

PMAC211 Multi-channel power meter

Installation & Operation Manual V1.0



Pilot[®] 珠海派诺科技股份有限公司
ZHUHAI PILOT TECHNOLOGY CO., LTD.



Danger and warning !

- ◆ The device should be install by qualified people
- ◆ The manufacturer shall not be held responsible for any accident caused by the failure to comply with the instructions in this manual.



Risks of electric shocks, burning, or explosion

- ◆ This device can be installed and maintained only by qualified people.
- ◆ Before operating the device, isolate the voltage input and power supply and short-circuit the secondary windings of all current transformers.
- ◆ Use a reliable voltage measurement device to make sure voltage cut off.
- ◆ Put all mechanical parts, doors, or covers in their original positions before energizing the device.
- ◆ Always supply the device with the correct working voltage during its operation.

Failure to take these preventive measures could cause damage to equipment or injuries to people.

Note :

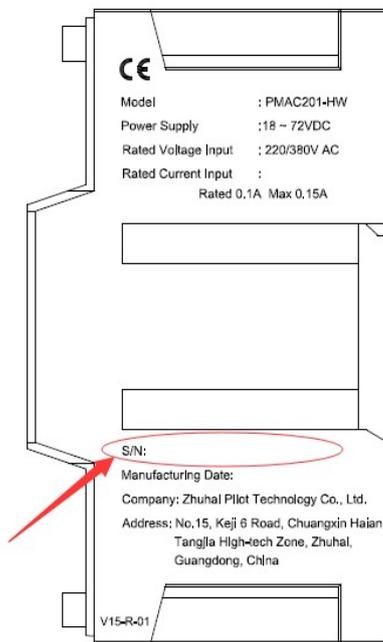
① What is the meter ID?

You can find the S/N on the meter house. As picture 1-1

The last The last two numbers is the meter' s ID address. (But if the last two numbers are "00" , then use "100" as meter ID address)

For example: if the S/N number is 15023876, then the meter ID is 76

If the S/N number is 15033800, the the meter ID is 100.



picture 1-1

② Communication setting

8 data bit

1 stop bit

No parity

Baud rate: 9600bps (default)

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1. Product Information

PMAC211 Multi-channel power meter can be used for monitoring low voltage electronic parameter of multi circuits, energy consumption and alarm for parameter. One PMAC211 can maximum monitor 4 three phase circuit, small size to save space, RS485 port to communication, suitable for low voltage power distribution system and energy efficiency management etc..applications.

Products main function as below:

- ◆ Three phase AC voltage measurement
- ◆ Frequency measurement
- ◆ 3 phase current, 3 phase active power, 3 phase reactive power, 3 phase apparent power, 3 phase power factor, 3 phase active energy, 3 phase reactive energy for each circuit
- ◆ Total active power, total reactive power, total apparent power, total power factor, total active energy, total reactive energy for each circuit
- ◆ Over limit alarm for current, over/under limit alarm for voltage, LED light flash when alarm occurs
- ◆ One RS485 communication, MODBUS-RTU protocol

2. Technical Specification

2.1 Technical parameter

| Parameter | Range | |
|---------------------|---------------------------------------|---------|
| Power supply | AC 85~265V, DC100~300V, Power loss≤2W | |
| Rated input voltage | 3×220/380V 45Hz~65Hz | |
| Rated input current | Connection with standard external CT | |
| Insulating property | Power frequency withstand voltage | 2000VAC |
| | Insulation resistance | ≥ 100MΩ |
| | Impulse withstand voltage | 6000V |
| IP index | IP52(front panel), IP20 (case) | |

2.2 Measuring range and accuracy

| Item | Range | Accuracy | Resolution |
|-----------------|--------------------------|--------------------------------------|------------|
| Voltage | AC 0~500V | 0.5% | 0.1V |
| Current | AC 0~600A | Solid core: 0.5% Split core: 1.0% | 0.1A |
| Active Power | Each phase: 0~216kW | Solid core: 1.0% Split core: 2.0% | 0.1 W |
| Reactive Power | Each phase: 0~216kVar | Solid core: 2.0% Split core: 3.0% | 0.1 Var |
| Power Factor | 0 ~ 1.0 | 1.0% | 0.001 |
| Frequency | 45 ~ 65 Hz | 0.01Hz | 0.01 Hz |
| Active Energy | 0 ~ 99999999.9kWh | Solid core: 1.0% Split core: 2.0% | 0.1 kWh |
| Reactive Energy | 0 ~ 99999999.9KVarh | Solid core: 2.0% Split core: 3.0% | 0.1 kvarh |

2.3 Electromagnetic compatibility

| Item | Standard | Level |
|--|--|---------|
| Electrostatic discharge immunity | GB/T17626.2-2006 (IEC61000-4-2: 2001) | Level 4 |
| RF Electromagnetic field radiated immunity | GB/T17626.3-2006 (IEC61000-4-3: 2002) | Level 4 |
| Electrical fast transient pulse group immunity | GB/T17626.4-2008 (IEC61000-4-4: 2006) | Level 4 |
| Surge (impact) immunity | GB/T17626.5-2008 (IEC61000-4-5: 2005) | Level 4 |
| Radio frequency interference immunity | GB/T17626.6-2008 (IEC61000-4-6: 2006) | Level 3 |
| Electromagnetic emission limits | GB 9254-2008 (CISPR22: 2006) | Pass |

2.4 Working environment

| Name | Parameter |
|---------------------------|--------------------------|
| Install environment | Indoor |
| Working temperature | -10°C ~ +55°C |
| Limit working temperature | -20°C ~ +55°C |
| Storage temperature | -40°C ~ +70°C |
| Humidity | 5% ~ 95%, non-condensing |

3. Model Information

3.1 Order Information

| | | |
|--|------------|----------------------------------|
| PMAC211 - □ - □ | | |
| ① ② | | |
| ① Number of the circuit | | |
| 1 | 1 Channel | |
| 4 | 4 Channel | |
| ② Type of the current transformer | | |
| A | LACT-100C1 | 100A solid core CT (100A/100mA) |
| B | LACT-100K1 | 100A split core CT (100A/33.3mA) |

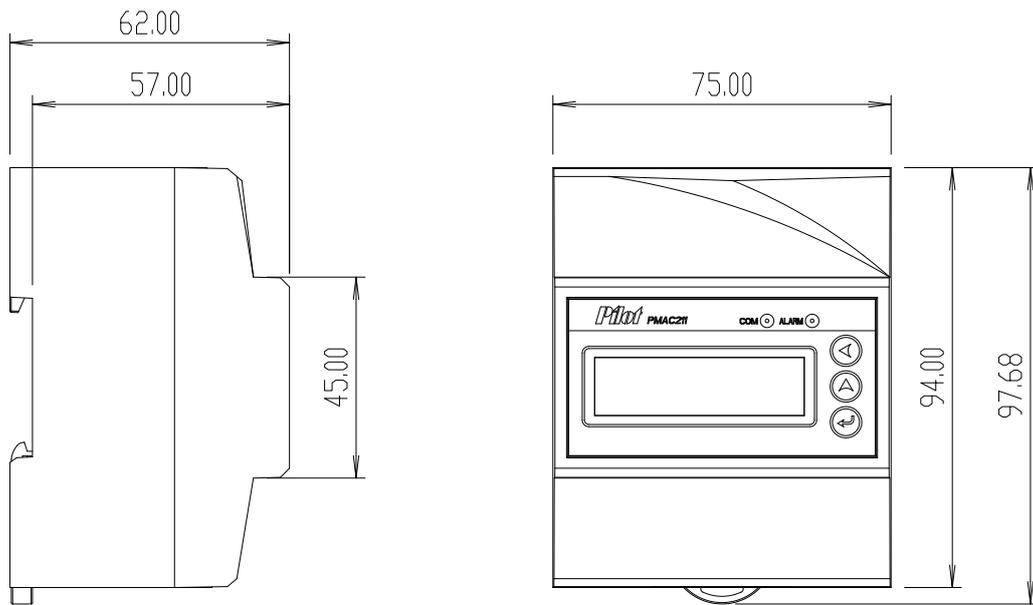
3.2 Accessory information

There are 2 kinds of current transformers, please refer to Chapter 4 for their appearance and dimension.

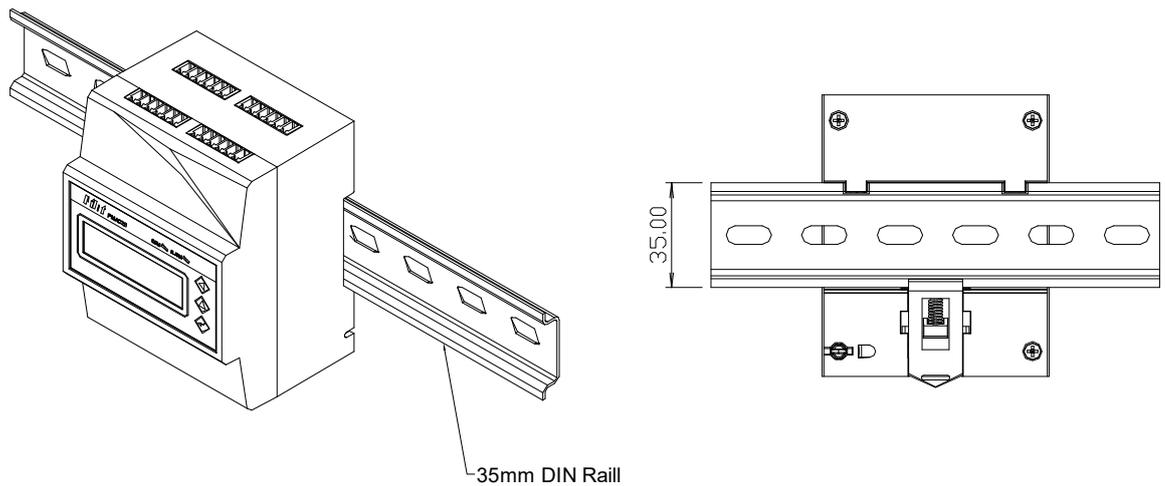
4. Product Installation

4.1 Dimension & Installation of main model

Unit: mm

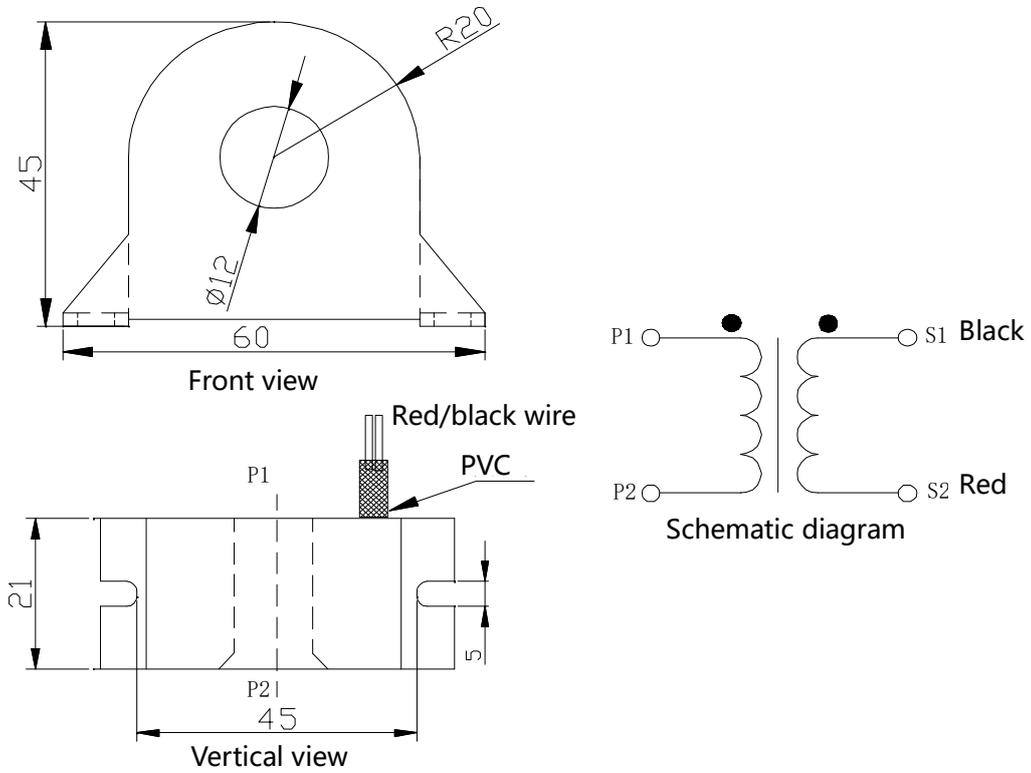


Picture 4.1 PMAC211 Dimension

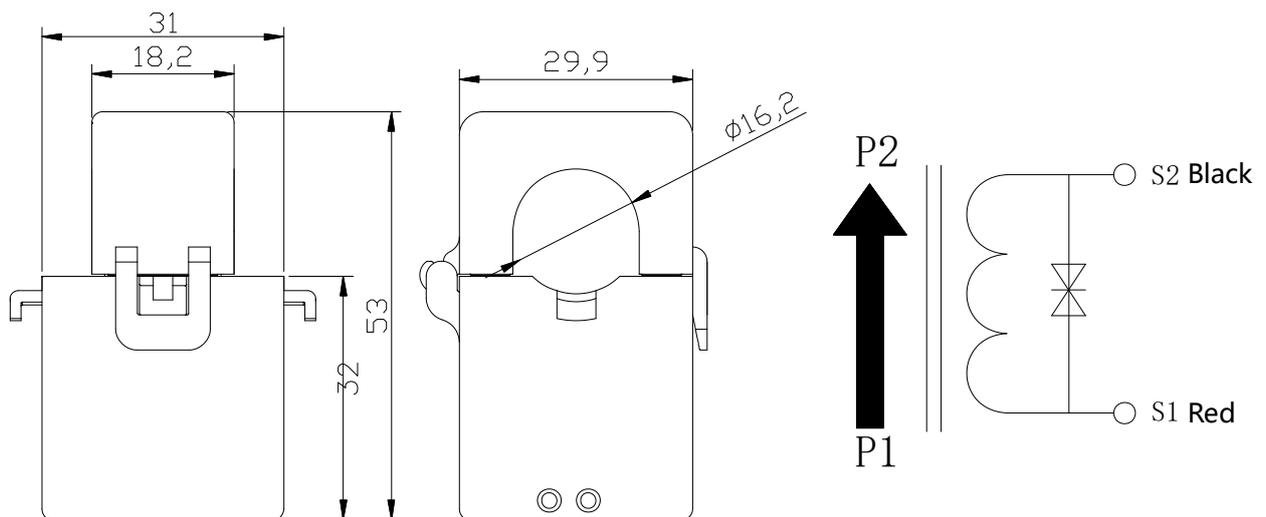


Picture 4.2 PMAC211 Installation

4.2 Dimension of Current Transformer



Picture 4.3 LACT-100C1 solid core CT dimension

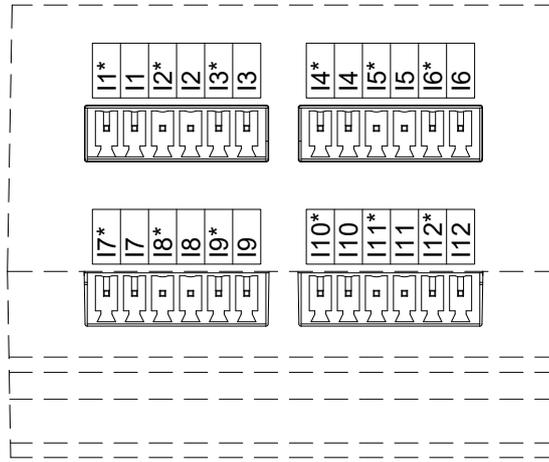


Picture 4.4 LACT-100K1 split core CT dimension

4.3 Terminal Definition

| Upward View for bottom terminal | | | |
|---------------------------------|-----------------------|------|-----------------|
| | | | |
| Mark | Definition | Mark | Definition |
| L/+ | Power supply Positive | VA | Phase A voltage |
| N/- | power supply negative | VB | Phase B voltage |
| NC | Null | VC | Phase C voltage |
| 485- | RS485- | VN | Neutral Voltage |
| 485+ | RS485+ | | |
| SHLD | Communication Shield | | |

Top view for upper terminal

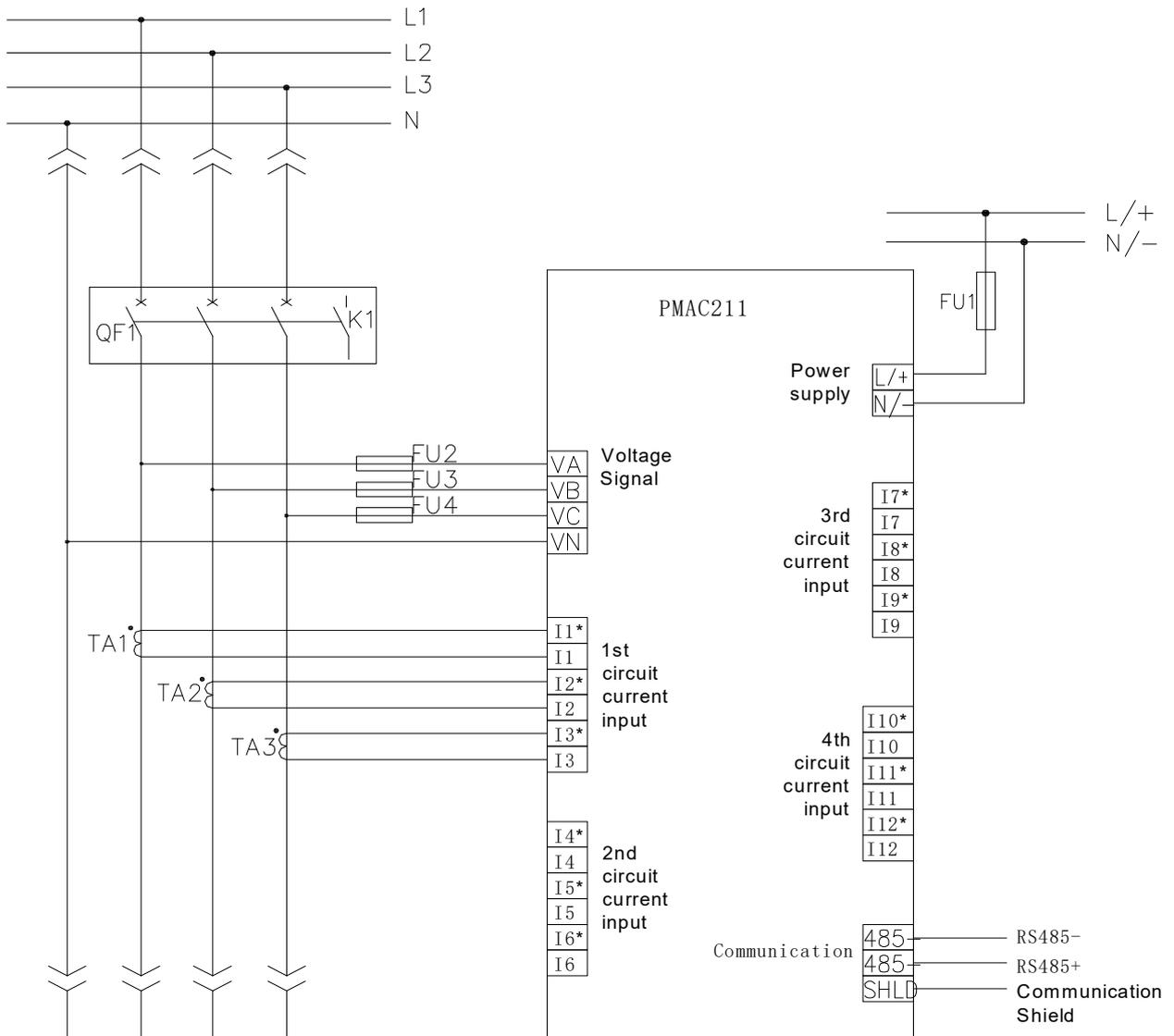


| Mark | Definition | Mark | Definition |
|------|--|------|--|
| I1 | 1 st circuit phase A current output | I4 | 2 nd circuit phase A current output |
| I1* | 1 st circuit phase A current input | I4* | 2 nd circuit phase A current input |
| I2 | 1 st circuit phase B current output | I5 | 2 nd circuit phase B current output |
| I2* | 1 st circuit phase B current input | I5* | 2 nd circuit phase B current input |
| I3 | 1 st circuit phase C current output | I6 | 2 nd circuit phase C current output |
| I3* | 1 st circuit phase C current input | I6* | 2 nd circuit phase C current input |

| Mark | Definition | Mark | Definition |
|-------------|---|-------------|--|
| 17 | 3 rd circuit phase A current output | I10 | 4 th circuit phase A current output |
| 17* | 3 rd circuit phase A current input | I10* | 4 th circuit phase A current input |
| 18 | 3 rd circuit phase B current output | I11 | 4 th circuit phase B current output |
| 18* | 3 rd circuit phase B current input | I11* | 4 th circuit phase B current input |
| 19 | 3 rd circuit phase C current output | I12 | 4 th circuit phase C current output |
| 19* | 3 rd circuit phase C current input | I12* | 4 th circuit phase C current input |

4.4 Typical wiring

PMAC211 support three phase 4 wires connection mode as below picture:

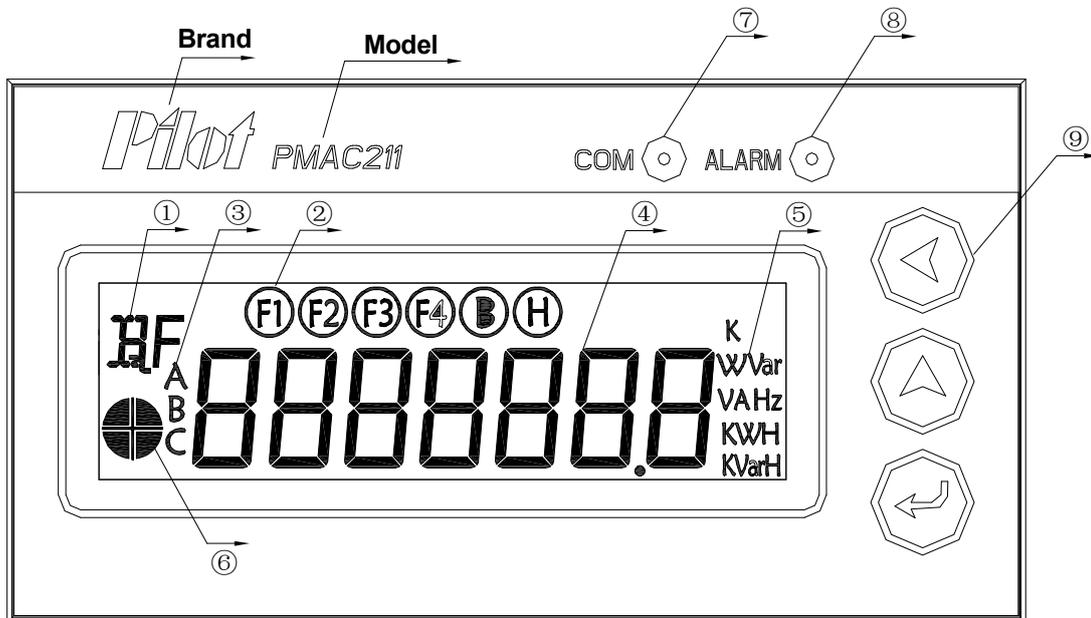


Note:

1. The no mark terminal is invalid
2. The main model can connect split core CT or sold core CT
3. Current input for 2nd , 3rd , 4th circuit is the same as 1st circuit current input

5. Display and operation

5.1 Introduction for display



Introduction for display:

- ①: Prompt for real-time data type
- ②: Prompt for circuit, for example: F1 means 1st circuit, F4 means 4th circuit
- ③: 3 phase prompt, for example: when display voltage data, display F1 and B prompt, means 1st circuit phase B voltage
- ④: Real-time data display area
- ⑤: Real-time data unit
- ⑥: Distinguish alarm threshold value, when display upper hemicycle, means upper alarm, when display bottom hemicycle, means low alarm
- ⑦: Communication indication light ;
- ⑧: Alarm indication light;
- ⑨: Button;

5.2 Button introduction

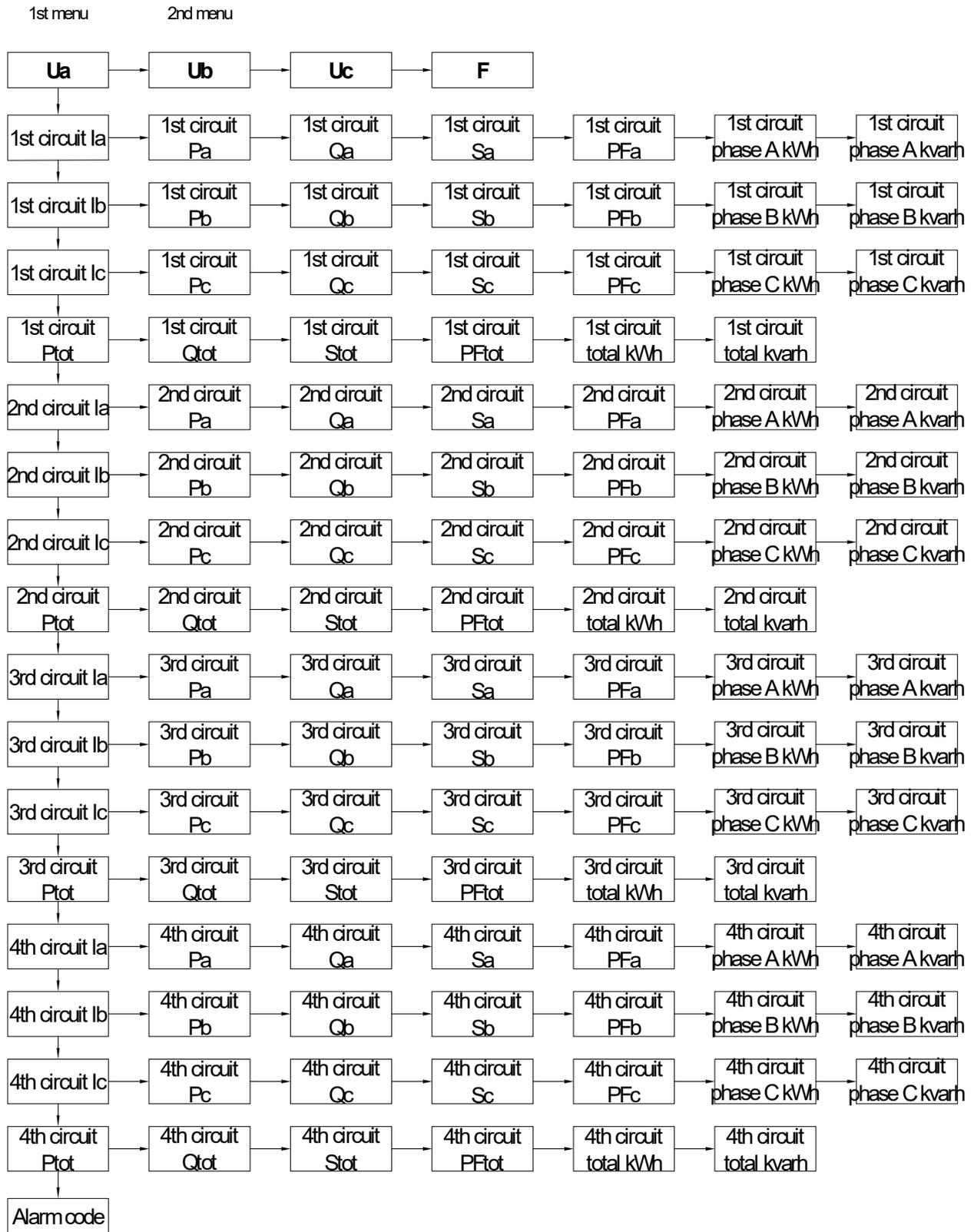
In different interface, there has different function for the same button.

| symbol | Definition | Real-time data interface | Configuration interface | |
|---|--------------|-------------------------------|--|--|
| | | | Inquiry configuration | Modify configuration |
|  | Left button | Turn page in 2nd menu | \ | Move data bit |
|  | Up button | Turn page in 1st menu | Turn to real-time data display interface | Plus 1 of the data bit |
|  | Enter button | Enter configuration interface | Enter modify configuration interface | Confirm modification/back to inquiry configuration interface |

5.3 Real-time data inquiry

Real-time data follow with 1st menu, 2nd menu display format, the tree diagram of the menu as below:

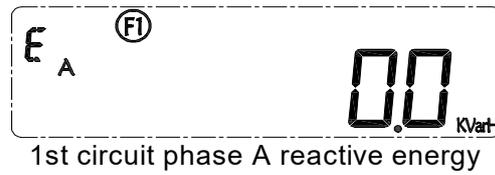
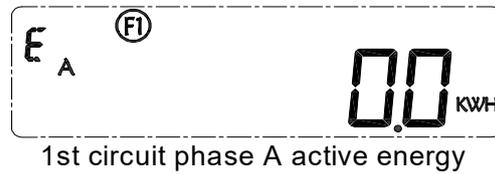
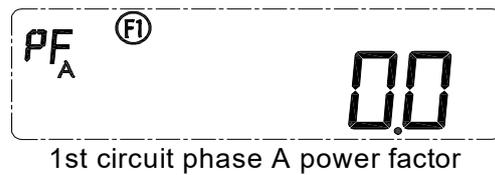
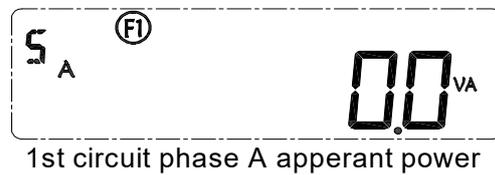
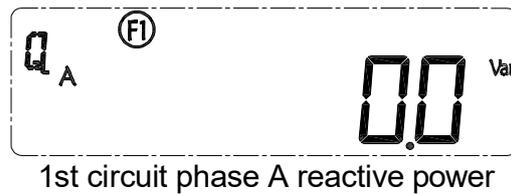
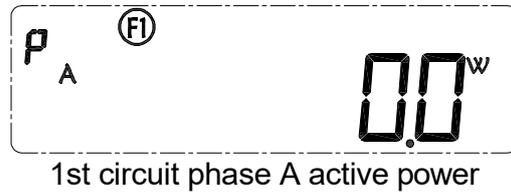
1st row of real-time data menu tree diagram is 1st menu, each line is the 2nd menu corresponding of the 1st menu.



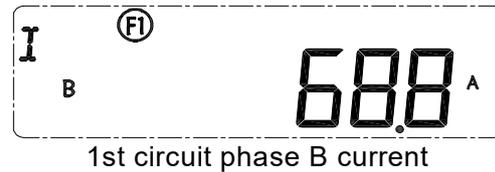
Step to inquiry real-time data:

| | |
|--|---|
| | <p>When power on, display as below:</p>  <p>Phase A voltage</p> |
| <p>Press  button continuously, you can see the data one after another</p> |  <p>Phase B voltage</p>  <p>Phase C voltage</p>  <p>Frequency</p> |
| <p>Press  button to enter into next menu</p> |  <p>1st circuit phase A current</p> |

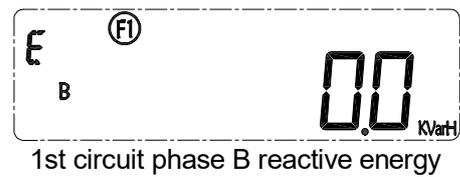
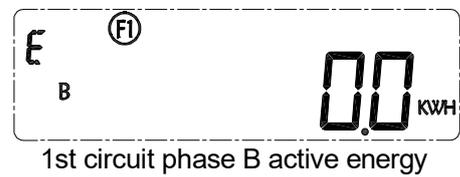
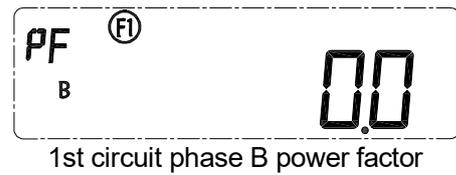
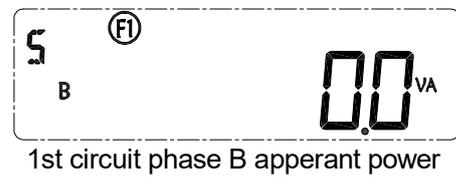
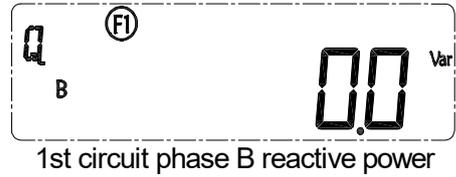
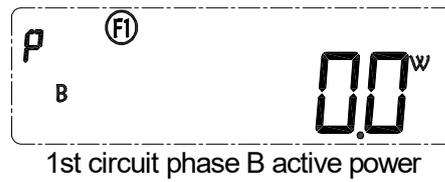
Press  button continuously, you can see the data one after another



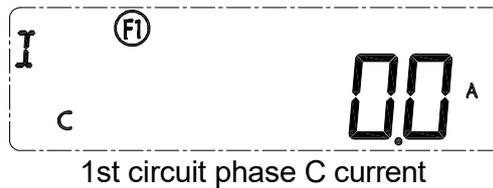
Press  button to enter into next menu



Press  button continuously, you can see the data one after another



Press  button to enter into next menu



| | |
|--|--|
| <p>Press  button to enter into next menu</p> |  <p>1st circuit total active power</p> |
| <p>..... (other circuit data inquiry is the same as 1st circuit)</p> | |
| <p>Press  button to enter into next menu (when alarm occurs, the alarm indication light will flash once per 2s)</p> |  <p>No alarm</p> <p>Different alarm code means different type of alarm</p> |

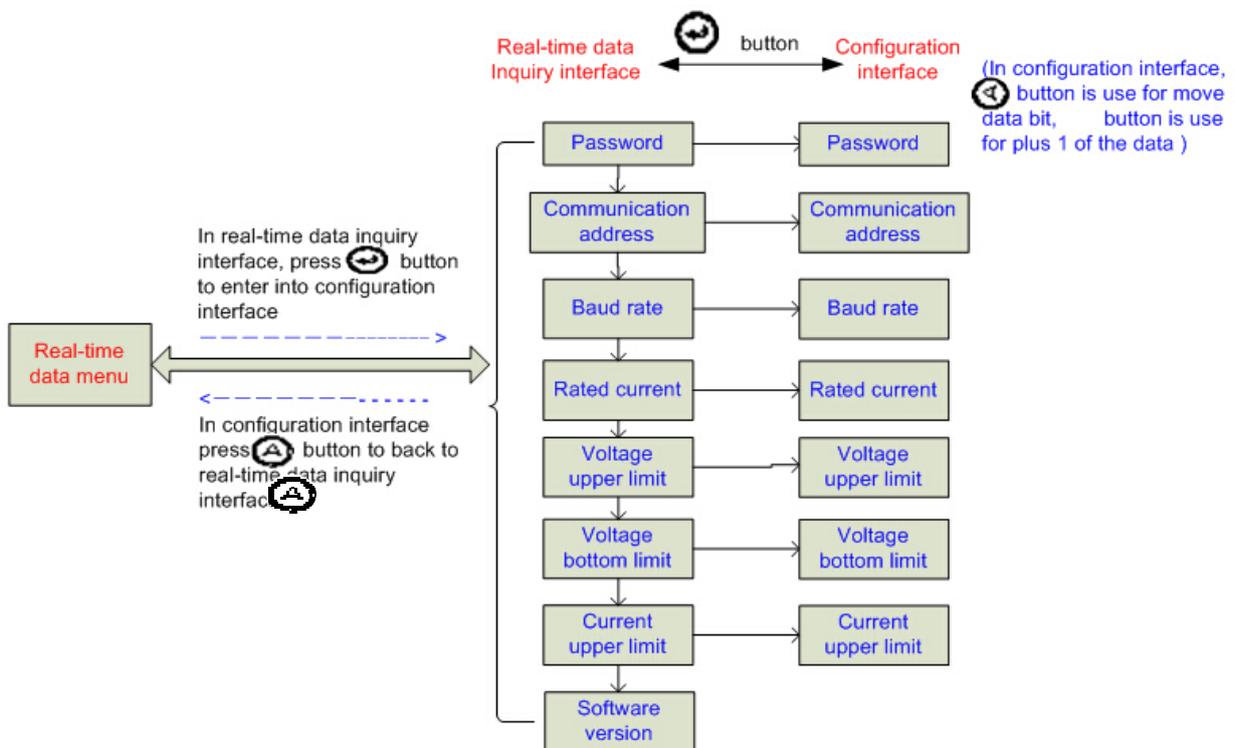
| | |
|--|--|
| | <div data-bbox="842 331 1366 465"> </div> <p data-bbox="922 465 1276 504">Voltage upper limit alarm</p> <div data-bbox="842 533 1366 667"> </div> <p data-bbox="922 667 1276 705">Voltage bottom limit alarm</p> <div data-bbox="842 734 1366 869"> </div> <p data-bbox="858 869 1340 907">Voltage upper & bottom limit alarm</p> <div data-bbox="842 936 1366 1070"> </div> <p data-bbox="922 1070 1276 1108">Current upper limit alarm</p> <div data-bbox="842 1137 1366 1272"> </div> <p data-bbox="858 1272 1340 1310">Voltage & Current upper limit alarm</p> <div data-bbox="842 1339 1366 1473"> </div> <p data-bbox="845 1473 1353 1556">Voltage bottom limit & Current upper limit alarm</p> <div data-bbox="842 1563 1366 1697"> </div> <p data-bbox="890 1697 1308 1780">Voltage upper / bottom limit & Current upper limit alarm</p> |
|--|--|

Other 1st menu and corresponding 2nd menu operate and display is the same as above description.

When there has no operation in 3 minutes, the display will automatically turn to Phase A voltage interface.

5.4 Parameter configuration

Below is the structure for parameter configuration interface , from real-time inquiry to parameter configuration interface:



Parameter setting range:

| Item | Data range | Illustration |
|-------------------------|--------------------------------|--|
| Password | 1 | Initial value is 1 |
| Communication address | 1~247 | Initial value is 1 |
| Communication baud rate | 4800bps or 9600bps | Initial value is 9600bps 0: 4800bps; 1: 9600bps; |
| Rated current | 50~600A | Default 100A |
| Voltage upper limit | 0~280.0V , 0 means alarm close | Alarm action: when the value larger than setting value Alarm return: 5s later after the action condition disappear |
| Voltage bottom limit | 0~220.0V , 0 means alarm close | Alarm action: when the value smaller than setting value Alarm return: 5s later after the action condition disappear |
| Current upper limit | 0~800.0A , 0 means alarm close | Alarm action: when the value larger than setting value Alarm return: 5s later after the action condition disappear |

Step for parameter setting:

| | |
|---|---|
| <ol style="list-style-type: none"> 1. In any real-time data inquiry interface, press  button, enter into configuration mode 2. Press  button once, the single digit flash for enter password 3. Press  button once, to change the single digit to 1 (default password is 1) | <p>Input password</p>  |
| <ol style="list-style-type: none"> 1. Press  button until it display A 2. Press  button once, then the data bit flash 3. Press  button once to modify value 4. Press  button once to confirm the new value | <p>Set communication address</p>  |
| <ol style="list-style-type: none"> 1. Press  button until it display b 2. Press  button once , the value flash 3. Press  button once to modify baud rate 4. Press  button once to confirm the new baud rate | <p>Set communication baud rate</p>  |
| <ol style="list-style-type: none"> 1. Press  until it display I 2. Press  button once , the value flash | <p>Set rated current</p> |

| | |
|---|--|
| <p>3. Press  button once to modify baud rate</p> <p>4. Press  button once to confirm the new value</p> |  |
| <p>1. Press  until it display U</p> <p>2. Press  button once , the value flash</p> <p>3. Press  button once to modify baud rate</p> <p>4. Press  button once to confirm the new value</p> | <p>Set voltage upper limit value</p>  |
| <p>1. Press  until it display U</p> <p>2. Press  button once , the value flash</p> <p>3. Press  button once to modify baud rate</p> <p>4. Press  button once to confirm the new value</p> | <p>Set voltage bottom limit value</p>  |
| <p>1. Press  until it display I</p> <p>2. Press  button once , the value flash</p> <p>3. Press  button once to modify baud rate</p> <p>4. Press  button once to confirm the new value</p> <p>Note: when display current upper limit alarm, it means 1st circuit phase A current upper limit, but after setting, it will sync</p> | <p>Set current upper limit value</p>  |

| | |
|---|--|
| <p>synchronized updating all the three phase circuit current upper limit</p> | |
| <p>1. Press  button to enter software version interface (read only)</p> |  |

Note :

When there is no operation in 3 minutes, the display will automatically turn to Phase A voltage interface.

6. MODBUS Protocol

PMAC211 provide one RS485 communication port, use MODBUS-RTU communication protocol.

8 data bit

1 stop bit

No parity

Please kindly refer to “PMAC211_MODBUS protocol and register list” for more detail about the register list.

7. Failure recovery

| Probably problem | Probably reason | Solution |
|---|---------------------------------|--|
| Indication light no light on after input control power supply | Power supply don't connect well | <p>Check if the power supply terminal has input correct working voltage</p> <p>Check if the control power supply is burned</p> |
| Monitor incorrect value | Incorrect voltage value | <p>Check if VN connect is OK</p> <p>Check if the monitored voltage is mismatch of the device rated parameter</p> |
| | Incorrect current value | <p>Check if the monitored current is mismatch of the device rated parameter</p> |
| | Incorrect power value | <p>Check if set correct monitor mode</p> <p>Check if the phase sequene of corresponding voltage and current is correct or not</p> <p>Check if the terminal of current is correct</p> |

| | | |
|--|---|---|
| Upper device can't communication with device | Incorrect communication address | Check if the setting address is correct according to the definition |
| | Incorrect communication baud rate | Check if the setting baud rate is correct according to the definition |
| | Communication link haven't connect with terminal resistance | Check if has input 120 Ω resistance |
| | Communication link been Interrupted | Check if the communication shield is connect well with earth |
| | Communication stop | Check if the communication cable is disconnect |

Note:

- PILOT reserves the right to modify this manual without prior notice in view of continued improvement.
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