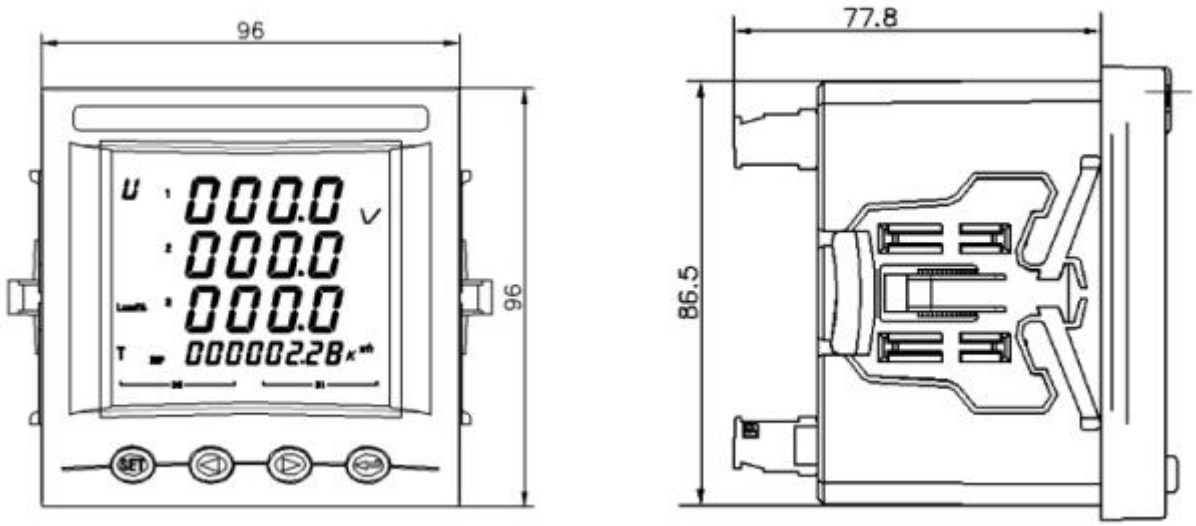


Figure 2 PM-320 appearance size

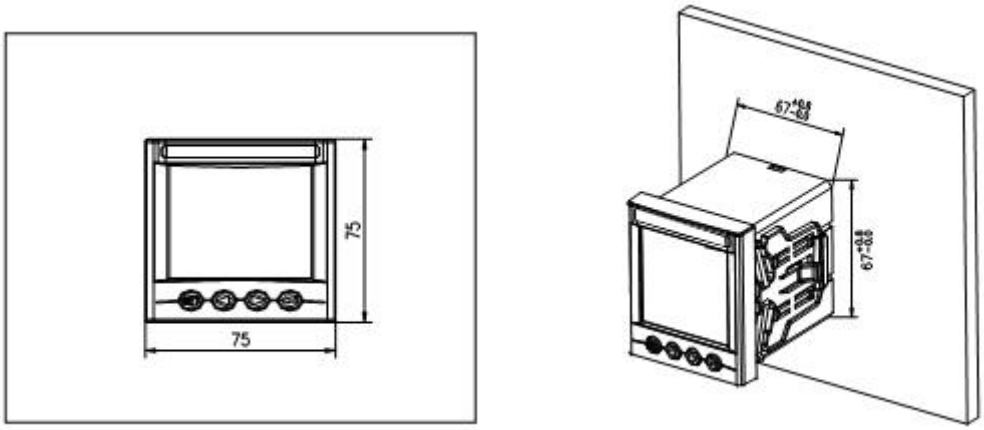


Figure 3 PM-310 installation dimensions

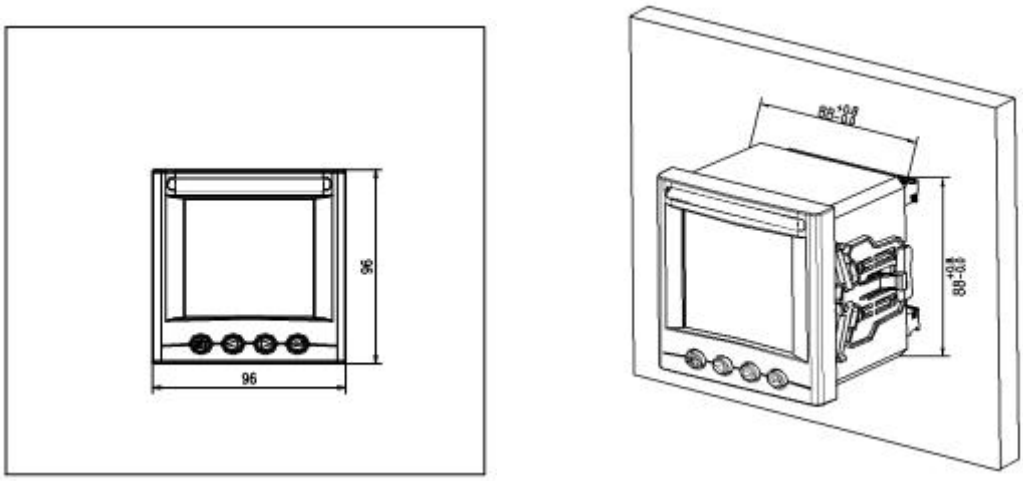


Figure 4 PM-320 installation dimensions

4.2 Installation method

1)Opening in fixed distribution cabinet

2)Take out the instrument and take out the clip

3) The instrument is mounted from the Front to the mounting hole, as shown in figure 5

4) Insert the instrument clasp to secure the instrument, as shown in figure 6

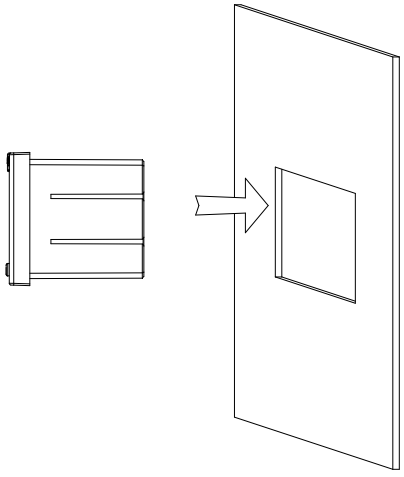


Figure 5

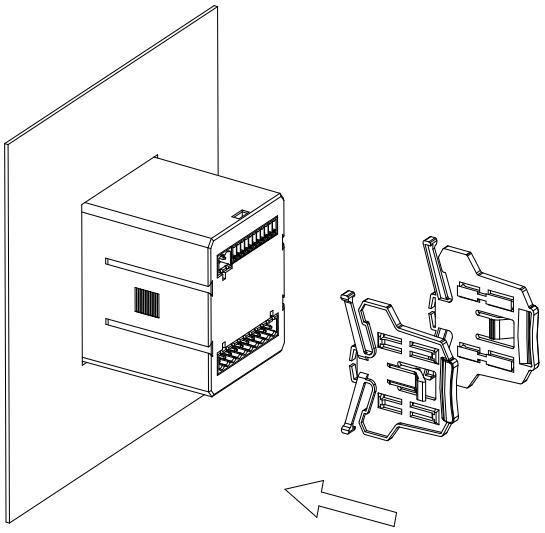


Figure 6

4.3 Wiring method

According to varied design requirements, power and voltage input terminals are recommended with fuse(BS88 1A gG) to meet with the safety performance requirements of prevailing electric codes.

4.3.1 Instrument terminal block and wiring method

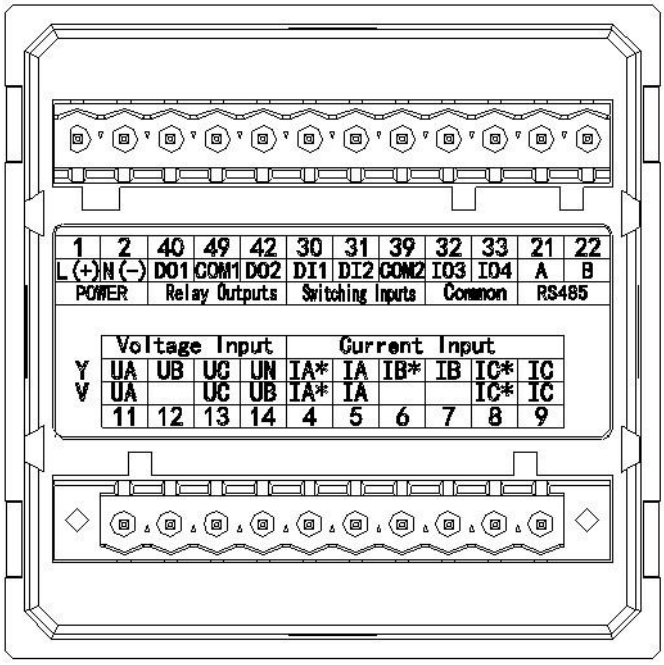


Figure 7 PM-310 series terminal block diagram

Note: pulse output: 32 - E +, 33 - E-.

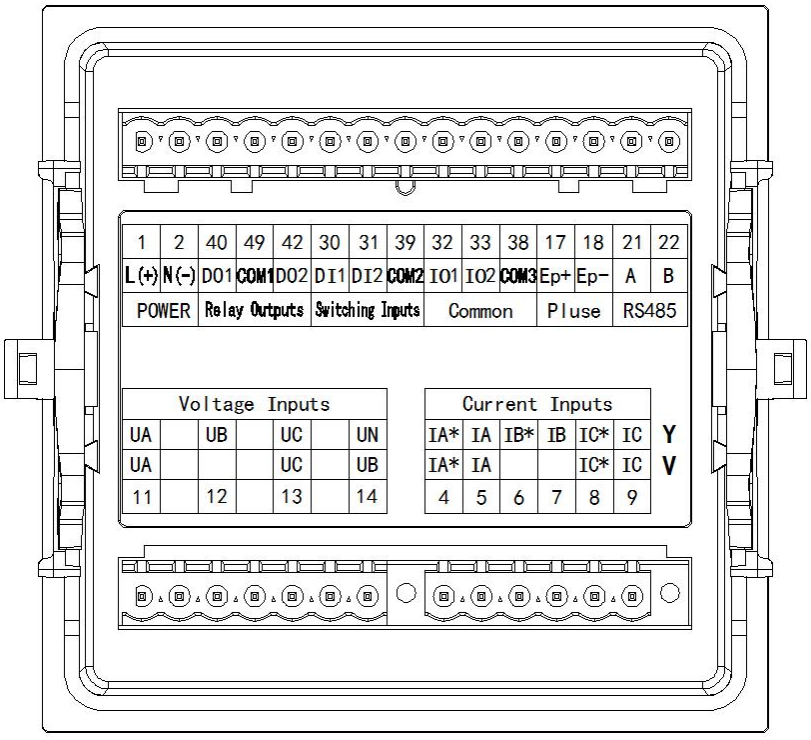


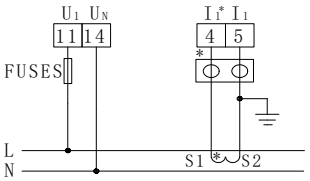
Figure 8 PM-320 series terminal block diagram

Note: Common terminals have no functions

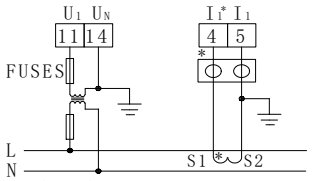
4.3.2 Instrument signal terminal wiring method

Signal terminal: "4,5,6,7,8,9" is the terminal number of the current input; "11,12,13,14" is the terminal number of the voltage input.

Single-phase:



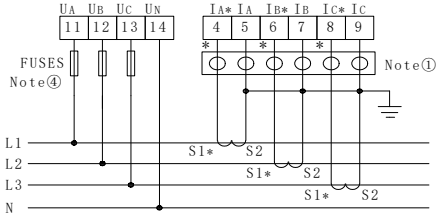
Single-phase-2-wire 1CT



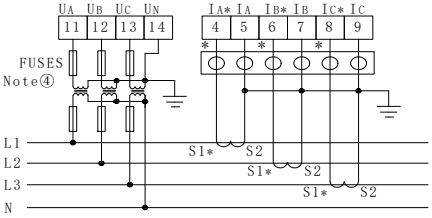
Single-phase-2-wire 1PT、1CT

Note：When used as a single-phase power meter, please set the connection at 3P4L

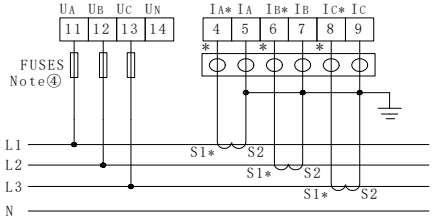
Three-phase



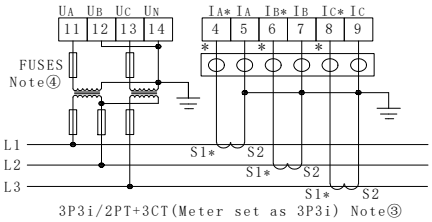
3P4L/3CT(Meter set as 3P4L)



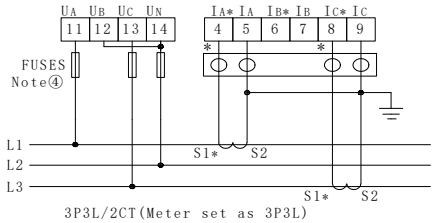
3P4L/3PT+3CT(Meter set as 3P4L)



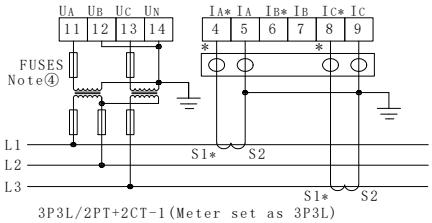
3P3L/3CT(Meter set as 3P4L) Note②



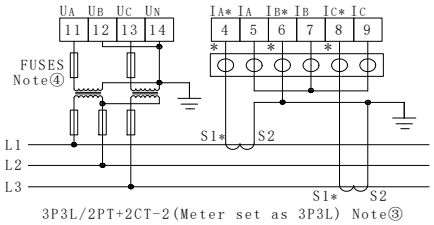
3P3i/2PT+3CT(Meter set as 3P3i) Note③



3P3L/2CT(Meter set as 3P3L)



3P3L/2PT+2CT-1(Meter set as 3P3L)



3P3L/2PT+2CT-2(Meter set as 3P3L) Note③

Note①:⊡⊡⊡⊡⊡⊡ is the test terminal for CT secondary side short circuit.

Note②:Only applicable to three-phase balanced load.

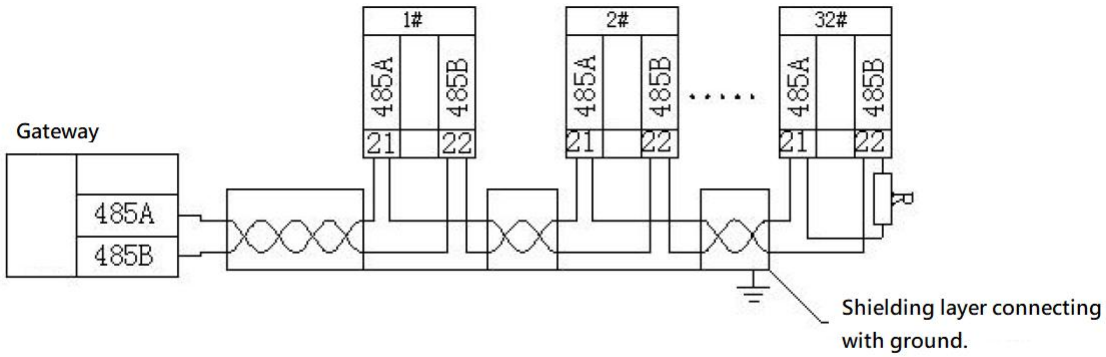
Note③:Phase B displays only current and does not participate in other electricity calculation.

Note④:FUSES rated current 1A must be installed.

Figure 9 Schematic diagram of instrument signal wiring

An example of wiring for the communication part is shown below:

Correct wiring method: the communication cable shield is connected to the earth.



It is recommended to add a matching resistor between A and B of the end meter, and the resistance range is 120Ω~10 kΩ.

Figure 10 RS485 communication wiring diagram

It is recommended to add a matching resistor between A and B of the end meter, and the resistance range is 120Ω~10 kΩ.

5. Operating instructions

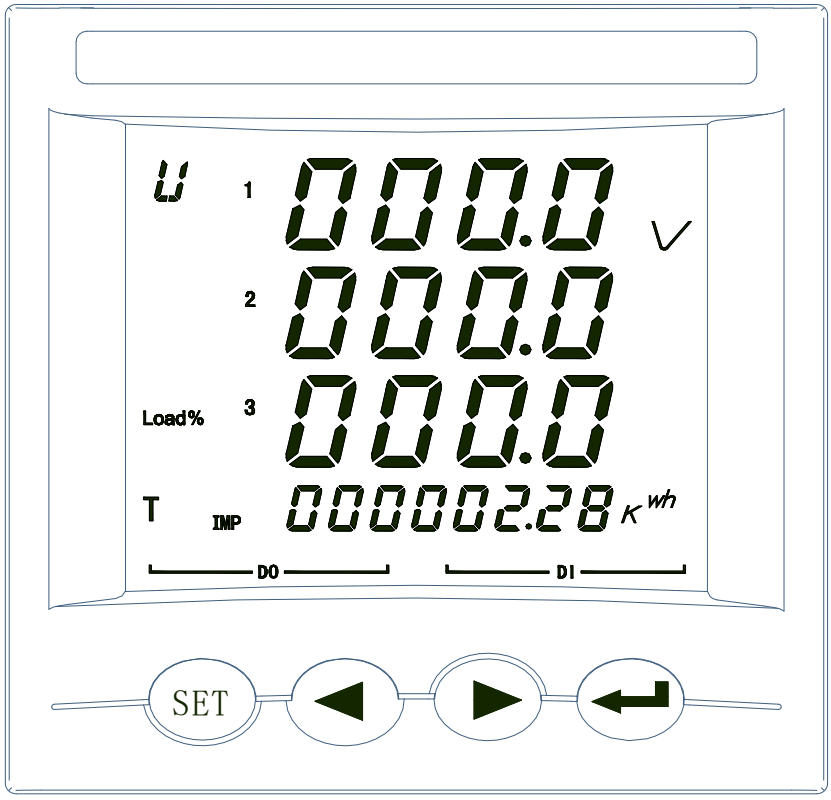


Figure 11 LCD front pane

5.1 Explanation for keypad functionality

Four keys of PM series intelligent power collection and monitoring device separately indicate SET key, LEFT key, RIGHT key, ENTER key from left to right.

Table 4 key function description

Panel key category	Key Function
SET key (SET)	Under measurement mode, Press This key enter programming mode, meters hint Input password PASS, after Input correct password, set up meters programming; Under programming mode, used for Return to previous menu。
Left key(◀)	Under measurement mode, used for switching Display item; Under programming mode, used for switching same class menu or ones place reduced。
Right key(▶)	Under measurement mode, used for switching Display item; Under programming mode, used for switching same class menu or ones place increase。
ENTER key(↵)	Under measurement mode, when Displaying Electric energy data, press This key can look over time sharing multi-rate Electric energy(if any); Programming mode, used for menu item selection confirm and parameter revision confirm。
Left key+ENTER key(◀ + ↵)	Programming mode, this key combination is used for the reduction of hundreds of digits.
Right key+ENTER key(▶ + ↵)	Programming mode, this key combination is used to increase the hundred digits.

Note: When using the combination key, you can hold down the Left and Right key and then press the Enter key.

5.2 Display Example

5.2.1 The steps for viewing various types of power parameters of the PM-310/320 are shown in Figure 12.
PM-310/320 three-phase power meter:

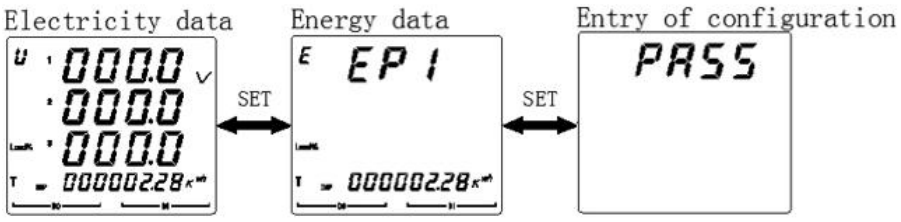


Figure 12

Note: The SET key allows users to toggle the display of all major categories of data.

5.2.2 View the power parameters of the PM-310/320 as shown in Figure 13.

PM-310/320 three phase electric energy：

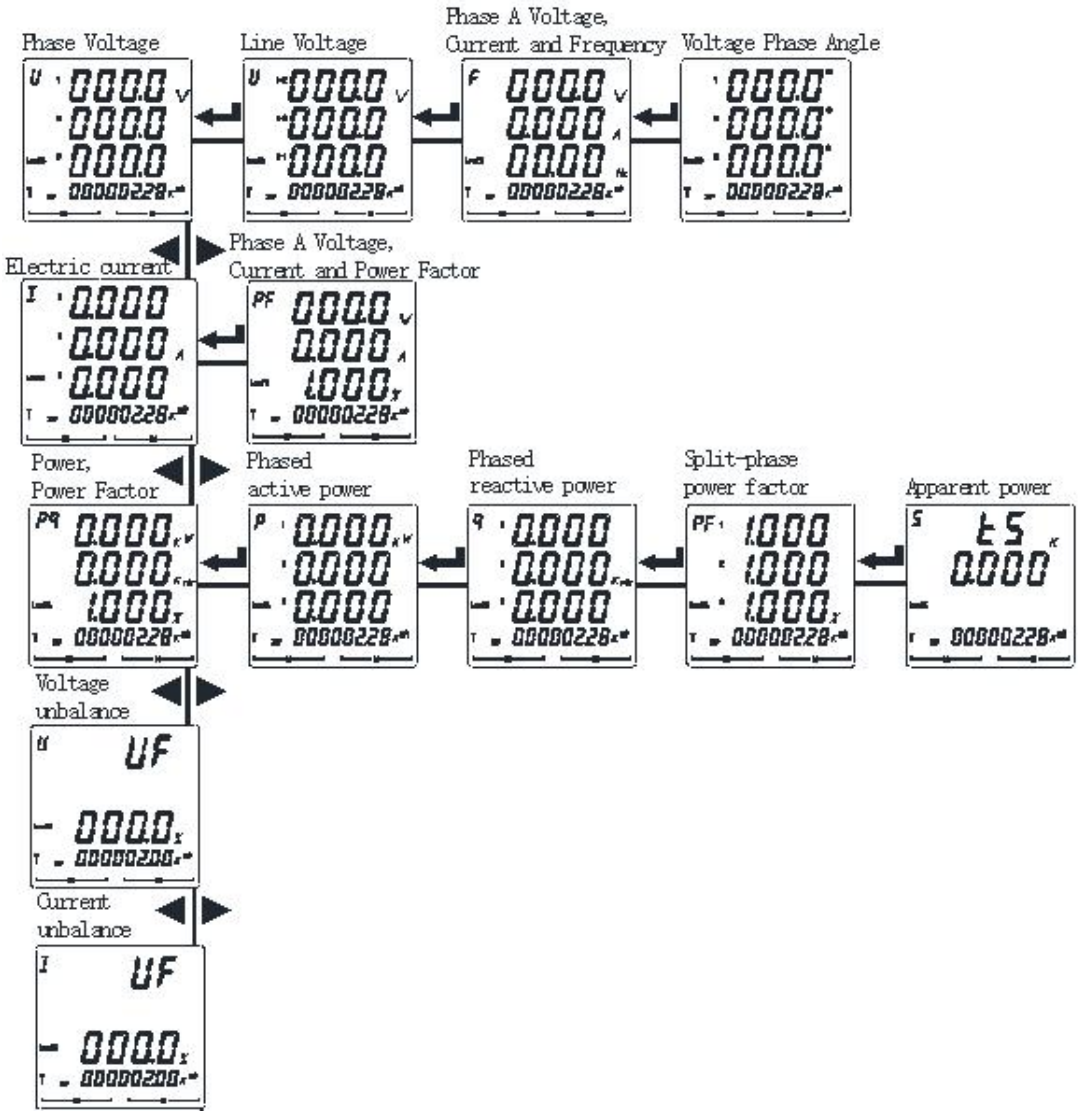


Figure 13

5.2.3 View the power parameters of the PM-310/320 as shown in Figure 14.

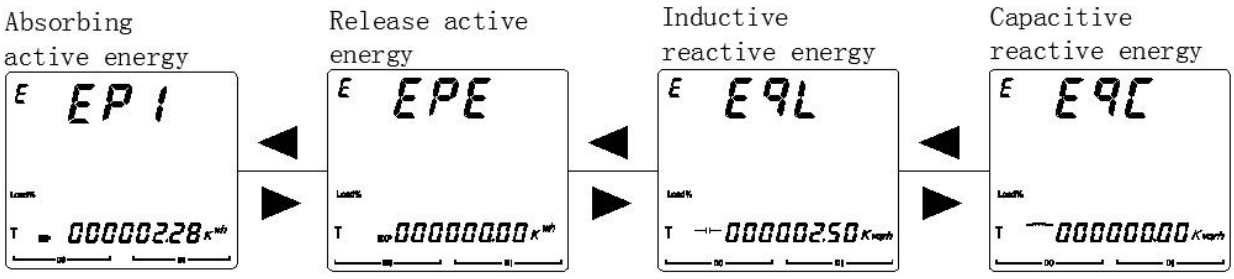


Figure 14

5.3 Programming menu

5.3.1 Meter general programming menu

Table 5

First menu	Second menu	Tertiary menu	Description
SYS	dISP		Start-up display selection: 0-automatic page turning; other page numbers correspond to the current meter model power parameter interface.
	CodE	0～9999	Password setting (Initial password 0001)
	CLr.E		Press ENTER key Electric energy clear
	CLr.d		Press Enter key, clear demand record
	CLr.n		Press Enter key, clear demand record
	EP.E9	E1/E2	Primary(EI) or secondary(E2) energy display option,The default is E1.
	PLUS	1.6-160.0	Constant of Energy plus(e.g:10.0-10000imp/kWh)
	CF	EP/EQ	Active pulse (EP), reactive pulse (EQ) switching, default active pulse
In	LinE	3P3L、3P4L	Connection mode(Three-phase-three-wire Three-phase-four-wire)
	In.U	100V、400V、660V	Input voltage range
	In.I	1A、5A	Input current range
	In.Pt	0～9999	Voltage ratio
	In.Ct	0～9999	Current ratio
	In.U0	0～999.9V	Voltage shielding
	In.I0	0～999.9A	Current shielding
bUS	Addr	1～247	Communication address
	bAUd	1200、2400、4800、9600、19200、38400	Communication baud rate
	nodE	None/2bit/odd/even	Communication data mode

	645 Addr	000000000001～ 999999999999	645 Protocol Communication Address
do.1-do.2	SEL	See 5.4.3for details.	Alarm item selection
	dLy	0000～9999	Alarm delay or remote control delay
	bAnd	0000～9999	Hysteresis setting
	AL.Hi	-9999～9999	High alarm value setting
	AL.Lo	-9999～9999	Low alarm value setting
	In.-0		Whether low alarm is allowed when the signal is 0
uEr			Meter version number and number

5.3.2 LCD display instrument backlight control menu

Table 6

First menu	Second menu	Tertiary menu	Description
SYS	b.LCd	0-9999	When set to 0, the backlight is always on. When set to 1-9999, the backlight is off after 1-9999 seconds.

5.4 Programming example

The programming example use flow chart to introduce how to change some options of programming menu such as current times, transducer setting etc.

Note: After completing setting or selecting, press ENTER button to confirm, after confirming, pressing SET key until SAVE/YES page appear, now, the ENTER button must be pressed to confirm, otherwise, the setting is invalid.

5.4.1 How to modify the current ratio

For example: the signal is 1000A/5A meter, the ratio setting is shown in Figure 15.

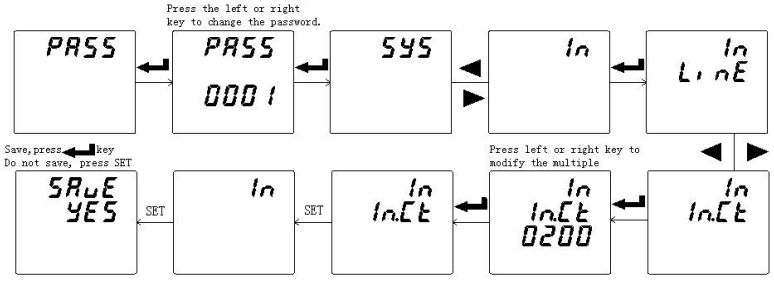


Figure 15

5.4.2 Switching/Relay alarm output setting

For example: when the total active power is lower than 3.3kW or higher than 66kW, the first alarm will act after 10 seconds,and Hysteresis setting is 1kW. When the power is 0, the alarm is allowed. The setting is shown in Figure 16.

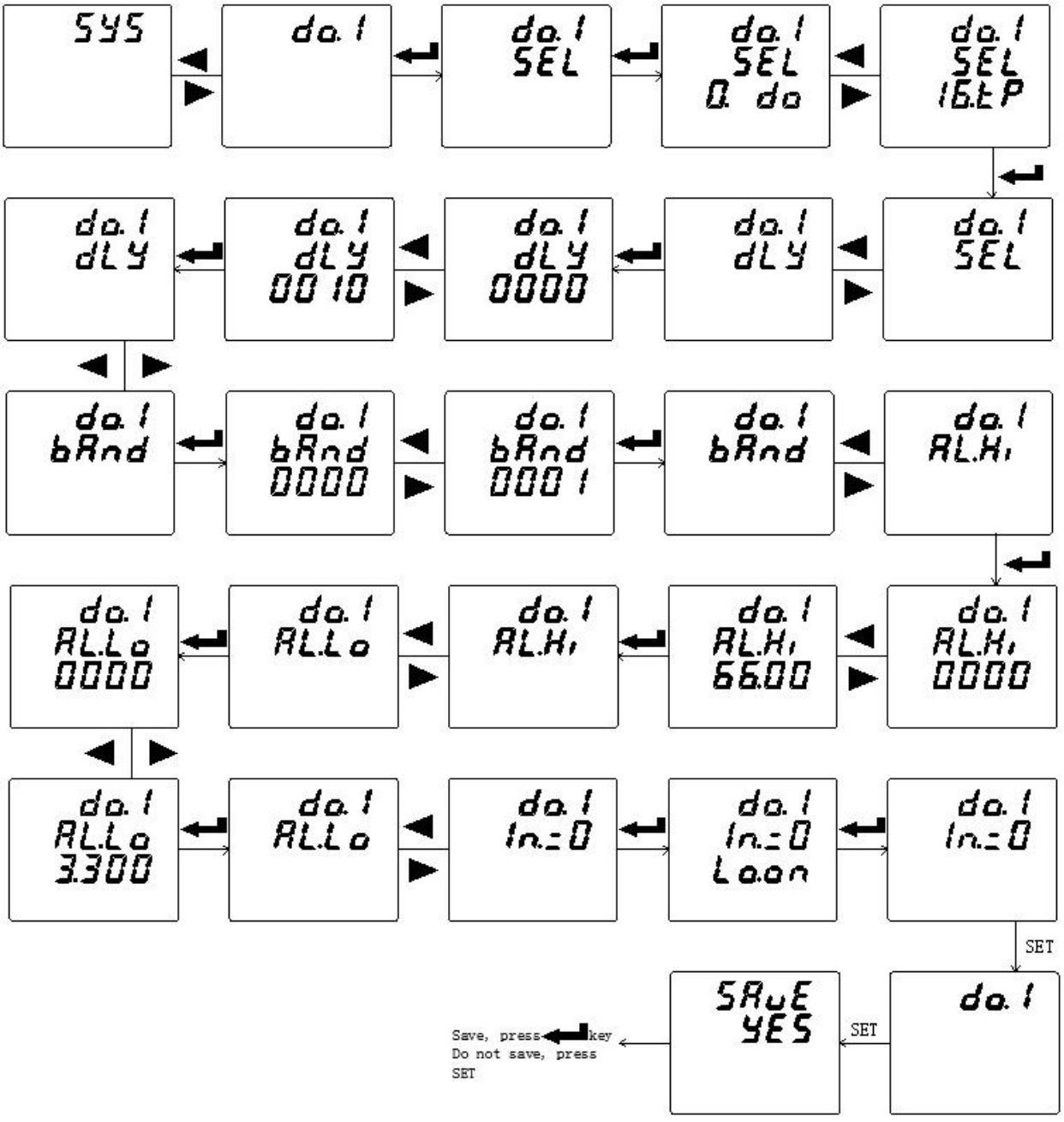


Figure 16

Table 7

<table>
<tr><td>do.1</td><td>The first switching/relay alarm output</td></tr>
<tr><td>SEL</td><td>Alarm item setting
<table>
<tr><td>00</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td></tr>
<tr><td>Remote control</td><td>UA</td><td>UB</td><td>UC</td><td>Three-phase phase voltage maximum value</td><td>UAB</td><td>UBC</td><td>UCA</td></tr>
<tr><td colspan="2">08</td><td>09</td><td>10</td><td>11</td><td colspan="2">12</td><td>13</td><td>14</td></tr>
<tr><td colspan="2">Three-phase line voltage maximum value</td><td>IA</td><td>IB</td><td>IC</td><td colspan="2">Three-phase current maximum value</td><td>PA</td><td>PB</td></tr>
<tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr>
<tr><td>PC</td><td>Psum</td><td>QA</td><td>QB</td><td>QC</td><td>Qsum</td><td>SA</td><td>SB</td><td>SC</td></tr>
<tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td colspan="2">30</td><td>31</td></tr>
<tr><td>Ssum</td><td>PFA</td><td>PFB</td><td>PFC</td><td>PF</td><td>F</td><td colspan="2">Voltage imbalance</td><td>Current imbalance</td></tr>
<tr><td colspan="3">32</td><td colspan="3">33</td><td colspan="3">34</td></tr>
<tr><td colspan="3">DI1(Linkage)</td><td colspan="3">DI2(Linkage)</td><td colspan="3">FL（Combined alarm）</td></tr>
<tr><td colspan="6">The corresponding channel "In.=0" needs to be set to "Lo.on"</td><td colspan="3">The second way DO can be set</td></tr>
</table></td></tr>
<tr><td>dLY</td><td>When the alarm item SEL is 00 (remote control), DLY indicates the duration after the switching amount is activated.
When the alarm item SEL is not 00 (alarm), DLY indicates the delay time before the switching action.</td></tr>
<tr><td>bAnd</td><td>Hysteresis setting</td></tr>
<tr><td>AL.Hi</td><td>High alarm value setting (do not set the maximum 9999)</td></tr>
<tr><td>AL.Lo</td><td>Low alarm value setting (do not set minimum -9999)</td></tr>
<tr><td>In.=0</td><td>Whether low alarm is allowed when the signal is 0, Lo.on is enabled, Lo.of is forbidden</td></tr>
</table>

Note:

1. Hysteresis setting, high alarm value setting and low alarm value setting correspond to the display value of the battery, and the display contains a decimal point.e.g. input 220V 100A/5A, three phase four wire, 100% P total as 220*100*3=66kW, e.g. 100% power high alarm, "AL.Hi" taken as 66.00; 100% voltage high alarm, "AL.Hi" taken as 220.0; 100% current high alarm, "AL.Hi" taken as 100.0

2.Indication of three phase XX maximum/minimum value: high alarm represents maximum value of three phase; low alarm represents minimum value of three phase

3.Secondary DO to be set as "34.FL" combination alarm function; after setting, level II menu changed as "SEL" (function selection), "dLy" (delay), "H-U" (high voltage), "L-U" (low voltage), "H-F" (high frequency), "L-F" (low frequency), "H-P" (high frequency), "L-P" (low frequency), "H-I" (high current), "L-PF" (low power factor), " H-b.U " (over voltage unbalance, set as -1 phase miss, judgment condition at least one phase>0.5Ue, at least one phase<0.1Ue), " H-b.I " (over current unbalance, set as -1 phase miss, judgment condition at least one phase>0.2Ie, at least one phase<0.01Ie).

4.Unbalance calculation

(Difference between maximum deviation from the mean value and mean value)/mean value *100%,if the mean value of denominator is less than the rated value, the denominator is rated value; voltage rated value Ue; 3 phase 4 wire Ue as the phase voltage, menu setting 400V instrument as 220V*PT, 100V instrument as 57V*PT.Current rated value Ie: 5A instrument as 5A*CT, 1A instrument as 1A*CT.

Unbalance set parameter in percentage, e.g. 20 means 20%.

6 Communication

6.1 General

PM series instruments adopt a protocol compatible with Modbus-RTU: “9600,8, N, 1”, of which 9600 is the default baud rate and can be programmed to 2400,4800,19200, etc. . 8 Means 8 data bits; N Means No parity bit; 1 means there is one stop bit.

Error Detection: CRC16(CYCLIC REDUNDANCY CHECK)

6.2 Agreement

When the data frame arrives at the terminal device, it enters the addressed device through a simple “Port”, which removes the “Envelope”(data header) of the data frame, reads the data, and, if there is no error, performs the task requested by the data, it then adds its own generated data to the retrieved “Envelope”and returns the data frame to the sender. The returned response Data includes the following: the Terminal Address, the executed command, the requested Data generated by the execution command, and a CRC Check. Any error that occurs will not result in a successful response, or an error indicator frame will be returned.

6.2.1 Data frame format

Address	Function	Data	Validation
8-Bits	8-Bits	N×8-Bits	16-Bits

6.2.2 Address field

The address field is at the beginning of the frame and consists of one byte (8-Bits, 8-bit binary code) , the decimal is 0 ~ 255, only 1 ~ 247 is used in this instrument, other addresses are reserved. These addresses indicate the address of the user-specified terminal device that will receive data from the host to which it is connected. The address of each terminal device on the same bus must be unique, and only the addressed terminal will respond to a query containing that address. When a terminal sends back a response, the slave address data in the response tells the host which terminal is communicating with it.

6.2.3 Function field

The Functional Domain Code tells the addressable terminal what function to perform. The following table lists the function codes used in this series of meters, as well as their meanings, and functions.

Code (hexadecimal)	Meaning	Behavior
03H	Read Hold Register	Gets the current binary value in one or more hold registers
10H	Preset Multiple Register	The specific binary value is loaded into a continuous hold register

6.2.4 Data field

The data field contains the data needed by the terminal to perform a specific function or the data collected by the terminal in response to a query. This data may be a value, a parameter, an address, or a set value.

For example, a function field tells a terminal to read a register, and a data field indicates which register to start from and how many pieces of data to read from.

6.2.5 Error Check field

The domain uses the CRC16 Cyclic redundancy check, allowing hosts and terminals to check for transmission errors. Sometimes due to electrical noise and other interference, some changes may occur on the line when a set of data is transmitted from one device to another. Error Checking ensures that the host or slave does not respond to the changed data, this improves the security, reliability and efficiency of the system.

6.3 Message example

As far as possible, the examples in this section are in the following tabular format (hexadecimal data)

Addr	Fun	Data start		Data #of		CRC16	
		Reg Hi	Reg Lo	Reg Hi	Reg Lo	Lo	Hi
01H	03H	00H	00H	00H	06H	C5H	C8H
Address	Function Code	Data starting address		Number of data reads		The Cyclic redundancy check code	

EXAMPLE: Read Password

Query data frame	01 03 00 00 00 01 84 0A
Return data frame	01 03 02 00 01 79 84

EXPLANATION:

Send Message:

01：From the machine address

03：Function Code

00 00：Password Register address (see 6.4)

00 01：Read 1 register

84 0A：CRC

Reply Message:

01：From the machine address

03：Function Code

02：Number of bytes returned

00 01：Current password

79 84：CRC

6.4 Register listing(MODBUS-RTU)

Table 8

Address	Parameter	Read or write	Value range	Data type
0000H	Password saved	R/W	0001-9999	Uint16
0001H high byte	Communication address	R/W	0001-0247	Uint16
0001H low byte	Communication baud rate	R/W	0-3：38400、19200、 9600、4800bps	
0002H	Control character	R/W	8th bit-connection mode (0-3-phase-4-wire, 1-3-phase-3-wire) 7th bit-input voltage range (0-400V, 1-100V) second bit-input current range (0-5A, 0-1 A)	Uint16
0003H	PT transformation ratio	R/W	1-9999	Uint16
0004H	CT transformation ratio	R/W	1-9999	Uint16
0011H high byte	Backlight control	R/W	Only applied to LCD Display meters 0= lights	Uint16
0022H	Switching input and output status	R/W	See 6.2.1	Uint16
0023H high byte	Decimal point U (DPT)	R	3～7	Uint16
0023H low byte	Decimal point I (DCT)	R	1～5	
0024H high byte	Decimal point PQ (DPQ)	R	4～10	Uint16
0024H low byte	Symbol PQ	R	High byte-low byte:Q、Qc、Qb、Qa、P、Pc、Pb、Pa; 0 is positive and 1 is negative	
The following is the primary side power parameter				
0025H	UAN	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0026H	UBN	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0027H	UCN	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0028H	UAB	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0029H	UBC	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
002AH	UCA	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
002BH	IA	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
002CH	IB	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
002DH	IC	R	0-9999 (see 6.5.2 for conversion formula)	Uint16

002EH	PA	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
002FH	PB	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0030H	PC	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0031H	Psum	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0032H	QA	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0033H	QB	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0034H	QC	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0035H	Qsum	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
0036H	PFA	R	0-1000 (see 6.5.2 for conversion formula)	Uint16
0037H	PFB	R	0-1000 (see 6.5.2 for conversion formula)	Uint16
0038H	PFC	R	0-1000 (see 6.5.2 for conversion formula)	Uint16
0039H	PFsum	R	0-1000 (see 6.5.2 for conversion formula)	Uint16
003AH	SA	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
003BH	SB	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
003CH	SC	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
003DH	Ssum	R	0-9999 (see 6.5.2 for conversion formula)	Uint16
003EH	F	R	4500-6500(see 6.5.2 for conversion formula)	Uint16
The following is the energy address table				
003FH～0040H	Absorptive active electric energy secondary side	R	0-999999999(see 6.5.2 for conversion formula)	Uint32
0041H～0042H	Release active electric energy secondary side	R	0-999999999(see 6.5.2 for conversion formula)	Uint32
0043H～0044H	Inductive reactive electric energy secondary side	R	0-999999999(see 6.5.2 for conversion formula)	Uint32
0045H～0046H	Capacitive reactive electric energy secondary side	R	0-999999999(see 6.5.2 for conversion formula)	Uint32
0047H～0048H	absorptive active electric energy primary side（consumer electricity consumption）	R	(see 6.5.2 for conversion formula)	Float
0049H～004AH	Release active electric energy primary side	R	(see 6.5.2 for conversion formula)	Float
004BH～004CH	Inductive reactive electric energy primary side	R	(see 6.5.2 for conversion formula)	Float
004DH～004EH	Capacitive reactive electric energy primary side	R	(see 6.5.2 for conversion formula)	Float
The following is the primary side zero sequence voltage and current address table				
0074H	Zero sequence voltage	R	0-9999(see 6.5.2 for conversion formula)	Uint16
0075H	Zero sequence current	R	0-9999(see 6.5.2 for conversion formula)	Uint16
0076H	Current percentage	R	Unit 0.01%	Uint16

0077H	Voltage current phase sequence state	R	High: Current, low: Voltage 0: Normal 1: Error	Uint16
The following is the voltage phase parameter address table				
008CH	Voltage UA phase angle	R	0-9999（1 decimal place, example 1200 means 120.0）	Uint16
008DH	Voltage UB phase angle	R	0-9999（1 decimal place, example 1200 means 120.0）	Uint16
008EH	Voltage UC phase angle	R	0-9999（1 decimal place, example 1200 means 120.0）	Uint16
The following is the secondary side power parameters				
0100H	UAN	R	0-9999 (1 decimal place, unit V)	Uint16
0101H	UBN	R	0-9999 (1 decimal place, unit V)	Uint16
0102H	UCN	R	0-9999 (1 decimal place, unit V)	Uint16
0103H	UAB	R	0-9999 (1 decimal place, unit V)	Uint16
0104H	UBC	R	0-9999 (1 decimal place, unit V)	Uint16
0105H	UCA	R	0-9999 (1 decimal place, unit V)	Uint16
0106H	IA	R	0-9999 (3 decimal places, unit I)	Uint16
0107H	IB	R	0-9999 (3 decimal places, unit I)	Uint16
0108H	IC	R	0-9999 (3 decimal places, unit I)	Uint16
0109H	PA	R	0-9999 (3 decimal places, unit kw)	Int16
010AH	PB	R	0-9999 (3 decimal places, unit kw)	Int16
010BH	PC	R	0-9999 (3 decimal places, unit kw)	Int16
010CH	Psum	R	0-9999 (3 decimal places, unit kw)	Int16
010DH	QA	R	0-9999 (3 decimal places, unit kvar)	Int16
010EH	QB	R	0-9999 (3 decimal places, unit kvar)	Int16
010FH	QC	R	0-9999 (3 decimal places, unit kvar)	Int16
0110H	Qsum	R	0-9999 (3 decimal places, unit kvar)	Int16
0111H	PFA	R	-1000 to 1000 (3 decimal places)	Int16
0112H	PFB	R	-1000 to 1000 (3 decimal places)	Int16
0113H	PFC	R	-1000 to 1000 (3 decimal places)	Int16
0114H	PFsum	R	-1000 to 1000 (3 decimal places)	Int16
0115H	SA	R	0-9999 (3 decimal places, unit VA)	Uint16
0116H	SB	R	0-9999 (3 decimal places, unit VA)	Uint16
0117H	SC	R	0-9999 (3 decimal places, unit VA)	Uint16
0118H	Ssum	R	0-9999 (3 decimal places, unit VA)	Uint16
0119H	F	R	4500-6500 (2 decimal places)	Uint16
011AH	Zero sequence voltage	R	0-9999 (1 decimal place, unit V)	Uint16
011BH	Zero sequence current	R	0-9999 (3 decimal places, unit I)	Uint16
DO setting and status read address				

025DH	Communication mode	R/W	0: None 1: 2 Stop 2: Odd 3: Even	Uint16
025EH	Pulse constant setting	R/W	16-1600 100 stands for 10000imp/kWh	Uint16
025FH	DIDO status	R		Uint16
0260H	DO1 alarm selection	R/W	0000-9999 (same as DO setting menu 5.3.3 in SEL)	Uint16
0261H	DO1 alarm delay	R/W	0000-9999 (same as DO setting menu 5.3.3 DLY)	Uint16
0262H	DO1 hysteresis setting	R/W	0000-9999 (same as DO setting menu 5.4.3 bAnd)	Uint16
0263H	DO1 high alarm value	R/W	-9999～9999 (with the DO setting menu 5.3.3 AL.Hi)	Int16
0264H	DO1 low alarm value	R/W	-9999 ～ 9999 (along with DO setting menu 5.3.3 AL.Lo)	Int16
0265H	DO1 low alarm enable	R/W	Enable at 0 (same as DO setting menu 5.4.3 in In.=0)	Uint16
0266H-026BH	DO2 alarm settings	R/W	Same as DO1 alarm setting, high and low voltage value and voltage value in DO2 combination alarm	Uint16
0278H	DLT645 address setting	R/W	High four-bit address, hex form	Uint16
0279H	DLT645 address setting	R/W	Medium four-bit address, hex form	Uint16
027AH	DLT645 address setting	R/W	Low four-bit address, hex form	Uint16
027BH	DO2 combination alarm over frequency value	R/W	0000-9999 (same as DO2 setting menu 5.4.3 H-F)	Uint16
027CH	DO2 combination alarm underfrequency value	R/W	0000-9999 (same as DO2 setting menu 5.5.3 L-F)	Uint16
027DH	DO2 combination alarm over power value	R/W	-9999 ～ 9999 (the same as the DO2 setting menu 5.4.3 H-P)	Int16
027EH	DO2 combination alarm underpower value	R/W	-9999 ～ 9999 (L-P in the same DO2 setting menu 5.4.3)	Int16
027FH	DO2 combination alarm over current value	R/W	0000-9999 (the same as the DO2 setting menu 5.4.3 H-I)	Uint16
0280H	DO2 combination alarm underpower factor value	R/W	-1000 to 1000 (L-PF in the same setting as the DO2 setting menu 5.4.3)	Int16
0281H	DO2 combination alarm overvoltage imbalance value	R/W	-1 to 999 (H-b.U in the same setting as the DO2 setting menu 5.4.3)	Int16
0282H	DO2 combination alarm overcurrent imbalance value	R/W	-1 to 999 (H-b.I in the same setting as the DO2 setting menu 5.4.3)	Int16

03E8H	Alarm status of DO2 combined alarm	R	bit0="H- U"（high voltage） bit1="L- U"（low voltage） bit2="H- F"（high frequency） bit3="L- F"（low frequency） bit4="H- P"（high power） bit5="L- P"（low power） bit6="H- I"（high current） bit7="L- PF"（low power factor） bit8="H- b.U"（over voltage unbalance, set as -1 phase miss） bit9="H- b.I"（Current imbalance）	Uint16
03E9H	DO1 current alarm value	R	0000-9999	Uint16
03EAH	DO2 current alarm value	R	0000-9999	Uint16
03EDH	DO2 combination alarm current overvoltage value	R	0000-9999	Uint16
03EEH	DO2 combination alarm current undervoltage value	R	0000-9999	Uint16
03EFH	DO2 combination alarm current over frequency value	R	0000-9999	Uint16
03F0H	DO2 combination alarm current underfrequency value	R	0000-9999	Uint16
03F1H	DO2 combination alarm current overpower value	R	0000-9999	Uint16
03F2H	DO2 combination alarm current underpower value	R	0000-9999	Uint16
03F3H	DO2 combination alarm current overcurrent value	R	0000-9999	Uint16
03F4H	DO2 combination alarm underpower factor value	R	0000-9999	Uint16
03F5H	DO2 combination alarm overvoltage imbalance value	R	0000-9999	Uint16
03F6H	DO2 combination alarm overcurrent imbalance value	R	0000-9999	Uint16
0700H	**Voltage imbalance**	R	0-9999 (1 decimal place, example 20 means 2%)	Uint16
0701H	Current imbalance	R	0-9999 (1 decimal place, example 20 means 2%)	Uint16

6.5 Communication application

The PM series intelligent power collection and monitoring device has unified planning of the communication address table during design. The user can conveniently realize the functions of telemetry, remote signaling and remote control according to the following description.

6.5.1 Switching input and output

The switching input of PM series intelligent power collection and monitoring device adopts dry contact switch signal input mode. The instrument is equipped with working power supply, no external power supply is required. When the external contact is closed or disconnected, the meter displays the switch status locally, and the remote transmission function can be realized through the communication port of the meter, that is, the "remote message" function.

The switching output of PM series intelligent power collection and monitoring device is relay output, which can be remotely controlled by the host computer (the remote control has two modes: 1, level trigger; 2. pulse trigger) to realize the "remote control" function, or according to customer requirements. Implement the corresponding alarm function (such as over current, under voltage).

The communication address of the PM series intelligent power collection monitoring device and the digital switching input and switching output is 0022H, and its correspondence with the digital input and output is as follows:

0022H	16	15	14	13	12	11	10	9	8～1
			DO2	DO1			DI2	DI1	Reserved

6.5.2 Power parameters and electrical energy

The series of measured values are read by the command No. 03 of the Modbus-RTU communication protocol. The correspondence between the communication value and the actual value is as follows: (Agreed Val_t is the communication read value, Val_s is the actual value).

1. Phase voltage UA, UB, UC, line voltage UAB, UBC, UCA, zero sequence voltage:

Val_s=Val_t×10＾（DPT-4），Unit volt V, DPT is read from the high byte of 0023H .

2. Current IA, IB, IC, zero sequence current:

Val_s=Val_t×10＾（DCT-4），Unit Ampere A, DCT is read from the low byte of 0023H.

3.Power PA, PB, PC, Psum, QA, QB, QC, Qsum:

Val_s=Val_t×10＾（DPQ-4），Active power unit watt W, reactive power unit var, DPQ read from 0024H high byte, active power and reactive power symbols from 0024H low byte (from high to low, Q, Qc, Qb, Qa, P, Pc, Pb, Pa) read.

4.Power factor values PFA, PFB, PFC, PFsum:

Val_s=Val_t/1000，No unit

5.Frequency:

Val_s=Val_t/100，Unit Hertz Hz

6.Electrical energy:

For PM series intelligent power acquisition and monitoring devices, the following methods can be used to read power.

Read address 003FH～0040H (absorbed active energy), 0041H～0042H (release active energy), 0043H～0044H (inductive reactive energy), 0045H～0046H (capacitive reactive energy) secondary energy, read again PT, CT, calculated according to the following formula:

Electrical energy communication readout value Val_t=first word × 65536 + second word

The primary value of electric energy is Val_s=Val_t/1000×PT×CT, the unit of active energy: kilowatt hour (kWh), and the unit of reactive energy: kilowatt hour (kvarh). The PT is read from the address 0003H, and the CT is read from the address 0004H.

Note: In general, the user reads the absorbed active energy.

6.6 Communication (compatible with MODBUS-RTU protocol, DLT645 protocol, supports 07 and 97 versions)

On the meter 

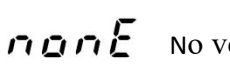
Indicates that the address of the Modbus-RTU protocol is 1

On the meter 

Indicates that the communication baud rate is 2400

On the meter 

Indicates that the parity bit is even parity



No verification 

2 stop bits 

Odd parity

On the meter 

Indicates that the communication address of the DLT645 protocol is 000000000011

DLT-645 protocol supports reading four-quadrant energy, three-phase voltage, current, active power, reactive power, power factor, can read by data block.

Example: The command to read the forward active energy version 07 specification is:

send →	11H	68 11 00 00 00 00 00 68 11 04 33 33 34 33 C3 16	2013-06-05 11:27:53	
receive ←	91H	68 11 00 00 00 00 00 68 91 08 33 33 34 33 A8 35 33 33 8A 16	2013-06-05 11:27:53	success

The command to read the 97 version of the forward active energy specification is:

send →	01H	68 11 00 00 00 00 00 68 01 02 43 C3 EA 16	2013-06-05 11:27:06	
receive ←	81H	68 11 00 00 00 00 00 68 81 06 43 C3 A8 35 33 33 B1 16	2013-06-05 11:27:06	success

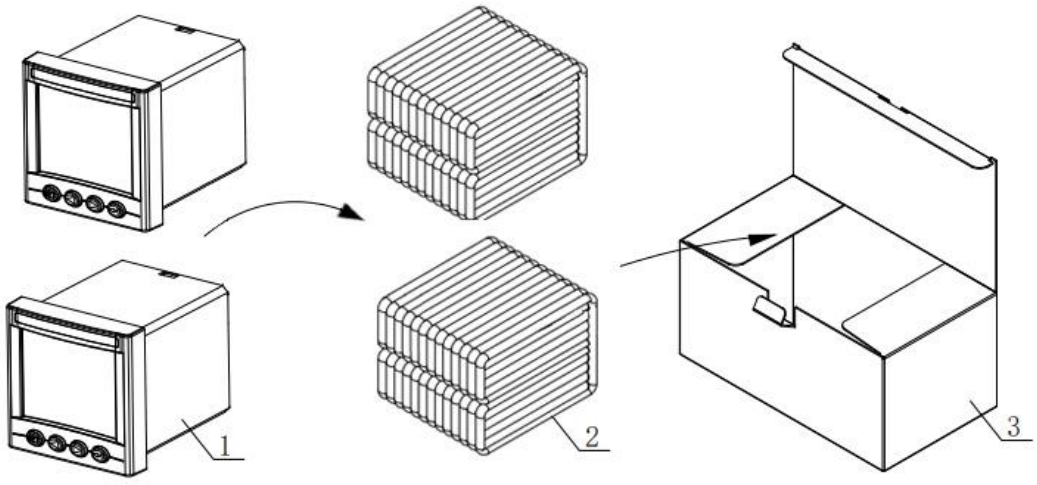
7 Common fault analysis

Table 12 Common fault analysis and elimination

Fault content	Analysis	Remarks
No display after power on	Check if the power supply voltage is within the operating voltage range	
Voltage, current, power, etc. readings are incorrect	Check if the voltage-to-current ratio setting is correct Check if the wiring mode setting is consistent with the actual Check if voltage transformer, current transformer is intact	
Power or power factor is incorrect	Check if the wiring mode setting is consistent with the actual Check if the voltage and current phase sequence is correct Check if the wiring is correct	
Communication is not normal	Check whether the address, baud rate, check digit, etc. in the communication settings are consistent with the host computer. Check if the RS485 converter is normal Parallel connection of 120 ohms or more at the end of communication Check if the wiring is correct	

8 Packaging and Accessories

Front Panel	
Certificate of Approval	
Box Label	TECOM TECOM CO.,LTD. Model: PM-310 Q'TY: 1 Part No: 671-502567R 671-502567R H3F00001 RoHS QC PASS CE Made in China
Carton Label	TECOM TECOM CO.,LTD. Model: PM-310 Part No: 671-502567R Q'TY: 48 C/No.: / G.W: 17.92 KGW N.W.: 12.68 KGW RoHS QC PASS CE Made in China 202306280001 K2022122601100 S 1-1

Product Label	TECOM TECOM CO.,LTD. Model: PM-310 PT: AC 380V Part No: 671-502567R CT: AC 5A Specifications: 2DI/2DO Auxiliary Power: AC/DC85-265V 0.5 *JYZ18060110051* 32 33 + EP - PULSE OUTPUT User Manual 671-502567R H3F00001
Packaging	KC  Shipping Terminal  Transparent Bracket*2  Size: 230*145*120mm

Front Panel	
Certificate of Approval	
Box Label	TECOM TECOM CO.,LTD. Model: PM-320 Q'TY: 1 Part No: 671-502668R 671-502668R H3F00001 RoHS QC PASS CE Made in China
Carton Label	TECOM TECOM CO.,LTD. Model: PM-320 Part No: 671-502668R Q'TY: 36 C/No.: / G.W: 17.77 KGW N.W.: 13.52 KGW RoHS QC PASS CE Made in China 202306280001 K2022122601100 S 1-1

<table>
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Model: PM-320 PT: AC 660V
Part No: 671-502668R CT: AC 5A
Specifications: 2DI/2DO Auxiliary Power: AC/DC85-265V
12306280010001
17 18
+ EP -
PULSE OUTPUT
User Manual
671-502668R H3F00001</td></tr>
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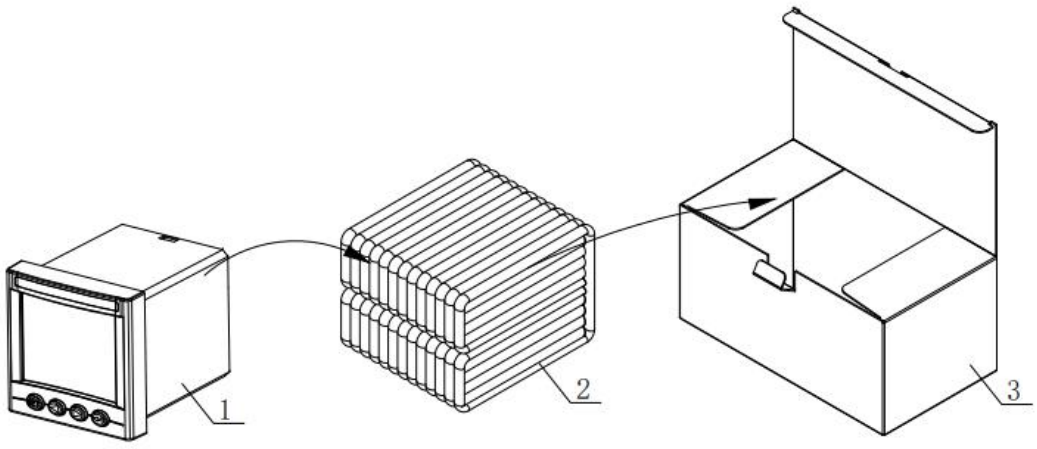
Shipping Terminal</td><td> 
Transparent Bracket*2</td></tr>
<tr><td colspan="3"> 
Size: 170*150*120mm</td></tr>
</table>

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