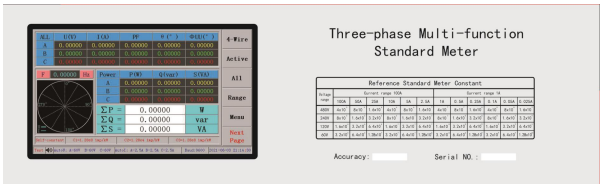

User's manual

V2.0

Three-phase multifunctional standard watt-hour meter

Catalogue

➢ Chapter 1 Product Overview

The three-phase multifunctional standard watt-hour meter is a high-precision multifunctional wide-range standard watt-hour meter with an accuracy level of 0.05%. Adopting dual-core touch screen technology, automatic temperature balance technology and other compensation technologies, the index is stable, the function is rich, the interface is novel, the touch operation is clear and simple, the overall weight is light, the volume is small and the precision is high.

It can be widely used in electric energy metering industry, electric energy laboratory and other related departments, which can be used in laboratories and carried to work on site.

Note: In order to ensure the smooth progress of your work and the safety of you and the equipment you use, please read this manual carefully before using this product.

➢ Chapter 2 Functional Characteristics

Touch screen	7-inch 800*480 dot matrix HMI color touch LCD display (capacitor)
Wide range measurement	Voltage (phase voltage): 30 ~ 600V Current: 10mA ~ 120A
Range switching	Manual or automatic
Multi-mode measurement	It can measure AC voltage, current and power (active, reactive and apparent) under various connection modes such as single-phase, three-phase four-wire Y type/three-wire Δ type
Multifunctional measurement	a) Basic measurement functions such as voltage, current, phase, frequency, active power, reactive power, apparent power factor and error corresponding to full wave, fundamental wave and harmonic wave b) Simultaneous measurement of voltage, current and power stability (up to 3 power stability algorithms) c) Measurement of voltage and current three-phase unbalance d) Vector diagram display, phase display mode: 0 ~ 360 e) Waveform display, harmonic analysis, distortion calculation, spectrum diagram display, which can display the amplitude, content and phase of harmonics f) 1-way pulse input port to measure the constant and frequency of the meter under inspection

	g) 2-way pulse output, constant types can be set: active, reactive, apparent, voltage, current, frequency
Electric energy error verification	It can check the estimated value of electric energy metering error and standard deviation of electric energy meter and electric energy meter verification device. Special compensation technology will not cause too much error jumping due to too small load (too low power pulse frequency) when the load is small. Can display the current error, standard deviation estimate value
Accumulation of electric energy	It can accumulate electric energy for a long time and compare it with the tested meter
Harmonic analysis	It can analyze harmonics of power frequency voltage and current with 51 times and below
Data and graphic display	It can visually display the measurement working state and various measurement data, as well as the waveform of measured voltage and current, the phase vector diagram of voltage and current, and the harmonic spectrum analysis diagram
Communication mode	Asynchronous communication is adopted, baud rate can be selected, and the default is 9600bps
Chassis	Adopt standard portable aluminum chassis, which is small in size, light in weight and convenient to carry
Multi-purpose	It can be used as standard meter and tester of watt-hour meter verification device. It can be used alone, can also be used by remote control through communication with PC, and can also be used with verification device

➢ Chapter 3 Technical Introduction

1. Signal range

Voltage	30 ~ 600V (phase voltage)
Current	10mA ~ 120A
Frequency	40 ~ 70Hz
Input pulse frequency	2MHz (TTL)
Output constant	Using automatic constant, output pulse frequency Fout: 25KHz at rated range

2. Accuracy

Measurement	**Accuracy (PF ⩾ 0. 5)**
Voltage (RMS)	Range: 60V, 120V, 240V, 480V Sine wave: ± 0.05% RD (30V ~ 600V) ± 0.05% RG (10V ~ 30V), RG=30V 2-21 harmonics: ± 0.05% RD (30V ~ 600V) Distorted wave: ± 0.05% RD (30V ~ 600V)
Current (RMS)	Range: 100A, 10A, 1A, 0.1 A Sine wave: ± 0.05% RD (10mA ~ 120A) ± 0.05% RG (1mA ~ 10mA), RG=10mA

	2-21 harmonics: ± 0.05% RD (10mA ~ 120A) Distorted wave: ± 0.05% RD (10mA ~ 120A)
Active power	Sine wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A) 2-21 harmonics: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A) Fundamental wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A)
Active energy	Sine wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A) 2-21 harmonics: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A) Fundamental wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A)
Reactive power	Sine wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A)
Reactive power	Sine wave: ± 0.05% RD (30V ~ 600V, 10mA ~ 120A)
Frequency	Measurement range: 40 ~ 70Hz Resolution: 0.00001 Hz Accuracy: ± 0.005 Hz
Phase	Measurement range: 0 ~ 359.999 Resolution: 0.001 ® Accuracy: ± 0.02 ° (30V ~ 600V, 10mA ~ 120A)
Harmonic voltage	2 ~ 10 times: when the harmonic content is less than or equal to 30%; Error: ≤ 0.1% 11 ~ 21 times: when the harmonic content is less than or equal to 30%; Error: ≤ 0.2% 22 ~ 51 times: when the harmonic content is less than or equal to 30%; Error: ≤ 0.5%
Harmonic current	2 ~ 10 times: when the harmonic content is less than or equal to 50%; Error: ≤ 0.1% 11 ~ 21 times: when the harmonic content is less than or equal to 50%; Error: ≤ 0.2% 22 ~ 51 times: when the harmonic content is less than or equal to 50%; Error: ≤ 0.5%

3. Input impedance

Voltage	≥ 750 K Ω
Current	0.001 Ω

4. Working environment

Temperature	Normal temperature type: 15 ~ 30 ° C
Temperature coefficient	0.0005/° C
Preheating time	30 minutes
Wide temperature type	10 ~ 43 ° C temperature coefficient: 0.0002/ ° C; No preheating required
Verification temperature	23 ± 1 ° C
Humidity	45 ~ 80% R.H
Power supply	220V ± 10% 50Hz ± 1%
Power	≤ 50VA

consumption	

5. Others

Volume	450 × 130 × 400 mm
Weight	5 kg

➢ Chapter 4 Working Principle

The three-phase multifunctional standard watt-hour meter adopts modular design, and the signal acquisition circuit converts the measured large voltage and large current signals into small voltage signals. After being processed, it is sent to AD sampling circuit. After being converted into digital signal by AD sampling circuit, it is sent to DSP for processing. After being processed by DSP, it is sent to arm main control board and displayed for processing. At the same time, arm main control board can control the bottom gear and the output state of equipment channel, and communicate with upper computer.

➢ Chapter 5 Structure and Wiring

1. Structure

Adopts luxury new aluminum chassis.

The front panel is equipped with a 7-inch touch color display (capacitor), as shown in Figure 5.1. 1.

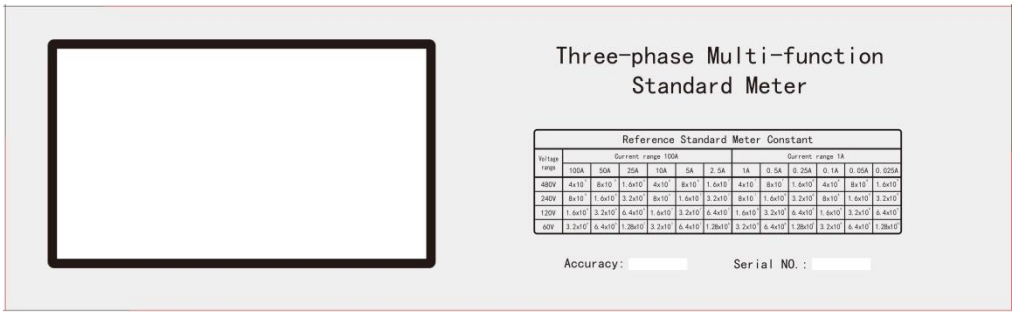

Figure 5.1. 1 Front Panel

Layout of rear panel: power socket, switch and various terminals, see Figure 5.1. 2.

Universal serial communication port symbol RS-232 standard.

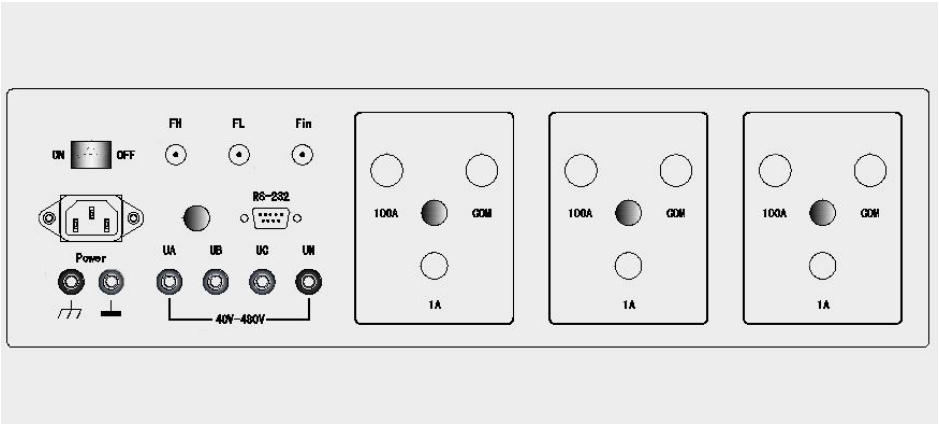

Figure 5.1. 2 Rear Panel

1. Wiring

a) Connect 220V mains power to the power supply socket;

b) The measured voltage and current signals are connected to the corresponding terminals of the back panel according to the phase sequence;

c) If the watt-hour meter or calibration device is detected, the current line of the watt-hour meter or calibration device is connected with the instrument according to the phase sequence. Voltage lines are connected in parallel with this instrument in phase sequence. The output power pulse signal of the tested meter or device is connected with the Fin interface of the instrument;

d) If the instrument is verified, the current line of the verification device is connected with the instrument according to the phase sequence, the voltage line is connected with the instrument according to the phase sequence, and the power pulse output FH or FL of the instrument is connected with the pulse input port Fin interface of the verification device;

e) The grounding terminal of the casing should be connected with PE protection line of user power supply system;

Note: The range of access to each signal must comply with the provisions in "Chapter 3 Technical Introduction" of this specification.

➢ Chapter 6 Operation Methods

1. Turn on

a) Check the wiring;

b) After confirming that the wiring is correct, turn on the power switch on the back panel of the instrument. After hearing the "beep" sound, the display will light up and display the picture as shown in Figure 6.1. 1. Indicate that the power supply is normal;

c) After Loading is finished, the system starts up, and the default is the electricity analysis interface, and the default range is automatic mode;

Figure 6.1. 1 Boot interface

2. Shut down

a) The measurement signal input is zero;

b) After confirming that the input signal is zero, turn off the power switch;

Note: Before adding the current measurement signal, the instrument must enter the working state, otherwise it will cause the current source alarm.

3. Touch control area and instrument information bar

There is a touch control area on the right side of all interfaces, and another touch control area is added to the special interface, which will be explained separately in the figure. Generally, the red area ① in Figure 6.3. 1 is the navigation touch area.

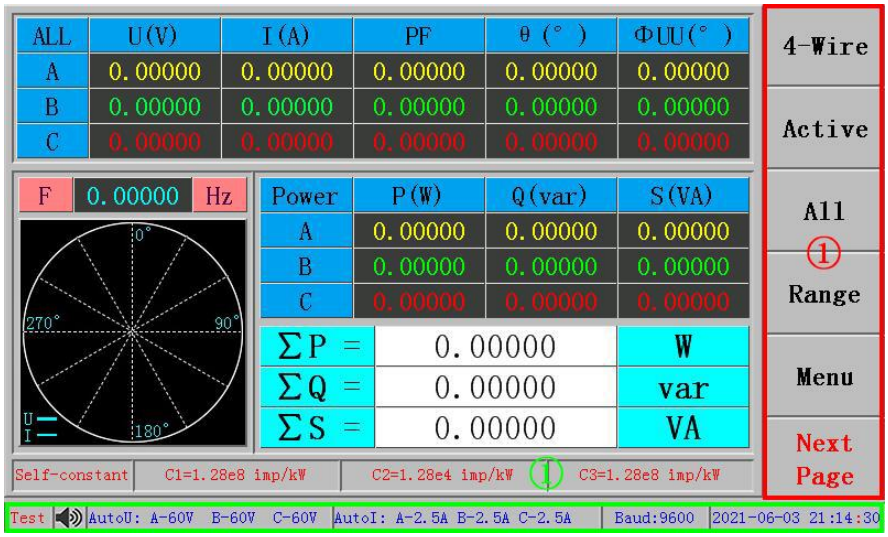

Figure 6.3. 1 Navigation Touch Area Indication

Instrument information column (green area ①):

① Measurement: Represents the current test page;

②  Indicates that the buzzer is on;

③ Automatic U: A-60V B-60V C-60V: indicates the current voltage range state of the instrument;

④ Automatic I: A-2. 5A B-2. 5A C-2. 5A: Indicates the current range state of the instrument;

⑤ Baud: 9600: Indicates the current communication baud rate of the instrument;

⑥ 2021-05-11 14:24:08: indicates the current time;

4. Touch keyboard operation

Touching some touch keys will call the touch keyboard, as shown in Figure 6.4. 1.

Figure 6.4. 1 Touch keyboard

a) CLR: Clear key to clear all input values;
b) DEL: Delete key to delete the last input value;
c) OK: OK key;
d) .: The decimal point key;
e) -: minus sign bond;
f) Others are numeric keys;

5. Menu interface

Select "Menu" in the navigation touch area to enter the page, as shown in Figure 6.5. 1.

Figure 6.5. 1 Menu

The functions of each button in the screen are as follows. Touch the corresponding button to enter the corresponding interface:

a) Electricity analysis: routine measurement interface, displaying all measured values, vector diagrams, etc.;
b) Waveform Harmonic: Harmonic analysis interface, display voltage, current waveform, distortion, harmonic analysis;
c) Phase vector: Phase vector interface, showing vector diagram, phase value, symmetry, imbalance, etc.;
d) Error calibration: Error calibration interface, which can calibrate the estimated value of electric energy metering error and standard deviation of electric energy meter and electric energy meter verification device;
e) Constant test: Constant test interface, which can test the constants of the tested table;
f) Electric energy accumulation: Electric energy accumulation interface, which can accumulate electric energy for a long time and compare it with the tested table;
g) Gear setting: Gear setting interface, which can set voltage and current gears respectively;
h) Channel setting: Channel setting interface, which can set the pulse output state of two pulse channels respectively;
i) Stability: Stability analysis interface, which can analyze voltage, current and power stability;
j) Instrument setting: instrument setting interface, which can set relevant parameters when the instrument works;
k) Instrument calibration: Instrument calibration interface, can be recalibrated to the instrument, enter the interface, need a password, generally not open to users;
l) System help: System help interface, showing the instrument name,

accuracy, serial number, software version number, etc.;

6. Electricity analysis

Enter the interface by default when you start up. You can press "Electricity Analysis" in the menu interface or select "Electricity" in the navigation touch area to enter the page, as shown in Figure 6.6. 1.

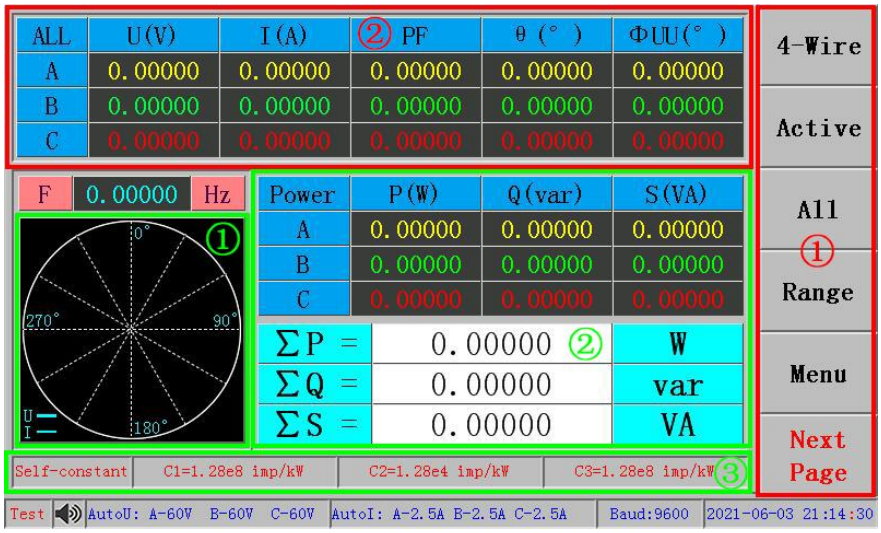

Figure 6.6. 1 Electricity Analysis

a) The red touch area ① in the figure is the navigation touch area, in which there are 6 touch keys with the following functions:
   ① Four-wire: the touch key of instrument measurement mode can be switched to "four-wire" or "three-wire";
   ② Active: Instrument measurement mode touch key, can be switched to "active", "natural reactive", "apparent";
   ③ Full-wave: The instrument measurement mode touch key can be switched to "full-wave", "fundamental wave" and "harmonic wave";
   ④ Gear: Press this key to enter the gear setting interface, as shown in Figure 6.9. 1;
   ⑤ Menu: Press this key to enter the menu interface, as shown in Figure 6.5. 1;
   ⑥ Next page: Touch this key to enter the touch area of the next page, which are "waveform", "phase", "error", "constant test", "electric energy accumulation" and "previous page";
b) In the figure, the red touch area ② is the measurement display area, and you can enter the stability analysis interface by touching it at the same time, as shown in Figure 6.7. 1;
c) The green area ① in the picture is a vector picture;
d) The green area ② in the figure is the split-phase power and the total power;
e) The green area ③ in the figure is the constant in this table, where C1 and C2 respectively represent the output constants of pulse output

ports FH and FL of the instrument; The unit represents the data type of the output constant;

① IMP/KWH: Active energy constant;
② IMP/KVARH: Reactive energy constant;
③ IMP/KVAh: Apparent electrical energy constant;
④ IMP/KVH: Voltage constant;
⑤ IMP/KAh: Current constant;
⑥ IMP/KHZH: Frequency constant;

f) Other display areas in the figure are the same as above;

7. Stability

Press "Stability" in the menu interface or touch in the power analysis touch area ② to enter the stability analysis interface, as shown in Figure 6.7. 1.

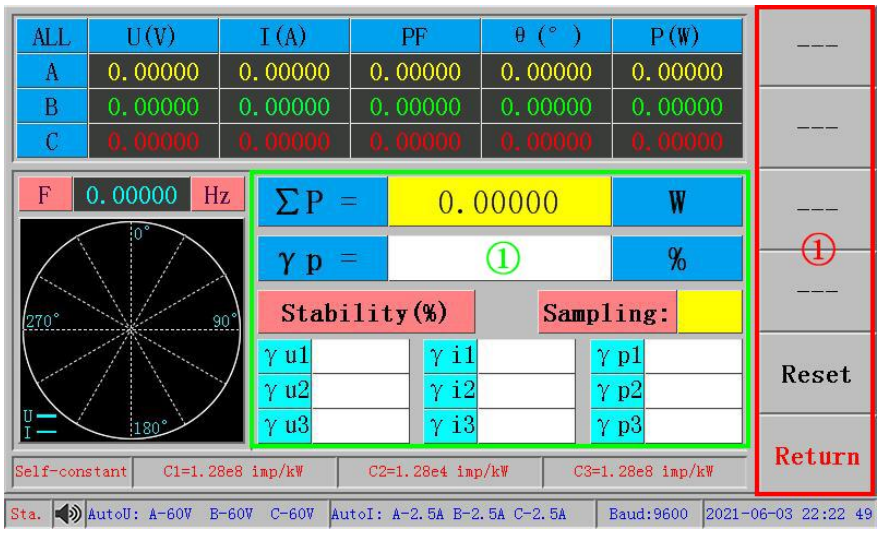

Figure 6.7. 1 Stability analysis

a) The red touch area ① in the figure is the navigation touch area, in which two touch keys have the following functions:
① Start-up: stability recalculation;
② Return: Switch to the electricity analysis interface;

b) The green area ① in the figure is the stability display area;
① γ u1, γ u2 and γ u3: are the voltage stability of A, B and C phases;
② γ i1, γ i2 and γ i3 are the three-phase current stability of A, B and C;
③ γ p1, γ p2, γ p3: the three-phase power stability of A, B and C;
④ γ p is the total power stability;

c) Other display areas in the figure are the same as those described in (6. Electricity analysis);

8. Harmonic analysis

Press "Waveform Harmonic" in the menu interface or select "Waveform" in the navigation touch area to enter the harmonic analysis interface, as shown in Figure 6.8. 1.

Figure 6.8. 1 Harmonic analysis

a) The red touch area ① in the figure is the navigation touch area, in which there are 6 touch keys with the following functions:

⑤ Voltage: Current harmonic analysis type, which can be switched to "voltage" or "current";

⑥ Phase A: The current harmonic analysis phase can be switched to "Phase A", "Phase B" and "Phase C";

⑦ Left shift: the number of current harmonic correspondence analysis is reduced by one;

⑧ Right shift: the number of current harmonic correspondence analysis plus one;

⑨ × 1: Set harmonic page turning step, which can be switched to "× 1" and "× 10";

⑩ Next page: Touch this key to enter the touch area of the next page, which are "Electricity", "Phase", "Error", "Gear", "Menu" and "Previous Page";

b) The red touch area ② in the figure is the 51st harmonic spectrum analysis diagram, and the total harmonic analysis interface can be entered by touching here at the same time, as shown in Figure 6.8. 2;

c) The green area ① in the figure is the waveform analysis diagram corresponding to the current setting;

d) The green area ② in the figure is the distortion (THD) of the phase corresponding to the measured values of voltage and current and the current setting type;

e) The green area ③ in the figure is the harmonic content (HRx), harmonic value (HCx) and harmonic initial phase angle (HPx) corresponding to the harmonic times of all corresponding phases of the current setting type;

f) Other display areas in the figure are the same as those described in (5. Electricity analysis);

Figure 6.8. 2 Total Harmonic Analysis

a) The red touch area ① in the figure is the navigation touch area, in which three touch keys have the following functions:

① Voltage: Current harmonic analysis type, which can be switched to "voltage" or "current";

② Phase A: The current harmonic analysis phase can be switched to "Phase A", "Phase B" and "Phase C";

③ Return: Touch "Return" to switch to harmonic analysis interface;

b) The green area ① in the figure is the harmonic content (HRx), harmonic value (HCx) and harmonic initial phase angle (HPx) corresponding to the 51 harmonic times of all corresponding phases of the current setting type;

c) Other display areas in the figure are the same as those described in (6. Electricity analysis);

9. Phase vector

Press "Phase Vector" in the menu interface or select "Phase" in the navigation touch area to enter the phase vector interface, as shown in Figure 6.9. 1.

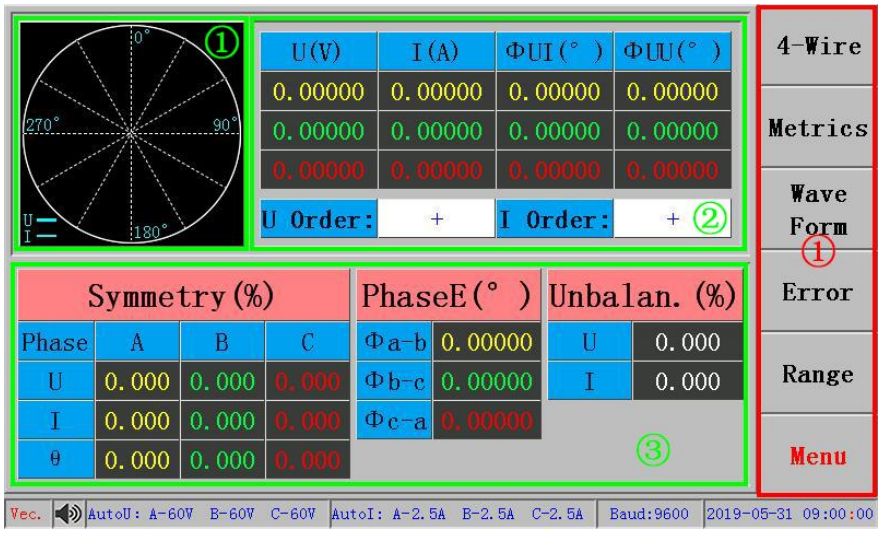

Figure 6.9. 1 Phase vector

a) The red touch area ① in the figure is the navigation touch area, in which there are 6 touch keys with the following functions:
   ① Four lines: the same (6. Electricity analysis);
   ② Electricity, harmonic, phase, gear, menu: Touch this key to enter the corresponding pages respectively;
b) The green area ① in the picture is a vector picture;
c) The green area ② in the figure is voltage (U), current (I), angle between voltages (Φ UU), angle between voltage and current (Φ UI);
d) The green area ③ in the figure is symmetry, phase difference and imbalance;
e) Other display areas in the figure are the same as those described in (6. Electricity analysis);

10. Range setting

Press "Gear Setting" in the menu interface or select "Gear" in the navigation touch area to enter the gear setting interface, as shown in Figure 6.10. 1.

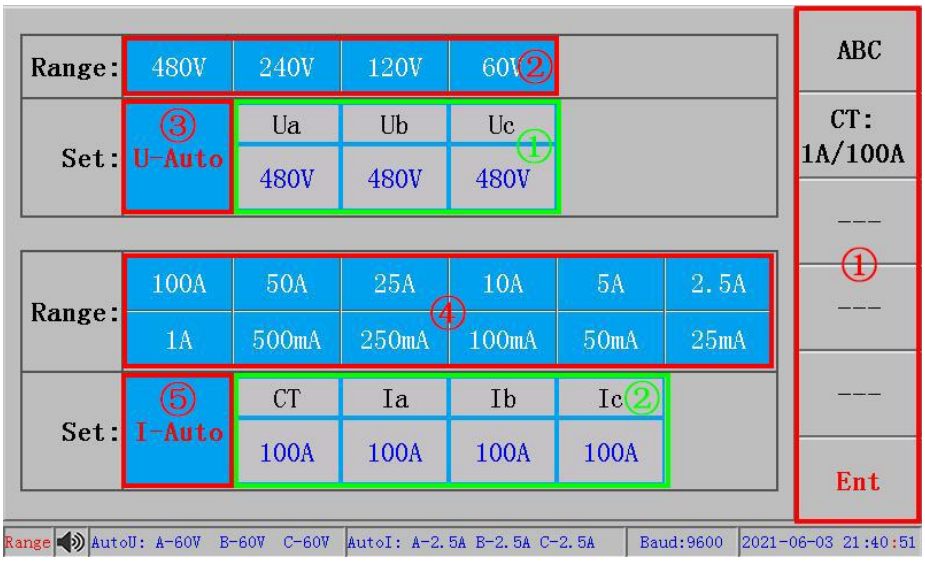

Figure 6.10. 1 Gear setting

a) The red touch area ① in the figure is the navigation touch area, in which three touch keys have the following functions:
   ① ABC: Phase setting, which can be switched to "Phase A", "Phase B", "Phase C" and "Phase ABC";
   ② CT: 1A/100A: Instrument current input terminal, corresponding to CT in current gear setting, 100A means 100A terminal input, 1A means 1A terminal input, where 1A terminal input cannot exceed 1.25 A, otherwise the corresponding phase fuse will be burned;
   ③ OK: Touch this key to return to the previously displayed page;
b) The red touch area ② in the figure is the voltage gear selection area, and the optimal gear can be selected;
c) The red touch area ③ in the figure is voltage mode, which can be

selected as "automatic" and "manual" mode;

d) The red touch area ④ in the figure is the current gear selection area, and the optimal gear can be selected;

e) The red touch area ⑤ in the figure is current mode, which can be selected as "automatic" and "manual" mode;

f) The green area ① in the figure shows the current voltage gears of each phase;

g) The green area ② in the figure is displayed for the current current gears and current input terminals of each phase;

h) Other display areas in the figure are the same as those described in (6. Electricity analysis);

11. Error check

Press "Error Check" in the menu interface to enter the error check interface, as shown in Figure 6.11. 1.

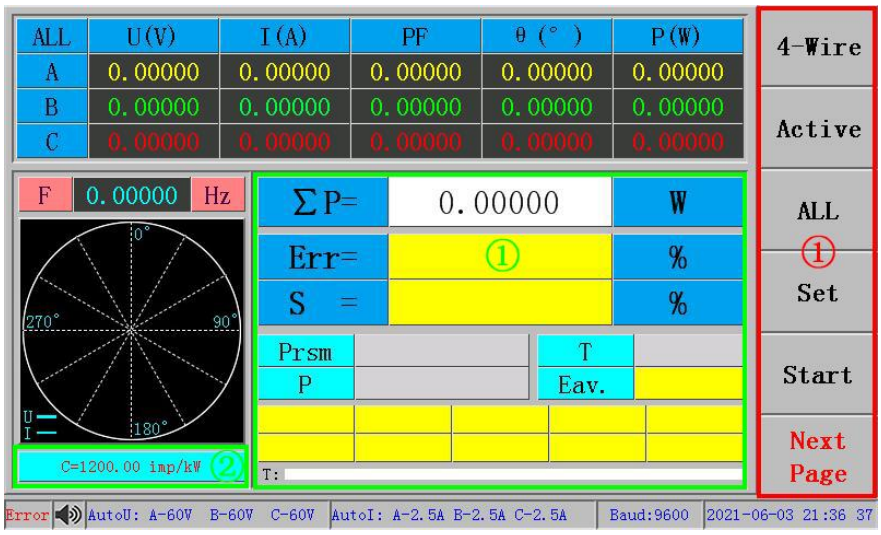

Figure 6.11. 1 Error check

a) The red touch area ① in the figure is the navigation touch area, in which there are 6 touch keys with the following functions:

① Parameters: Press this key to enter the error parameter setting interface (Figure 6.11. 2), and set error parameters;

② Start: Indicates the error start or stop, which can be switched to "start" and "stop";

③ Four-wire, active, full-wave, next page: the same as (6. Electricity analysis);

b) The green area ① in the figure is the current error display area, and the functions of each phase are as follows:

① Err: Current error value;

② S: Standard deviation;

③ Prsm: Theoretical pulse number of standard table;

④ P: Actual pulse number of standard table;

⑤ T: The number of bezels to be checked;

⑥ Eav.: Average error value;

⑦ The yellow area is the error storage display area;

c) The green area ② in the figure is the constant of the tested table;

d) Other display areas in the figure are the same as those described in (6. Electricity analysis);

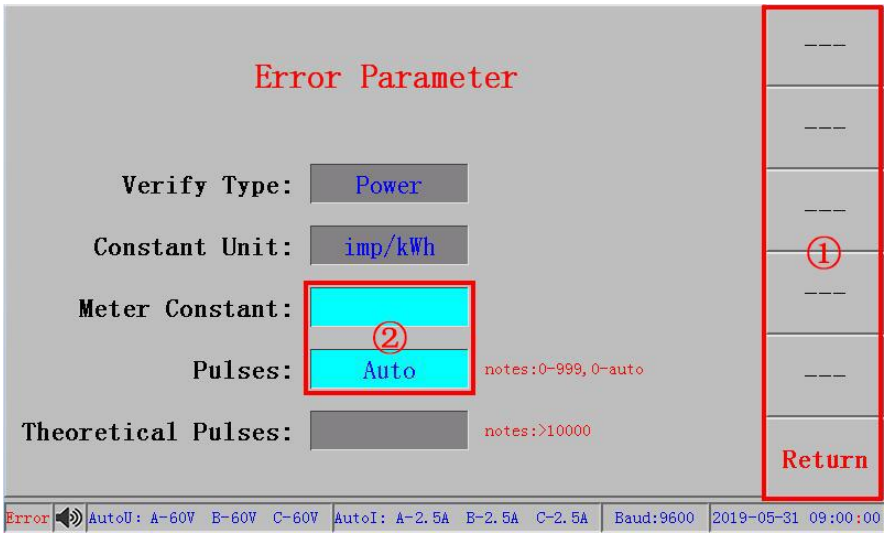

Figure 6.11. 2 Setting of error parameters

a) The red touch area ① in the figure is the navigation touch area, and pressing "Return" can switch to the error verification interface;

b) The red touch area ② in the figure is the parameter setting area, which can be set correspondingly by touching the corresponding key;

c) Theoretical pulse number = standard table constant × number of turns ÷ corrected table constant;

12. Constant test

Press "Constant Test" in the menu interface to enter the constant test interface, as shown in Figure 6.12. 1.

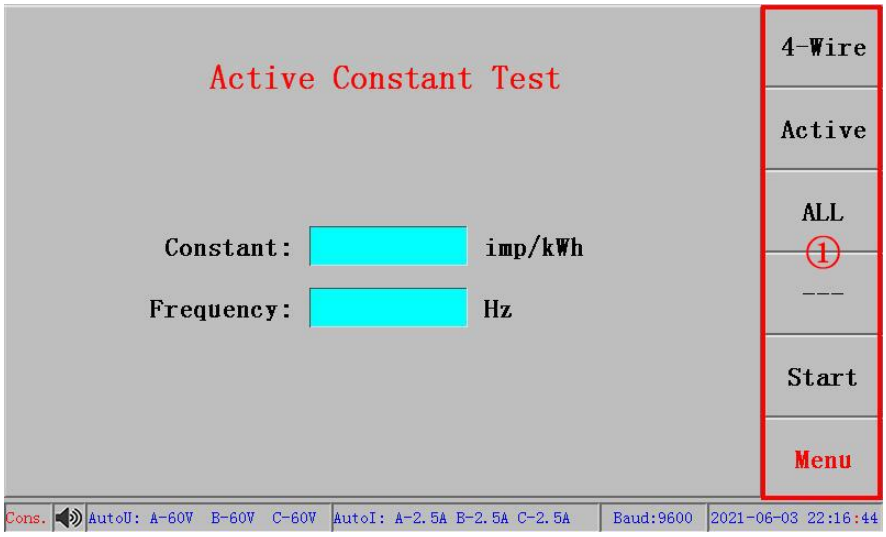

Figure 6.12. 1 Constant test

a) The red touch area ① in the figure is the navigation touch area, in which five touch keys have the following functions:
   ① Start: Indicates the start or stop of constant test, which can be switched to "start" and "stop";
   ② Four-wire, active, full-wave, menu: the same as (6. Electricity analysis);

13. Accumulation of electric energy

Press "Electric Energy Accumulation" in the menu interface to enter the electric energy accumulation interface, as shown in Figure 6.13. 1.

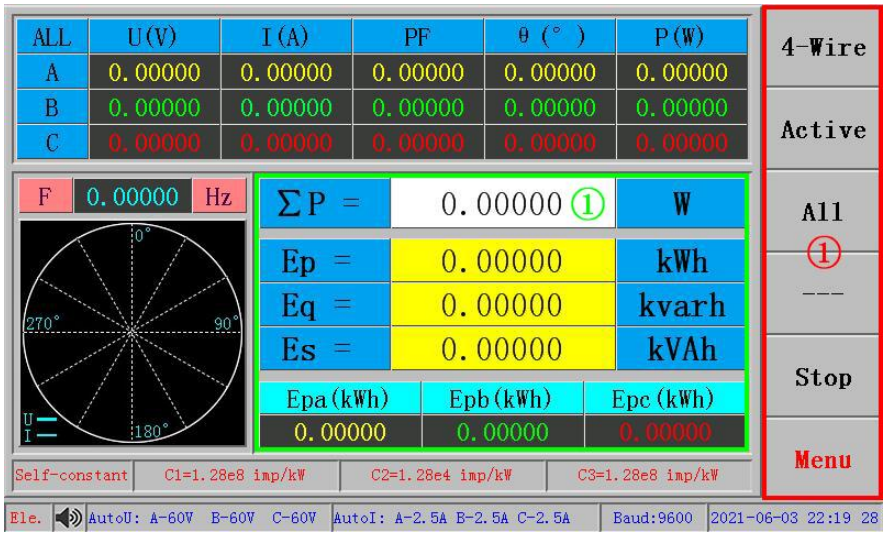

Figure 6.13. 1 Accumulation of electric energy

a) The red touch area ① in the figure is the navigation touch area, in which five touch keys have the following functions:
   ① Stop: Indicates the start or stop of electric energy accumulation, which can be switched to "start" and "stop";
   ② Four-wire, active, full-wave, menu: the same as (5. Electricity analysis);

b) The green area ① in the figure is the current electric energy accumulation area, and the functions of each phase are as follows:
   ① Ep: Total active energy;
   ② EQ: Total reactive power;
   ③ Es: Total apparent electrical energy;
   ④ Epa: active A-phase electric energy;
   ⑤ Epb: active B-phase electric energy;
   ⑥ Epc.: Active C phase electric energy;

c) Other display areas in the figure are the same as those described in (6. Electricity analysis);

14. Channel setting

Then press "channel setting" in the menu interface to enter the channel setting

interface, as shown in Figure 6.14. 1.

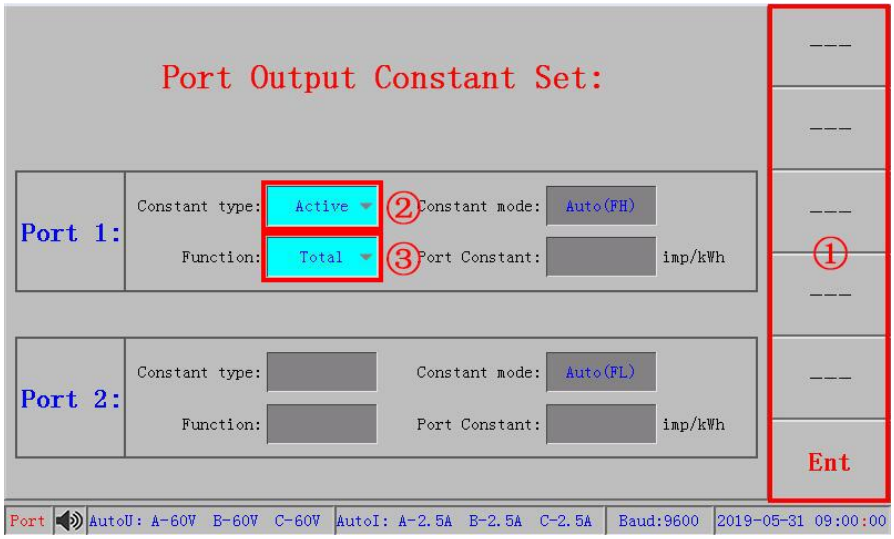

Figure 6.14. 1 Channel setup

a) The red touch area ① in the figure is the navigation touch area, and its function is the same as that described in (6. Electricity analysis);
b) The red touch area ② in the figure is a constant type selection, and the pulses of each output channel can be set as active, reactive, apparent, voltage, current and frequency;
c) In the figure, the red touch area ③ is the channel function selection, and the pulse of each output channel can be set to be combined, divided into A, divided into B and divided into C;
d) Constant mode: By default, channel 1 outputs high-frequency pulses and channel 2 outputs low-frequency pulses;
e) Channel constant: the constant value corresponding to the current gear of the instrument;

15. Instrument setting

Press "Instrument Settings" in the menu interface to enter the Instrument Settings interface, as shown in Figure 6.15. 1.

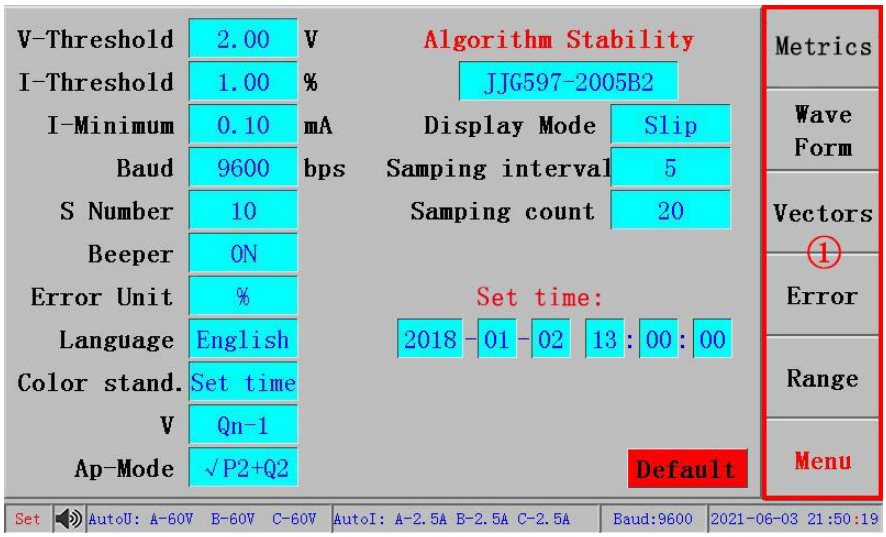

Figure 6.15. 1 Instrument setup

a) The red touch area ① in the figure is the navigation touch area, and its function is the same as that described in (6. Electricity analysis);

b) All light blue colors are the corresponding touch keys, and the functions are described as follows:

① Voltage threshold: minimum measured voltage value;

② Current Threshold: the minimum current value that can be measured in all current gears;

③ Bottom current: The standard meter can measure the bottom current value;

④ Baud rate: Baud rate of communication between standard table and external equipment;

⑤ Number of standard deviation: the number of times to calculate the standard deviation;

⑥ Buzzer sound: "on"/"off" corresponds to the key tone opening and closing respectively;

⑦ Error unit: When error is checked, it is calculated as% for display;

⑧ Language selection: It can be set to "Chinese" and "English" status;

⑨ Color standard: three-phase electric color, can be set to "yellow, green and red", "red, yellow and blue", "red, white and blue";

⑩ Reactive power measurement: Reactive power calculation method, reactive power 1, 2 and 3 correspond to "90 phase shift", "integration" and "Shelbert" respectively;

⑪ Apparent power: Apparent power calculation method;

⑫ Stability algorithm: Stability calculation method;

⑬ Time setting: Standard table time can be set;

16. Instrument calibration

Press "Instrument Calibration" in the menu interface to enter the instrument calibration password input interface. If the password is entered correctly, enter the

instrument calibration interface, and manually operate the corresponding gear coefficients of the calibration standard table, which is generally closed to the outside world.

17. System help

Press "System Help" in the menu interface to enter the system help interface, as shown in Figure 6.17. 1.

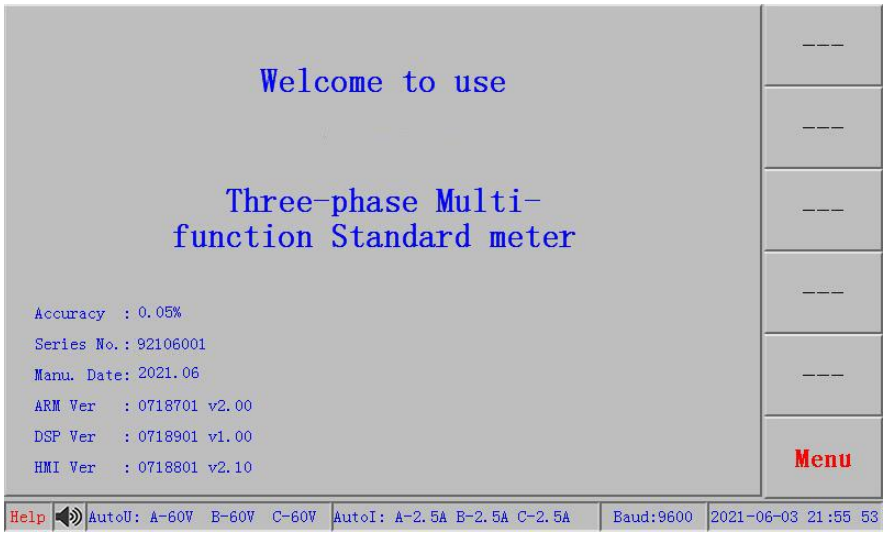

Figure 6.17. 1 System Help

➢ Chapter 7 High Frequency Pulse Constants Table

1. Output pulse frequency:

FH = CH · P/3600 (Hz)

FL = FH/10000 (Hz)

2. Output level: TTL level

3. The high frequency pulse constants of electric energy are as follows: CH (imp/kwh, imp/kvarh, imp/kVAh)

	100A	50A	25A	10A	5A	2.5 A
480V	4×10^5	8×10^5	1.6×10^6	4×10^6	8×10^6	1.6×10^7
240V	8×10^5	1.6×10^6	3.2×10^6	8×10^6	1.6×10^7	3.2×10^7
120V	1.6×10^6	3.2×10^6	6.4×10^6	1.6×10^7	3.2×10^7	6.4×10^7
60V	3.2×10^6	6.4×10^6	1.28×10^7	3.2×10^7	6.4×10^7	1.28×10^8

	1A	500mA	250mA	100mA	50mA	25mA
480V	4×10^7	8×10^7	1.6×10^8	4×10^8	8×10^8	1.6×10^9
240V	8×10^7	1.6×10^8	3.2×10^8	8×10^8	1.6×10^9	3.2×10^9

120V	1.6×10^8	3.2×10^8	6.4×10^8	1.6×10^9	3.2×10^9	6.4×10^9
60V	3.2×10^8	6.4×10^8	1.28×10^9	3.2×10^9	6.4×10^9	1.28×10^{10}

4. The high frequency pulse constants of voltage are as follows: C_H (imp/kVh)

480V	**240V**	**120V**	**60V**
1.8×10^8	3.6×10^8	7.2×10^8	1.44×10^9

5. The high frequency pulse constants of current are as follows: C_H (imp/kAh)

100A	**50A**	**25A**	**10A**	**5A**	**2.5 A**
8.64×10^8	1.728×10^9	3.456×10^9	8.64×10^9	1.728×10^{10}	3.456×10^{10}
1A	**500mA**	**250mA**	**100mA**	**50mA**	**25mA**
8.64×10^{10}	1.728×10^{11}	3.456×10^{11}	8.64×1011	1.728×10^{12}	3.456×10^{12}

6. The high frequency pulse constant of frequency: C_H (imp/kHzh)
   $C_H = 1.44 \times 10^9$ imp/kHzh

➢ Chapter 8 Communication Notes

1. Serial port parameters

RS232 communication interface is adopted.

When serial asynchronous communication interface is adopted, serial data is based on bytes, with 8 data bits, 1 stop bit and no parity bit.

When serial communication is adopted, the baud rate of communication can be selected: 2400, 9600, 19200 and 115200.

2. Communication format

Each communication instruction sent by the host computer to the instrument consists of three parts: instruction characters, parameters and end marks, in which the instruction characters and parameters are ASC codes and the end marks are 0D in hexadecimal.

The instrument has return information for each instruction, and the format of return information is also composed of three parts: return flag character, parameter and end flag, in which the return flag character and parameter are ASC code, and the end flag is hexadecimal 3B.

3. Voltage range setting

	Instruction character	**Parameter**	**End sign**
Send	UB	X	0D

Echo	UBACK	None	3B
Parameter X	0-480V 1-240V 2-120V 3-60V		

4. Current range setting

	Instruction character	Parameter	End sign
Send	IB	0X	0D
Echo	IBACK	None	3B
Parameter X	0-100A 1-50A 2-25A 3-10A 4-5A 5-2.5 A 6-1A 7-500mA 8-250mA 9-100mA A-50mA B-25mA		

5. Measurement mode setting

	Instruction character	Parameter	End sign
Send	MS	X	0D
Echo	MSACK	None	3B
Parameter X	0-three-phase four-wire active 1-three-phase four-wire sinusoidal reactive power 3-3-phase 3-wire active 4-3-phase 3-wire sinusoidal reactive 7-3-Phase 4-Wire Apparent 8-3-Phase 3-Wire Apparent		

6. Channel 1 Output Constant Setting (Fixed High Frequency Output)

	Instruction character	Parameter	End sign
Send	P1	A, B, C, D	0D
Echo	P1ACK	None	3B
Parameter a (Constant type)	0-Active Power 1-Reactive Power 2-Apparent Power 3-Voltage 4-Current 5-Frequency		
Parameter b (Channel functionality)	0-combined 1-A phase 2-B phase 3-C phase Note: When the constant type is voltage and current, only the phase separation function can be set; When the constant type is frequency, this function is not available and can be set at will;		
Parameter c (Constant Mode)	0-Automatic Constant 1-Manual Constant Note: Temporary setting is invalid		
Parameter d (Channel constant)	Science and technology law means: Xxxxxxxyy X-integer bit xxxxxxx-decimal part yy-exponent Note: Temporary setting is invalid		

7. Measurement data and instrument status query

	Instruction character	Parameter	End sign
Send	DT	0	0D
Echo	S	Measurement data and instrument status	3B

Note: Parameter description

There are 31 parameters, and each parameter consists of flag characters and data. The specific contents are as follows:

Mark character ASC code	Data ASC code	Unit	Data meaning	Parameter type
A	XXXXXXXXX	V	Phase A voltage	Measurement
B	XXXXXXXXX	V	Phase B voltage	Measurement
C	XXXXXXXXX	V	Phase C voltage	Measurement
D	XXXXXXXXX	A (mA)	Phase A current	Measurement
E	XXXXXXXXX	A (mA)	Phase B current	Measurement
F	XXXXXXXXX	A (mA)	Phase C current	Measurement
G	XXXXXXXXX	W (kW)	Phase A active	Measurement
H	XXXXXXXXX	W (kW)	Phase B active	Measurement
I	XXXXXXXXX	W (kW)	Phase C active	Measurement
J	XXXXXXXXX	W (kW)	Three-phase total	Measurement
K	XXXXXXXXX	var (kvar)	Phase A reactive	Measurement
L	XXXXXXXXX	var (kvar)	Phase B reactive	Measurement
M	XXXXXXXXX	var (kvar)	Phase C reactive	Measurement
N	XXXXXXXXX	var (kvar)	Three-phase total	Measurement
O	XXXXXXXXX	VA (kVA)	A-phase apparent	Measurement
P	XXXXXXXXX	VA (kVA)	B-phase apparent	Measurement
Q	XXXXXXXXX	VA (kVA)	C-phase apparent	Measurement
R	XXXXXXXXX	VA (kVA)	Three-phase total	Measurement
S	XXXXXXXXX		Phase A power	Measurement
T	XXXXXXXXX		Phase B power	Measurement
U	XXXXXXXXX		Phase C power	Measurement
V	XXXXXXXXX		Three-phase total	Measurement
W	XXXXXXXXX	° (degree)	Equivalent angle	Measurement
X	XXXXXXXXX	° (degree)	Equivalent angle	Measurement
Y	XXXXXXXXX	° (degree)	Equivalent angle	Measurement
Z	XXXXXXXXX	Hz	Frequency	Measurement
A	XXXXXXXXX	° (degree)	Equivalent angle	Measurement
B	XXXXXXXXX	° (degree)	Equivalent angle	Measurement
M	X		Voltage range	Instrument

N	X		Current range	Instrument
O	X		Measure-mode	Instrument

The beginning mark of each block of data is S, then A, B, etc., which indicates different measurement data. The parameter data length of measurement data is 10 characters, the first 4 bits are flag characters, and the last 6 bits are data.

The explanation is as follows: the first place is the unit; The second bit is a sign (0 is positive and 1 is negative); The third place is the decimal point position, 0 represents 0 decimal places, which is an integer, 1 represents 1 decimal places, and so on; The fourth place is reserved; A total of 6 bits from the 5th to the 10th represent the measured data, and each bit represents a BCD code.

Parameter type for the state of the meter parameter data length of 1 character, representing a BCD code, the specific content of the same as send command parameters.

➢ Chapter 9 Instrument Matching

1. 1 Three-phase Multifunctional Standard Watt-hour Meter
2. 1 Product certificate
3. 1 Instruction manual
4. 1 Packing list
5. 1 Power cord
6. 1 spare fuse tube (2A) for power supply (attached to fuse holder)