MultiMeter
Multi-circuit Smart Meter
MPM(4000) Series

User Manual

06/2025

matismart

AIoT Electric

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1 Product Overview

The MPM4000 is a multi-circuit, DIN-rail mounted, three-phase multi-function power meter. It can be connected to open-core Rogowski Coils or voltage-type CTs. When users install the device on-site, there's no need to disconnect the circuit cables, which enables non-invasive installation and rapid measurement. This simplifies the testing process and effectively reduces construction costs.

The meter supports simultaneous access to up to four three-phase circuits. It requires the voltage signals for each circuit to be consistent, while the current signals are input via an RJ45 interface. The product is compatible with both three-phase three-wire and three-phase four-wire systems and can measure the following in the A, B, and C three-phase power grid:

- Voltage, current
- Active, reactive, and apparent power
- Power factor
- Energy (forward/reverse)
- Electrical parameters such as harmonic analysis

In addition, the MPM4000 is available in versions with zero-sequence detection and temperature detection functions. These can be used for monitoring leakage currents or temperatures in specific circuits, further meeting safety and environmental monitoring needs.

Regarding communication, the meter comes standard with **RS485** and **Ethernet** interfaces, supporting the standard Modbus-RTU and Modbus-TCP protocols. This enables the stable and rapid upload of measured multi-channel electrical parameters to a system data center or a third-party platform, facilitating centralized management and remote operation and maintenance.

2   Model Definition and Selection

2.1   Model Definition

MPM	4	4	1	0	-A

MPM
4: The total number of circuits is 4
1~4: Optional circuit number (1~4)
1: Rogowski Coil
2: Voltage type CT (VCT 0.333V)
0 = No expansion
1 = Zero sequence (only for circuit 1)
2 = Temperature (only available for circuit 1)
A: 220V AC auxiliary power supply (95-265V AC)
D: 24V DC auxiliary power supply (18-36V DC)
H: 480V AC auxiliary power supply (90-528V AC)

2.2   Model Examples

Model	Description
MPM4410-A	4-circuit, Rogowski Coil input, no expansion, 220V AC power supply
MPM4221-D	2 circuits, VCT input, with zero sequence detection, 24V DC power supply (only circuit 1 supports zero sequence)
MPM4312-H	3 circuits, Rogowski Coil input, with temperature detection, 480V AC power supply

(only circuit 1 supports temperature)	

3 Appearance and Installation

3.1 Dimensions and Structure

Parameters	Value
Dimensions	90mm × 89mm × 66mm
Protection grade	IP20 (suitable for installation in electrical boxes)
Weight	About 300g
Installation mode	Standard 35mm DIN rail mounting

3.1.1 Dimensions
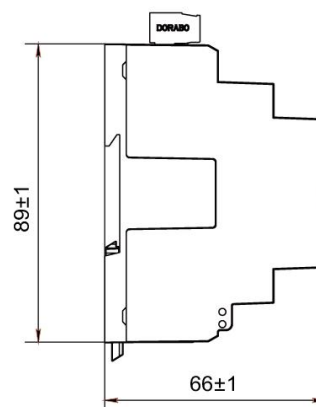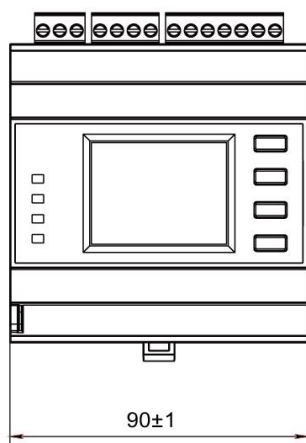
3.1.2 Structure
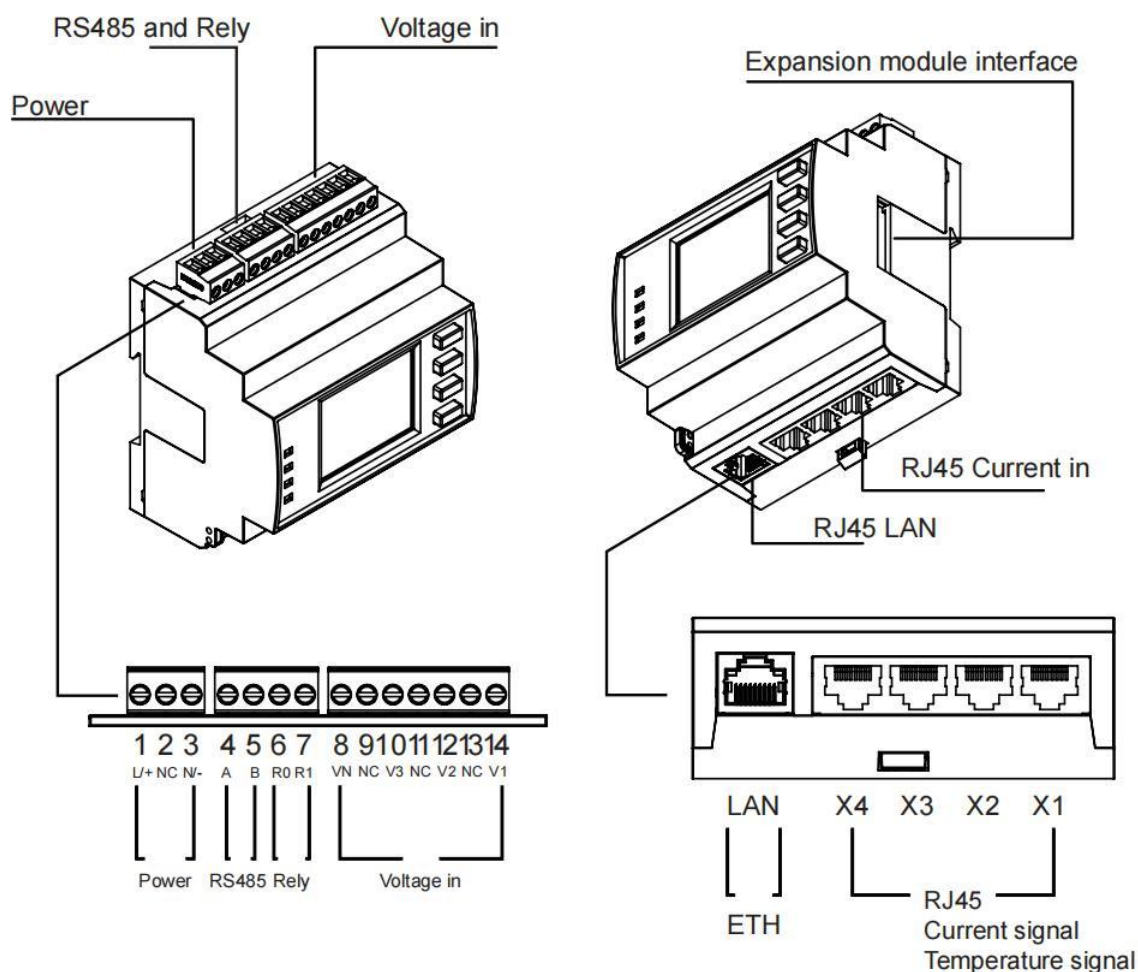
3.2 Terminal Block (Structure Description)

Interface NO.	Interface Name	Interface Description
1	L/+	Power input positive; no polarity for AC, pay attention to the positive pole for DC
2	NC	Null (unused)
3	N/-	Power input negative pole
4	A	RS485 communication terminal A
5	B	RS485 communication terminal B
6	R0	Relay output terminal (dry contact)
7	R1	Relay output terminal
8	VN	N phase voltage input terminal

9	NC	Null (unused)
10	V3	C phase voltage input terminal
11	NC	Null (unused)
12	V2	B phase voltage input terminal
13	NC	Null (unused)
14	V1	A phase voltage input terminal

4 Wiring

The MPM4000 series meters support multiple current input modes and voltage system types. Wiring should be selected based on the specific application and current transformer configuration. Current signals are uniformly input via an RJ45 interface, while voltage and auxiliary power use terminal block wiring.

4.1 Power Wiring

Based on the model, the following power inputs are supported:

Model suffix	Power Supply Type	Typical Applications
A	AC 95~265V / DC 110~260V	General power distribution system
D	DC 24V	Communication power system
H	AC 90–528V	Industrial/rail transit systems

Please connect the power terminals according to the product nameplate markings to ensure that the wiring is secure. It is recommended to install a fuse in the access circuit for protection.

4.2 Voltage Input Wiring

- Support three-phase three-wire (three-wire system) and three-phase four-wire (four-wire system) systems;
- Wire system: 3P4W 4CT, 3P4W 3CT, 3P3W 3CT, 3P3W 2CT, 1P3W, 1P2W

•L1, L2, L3, N correspond to phase sequence terminals;

•It is recommended to use a 1A fuse for voltage circuit protection;

•It is required that each circuit share the same set of voltage input signals.

4.3 Current Input Wiring (RJ45)

The MPM4000 current input signal is connected through the RJ45 interface and is compatible with the following two types of transformers:

Type	Description
Rogowski Coil	External wire-free open-core type, output 50mV/85mV/100mV
Voltage CT (VCT)	External voltage output type open-core transformer, range supports up to 99999A

Connection method:

•Each circuit corresponds to an RJ45 interface module;

•Connect in order according to module number (circuit 1 to 4);

•All circuits share a common voltage input, and current signals are collected independently.

4.4 Supported Wiring Modes

The MPM4000 multi-circuit meter supports the following common wiring modes:

Wiring mode	Abbreviation	Number of transformers	Description
Three-phase four-wire 4CT	3P4W_4CT	4 个	The N-phase current is directly measured using a transformer
Three-phase four-wire 3CT	3P4W_3CT	3 个	The N phase current is calculated by the system
Three-phase three-wire 3CT	3P3W_3CT	3 个	The B-phase current is directly measured using a transformer
Three-phase three-wire 2CT	3P3W_2CT	2 个	The B phase current is calculated by the system

| Single-phase three-wire | 1P3W | 2 个 | Suitable for single-phase systems with neutral line |
| Single-phase two-wire | 1P2W | 1 个 | Applicable to ordinary single-phase circuit |

4.4.1 Multi-circuit Voltage and Current Wiring Method
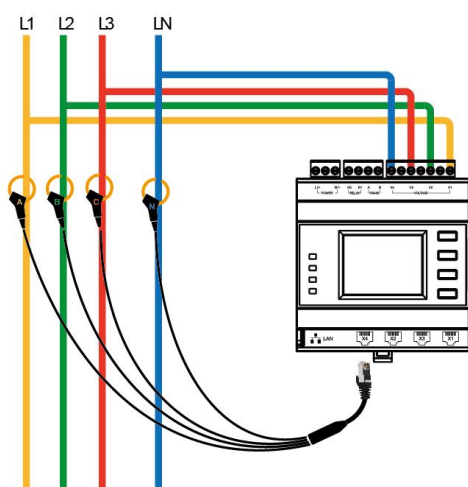
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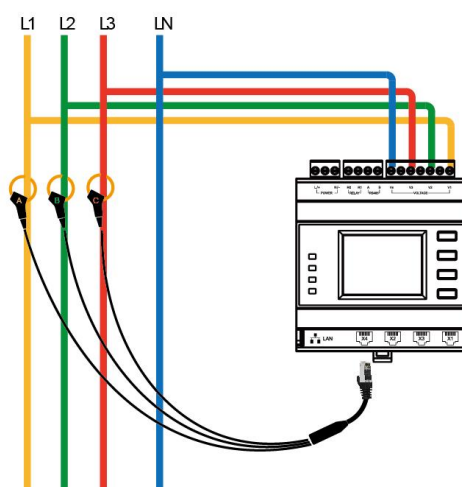
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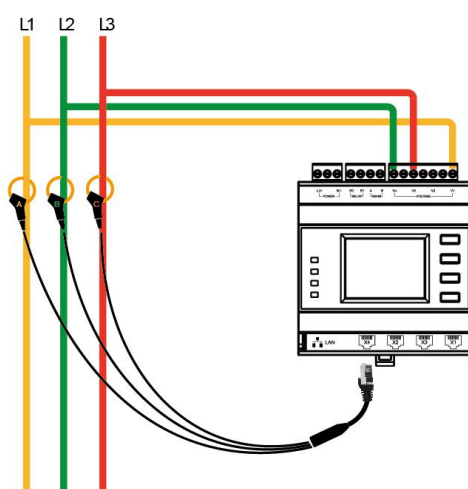
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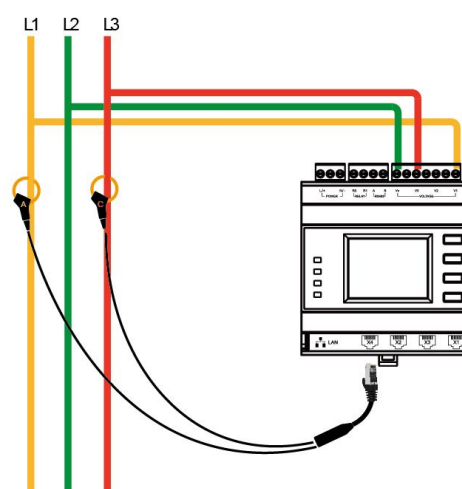
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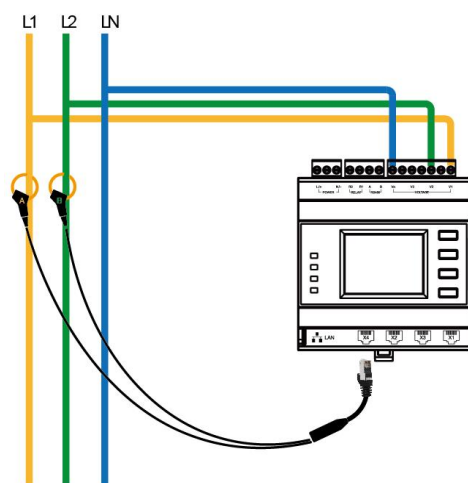
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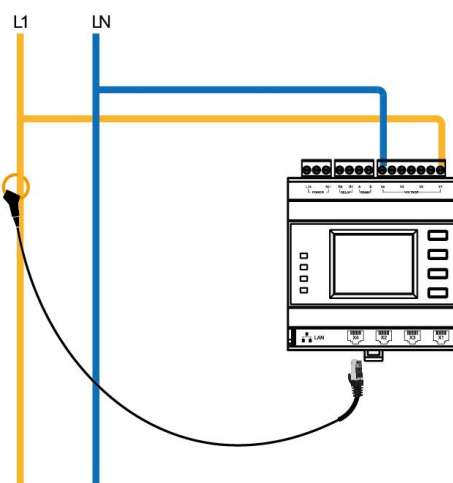
1P2W

4.4.2 Wiring Instructions for Versions with Zero Sequence or Temperature Detection:

When the meter is configured with temperature or zero-sequence detection, each circuit only needs to be connected to one current transformer (one sensor connected to the RJ45 port). In this case, the voltage and current circuits should be wired as follows:
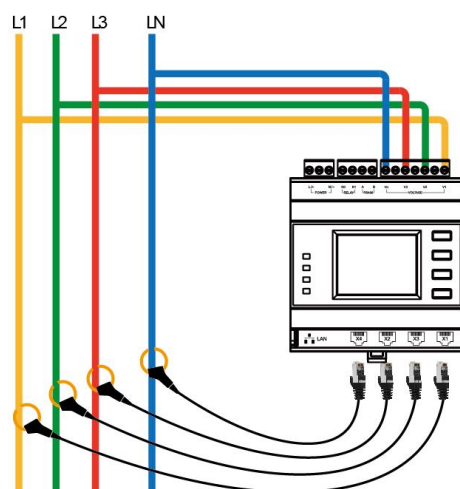
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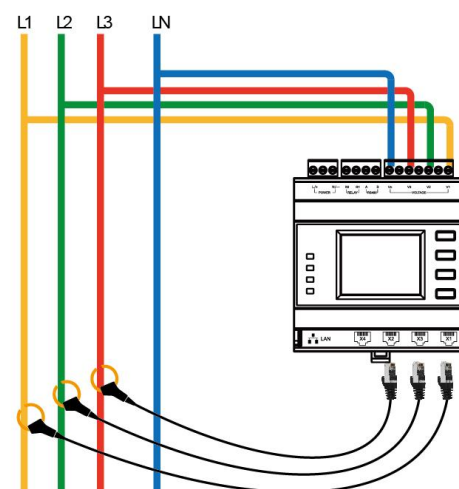
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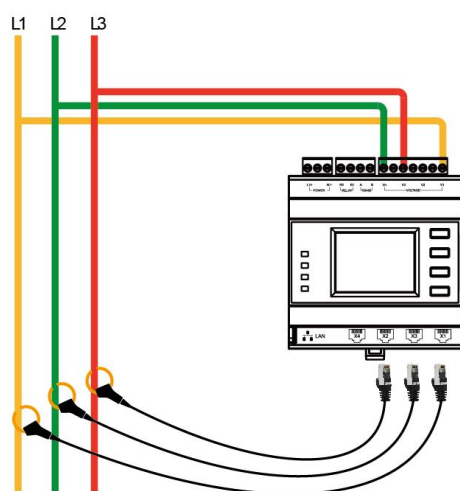
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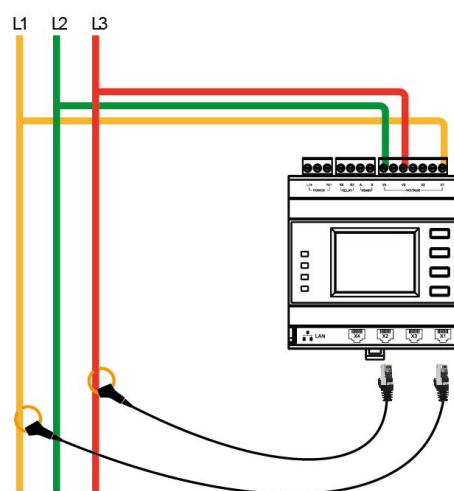
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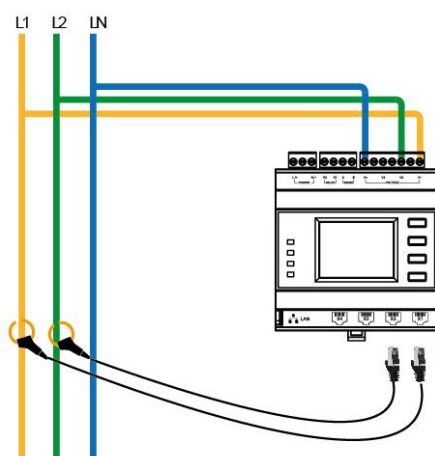
1P3W
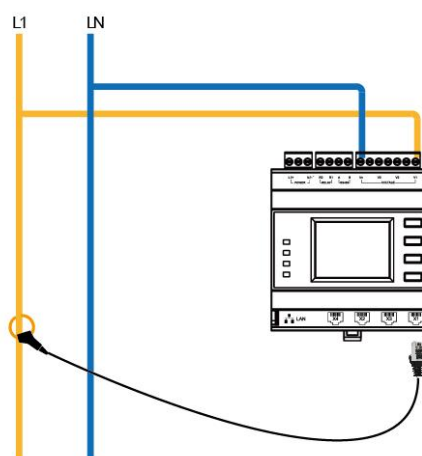
1P2W

4.5   Zero Sequence/Temperature Sensor Wiring (Optional)

• If you purchase a model with (zero sequence) or (temperature) expansion function:

• The zero-sequence current transformer is connected to the dedicated terminal (limited circuit 1);

• The temperature sensor is connected to the temperature input terminal (limited circuit 1);

• Only supports 1-way expansion function, and cannot use zero sequence + temperature at the same time;

• Please refer to the nameplate wiring diagram or the illustrated ports in the instruction manual for wiring.

4.6   RS485 Wiring Instructions

The MPM4000 is equipped with an RS485 communication interface that supports the Modbus-RTU protocol for remote data acquisition and system integration.

- Communication line: Shielded twisted pair cable is recommended;

- Topology: Daisy chain multiple devices in series;

- Wiring terminals: Terminal A on No. 6, Terminal B on No. 7;

- For long-distance or high-speed communications, a 120Ω terminal resistor must be connected in parallel at both ends of the daisy chain to suppress signal reflection.

4.7   Ethernet (ETH) Communication Description

MPM4000 supports one Ethernet interface (RJ45), adopts standard Modbus-TCP protocol, and is compatible with most host systems. Supports dual-mode access:

Mode	Access Method Description
Local debugging mode	Use network cable to connect directly to the computer for quick debugging and configuration
Network deployment mode	Join the LAN through a switch or router to achieve remote access

4.7.1   Built-in Web Management Page:

1. Built-in web management page, supporting parameter viewing and network configuration;

2. Default access address: http://192.168.1.31

3. Default port number: 80 (can be modified)

4.7.2   Data Access Process

1. Connect

- Local connection: PC and meter are directly connected via network cable

- LAN connection: connect to the meter via a switch or router

2. Interface Access

- Enter http://192.168.1.31 in your browser

- Enter the Web page to view and configure parameters

5   Functions and Measurement

The MPM4000 series supports multiple electrical parameter measurements, energy metering, and power quality analysis, making it suitable for detailed monitoring of multiple circuits in low-voltage distribution systems. The following is a description of each function:

5.1   Instantaneous Measurement Parameters

The MPM4000 series supports real-time measurement of the following electrical parameters for each circuit. Measurement data can be displayed locally or uploaded via communications. With high accuracy and fast response, it is suitable for a variety of monitoring and analysis scenarios.

5.1.1   Voltage Parameters

Description	Parameter Name
A, B, C three-phase voltage	U1/U2/U3
Average value of three-phase voltage	Uavg
Zero sequence voltage	U0
A-B, B-C, C-A line voltage	U12/U23/U31
Average value of three-phase line voltage	Uavg (line)

5.1.2   Current Parameters

Description	Parameter Name
A, B, C three-phase current	I1/I2/I3
Average value of three-phase current	Iavg
Neutral current (applicable to three-phase four-wire)	In
Zero-sequence current (needs to support	I0

extended functions and be connected to a transformer)	

5.1.3 Grid Frequency

Description	Parameter Name
Frequency of each phase	F1/F2/F3
System frequency (comprehensive value)	F∑

5.1.4 Power Factor (PF) and Fundamental Power Factor (DPF)

Description	Parameter Name
Power factor of each phase (including harmonics)	PF1/PF2/PF3
Total power factor	PF∑
Fundamental power factor of each phase (excluding harmonic influence)	DPF1/2/3
Total fundamental power factor	DPF∑

5.1.5 Power Parameters

Description	Parameter Name
Active power of each phase	P1/P2/P3
Total active power	P∑
Reactive power of each phase	Q1/Q2/Q3
Total reactive power	Q∑
Apparent power of each phase	S1/S2/S3
Total apparent power	S∑

5.2 Energy Metering Function

The MPM4000 supports cumulative metering of various energy types, categorizing and recording by phase, direction, and energy type, with both total statistics and itemized viewing. The device also features energy reset threshold protection to prevent data

overflow.

Function	Description
Active energy metering	Forward/reverse/total energy, in line with class 0.5S accuracy
Reactive energy metering	Inductive/capacitive forward and reverse metering
Branch circuit energy	The energy of each circuit is recorded separately, which is convenient for independent billing and statistics of the circuit
Energy storage	Support power-off retention and energy reset (authorization setting required)

5.2.1 Active Energy (Unit: kWh)

Energy Type	Parameter
Forward active energy	EP1, EP2, EP3, EP∑
Reverse active energy	EP1, EP2, EP3, EP∑

5.2.2 Reactive Energy (Unit: kVarh)

Energy Type	Parameter
Forward reactive energy	EQ1, EQ2, EQ3, EQ∑
Reverse reactive energy	EQ1, EQ2, EQ3, EQ∑

5.2.3 Apparent Energy (Unit: kVAh)

Energy Type	Parameter
Apparent energy	ES1, ES2, ES3, ES∑

5.3 Tariff Management Function (Multiple Tariffs)

The MPM4000 supports multi-tariff energy accumulation and can be configured with up to six electricity price tariffs. It is suitable for multiple scenarios such as peak and valley time-of-use electricity price management and tenant zone metering.

5.3.1 Function Overview

- Supports 6 independent tariffs: T1 ~ T6;

- Energy for each tariff is measured separately (ET1 ~ ET6);

- The current usage tariff number can be viewed in real time on the display page;

- Supports manual and automatic (RTC) modes.

5.3.2 Tariff Switching Control Mode

Control Mode	Switch Instructions
Manual mode	Select the current tariff via the display page or Modbus command
RTC mode	Automatically switch to the set tariff according to the real-time clock

1. Manual control mode:

Applicable to debugging or temporary manual billing scenarios, supporting the following two switching modes:

1) Mode 1: Enter the menu [Settings → Tariff → Tariff Selection] and manually select the current tariff;

2) Mode 2: Write the target tariff number (1 to 6) via Modbus configuration register 1071.

2. RTC Control Mode:

In RTC mode, the meter automatically switches tariffs according to the set time. This is

suitable for automation needs such as time-of-use electricity price management.

1)**Supported time periods:** Ta, Tb, Tc, Td, Te, Tf, a total of 6 periods;

2)**Supported tariff number:** T1 ~ T6, any tariff can be assigned to each period;

3)**Setting method:**

• Menu setting path: [Setting → Tariff → RTC Configuration];

• Or use Modbus command to set:

a)1072: Set the start time of each time period;

b)1073: Set the tariff number for the corresponding time period.

3. Time period setting rules (24-hour system):

1)The time periods must be set in ascending order;

2)For example:

• The starting time of Tc shall not be earlier than Ta and Tb;

• The starting time of Td shall not be earlier than Ta, Tb, and Tc;

• And so on, to avoid overlapping or covering time periods.

5.3.3 Application Notes

All tariff accumulated energy values can be read via communication or exported via FTP;

•Supports item analysis based on tariffs in conjunction with the billing platform;

•Suitable for peak-valley billing, tiered electricity price management, regional sublease, etc.

5.4 Demand Measurement Function

The MPM4000 calculates and records demand of active power, reactive power, and apparent power, and provides maximum demand values and occurrence times for energy consumption analysis and load capacity assessment.

5.4.1 Supported Demand Types

•The meter supports statistics on average and maximum demand for total active power, total reactive power, and total apparent power.

• Users can configure the demand calculation method and demand period through the meter interface or Modbus, and query real-time values and historical maximum values.

5.4.2　Demand Calculation Methods

Calculation Method	Description
Fixed	At the end of each complete demand cycle, the meter calculates the demand for the current interval and updates the display and records.
Sliding	The meter calculates the demand every 1 minute, rolling over the most recent period (e.g., the past 15 minutes).

5.4.3　Example (taking 15-minute intervals as an example)
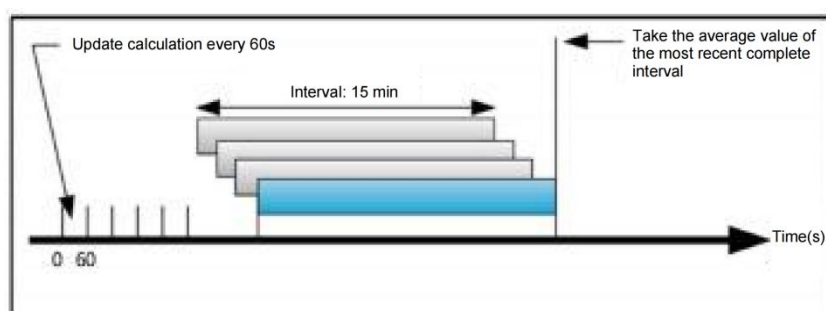
Picture 5-1　Sliding
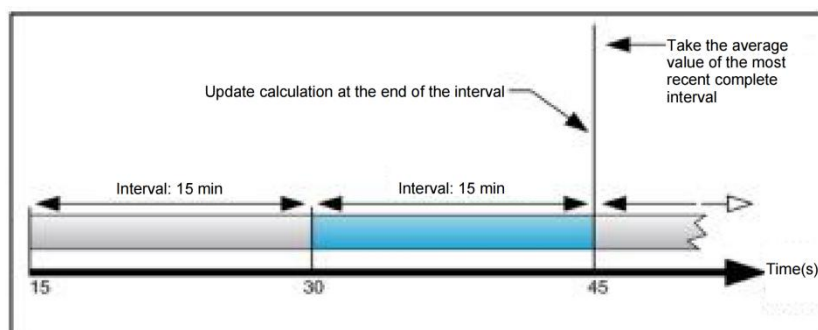
Picture 5-2 Fixed

5.5　Power Quality Analysis Function

Item	Description

Harmonic analysis	Support voltage and current 2nd to 50th harmonic analysis
Harmonic display mode	Each phase is displayed in separate items, and the individual and total values can be viewed.
Imbalance	Voltage/current imbalance percentage
Analysis function usage	Used to identify problems such as harmonic interference, device imbalance, and load asymmetry.

5.5.1　Voltage Harmonic Analysis

Item	Description
Harmonic percentage	Total harmonics THD (U1/U2/U3) odd harmonics, even harmonics percentage (U1/U2/U3)
Sub-harmonic percentage	Percentage of harmonics from 1st to 50th (U1/U2/U3)
Harmonic voltage value	Total harmonic valid value (U1/U2/U3)
Sub-harmonic values	1st to 50th harmonic voltage (U1/U2/U3)

5.5.2　Current Harmonic Analysis

Item	Parameter Content
Harmonic percentage	Total harmonics THD (I1/I2/I3) odd harmonics, even harmonics percentage (I1/I2/I3)
Sub-harmonic percentage	Percentage of harmonics from 1st to 50th (I1/I2/I3)
Harmonic current value	Total harmonic valid value (I1/I2/I3)
Sub-harmonic values	1st to 50th harmonic current (I1/I2/I3)

K factor	K factor (I1/I2/I3), reflecting the degree of current waveform distortion

5.5.3 Voltage/Current Imbalance Analysis

The MPM4000 can calculate the voltage and current imbalance of a three-phase system in real time, helping users determine the system load symmetry and operating quality.

1. Voltage imbalance

Negative sequence component imbalance (%)

Zero sequence component imbalance (%)

2. Current imbalance

Negative sequence component imbalance (%)

Zero sequence component imbalance (%)

All imbalance data are displayed in percentage and can be read via communication.

5.6 Phase Sequence and Phase angle Measurement

The MPM4000 supports phase measurement, phase sequence determination, and graphical display between voltage and current, helping users quickly determine the correctness of power distribution system wiring, power direction, and power factor properties.

Function Items	Description
Phase sequence detection	Supports determining A-B-C sequence or reverse sequence. Incorrect phase sequence may cause device reversal or incorrect metering direction.
Phase angle display	Displays the phase angle between each phase's voltage and current. The voltage-current angle can be used to determine load characteristics (inductive/capacitive) and power factor characteristics.
Application scenarios	Applicable to three-phase motor direction judgment, energy synchronization analysis, etc.

5.6.1 Phase Diagram Display

- Provides a graphical phase diagram to intuitively reflect the phase relationship between each phase voltage and current;

- Can display the A/B/C three-phase voltage vector direction and corresponding current vector;

- The graphical interface is suitable for on-site wiring confirmation and waveform analysis.

5.6.2 Phase Sequence Judgment

The MPM4000 meter supports phase sequence detection for three-phase voltage and three-phase current. Users can use the user interface or communication methods to determine whether the voltage/current phase sequence is correctly wired, thus avoiding measurement deviations caused by wiring errors.

Item	Description
Voltage phase sequence	Support judgment of A→B→C order or reverse order
Current phase sequence	Supports display of flow direction and sequential/reverse sequence of I1/I2/I3

5.6.2.1 Phase Sequence Viewing Method:

Method	Description
View locally	Enter the meter interface Measure → Phase Diagram → Phase Sequence to view the phase sequence status icon
Communication method	Read phase sequence status code via Modbus register

5.6.2.2 Phase Sequence Status and Icon Description:

Icon	Phase sequence status	Description

	The phase sequence is correct	Three-phase signal exists and the wiring sequence is correct
	Phase sequence error	The channel detects three-phase signals, but in the wrong order
	Phase sequence error	There is a phase loss or a phase voltage/current signal is weak or missing

Note:

- The "voltage phase sequence" and "current phase sequence" detected by the meter are independent of each other and can only determine whether the signal sequence itself is reasonable;

- It is impossible to determine the correspondence between voltage and current (i.e., whether the voltage and current are in phase), so when wiring, ensure that the phase A voltage corresponds to the phase A current, and so on;

- Incorrect voltage/current correspondence may lead to problems such as incorrect power direction judgment and abnormal power factor.

5.6.3　Phase Angle Measurement

Parameter Name	Description
U1/U2/U3	A/B/C phase voltage phase angle (referenced to system synchronization angle)
I1/I2/I3	A/B/C phase current phase angle
UI1~UI3	The phase angle between voltage and current (i.e., the power factor angle)

5.7　Maximum/Minimum Value Recording

The MPM4000 supports real-time recording of the maximum and minimum values of various key electrical parameters, making it easier for users to analyze load fluctuations, identify power usage anomalies, and provide trend warnings.

Item	Description
Record parameters	Voltage, current, power, frequency, etc.
Recording method	Record maximum and minimum values for each channel with time stamp
Trigger mode	Real-time trigger update, power-off retention
Clear method	Support manual clearing and can also be set to periodic clearing

Parameter Category	Supported Items
Phase voltage	U1, U2, U3, average phase voltage
Line voltage	U12, U23, U31, average line voltage
Current	I1, I2, I3, average current value
Active power	P1, P2, P3, total active power P∑
Reactive power	Q1, Q2, Q3, total reactive power Q∑
Apparent power	S1, S2, S3, total apparent power S∑

5.8 Current Input Parameter Auxiliary Function

Item	Description
Current ratio setting	The transformation ratio of external CT can be set to adapt to different measurement ranges
Current zero-point calibration	Support manual resetting or automatic offset correction
Display unit adjustment	Switchable A/kA display, suitable for high current applications

Verification tool support	Support host computer configuration software or menu setting ratio

5.9 Digital Signal Output Function

The MPM4000 provides one relay output (DO) for electrical parameter linkage control or alarm triggering, which can be configured through menus or communication. Its operating characteristics are as follows:

- Support setting trigger conditions, such as overload, temperature limit, zero sequence alarm, etc.;

- Configurable output delay, hold time and action logic;

- The relay output is a normally open (NO) contact, suitable for controlling lights, buzzers or linkage relays.

5.10 Alarm Function

The MPM4000 supports multiple electrical parameter alarms. Alarm conditions and output responses can be configured through the meter interface or Modbus registers. Alarm status can be read via local relay output or remotely from the platform.

5.10.1 Supported Alarm Types

The meter provides the following alarm items and supports setting alarm thresholds and release thresholds. The alarm logic is shown in the table below:

Alarm Type	Detection Object	Alarm Logic (Trigger & Release)
Overcurrent	Current of each phase	Any phase current ≥ alarm threshold → alarm; all phase currents < release threshold → alarm released
Under current	Current of each phase	Any phase current ≤ alarm threshold → alarm; all phase currents > release threshold → alarm released
Phase overvoltage	Phase voltage	Any phase voltage ≥ alarm threshold → alarm; all phase voltages < release threshold → alarm released
Phase undervoltage	Phase voltage	Any phase voltage ≤ alarm threshold → alarm; all phase voltages > release threshold → alarm released

Line voltage	Voltage of each line	Any line voltage ≥ alarm threshold → alarm; all line voltages < release threshold → alarm released
Underline voltage	Voltage of each line	Any line voltage ≥ alarm threshold → alarm; all line voltages < release threshold → alarm released
Over power	Total active/reactive/apparent	Absolute power value ≥ alarm threshold → alarm; Absolute power value < release threshold → alarm released
Over demand	Total active/reactive/apparent	Current demand ≥ alarm threshold → alarm; Current demand < release threshold → alarm release
Over THD-U	Phase voltage harmonics	Any phase THD-U ≥ alarm threshold → alarm; all phase THD-U < release threshold → alarm release
Over THD-I	Phase current harmonics	Any phase THD-I ≥ alarm threshold → alarm; all phase THD-I < release threshold → alarm release

Note: All alarm items support independent enable/disable settings.

5.10.2 Alarm Output Configuration

The meter's built-in relay output can be configured in alarm linkage mode, outputting a closing signal when an alarm is triggered. This is suitable for controlling applications such as audible and visual alarms and contactors.

• Output terminals: R0 (common) and R1 (normally open);

• Output control mode: needs to be configured as alarm output mode in the settings menu;

• After the alarm is cleared, the relay is automatically released.

It also supports real-time reading of alarm status through Modbus registers for background system acquisition.

6   Configuration Mode and Register Structure

The MPM4000 series supports parameter configuration and function settings via local buttons, host computer tools, or communication commands. The internal configuration parameters of the meter are centrally managed through registers and support remote

reading and modification.

6.1 Configuration Mechanism

Configuration Mode	Description
Local button settings	Use the 3 function buttons on the front panel of the device to navigate the menu level by level to complete the settings
Communication settings	Configuration via RS485 or Ethernet interface using Modbus commands
Configuration software	Optional host computer configuration software for batch distribution and import backup

6.2 Supported Configuration Items

The following parameters can be configured via the menu or communication:

Configuration Item	Range / Description
Communication address (ID)	1~247, default 1
Baud rate	2400~115200bps
Parity bit	No parity, even parity, odd parity
Transformer type	Rogowski / Voltage CT (VCT)
Current transformer ratio	Support manual setting
Zero sequence/ temperature function enable	Can be enabled or disabled (only for expansion models)
Energy reset operation	Need to enter the advanced permission menu to confirm
Clock and multi-tariff settings	Includes dates, time periods, calendars and tariff plans

6.3   Parameter Storage Instructions

- Configuration parameters are stored in the device's internal EEPROM and are not lost when power is off;

- The energy value, maximum/minimum value, demand value, zero sequence value, etc. will also be continuously recorded;

- Supports clearing stored data through communication commands (password permission required).

The MPM4000 series supports historical data recording and configuration parameter storage, and supports local export. Specific instructions are as follows:

6.3.1   Parameter Storage Function

- Configuration parameters are stored in the device's built-in EEPROM and are not lost when power is off.

- Key measurement data such as energy value, maximum/minimum value, demand, zero sequence, etc. will be retained continuously.

- Supports clearing some stored data through communication commands (password authorization required).

6.3.2   History Log

- Built-in eMMC storage chip with a default capacity of 8GB, which can be expanded to 64GB.

- The recording interval can be set from 5 seconds to 9999 seconds.

- During the recording process, it is prohibited to modify the recording parameters; historical data can be read in real time, but the current cycle data can only be exported after recording is stopped.

- Recordable content: energy records, demand changes, alarm event logs, configuration file changes, etc.

6.3.3   Data Export

- Data can be exported via the built-in FTP server. It is recommended to use FTP tools

such as FileZilla to connect to the device.

- The default FTP access address, username, and password can be customized by the user (depending on the firmware version).

- If Ethernet mode is enabled, files can also be exported remotely via the web page.

6.4   Communication Register Structure

This product complies with the Modbus register structure and mainly uses the holding register area (Function Code 0x03);

For detailed register addresses and data formats, please refer to the Register Address Table (separate manual or appendix);
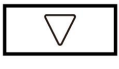
Usually starts with 40001, and common data includes:

Example Register	Content	Type
40001~40006	A/B/C phase voltage and current	Floating point number
40010~40020	Active/reactive/apparent power	Floating point number
40050~40060	Energy value (positive and negative/total)	Long integer
40100~40110	Zero sequence, temperature and other extended values	Integer
40200~40250	Configuration parameters, ratio, address, etc.	Integer or enumeration

7   Operation and Interface Display Instructions

This chapter introduces the screen display, button operation logic, and menu structure of the MPM4000 to help users complete measurement review and parameter setting operations.

7.1 Button Description

Button Symbol	Function Description
ESC	Return button: exit the current page
△	Up button: switch interface or increase value, long press to shift
▽	Down button: switch interface or reduce value, long press to shift
OK	OK button: confirm the operation and enter the submenu

7.2 Meter Startup Page

After powering on, the device will display the startup screen, initialize and enter the shortcut menu.

Startup screen

X1 phase voltage interface
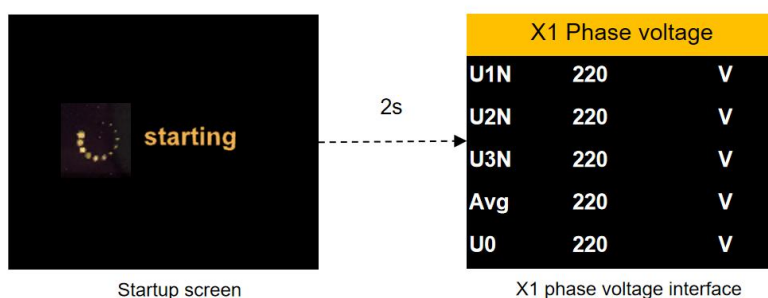
7.3   Menu Structure and Switching Method

The main menu includes four secondary menus:

1. Measurement Menu

2. Setting Menu

3. Reset Menu

4. Device Information Menu

You can switch menu items by pressing the up and down buttons, and enter the selected menu by pressing the OK button.
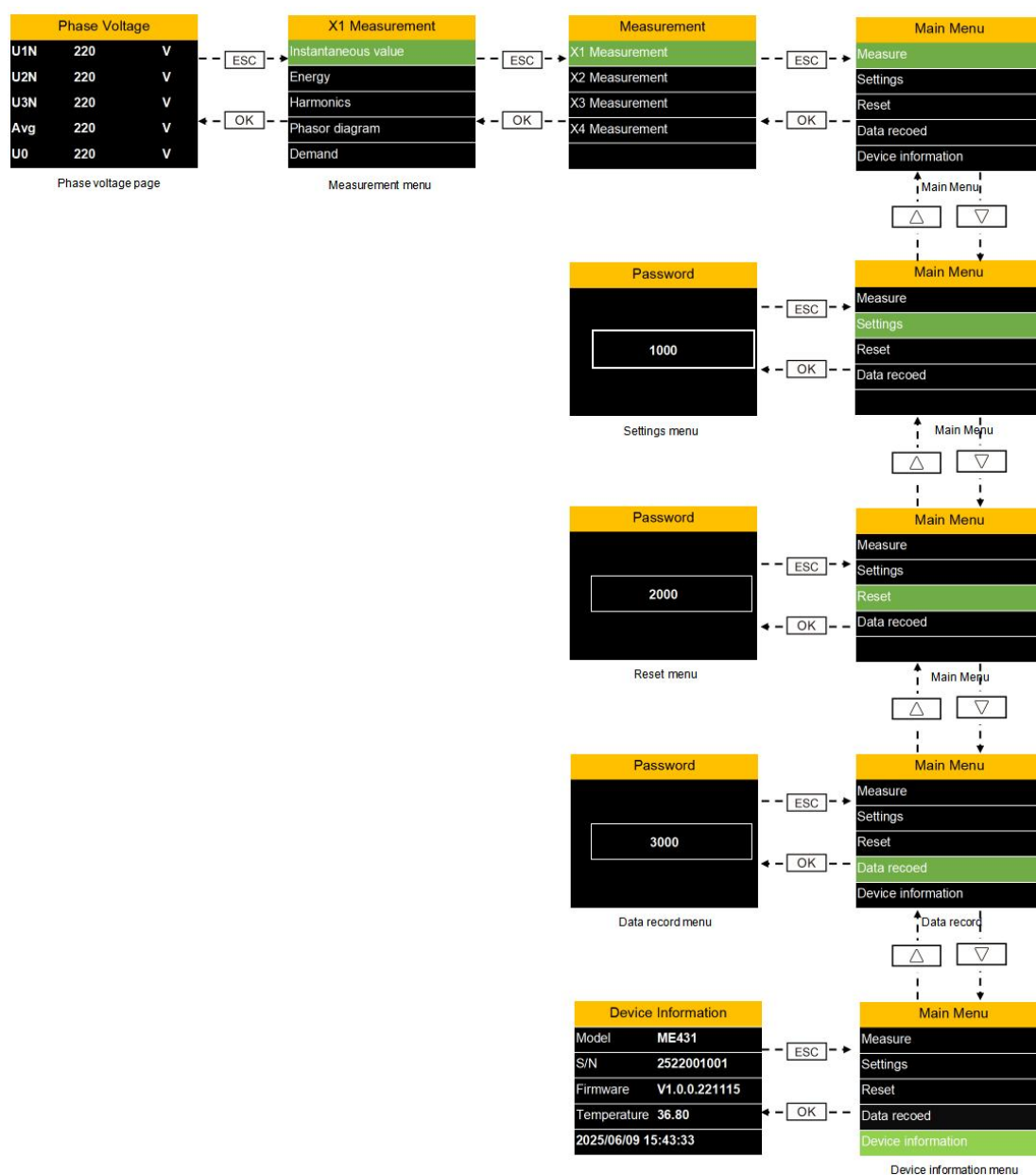
7.4   Measurement Menu

The measurement menu includes the following submenus:

- Instantaneous value: Display voltage, current, power, power factor, frequency, etc.

- Energy: Display active, reactive and apparent energy

- Harmonics: Display various voltage and current harmonics

- Phase diagram: Graphical display of phase sequence, voltage angle, current angle, etc.

- Demand: Display current demand and maximum demand

- Imbalance: Display voltage and current imbalance

- Maximum/minimum value: record the maximum/minimum value of each parameter

7.4.1   Instantaneous Value Submenu

Displays real-time parameters such as each phase voltage, current, power, power factor, frequency, etc.
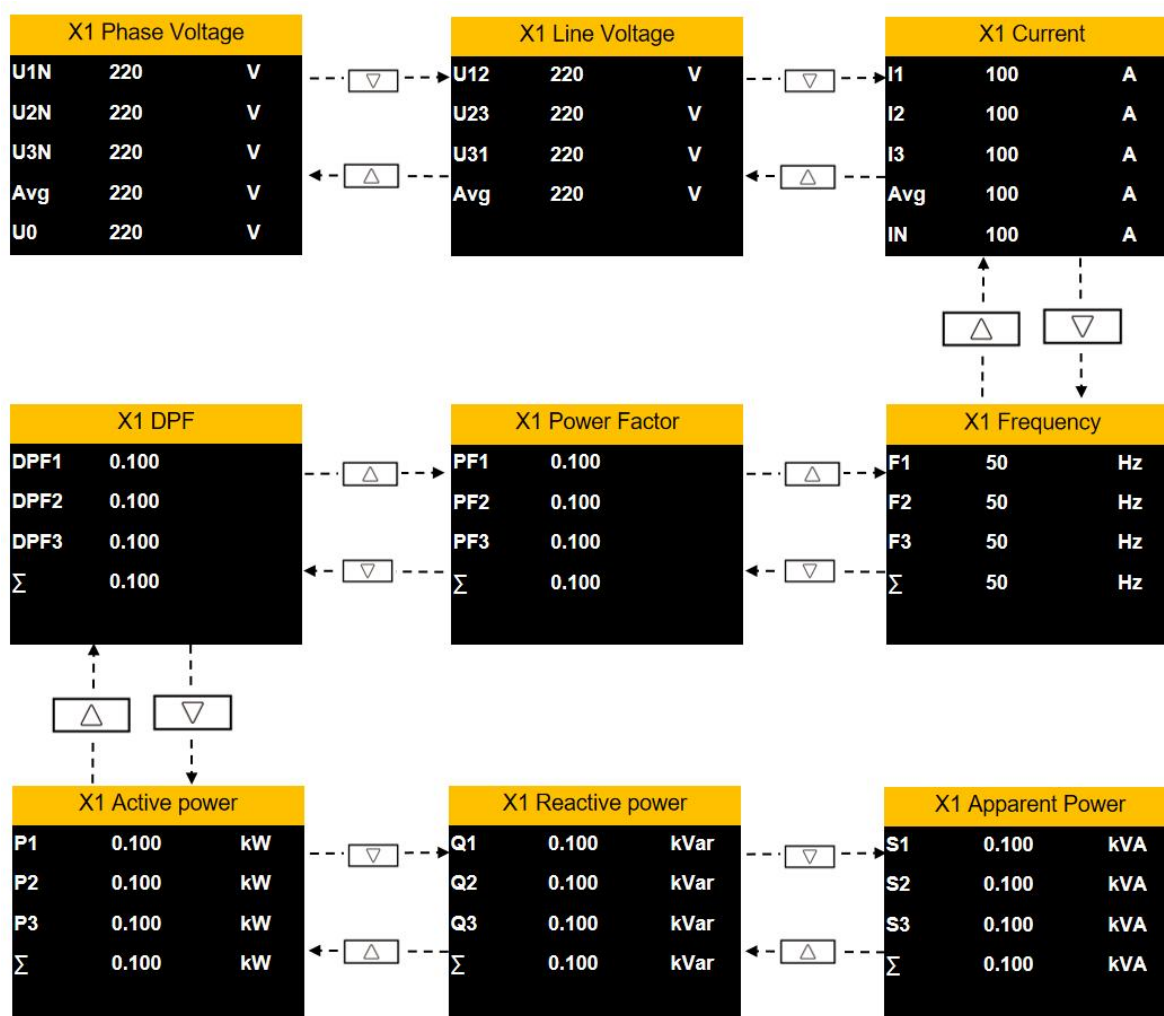
7.4.2 Energy Submenu

Displays accumulated data such as active energy, reactive energy and apparent energy.
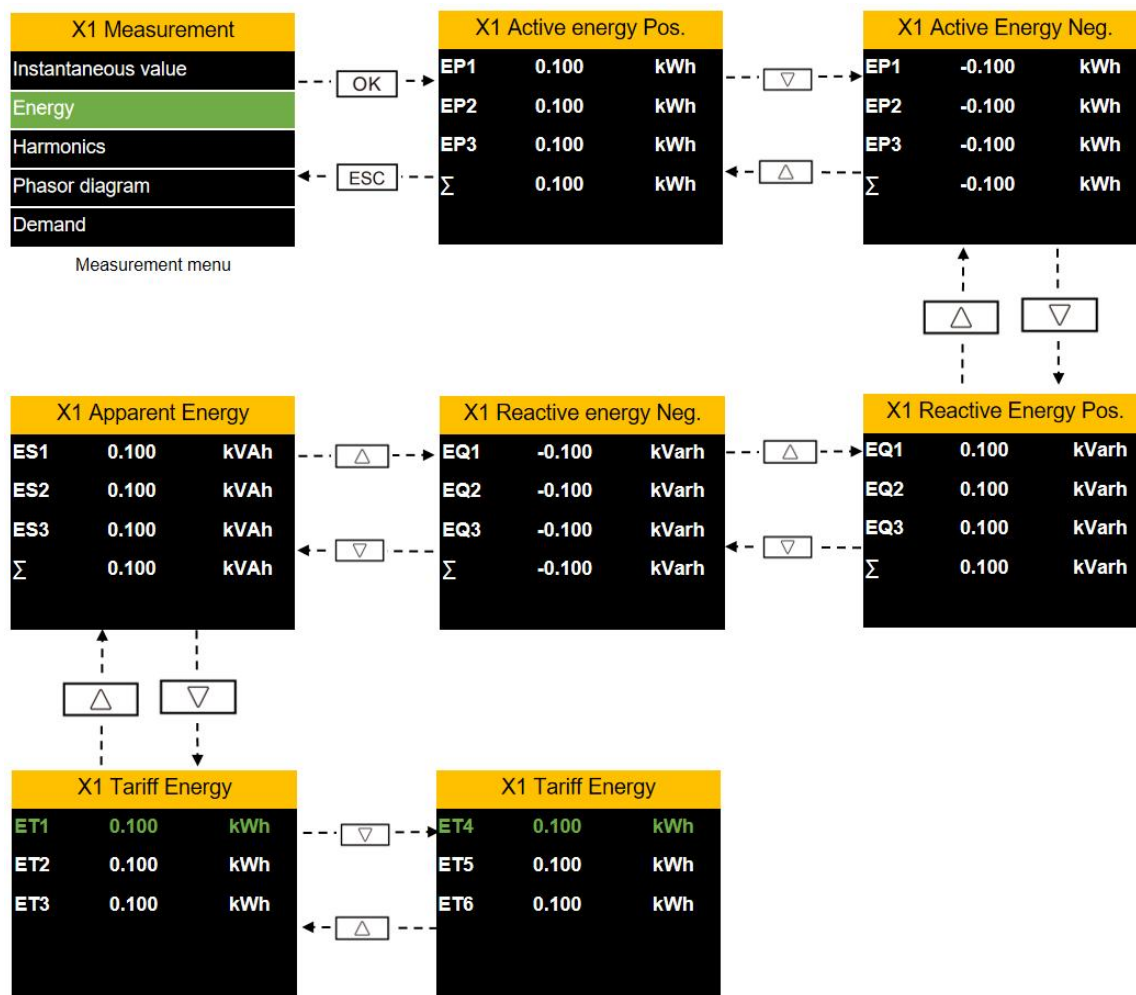
7.4.3 Harmonics Submenu

View the harmonic analysis results of each phase voltage and current, including total harmonics and sub-harmonics.

X1 Measurement		
Instantaneous value		
Energy		
Harmonics		
Phasor diagram		
Demand		

Measurement menu

OK →

ESC ←

X1 Active energy Pos.		
EP1	0.100	kWh
EP2	0.100	kWh
EP3	0.100	kWh
∑	0.100	kWh

▽ →

△ ←

X1 Active Energy Neg.		
EP1	-0.100	kWh
EP2	-0.100	kWh
EP3	-0.100	kWh
∑	-0.100	kWh

△ ▽

X1 Apparent Energy		
ES1	0.100	kVAh
ES2	0.100	kVAh
ES3	0.100	kVAh
∑	0.100	kVAh

△ →

▽ ←

X1 Reactive energy Neg.		
EQ1	-0.100	kVarh
EQ2	-0.100	kVarh
EQ3	-0.100	kVarh
∑	-0.100	kVarh

△ →

▽ ←

X1 Reactive Energy Pos.		
EQ1	0.100	kVarh
EQ2	0.100	kVarh
EQ3	0.100	kVarh
∑	0.100	kVarh

△ ▽

X1 Tariff Energy		
ET1	0.100	kWh
ET2	0.100	kWh
ET3	0.100	kWh

▽ →

△ ←

X1 Tariff Energy		
ET4	0.100	kWh
ET5	0.100	kWh
ET6	0.100	kWh

7.4.4　Phase Diagram Submenu

View the phase diagram of voltage and current, phase sequence status, voltage angle and current angle.

X1 Measurement		
Instantaneous value		
Energy		
Harmonics		
Phasor diagram		
Demand		

Measurement menu

OK →

ESC ←

X1 Phase Diagram

▽ →

△ ←

X1 Phase Sequence	
Voltage	
Current	

△ ▽

X1 UI Angle		
UI1	0.100	°
UI2	0.100	°
UI3	0.100	°

△ →

▽ ←

X1 Current Angle		
I1	0.100	°
I2	0.100	°
I3	0.100	°

△ →

▽ ←

X1 Voltage Angle		
U1	0.100	°
U2	0.100	°
U3	0.100	°
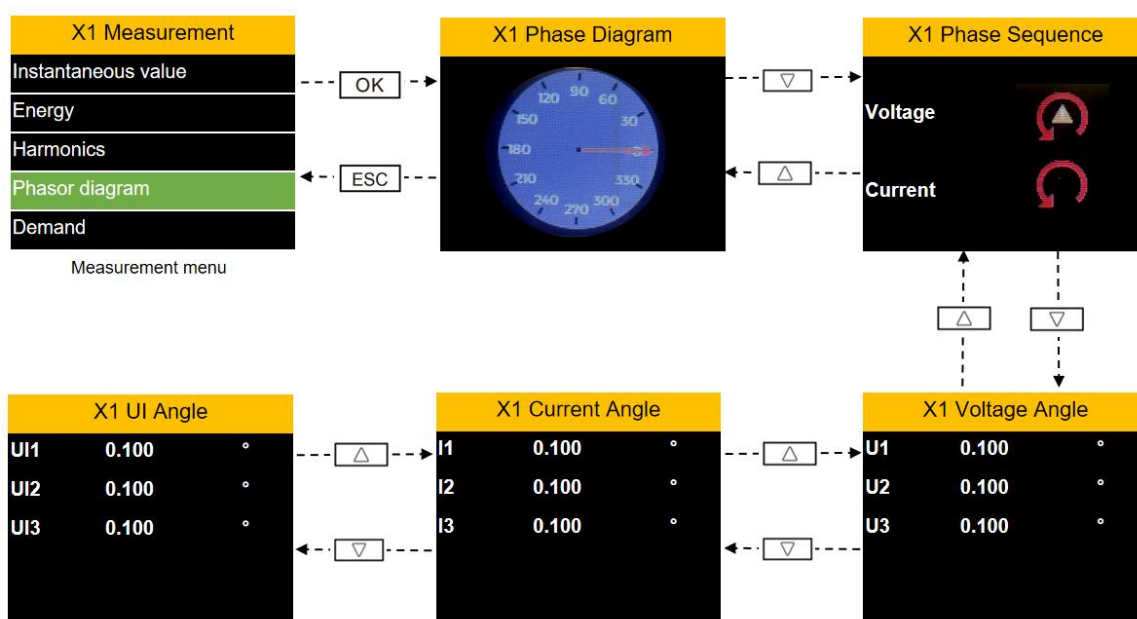
7.4.5　Demand Submenu

View the current and maximum demand of total active power, reactive power, and apparent power.
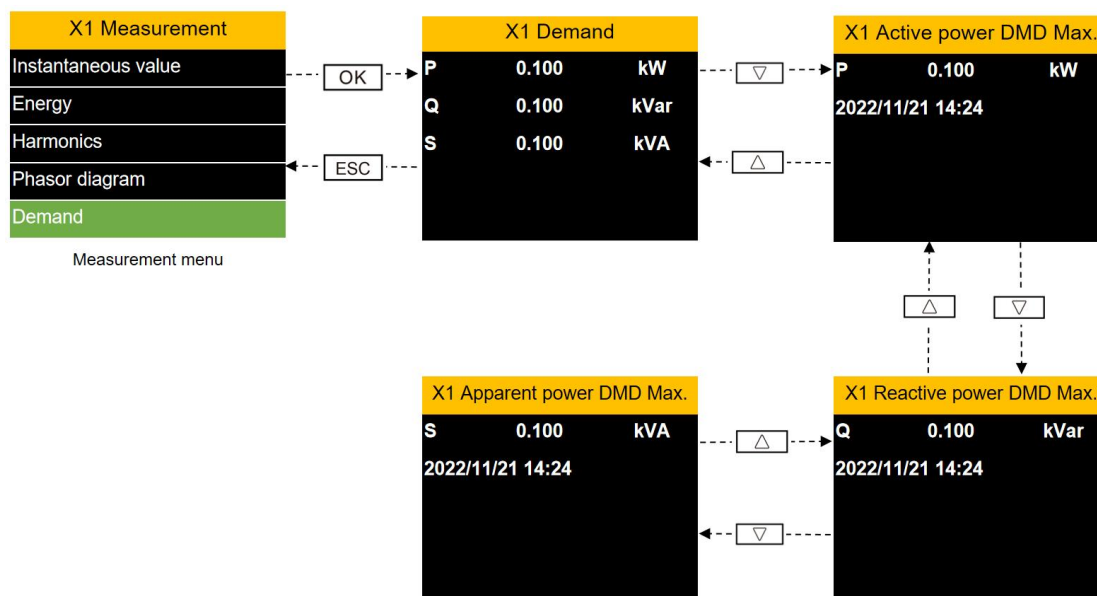
7.4.6　Imbalance Submenu

View the zero-sequence and negative-sequence imbalance of voltage and current.
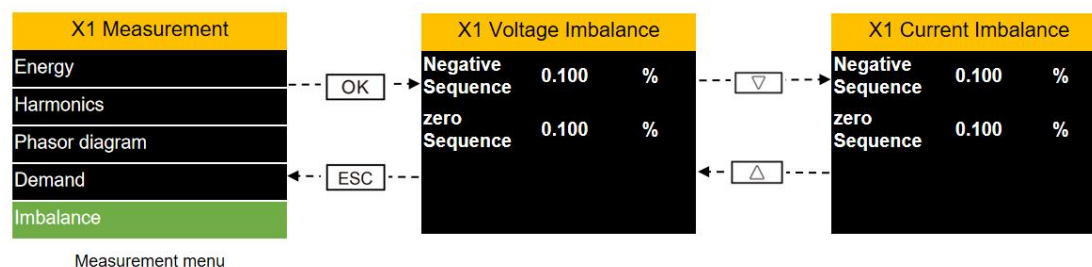
7.4.7　Maximum/Minimum Value Submenu

View the maximum and minimum records of parameters such as each phase voltage, current and power.

X1 Measurement
Harmonics
Phasor diagram
Demand
Imbalance
Max.&Min.

X1 Phase Voltage Max.		
L1	220	V
L2	220	V
L3	220	V
Avg	220	V

X1 Phase Voltage Min.		
L1	200	V
L2	200	V
L3	200	V
Avg	200	V

X1 Current Max.		
I1	100	A
I2	100	A
I3	100	A
Avg	100	A
IN	100	A

X1 Line Voltage Min.		
L12	200	V
L23	200	V
L31	200	V
Avg	200	V

X1 Line Voltage Max.		
L12	220	V
L23	220	V
L31	220	V
Avg	220	V

X1 Current Min.		
I1	0.100	A
I2	0.100	A
I3	0.100	A
Avg	0.100	A
IN	0.100	A

X1 Active power Max.		
P1	0.100	kW
P2	0.100	kW
P3	0.100	kW
∑	0.100	kW

X1 Active power Min.		
P1	0.100	kW
P2	0.100	kW
P3	0.100	kW
∑	0.100	kW

X1 Apparent power Max.		
S1	0.100	kVA
S2	0.100	kVA
S3	0.100	kVA
∑	0.100	kVA

X1 Reactive power Min.		
Q1	-0.100	kVar
Q2	-0.100	kVar
Q3	-0.100	kVar
∑	-0.100	kVar

X1 Reactive power Max.		
Q1	0.100	kVar
Q2	0.100	kVar
Q3	0.100	kVar
∑	0.100	kVar

X1 Apparent power Min.		
S1	0.100	kVA
S2	0.100	kVA
S3	0.100	kVA
∑	0.100	kVA

7.5   Setting Menu and Parameter Configuration

The MPM4000 meter features a comprehensive setting menu for on-site configuration of wiring modes, current sensor type, communication parameters, demand settings, alarm functions, display interface parameters, and password protection.

• Before entering the setting menu, you need to enter the password (default 1000):

• Use the [↑] [↓] to modify the number;

• Long press [↑] [↓] to switch the number of digits;

• Press [OK] to confirm;

• If the password is correct, go to the main settings menu, otherwise stay at the password input page;

• If you forget your password, you can enter the last four digits of the device serial number as the universal password.

7.5.1   Power Grid Submenu

After entering the power grid parameter settings, use the [↑] [↓] to modify the values and press [OK] to confirm:

Configurable Parameters	Description
Wiring mode	3P4W_4CT, 3P4W_3CT, 3P3W_3CT, 3P3W_2CT, 1P3W, 1P2W
Frequency	50Hz / 60Hz optional
VT ratio	1~10000 (primary terminal voltage/secondary terminal voltage)
CT ratio	1~10000 (primary current/secondary current)

Settings → [OK] → **Power Grid** → [OK] → **Wire Type**

Settings:
- Power Grid
- X1 Settings
- X2 Settings
- X3 Settings
- X4 Settings

Power Grid:
- Wire Type — 3P4W_4CT
- Frequency[Hz] — 50
- VT ratio

Wire Type:
- 3P4W_4CT
- 3P4W_3CT
- 3P3W_3CT

[ESC] / [OK]

[OK] ↓

Power Grid:
- VT ratio — 1.0000
- CT ratio — 1.0000

[△] / [▽]

Power Grid:
- Wire Type — 3P4W_3CT
- Frequency[Hz] — 50

[OK]

Wire Type:
- 3P4W_4CT
- 3P4W_3CT
- 3P3W_3CT
- Save changes?

[ESC] ↓

Power Grid:
- VT ratio — 1.0000
- CT ratio — 1.0000

[△] / [▽]

Power Grid:
- Wire Type — 3P4W_4CT
- Frequency[Hz] — 50

7.5.2　Current Transformer Submenu

Use the [↑] and [↓] to set and modify, and press [OK] to confirm:

Parameter	Description
Phase type	I1, I2, I3, In
CT type	Rcoil (Rogowski coil), VCT (voltage type CT)
Pri [A]	Primary current rating (1~999999A)
Sec [mV]	Secondary output rated voltage (1~99999mV)
Nominal current [A]	It is recommended to set the range to 2 times according to the actual current to optimize the accuracy

Note:

•Replacing a coil with a different ratio requires resetting the ratio;

- Example of an 85mV/kA @ 50Hz coil: Initial values Rcoil Pri = 1000A, Sec = 85mV; to measure 2000A, set Nominal = 4000A.
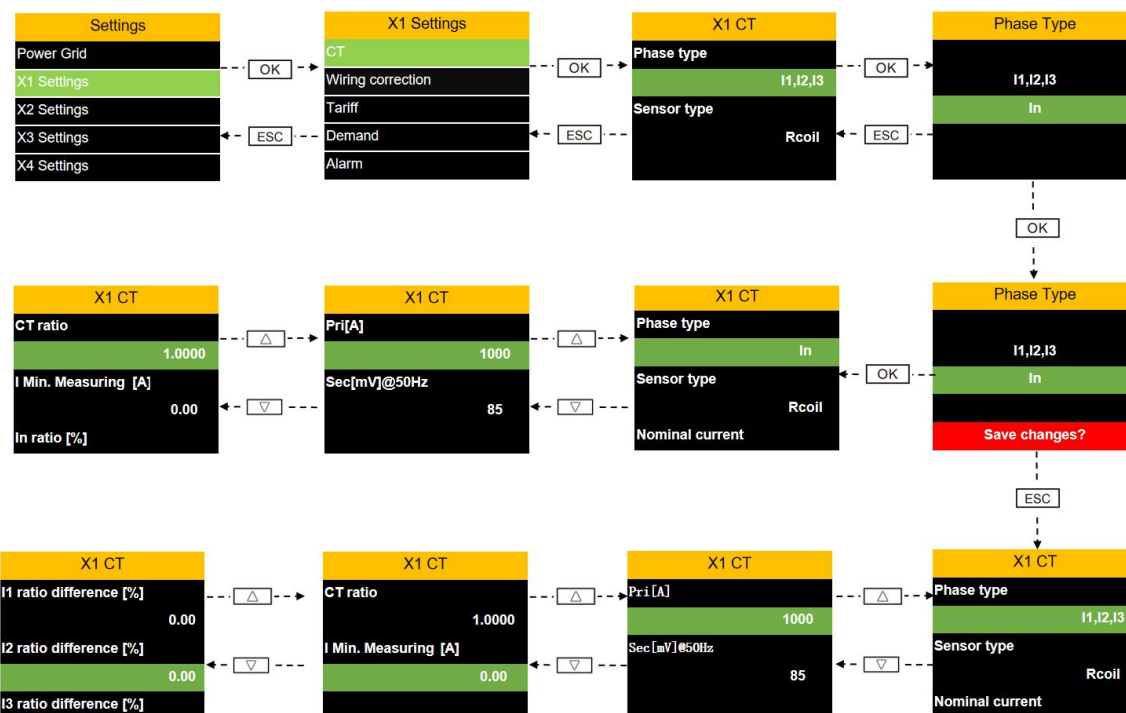
7.5.3 Minimum Measuring Voltage and Current

Used to set the minimum valid measurement threshold:

- Minimum voltage measurement value [V]

- Minimum current measurement value [A]

1. Current zero drift is adjusted in each circuit setting;
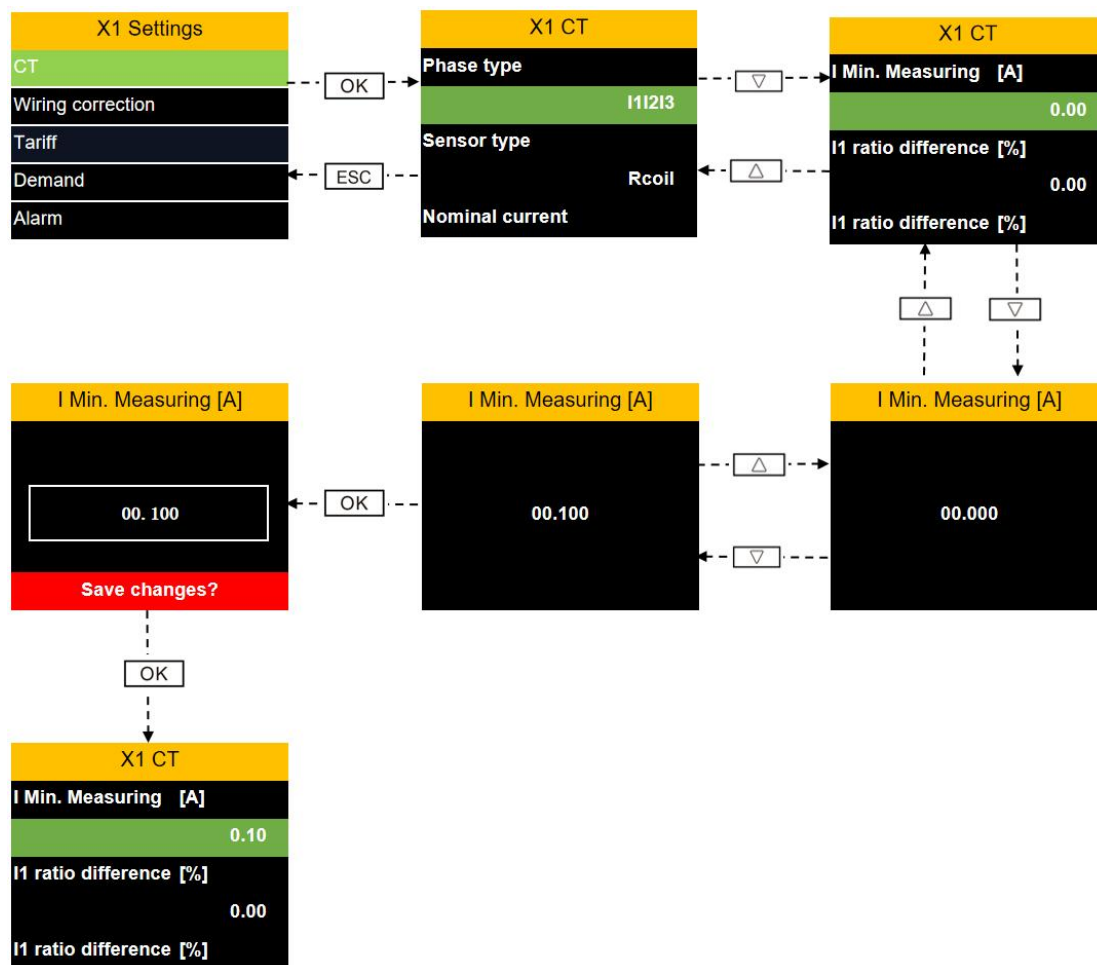
2. Voltage zero drift is set in the power grid menu.

-
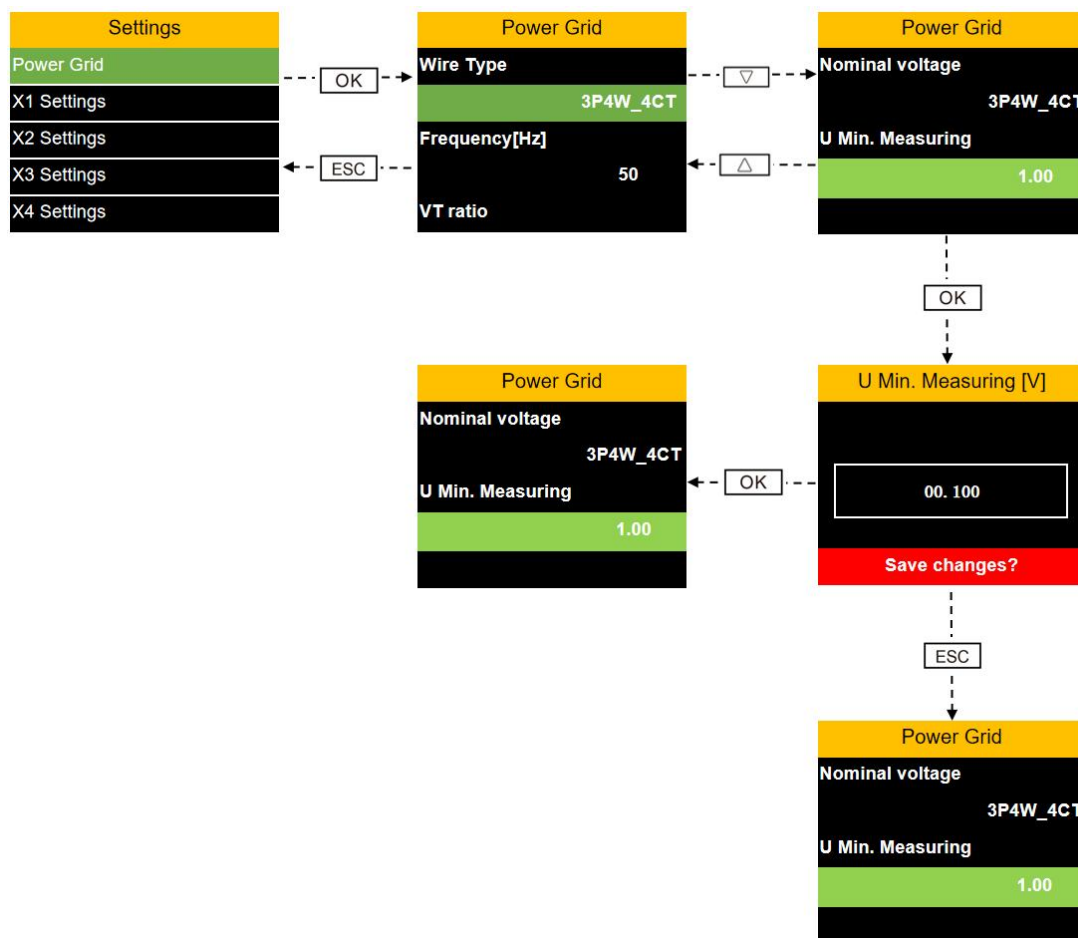
7.5.4 Tariff Submenu

- After entering, press [↑] or [↓] to select and press [OK] to confirm;

- The switching mode can be set: Manual / RTC.

1. RTC mode can be set:

- The start time of the six time periods (Ta, Tb, Tc, Td, Te, Tf);

- There are 6 tariffs to choose from for each time period.

2. Manual mode can be set:

- 6 tariffs for option (no time period setting).
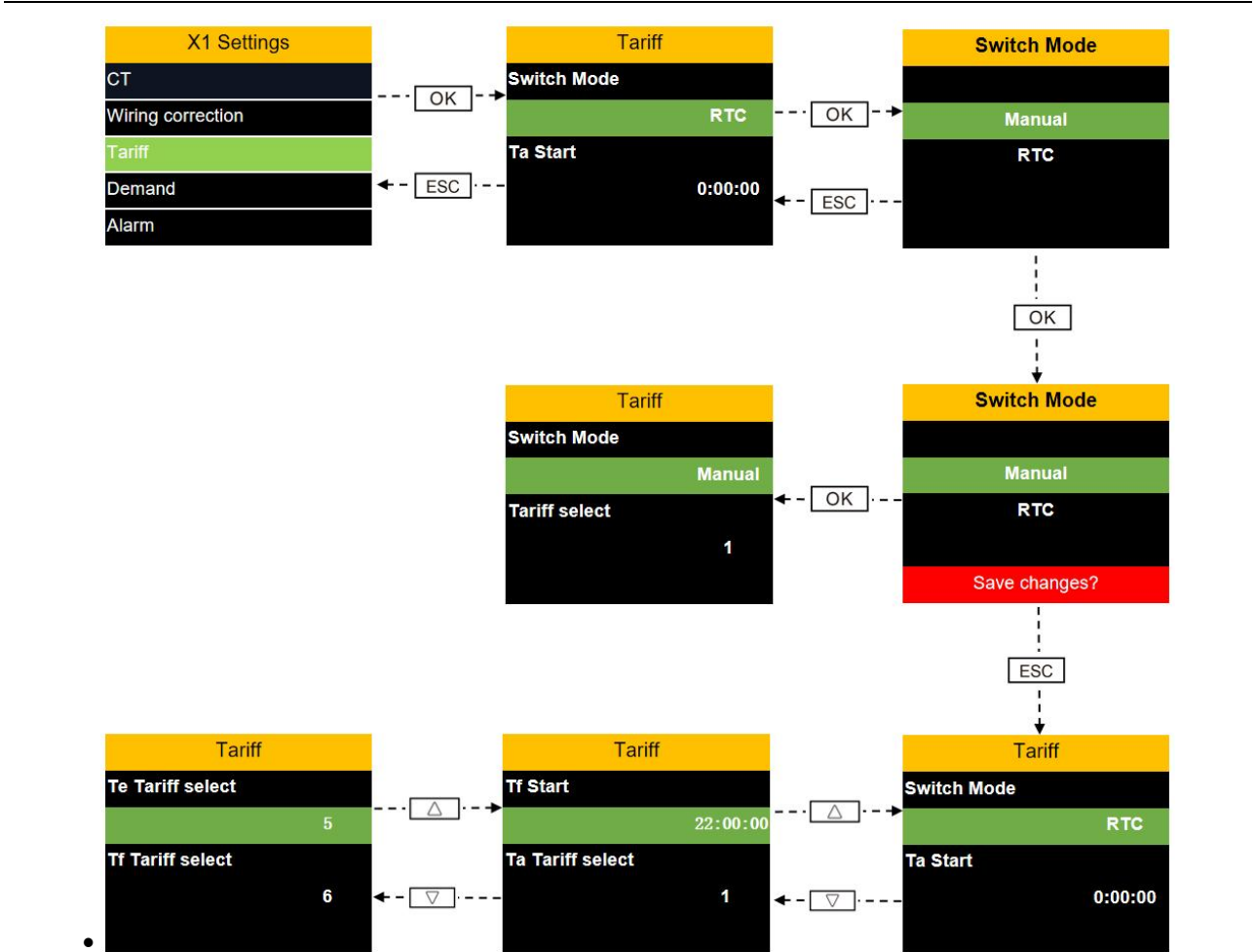
7.5.5 Demand Submenu

The demand calculation method and interval can be set:

Parameter	Description
Calculation method	Fixed (updated every cycle) / Sliding (updated every 1 minute)
Calculation interval	Range: 1-60 minutes, default 15 minutes

X1 Settings
CT
Wiring correction
Tariff
Demand
Alarm

OK / ESC

Demand
Method
Sliding
Block[minute]
31

OK / ESC

Method
Fixed
Sliding

OK

Method
Fixed
Sliding

OK

Demand
Method
Fixed
Block[minute]
31

Method
Fixed
Sliding
Save changes?

ESC

Demand
Method
Sliding
Block[minute]
31
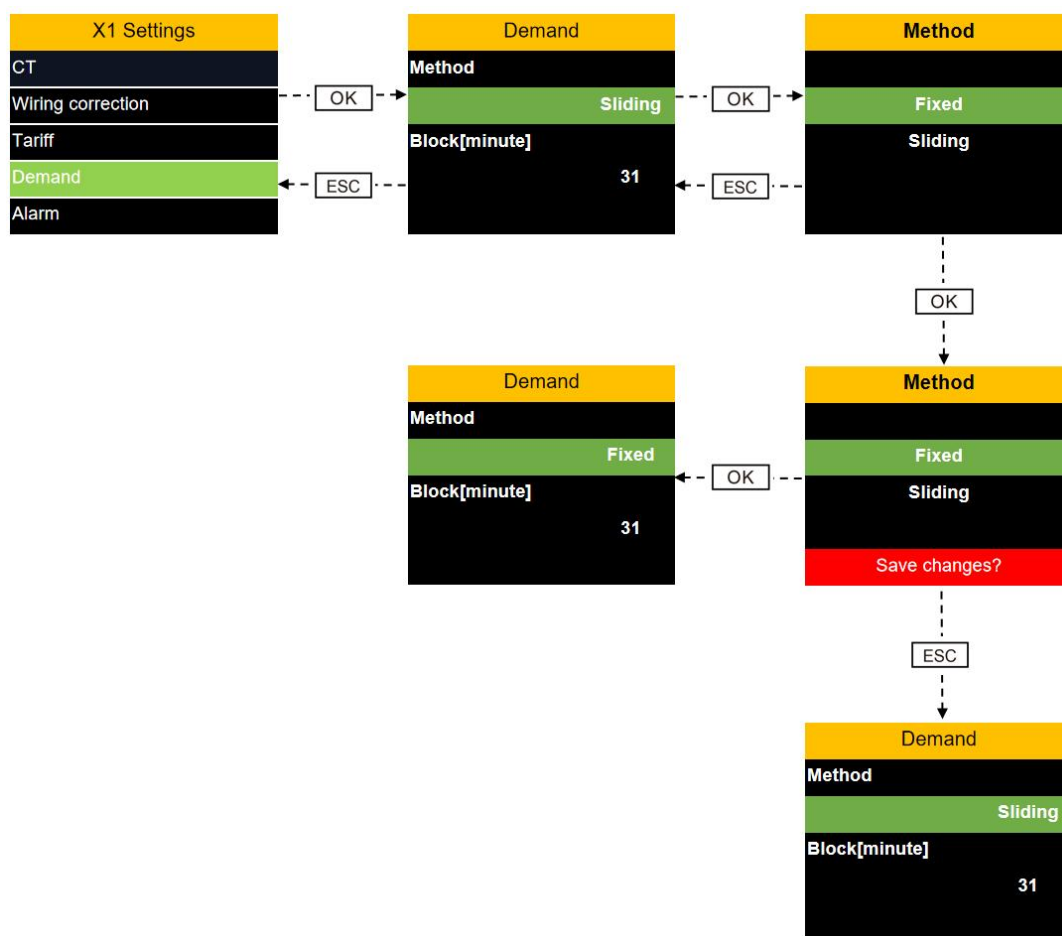
7.5.6   Alarm Submenu

Configurable thresholds and output controls for each alarm item:

Parameters	Description
Type	Over/under current, over/under phase voltage, over/under line voltage, power, demand, THD-U, THD-I
Status	Enable / Disable
Activation threshold [A]	Set alarm trigger current
Release point [%]	Set alarm release conditions
Buzzer output	No association / Association
Relay output	No association / Association
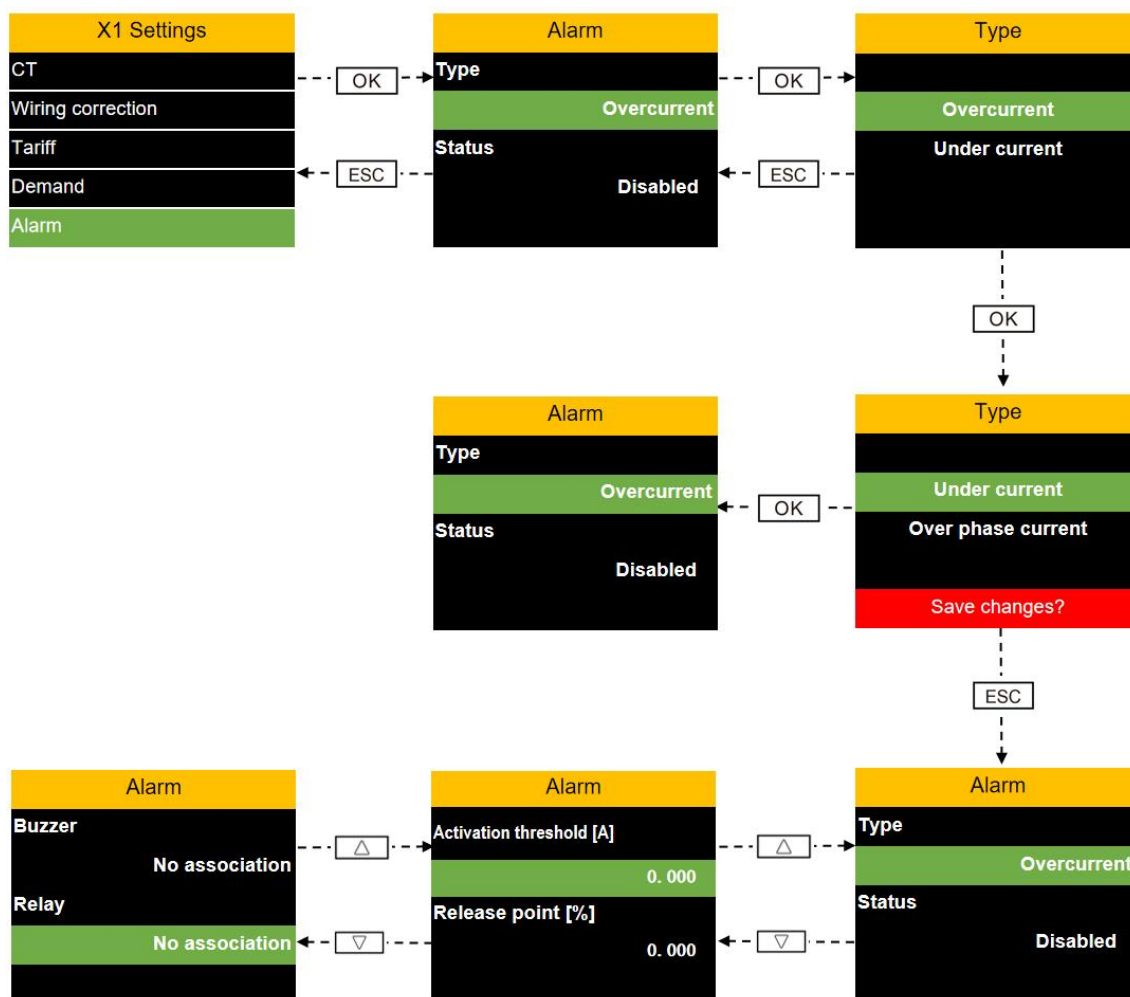
7.5.7 Relay Submenu

Used to set the working mode of the relay:

•Control mode: manual / alarm
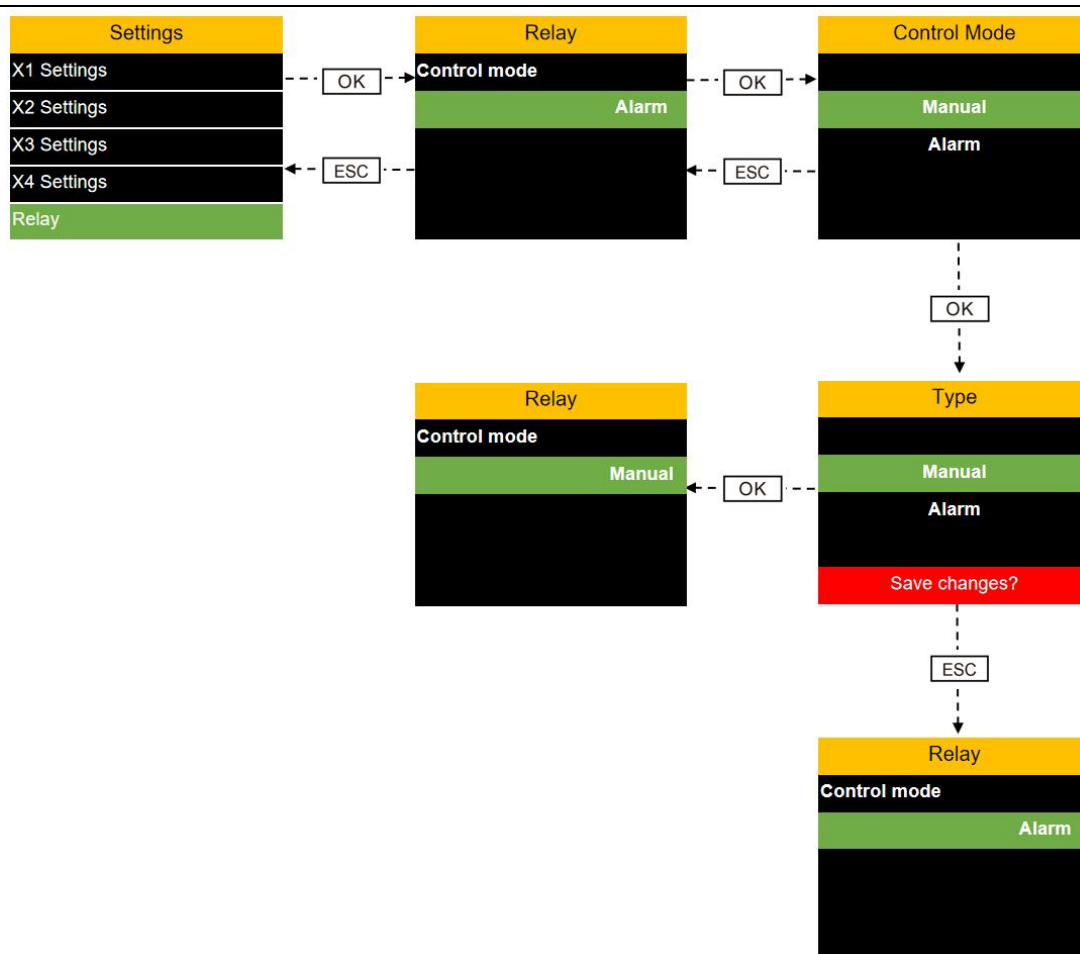
7.5.8 Communication Submenu

Supports configuration of communication interface parameters such as RS485, Modbus, LAN, Web, and FTP.

7.5.8.1 RS485 Setting Page Parameters

Parameter	Configurable Option
Status	Enable / Disable
Device address	000 - 247
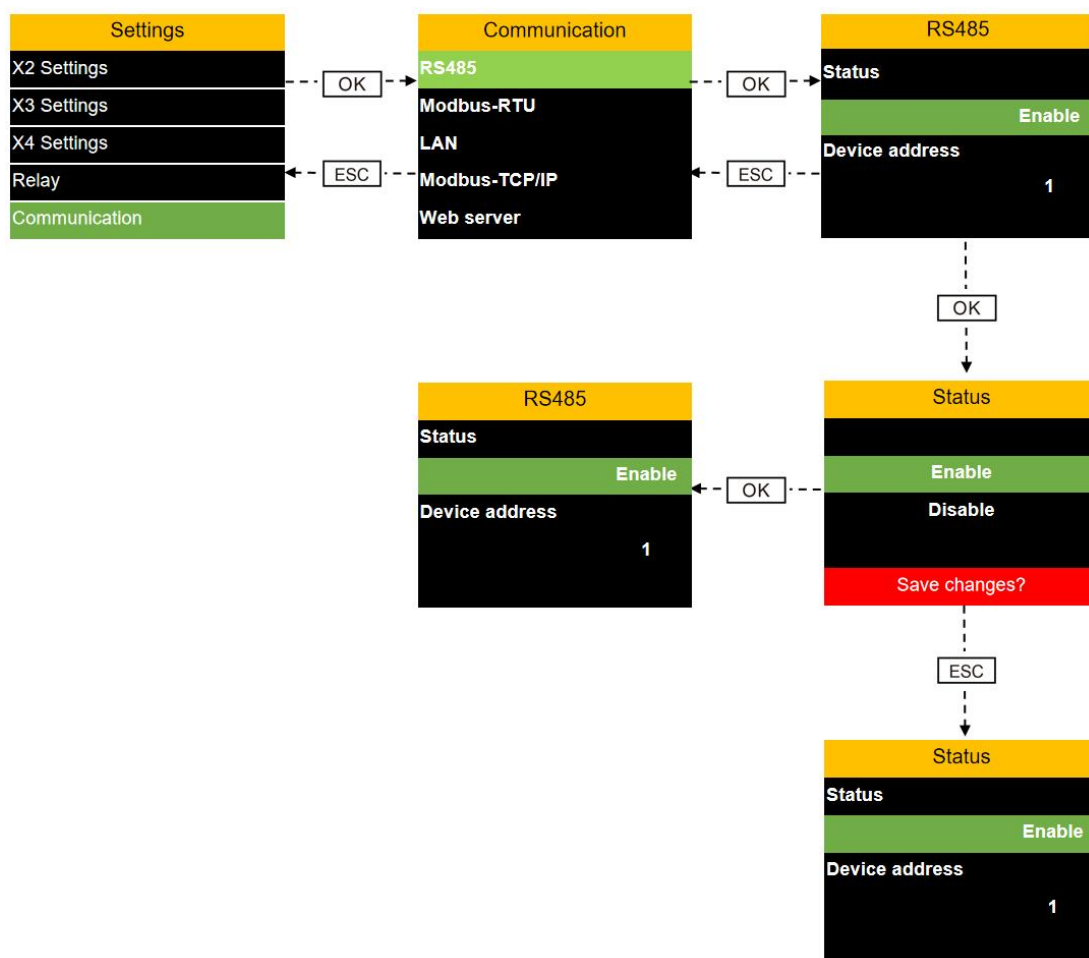
7.5.8.2 Modbus-RTU Setting Page Parameters

Parameter	Configurable Option
Baud rate [bps]	2400, 4800, 9600, 19200, 38400, 57600, 115200
Parity	No parity, odd parity, even parity
Stop bit	1, 2
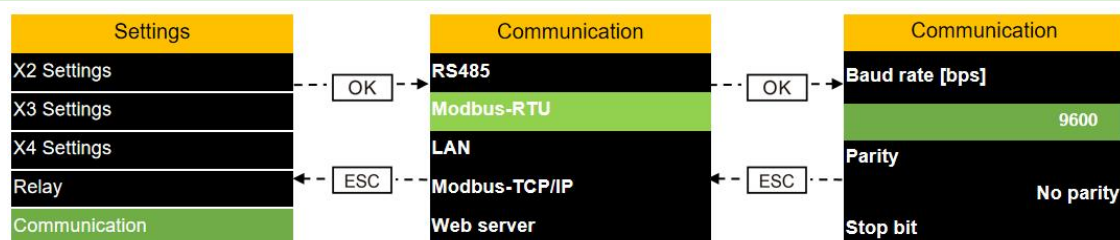
7.5.8.3 LAN Setting：

• DHCP enable/disable

- IP address

- Subnet mask
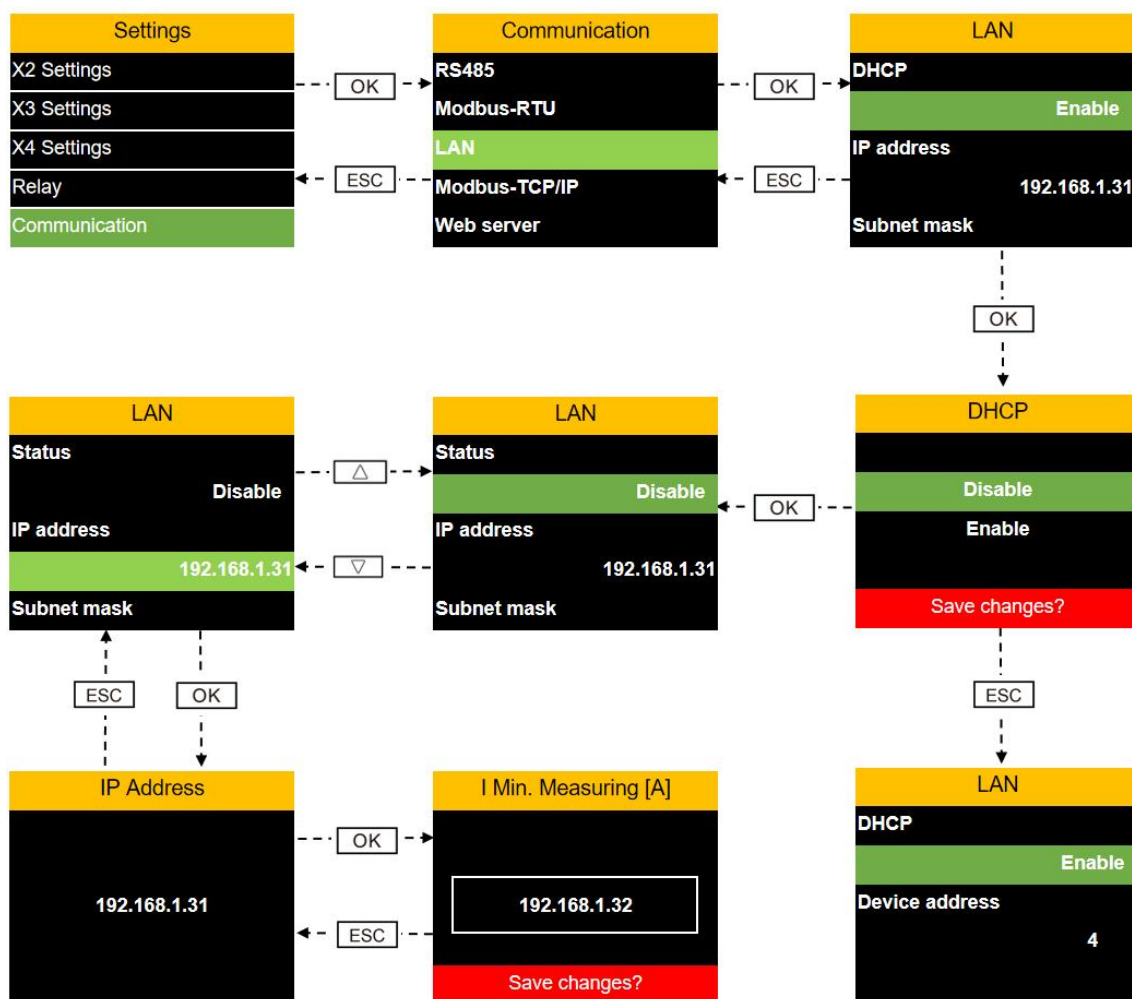
7.5.8.4   Modbus-TCP/IP Setting:

- Status enable/disable

- Port number

Settings
X2 Settings
X3 Settings
X4 Settings
Relay
Communication

OK / ESC

Communication
RS485
Modbus-RTU
LAN
Modbus-TCP/IP
Web server

OK / ESC

Modbus-TCP/IP
Status
Enable
Port No.
502

OK

Modbus-TCP/IP
Status
Disable
Port No.
502

△ / ▽

Modbus-TCP/IP
Status
Disable
Port No.
502

OK

Status
Disable
Enable
Save changes?

ESC

Modbus-TCP/IP
Status
Enable
Port No.
502

ESC / OK

Port No.
00503
Save changes?

7.5.8.5 Web Server Setting:

• Status enable/disable

• Port number

• Administrator/user name and password

7.5.8.6 FTP Server Setting:

• Status enable/disable

• Port number

• Administrator/user name and password

7.5.9 HMI Submenu

Used to set the display parameters of the human-machine page:

Parameter	Optional Value
Language	中文 / English
Clock	Year/Month/Day Hour:Minute:Second
Key tone	Enable / Disable
Backlight off time	Never / 1-5 minutes
Backlight brightness	1-5 level adjustment
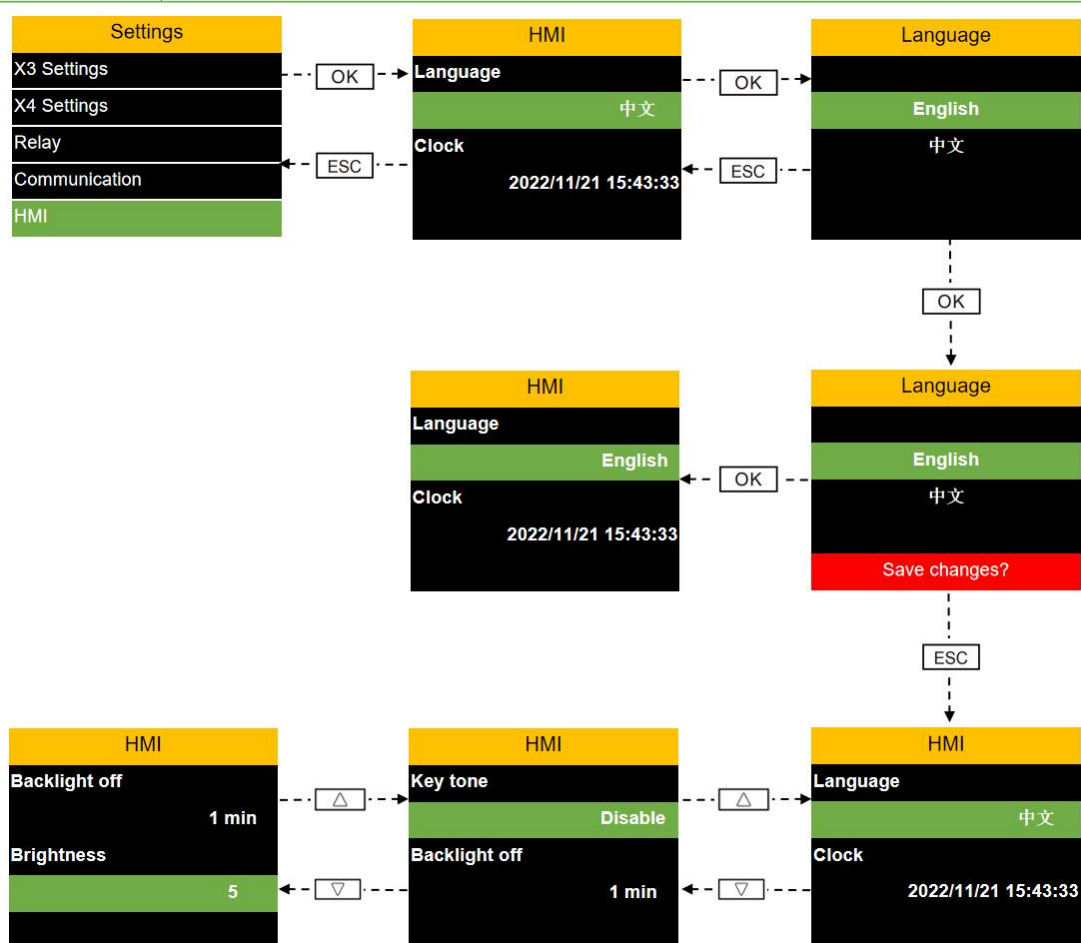
7.5.10 Password Menu

For security control:
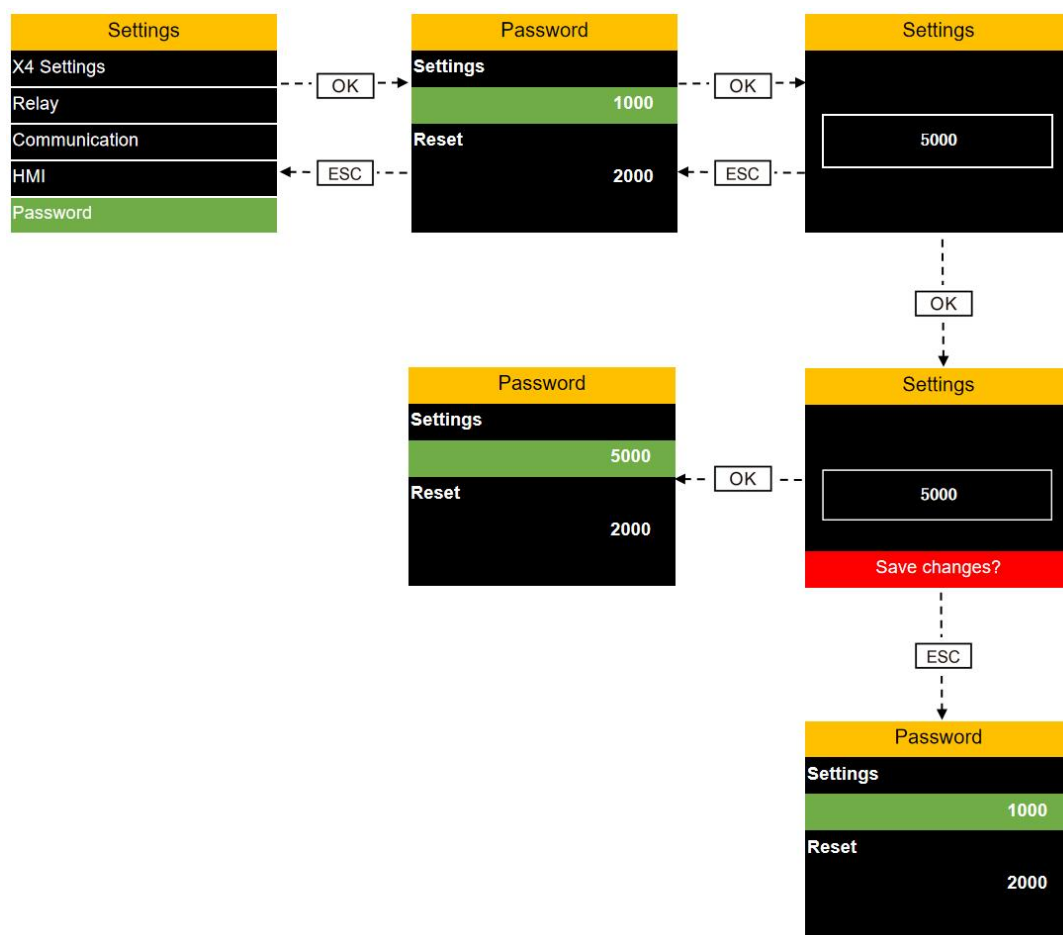
7.6 Device Record Page

The Device record menu is used to configure and manage data recording tasks. The followings can be set:

Items	Description
Status	Start/Stop recording
Record name	User-defined recording task name
Operator	Operator identification information
Location	Record task location notes
Start time	Set the recording start time
End time	Set the recording end time
Recording interval	Set the sampling recording interval (in seconds)

☑ Before going to the record page, you need to enter the reset password (default 3000):

- Press [OK] to go to the password input page;

- Use [↑] [↓] to modify the number, and long press to switch the number of digits;

- After entering correctly, go to the recording page.

7.7　Reset Menu Display Interface

7.7.1　The Reset Menu is Used to Clear or Restore the Following Items:

- Maximum/minimum value recording

- Maximum demand record

- Tariff energy data

- Accumulated energy

- Factory settings (restore defaults)

7.7.2　Before Going to the Reset Page, the Reset Password (Default 2000) is Required:

- Press [OK] to go to the password input page;

- Use [↑] [↓] to modify the value, and long press to shift;

- If the input is correct, it will go to the reset page, otherwise it will stay on the password page.
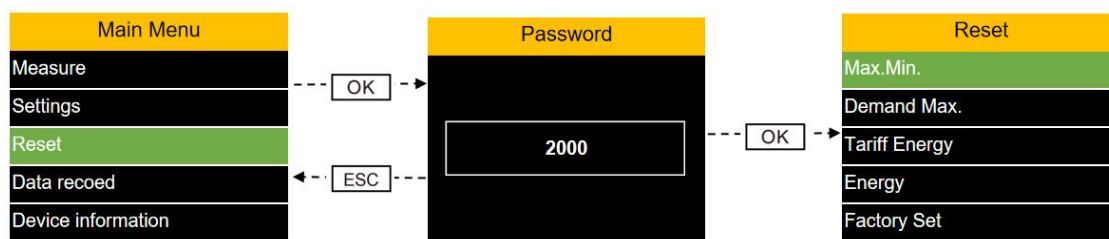
If you forget your password:

• You can use the last four digits of the device serial number as the password.

7.7.3 Reset Operation Instructions:

• Use [↑][↓] to select the item to be reset;

• Press [OK] to go to the confirmation page;

• When the "Reset" prompt appears, press [OK] to confirm or [ESC] to cancel.

7.8 Device Information Menu Display Page

The device information menu is used to view the main information and configuration parameters of the device, including:

Information Item	Description
Device model	The model of the current device
Program version number	Current firmware version number
Communication parameters	RS485 address, baud rate, parity bit, IP address, etc.
Grid parameters	Wiring method, VT/CT ratio, frequency setting
Device time	Current set year, month, day, hour, minute, and second

Main Menu

Measure	
Settings	
Reset	
Data recoed	
Device information	

OK

ESC

Device Information

Model	ME431
S/N	2522001001
Firmware	V1.0.0.250422
Temperature	38
2025/06/11 15:43:33	

▽

△

I/O Status

DO	Open

△ ▽

Power Grid

Wire Type	3P4W_4CT
Frequency[Hz]	50
Nominal Voltage	220V
VT ratio	1.0000

△

▽

LAN

DHCP	Disable
IP address	192.168.1.31
Subnet mask	255.255.255.0
Gateway	192.168.1.1
MAC	44-10-00-C8-00-58

△

▽

Communication

Status	Disable
Device address	1
Baud rate[bps]	9600
Parity	No parity
Stop bits	1

△ ▽

X1 I123 CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

▽

△

X2 I123 CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

▽

△

X3 I123 CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

△ ▽

X4 I123 CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

△

▽

X1 In CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

△

▽

X2 In CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

△ ▽

X3 In CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

▽

△

X4 In CT

Sensor type	Rcoil
Pri[A]	1000
Sec[mV]@50Hz	85
Nominal current [A]	1000

8 Product Technical Parameters and Electrical Performance

The MPM4000 meter supports DIN-rail installation and features a wide voltage range, extensive measurement capabilities, and stable electrical performance, making it suitable for a variety of industrial, commercial, and power distribution monitoring scenarios.

8.1 Basic Technical Parameters

Items	Parameter Description
Installation mode	DIN rail type (35mm DIN rail)
Display screen	2.0-inch TFT color LCD screen, resolution 320 × 240
Dimensions	90mm × 89mm × 66mm (L × W × D)
Weight	About 300g
Protection class	IP20 (compliant with IEC 60629), suitable for installation inside distribution cabinets
Operating temperature	-20℃ ~ +70℃
Storage temperature	-40℃ ~ +85℃
Relative humidity	5% ~ 95% RH, below 50°C (non-condensing)
Pollution class	Class 2
Altitude	≤ 3000m
Overvoltage category	Category III, for distribution systems up to 277/480VAC
Dielectric strength	Meets IEC61010-1 requirements

8.2 Power Supply and Power Consumption

Power Supply	Input Range	Frequency
Type A	AC 95~265V or DC 110~260V	45~60Hz
Type D	DC 24V (18~36V)	-

Type H	AC 90~528V	45~65Hz
Power consumption	Maximum ≤5VA	

8.3 Voltage Measurement Performance

Parameter	Value
Input mode	Three-phase three-wire / three-phase four-wire (L1/L2/L3/N)
Phase voltage range	0~600VAC
Maximum input voltage	720VAC (A-N maximum)
Voltage accuracy	Class 0.2
Frequency measurement	Range 45~65Hz, accuracy ±0.01Hz

8.4 Current Measurement Performance

Parameter	Value
Input mode	Rogowski Coil / Voltage Output CT (VCT)
Channel voltage range	0~900mVAC peak, 636mV RMS
Rogowski coil specifications	50mV/kA@50Hz(0-12000A),@60Hz(0-10000A) 85mV/kA@50Hz(0-7000A),@60Hz(0-6000A) 100mV/kA@50Hz(0-6000A),@60Hz(0-5000A)
Current accuracy	±0.1%
Number of circuits	Up to 4 three-phase circuits

supported	

8.5   Energy and Power Accuracy

Parameter	Value
Active and apparent power	IEC62053-22 class 0.5S
Reactive power	IEC62053-21 class 1S
Active energy	IEC62053-22 class 0.5S
Reactive energy	IEC62053-21 class 1S
Power factor	±0.005
Grid frequency	±0.01%(45~65Hz)

8.6   Digital Output Technical Parameters

Item	Parameter Description
Output mode	Electromagnetic relay, normally open contact
Contact capacity	3A / 30VDC or 3A / 250VAC
Response time	＜100ms
Dielectric strength	Between output and other system circuits ≥ 2kV
Service life	Mechanical life ≥100,000 times, electrical life ≥50,000 times
Control method	Local menu / host computer write register control

8.7   EMC and Safety Performance

Comply with the following electromagnetic compatibility and safety standards:

1.EMC Immunity:

Standard	Project Name	Class Requirements

Number		
EN61000-4-2	Electrostatic discharge immunity	±8kV contact discharge, ±15kV air discharge (Class IV)
EN61000-4-3	Radiated immunity	10V/m (80MHz~1GHz, Class III)
EN61000-4-4	Electrical fast transient/burst immunity	±4kV power ports (Class IV), ±2kV signal ports (Class III)
EN61000-4-5	Surge Immunity	±4kV common mode, ±2kV differential mode (Class III)
EN61000-4-6	RF Conducted Immunity	10V (150kHz～80MHz, Class III)

2.EMI Radiation Standard

Standard Number	Item	Class Description
EN55022	Radiation limits for industrial equipment	Class A industrial grade, suitable for non-home environments

3.Electrical Safety:

Item	Technical Requirements
Isolation withstand voltage	Isolation voltage between power supply and signal ≥ 2kV
Shell material	Engineering plastics (flame retardant grade UL94-V0)
Installation environment	Applicable to secondary systems such as distribution cabinets, complete sets of electrical equipment, etc.

9 Communication Port and Protocol

The MPM4000 meter has an RS485 communication port and an Ethernet port (RJ45), and support the standard Modbus protocol, making it easy to integrate with a host computer, gateway, configuration software, or energy management platform.

9.1 Communication Port Type

Interface Type	Description
RS485 port	One channel, two-line half-duplex
Ethernet port	One channel, RJ45 standard port, supports 10/100Mbps adaptive
Communication protocol	Modbus-RTU (for RS485); Modbus-TCP (for Ethernet)

9.2 RS485 Communication Parameters

Parameter	Configuration Scope / Description
Port standards	RS485, half-duplex, A/B two-wire communication
Default baud rate	9600bps (configurable from 2400 to 115200bps)
Default address	1 (configurable from 1 to 247)
Data bit	8
Stop bit	1 or 2
Parity bit	None, Even, Odd can be set
Communication distance	Recommended ≤ 1000 m
Wiring requirements	It is recommended to use shielded twisted pair cable (such as RVVP2×0.5)

9.3 Ethernet Communication Parameters

Parameter	Description
Port standards	RJ45, 10/100M adaptive
Protocol type	Modbus-TCP
IP address configuration	Support static IP setting or DHCP automatic acquisition (depending on firmware version)
Default port	502
Host computer access method	Support access through PC, PLC, cloud platform, and third-party system

9.4 Communication Command Format

• Modbus-RTU/TCP protocol standard frame structure, supporting function codes include:

  • 0x03: Read holding register

  • 0x06: Write a single register

  • 0x10: Write multiple registers

9.5 Communication status and Fault Prompts

• Abnormal communication status will be displayed as an error at the top of the screen or in the communication menu;

• RS485 port supports baud rate/address quick setting (through menu or host computer);

• If the Ethernet connection is interrupted, it will automatically reconnect by default;

• It is recommended to regularly check the firmness of line connectors to prevent interference from causing communication interruptions.

10 Typical Applications and Deployment Scenarios

The MPM4000 series meters are widely used in scenarios such as multi-circuit power monitoring, itemized metering, device energy analysis, and intelligent transformation of power distribution cabinets. They support a variety of installation environments and are suitable for a wide range of project needs, including industrial, commercial, energy, and

transportation.

10.1   Basic Technical Parameters

Application Industry	Scene Description
Data center	Quickly access cabinet circuits to monitor current, energy, and temperature; enable wire-free deployment via RJ45 wiring, improving circuit density and data acquisition capabilities.
Industrial automation	In scenarios where multiple devices are running in parallel, unified metering and energy consumption acquisition are achieved for each workstation or device circuit, facilitating analysis and diagnosis
Commercial building	Realizes itemized power monitoring of tenants/floors/lighting/air conditioning circuits, supports multiple tariffs, and adapts to energy billing scenarios
Complete electrical system	Installed in complete systems such as distribution boxes and low-voltage cabinets for centralized measurement, communication upload, and loop current status visualization
Education/medical	In the smart building energy efficiency system, multiple key circuits are connected to form a complete energy consumption profile, realizing centralized supervision and safety warning.
Energy projects	Realize branch current measurement and system operation status monitoring in scenarios such as photovoltaic combiner boxes, energy storage management, and wind power cabinets

10.2   Application Deployment Method

Multi-circuit unified acquisition

- One MPM4000 device can be used to collect electrical parameters for up to four three-phase circuits.

- Can be centrally uploaded to the data acquisition system or cloud platform via RS485/Ethernet;

- For each circuit, the current signal is acquired independently, while the voltage signal is shared, which simplifies wiring.

- Supports optional 1-channel zero-sequence or temperature acquisition to improve system security and multi-dimensional perception capabilities.

Integrated distribution cabinet

- Supports DIN rail standard and is compatible with conventional 200/400 width low-voltage cabinet sets;

- Voltage input uses terminal wiring, and current signal is connected through RJ45 modularization for rapid deployment;

- DO alarm output and communication upload can be integrated to achieve power distribution information linkage and alarm control.

10.3   Multi-device Networking Diagram

- RS485 communication: supports daisy chain connection of up to 32 devices;

- Ethernet communication: supports independent IP connection or access switch for centralized management;

- It supports centralized acquisition through master station polling, and also supports scheduled reporting by edge devices or gateways.