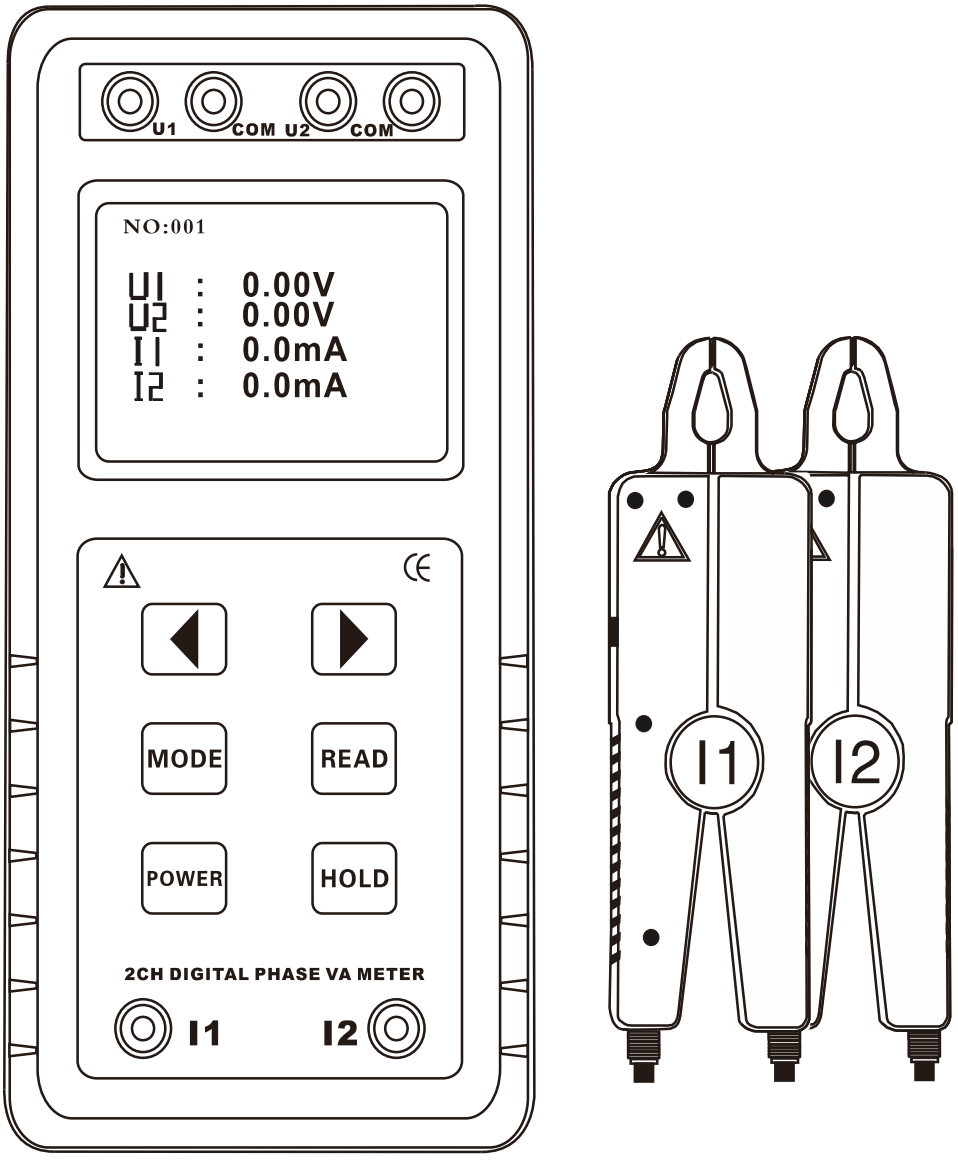
2CH Digital Phase VA Meter



ES2010E

USER MANUAL

Guangzhou Zhengneng Electronics Technology Co.,Ltd

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I. Safety Precautions And Procedures

Thank you for purchasing our digital double clamp phase voltammeter. Before you use the instrument for the first time, in order to avoid possible electric shock or personal injury, please be sure to: read and strictly observe the safety rules and precautions listed in this manual.

- This instrument is a live working equipment. For your safety, please comply with the relevant national safety regulations and strictly follow the electric safety work procedures.
- Pay attention to the text and symbols of the instrument panel and back plate.
- Before use, make sure that the instrument and accessories are in good condition and that they are not damaged, bare or broken.Do not use it when the instrument back cover and battery cover are not covered properly.When the instrument is in use and the enclosure or test wire is broken and the metal is exposed, please stop using it.
- Cannot be used to test voltages higher than 600V. Do not use under strong electromagnetic environment to avoid affecting the normal operation of the instrument. Do not test in flammable and hazardous areas.
- Make sure the connecting plug of the wire is tightly inserted into the connector. Please pay attention to the direction when testing the phase. The test line must be evacuated from the meter before being pulled out of the meter. Do not touch the input jack to avoid electric shock.
- Do not operate the instrument with wet hands or exposing it to rain. Do not use the instrument when it is wet.
- Do not place and store the instrument for long periods of time under high temperature and humidity, condensation, and direct sunlight.
- Keep the surface of the product clean and dry. Do not clean it with corrosives or crude materials. Use a soft cloth (such as eyeglass cloth), dip a lubricant that prevents rust and dehumidification, and gently wipe the current clamp.
- Do not hit or drop the instrument to avoid impact on the instrument and the current clamp, damage the instrument, especially the Joint surface of jaw.

- Pay attention to the measuring range and use environment specified by this instrument.
- It is forbidden to use, disassemble, calibrate and repair this instrument without permission. It must be operated by authorized personnel.
- The "  " in the manual is a safety warning sign, and the user must operate safely in accordance with the contents of this manual.
- The "  " and other dangerous signs in the manual must be followed by the user in strict accordance with the contents of this manual.

II. Introduction

Digital double clamp phase voltammeter is the latest product of our company's clamp-type meter series. It is a hand-held, dual-channel input all-digital, multi-function, high-precision measurement instrument.The instrument uses the latest microprocessor technology and digital signal processing technology to achieve power frequency measurement (such as voltage, current RMS, power frequency, phase relationship, etc.), Determine the transformer wiring group, inductive, capacitive circuit, test the secondary circuit and bus differential protection system, read out the phase relationship between the differential protection CT groups, check the power meter wiring is correct or not,the meter uses the clamp-type current transformer conversion method to input the measured current, so there is no need to disconnect the circuit under test. Provide a safe, accurate, and convenient new type of power meter for electricity inspection personnel.

Digital double clamp phase voltammeter is suitable for electric power, petrochemical, metallurgy, railway, industrial and mining enterprises, scientific research institutions, and measurement departments. Especially suitable for energy billing systems and relay protection systems.

III. Basic Function Introduction

1. Large screen high backlight display, clear display of the instrument's working status and test parameters, the operation is very convenient.
2. Measure two wire’s voltage, current, phase, and measure grid frequency.
3. Low-current 5mA measurement phase is very suitable for new users to check the connection status after no-load operation, the instrument has high measurement accuracy and wide measurement range.
4. Automatic identification of transformer windings, capacitive and inductive loads.

IV. Electrical Symbols

	Extremely dangerous! The operator must strictly abide by the safety rules, otherwise there will be danger of electric shock and cause personal injury or casualties.
	Danger! The operator must strictly abide by the safety rules, otherwise there will be danger of electric shock and cause personal injury or casualties.
	Caveat! The safety rules must be strictly observed, otherwise personal injury or equipment damage may result.
	AC
	DC
	Double insulation

V. Technical Specifications

1. Basic Working Condition

Influencing factors	Baseline conditions	Working conditions	Remark
Ambient temperature	23℃±1℃	-10℃～40℃	
Ambient humidity	40%～60%	＜80%	
Signal waveform	Sine wave	Sine wave	β=0.05
Signal frequency	50Hz±1Hz	45Hz～65Hz	

Instrument working voltage	9V±0.1V	9V±1V	
Voltage amplitude when measuring phase	220V±20V	30V～500V	
Current amplitude when measuring phase	2A±0.2A	10mA～20.00A	
External electric field, magnetic field	Should avoid		
Wire position to be measured	The wire under test is in the approximate geometric center of the jaw		

2. Range and Accuracy Error

classification	Range	Resolution	intrinsic error
Voltage	AC 0.00V～600V	0.01V	±(1.5%rdg+3dgt)
Current	AC 0.0mA～20.0A	0.1mA	±(1.5%rdg+3dgt)
Phase	0.0° ～360°	0.1°	±1°
Frequency	45Hz～65Hz	0.01Hz	±0.5Hz

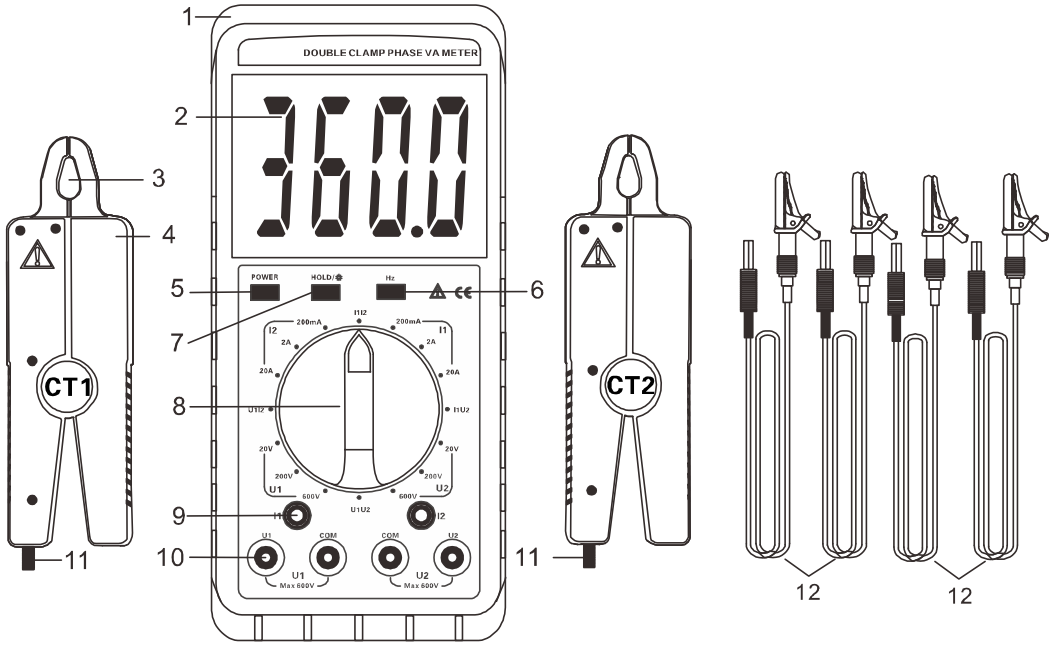
Remark：The phase error is ±3° under working conditions.

3.General Specification

Function	Measure two AC voltages, currents, phase between voltages, phase between currents, phases between voltages and currents, frequencies, determine transformer wiring groups, inductive, capacitive circuits, test secondary loops and busbar protection systems, read out the phase relationship between the CTs of the differential protection groups, check the wiring of the power meter, check the line equipment, etc.
Power	DC9V Alkaline dry battery
Power consumption	Turn on the backlight and consume up to 30mA. The battery can work continuously for more than 12 hours.
Display mode	LCD display，60×33mm
Instrument size	L/W/T：192*92.5*36mm
Voltage range	AC 0.00V～600V
Current range	AC 0.0mA～20.0A

Phase range	0.0° ～360.0°
Frequency range	45.00Hz～65.00Hz
Resolution	Voltage：AC 0.01V
	Current：AC 0.1mA
	Phase：0.1°
	Frequency：0.01Hz
Detection rate	About 2 seconds/time
Data hold	Press HOLD key to hold data during test, "H" symbol display
Automatic shut-down	About 15 minutes after power on, the meter will automatically shut down to reduce battery consumption
Backlight function	Suitable for dim places and night use
Voltage detection	When the battery voltage is lower than 7V, the low battery voltage will display
Instrument weight	Hose：362g(including battery)
	Tip-shaped current clamp：180g×2
	Test line：190g
Test line length	1.5m
Line length of the current clamp	2m
Working temperature and humidity	-10℃～40℃；below 80%Rh
Storage temperature and humidity	-10℃～60℃；below 70%Rh
input impedance	Test voltage input impedance is：1MΩ
Pressure resistance	The withstand voltage of 1000V/50Hz sine wave AC voltage between the instrument circuit and the housing lasts 1 minute
insulation	Between instrument line and housing≥100MΩ
structure	Double insulation
Suitable for safety regulations	IEC61010-1 CAT Ⅲ 600V, IEC61010-031, IEC61326, Pollution level 2

VI. Structure



1. Insulation anti-vibration sheath 2.LCD display 3.Clamp jaw

4.Current clamp 5.Boot-strap POWRR key 6.Hz key

7.Data hold HOLD key/backlight 8. Functional rotary switch

9. Current clamp input hole (2 wires) 10.Voltage input hole (2 wires)

11.Current clamp lead 12. Test wire(Red and black each 2）

VII. Operation

⚠	**Before use, carefully check all parts of the instrument for damage, and use them without any damage.**
	It is forbidden to use this instrument in hazardous areas
	Follow the manual instructions to install the battery.

1. Switch on/off

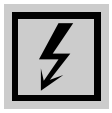
Press the POWER button to turn on, the LCD display. Press the POWER button to shut down, the meter will automatically shut down after about 15 minutes.

2. Data Hold/Delection

Press the HOLD button to keep the display data or cancel the hold。

3. Backlight Control

After power on, long press the HOLD button to control the backlight, suitable for dim places.

	Danger: Electricity! Must operated by the qualified personnel that trained and authorized . The operator must strictly abide by the safety rules, otherwise there is a danger of electric shock, resulting in personal injury or equipment damage.
	Danger! Cannot be used to measure voltage lines exceeding 600V, otherwise there is a danger of electric shock, resulting in personal injury or equipment damage.
	Danger! Cannot be used to measure the lines more than 20A. Otherwise, there is a danger of electric shock that may cause personal injury or equipment damage.

	Before testing, you must first switch the function rotary switch to the corresponding function indicating position, then connect the test line to the instrument, and then connect the test line to the tested circuit for testing.
	Must strictly follow the manual instructions to connect
	After the test is completed, the test line must be evacuated from the line before removed from the meter.

4. Phase Measurement

	The phase test relationship of this instrument: U1U2, I1I2, U1I2, I1U2, the phase of each relation measured is the phase of 1 signal advanced 2 signals.
	The U1 red voltage jack and the U2 red voltage jack and the start of the arrow symbol are the same .
	The direction of the current input clamp in phase testing is the same as the direction of the arrow sign on the clamp.
	For 3 phase line phase relationship, pairwise correspondence can be tested.

(1). Phase testing of U1U2

Rotate the rotary switch to U1U2 position, connect the red and black 4 test leads to the U1 and U2 of the instrument, voltage input jacks, and then connect the test leads to U1 and U2 lines.The test display value is the phase between the two voltage lines, that is U2 is the phase angle of U1. When testing the U1U2 phase, the

two circuit input circuits are completely isolated and insulated to avoid short circuit and burnout of the instrument.

(2). Phase testing of I1I2

Rotate the rotary switch to the I1I2 position. Connect the two current clamps to the I1 and I2 current input jacks on the front of the instrument. Then clamp the current clamp to the I1 and I2 lines. The test display value is the phase between the two currents.

(3). Phase testing of U1I2

Rotate the rotary switch to the U1I2 position. Connect the red and black test leads to the U1 voltage input jack of the meter. Connect one current clamp to the I2 current input jack on the front of the instrument, and then connect the test leads and current clamps to U1 , I2 line, test display value is the phase between voltage and current.

(4). Phase testing of I1U2

Rotate the rotary switch to the I1U2 position. Connect one current clamp to the I1 current input jack on the front of the instrument, and connect the red and black test wires to the U2 voltage input jack of the instrument. Then connect the current clamp and the test wire to the I1. , U2 lines, test display value is the phase between current and voltage.

5. AC Current、Leakage Current Measurement

Rotate the rotary switch to the 20A of I1. A current clamp is connected to the I1 current input jack on the front of the instrument. Then use a current clamp to clamp the circuit under test. The test display value is the current or leakage current in the circuit under test. If the current to be tested is relatively small, a smaller gear can be selected and tested to improve the accuracy of the test. It is also possible to rotate

the rotary switch to the appropriate limit of I2 and use I2 to test the current or leakage current. Note that the positions of the I1 and I2 of the rotary switch must correspond to the input jacks of the current clamps I1 and I2.

6. AC Voltage Measurement

Rotate the rotary switch to U1's 600V range. The red and black test leads are connected to the meter's U1 voltage input jack. Then connect the test line to the tested circuit, and the test display value is the voltage of the tested circuit. If the voltage to be tested is relatively small, a smaller gear can be selected and tested to improve the accuracy of the test. It is also possible to rotate the rotary switch to the appropriate limit of U2 and test the voltage with U2. Note that the positions of the U1 and U2 of the rotary switch must correspond to the input jacks of the voltages U1 and U2.

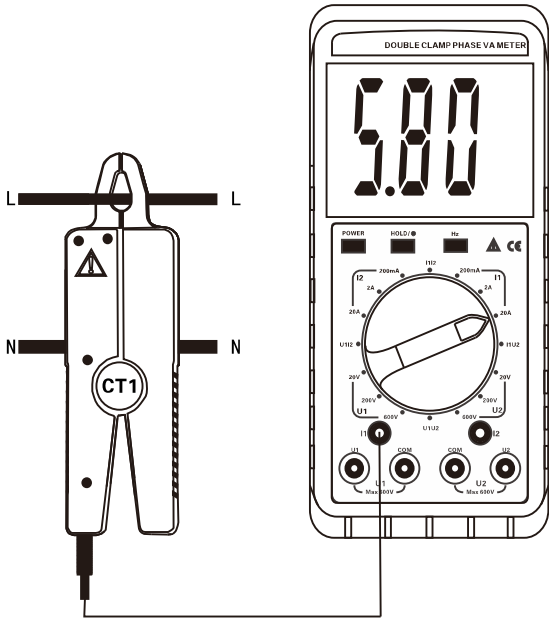
7. Perceptual and Capacitive Circuit Discrimination

Rotate the rotary switch to U112, input circuit voltage to U1 jack, circuit current input to I2 jack. If the phase is displayed in the range of 00 to 900, the measured load is inductive. If the phase is displayed in the range of 2700 to 3600, the measured load is capacitive.

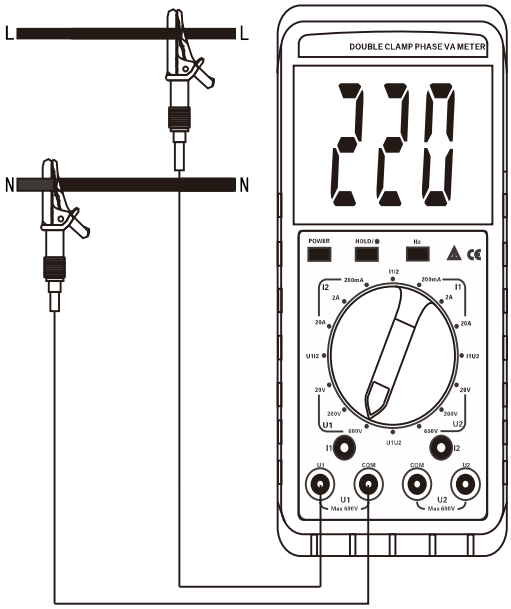
8.Frequency Measurement

Rotate the rotary switch to the current and voltage levels of U1 or U2 and press Hz to measure the current frequency.

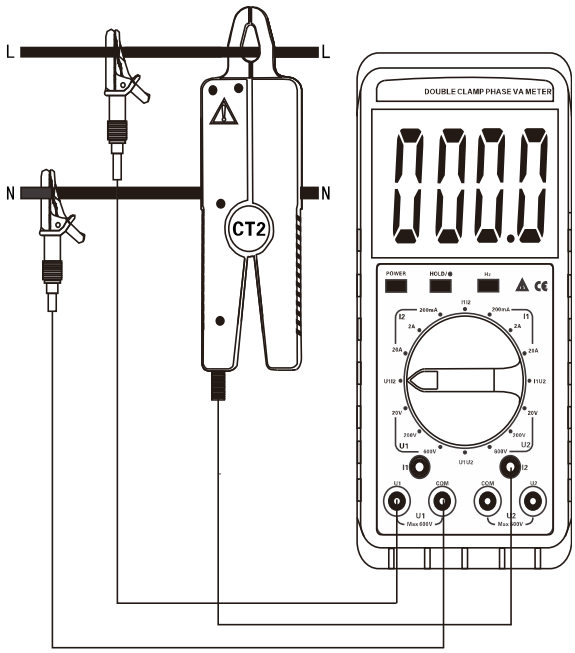
VIII. Various Test Wiring Reference：



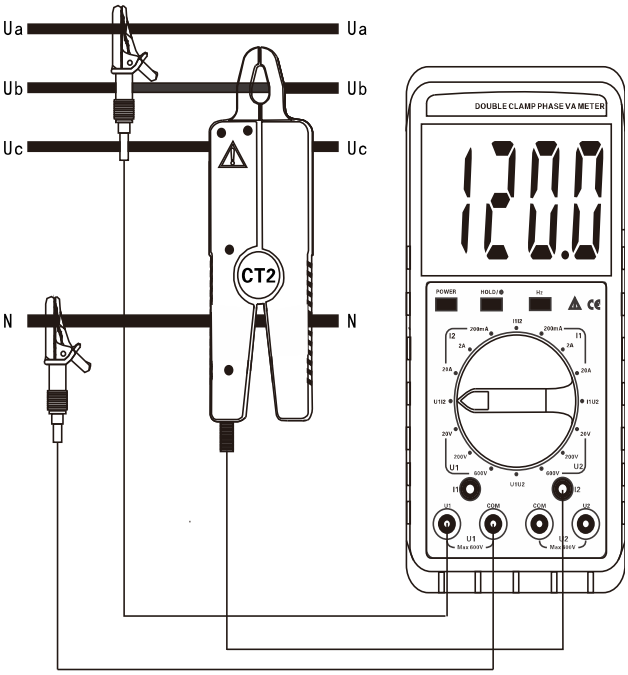
Test AC Current



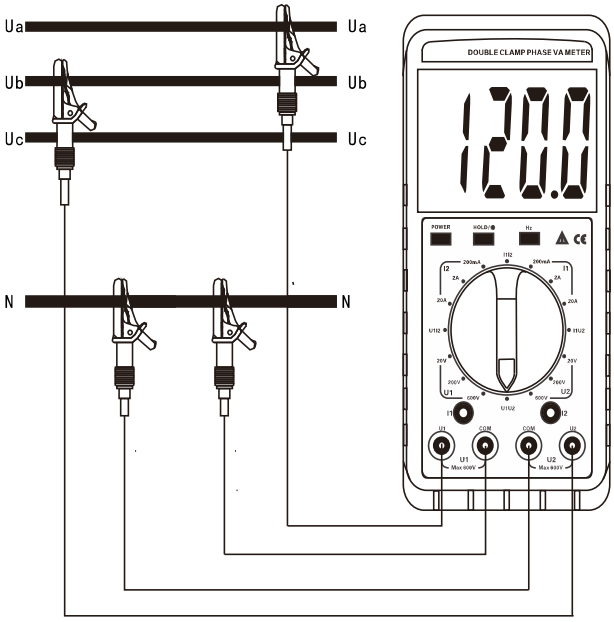
Test AC Voltage



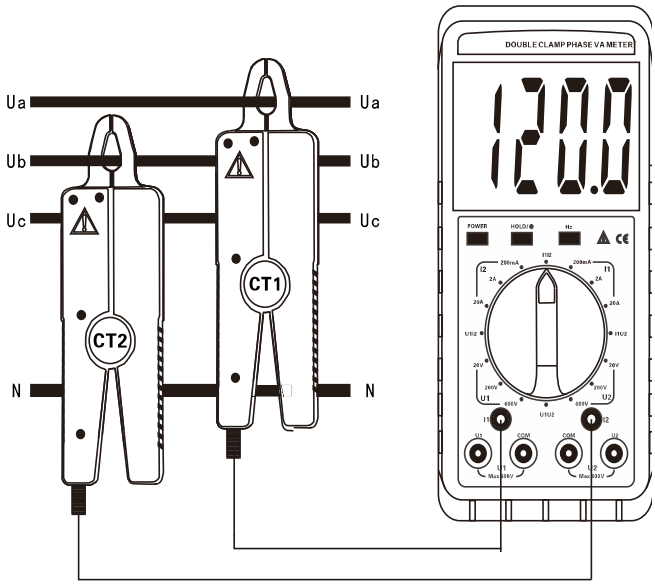
Test the phase of single phase U-I
Judging the inductive, capacitive circuit



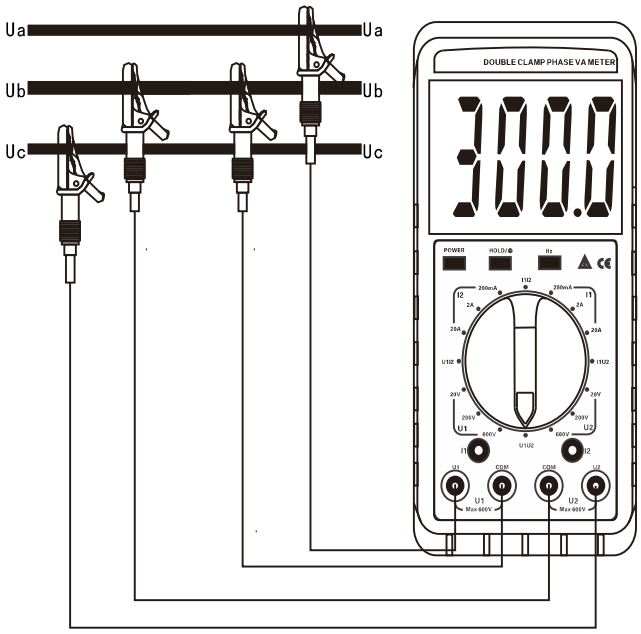
Test the phase of three-phase four-wire Ua-Ib



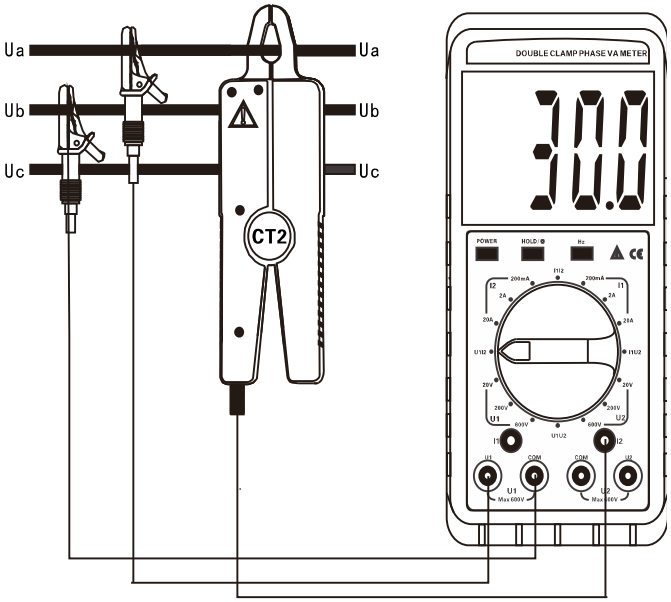
Test the phase of three-phase four-wire Ua-Ub



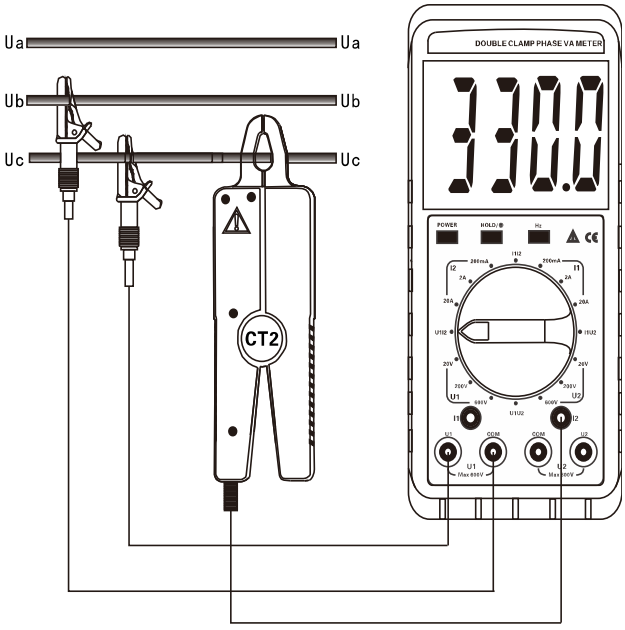
Test the phase of three-phase four-wire Ia-Ib



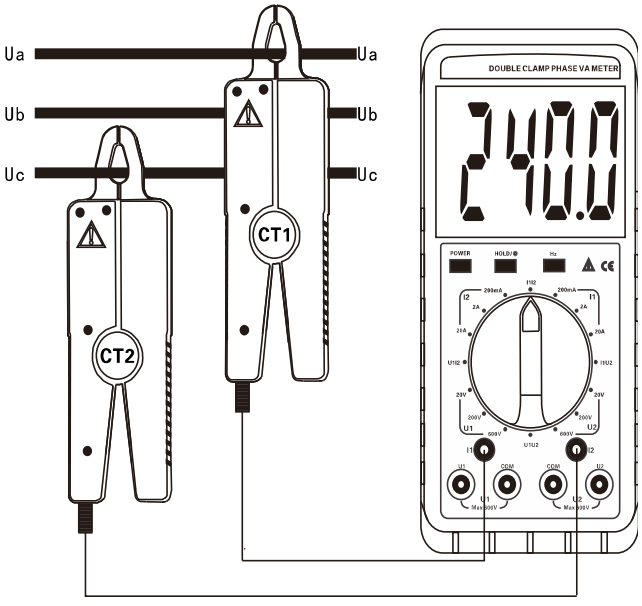
Test the phase of three-phase three-wire Uab-Ucb
Judging the phase sequence of three-phase three-wire system



Test the phase of three-phase three-wire Uab-Ia



Test the phase of three-phase three-wire Ucb-Ic



Test the phase of three-phase three-wire Ia-Ic

IX. Battery Replacement

⚠	Please pay attention to the polarity of the battery, it must be installed with the correct polarity, otherwise the instrument will be damaged.
	It is forbidden to replace the battery in hazardous locations
	Must use a qualified 9V alkaline dry battery

1. When the instrument power supply voltage is lower than 7V, the symbol "🔋" is displayed, indicating that the battery power is insufficient. Please replace the battery in time.

X. Other Explanations and Considerations

1. Current clamp specificity

The two current clamps of the meter are dedicated to this meter and cannot be used for another meter. Current clamp to prevent the impact, the jaw plane must be kept clean, completely closed test is reliable.

2. Current clamp maintenance

After the current clamp is used, the dust in the plane of the jaws should be promptly removed. The plane of the jaws should not be cleaned with rough objects or corrosion. It is best to use a soft cloth (such as: WD-40 lubrication) to gently wipe.

3.Before the measurement, it should be preheated for 3 to 5 minutes to ensure the measurement accuracy。

4. This instrument is used for the detection of secondary loops and low voltage loops. It cannot be used to measure the current in high voltage lines to prevent electric shock.

5. Three-phase four-wire (the phase when three-phase load is balanced)：

Phase relationship	**Phase value**	**Phase relationship**	**Phase value**
Ua-Ub	120°	Ia-Ib	120°
Ub-Uc	120°	Ib-Ic	120°
Uc-Ua	120°	Ic-Ia	120°

6. Three-phase three-wire (the phase when three-phase load is balanced)：

Phase relationship	**Phase value**	**Phase relationship**	**Phase value**
Uab-Ucb	300°	Ia-Ic	240°
Uab-Ia	30°	Ucb-Ic	330°

⚠	If the current clamp is reversed or the current line is reversed, the displayed phase value will be 180° out of phase, which is an increase of 180° from the above standard value.

XI．Accessories

Host	1PC
Instrument box	1PC
Current clamp	2PCS
Test line	4 (2 each for red and black)
Battery	9VAlkaline battery 1PC
Manual, certificate	1SET

The contents of this user manual cannot be used as a reason to use the product for special purposes.
The company is not responsible for other losses caused by use.
The company reserves the right to modify the contents of the user manual. If there is any change, it will not be notified.

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