

Dear Client

Thank you for Purchasing our **SMG2000B Double Clamps Digital Phase Meter**. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.



The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE

CAUTION RISK OF ELECTRICAL SHOCK!

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◆ **SERIOUS COMMITMENT**

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ **SAFETY REQUIREMENTS**

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric

shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

— **Security Terms**

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

Contents

I. Overview.....	6
II. Intrinsic Error.....	6
III. Operating Error.....	7
IV. Other Technical Specifications.....	8
V. Product Structure.....	9
VI. Notes.....	9
VII. Operation Instructions.....	10
VIII. Adjust the display.....	12
IX. Battery replacement.....	12

I. Overview

SMG2000B Double Clamp Digital Phase Meter is specially designed for measuring voltage, current and phase. It is characterized by high precision, low price, portable hand-held and dual-channel input measuring. It's easy to measure the phase between U-U, I-I and U-I, identify the inductive/capacitive circuit and the phase sequence of three-phase voltage, check the wiring group of transformer, test the secondary circuit and busbar differential protection system, display the phase relationship among the CT groups of a differential protection system, and check if the wire of electric meter is correctly connected. Under test, you do not need cut off the tested current which is inputted by clamp-current transformer. When measuring the phase between U1 and U2, the two input circuit loops are completely isolated, so it can completely avoid short circuit and burning down the meter caused by misconnection. The display of this device is high-contrast LCD screen, and the character in which could be as high as 25mm, and can be freely rotated approximately 70 ° to obtain the best visual effects.

The shell of the device is made of engineering insulating material, together with a rubber anti-vibration protection casing for safety and reliability.

II. Intrinsic Error

1. Operating Conditions

- 1) Temperature: (23 ± 5) °C
- 2) Relative humidity: $(45 \sim 75)$ %
- 3) Wave forms of measured signal: Sine wave, $\beta=0.02$
- 4) Frequency of measured signal: 50 ± 0.2 Hz
- 5) Position of Measured current carrying conductor in clamp jaw:

Optional position

- 6) Amplitude range of measured signal when measuring phase: 100 ~ 220V, 0.5A ~ 1.5A

7) External reference frequency electromagnetic interference: Should be avoided

2. Limits of Intrinsic Error

1) AC Voltage (see Table 1)

Table 1: Error of AC Voltage		
Measure range	Resolution	Limits of intrinsic error
20V	0.01V	$\pm (1.2\%RD+2)$
200V	0.1V	$\pm (1.0\%RD+2)$
500V	1V	$\pm (1.2\%RD+2)$

Input Impedance: All measure ranges input $2M\Omega$

2) AC current (see Table 2)

Table 2: Error of AC current		
Measure range	Resolution	Limits of intrinsic error
200mA	0.1mA	$\pm (1.0\%RD+2)$
2A	1mA	
10A	10mA	

3) Phase

U-U、U-I、I-I (see Table 3)

Table 3: Error of Power-frequency Phase		
Range	Resolution	Limits of intrinsic error
0~360°	1°	$\pm 3^\circ$

Loop impedance of input voltage when measuring phase U1-U2: $40K\Omega$

III. Operating Error

1. Rated Operating Conditions

- 1) Temperature: (0~40) °C
- 2) Relative humidity: (20~80) %
- 3) Wave forms of measured signal: Sine wave, $\beta=0.05$
- 4) Frequency of measured signal: (50±0.5) Hz

5) Position of Measured current carrying conductor in clamp jaw:
optional position.

6) Amplitude range of measured signal when measuring phase:

Phase U1-U2: 30V~500V

Phase I1-I2: 10mA~10.00A

Phase U1-I2 or I1-U2: 10V~500V、10mA~10.00A

7) External reference frequency electromagnetic interference: Should be avoided

2. Limits of Rated Operating Error

In item 1 Rated Operating Conditions, the limits of rated operating error should not more than twice limits of intrinsic error.

IV. Other Technical Specifications

1. Display: three and half bits

2. Sampling Rate: 3 times per second

3. Power Supply: single 9V laminated battery, supply current is less than 5mA

4. Dimensions

Meter shell: 192x95x55mm

Clamp shell: 140x42x20mm

Clamp jaw: $\Phi 7 \times 9$ mm

5. Weight

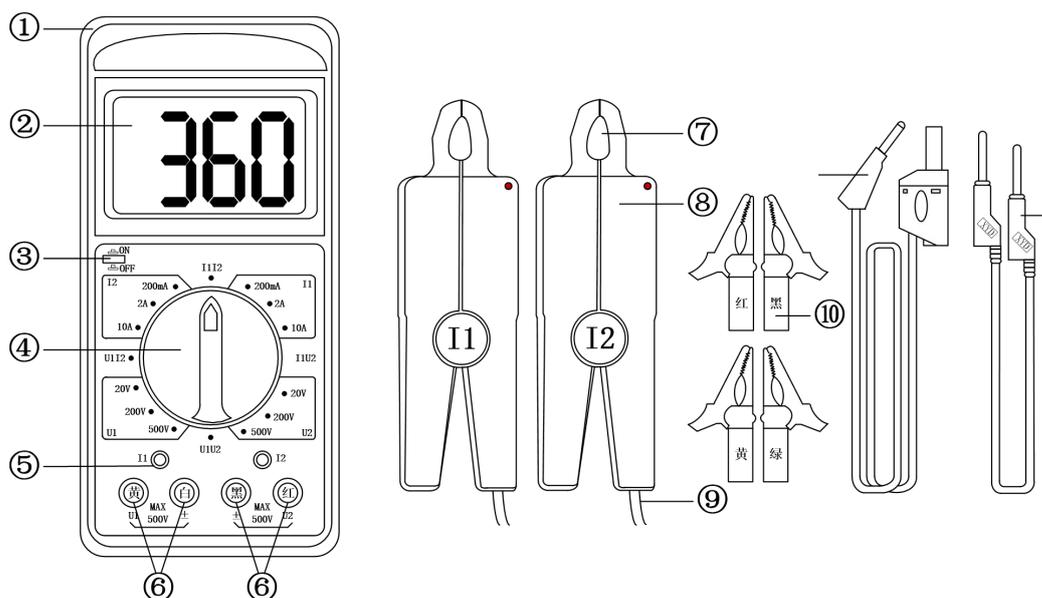
Meter body: 280g

Measuring clamp: 2x200g

6. Storage Conditions

Temperature: $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$

V. Product Structure



1.insulating protection casing	2.three and half bits LCD	3.ON/OFF button
4.measure range switch	5.current clamp jack (2 loops)	6.voltage input jack (2 loop)
7.current clamp jaw	8.current clamp jaw	9.down-lead of current clamp
10.crocodile clip (4 pieces)	11.test lead (4 pieces)	12.shorting stub (1 piece)

VI. Notes

1. Withstand Voltage

Parts between voltage input terminal and meter shell and parts between the iron core and handle of the clamp-current transformer and secondary windings can withstand 1000V/50Hz. Parts between the two voltage input terminals can stand Sinusoidal AC Voltage 500V/50Hz for 1min when testing.

2. Insulation Resistance

Insulation resistance between meter circuit and meter shell is more than or equals 10MΩ, insulation resistance between the two input terminals is also more than or equals 10MΩ.

VII. Operation Instructions

Press the ON/OFF button; turn the measure range switch to choose the correct testing parameters and range.

1. Measuring AC voltage

Turn the rotary switch to 500V in U1 region, and connect the measured voltage into jack U1, you can measure. If the measured value is less than 200V, you can directly turn the switch to 200V in U1 region to obtain better measurement accuracy.

The two channels U1, U2 are provided with the same voltage test function, so you can make the measurement through channel U2. Detailed methods please refer to the operation of U1.

2. Measuring AC current

Turn the rotary switch to 10A in I1 region, and connect the down-lead of the clamp-current transformer into jack I1, then clamp the measured circuit with clamp jaw, you can measure. If the measured current is less than 2A, you can directly turn the switch to 2A in I1 region to obtain better measurement accuracy.

The two jacks I1, I2 are provided with the same current test function, so you can make the measurement through jack U2. Detailed methods please refer to the operation of I1.

3. Measuring phase angle between two voltages

When measuring the phase angle that U2 lags U1, turn the rotary switch to parameter U1U2. Under measurement, you can turn the rotary switch clockwise to different measure ranges in U1 region to measure input voltage U1, or turn the rotary switch anticlockwise to different measure ranges in U2 region to measure input voltage U2.

Note: When measuring phase, the marks U1, U2 around voltage input jacks and the red "*" mark on clamp-current transformer are phases with the same name end.

4. Measuring phase angle between two current

When measuring the phase angle that I2 lags I1, turn the rotary switch to parameter I1I2. Under measurement, you can turn the rotary switch clockwise to different measure ranges in I1 region to measure input current I1, or turn the rotary switch anticlockwise to different measure ranges in I2 region to measure input current I2.

5. Measuring phase angle between current and voltage

Input the voltage into U1, input the current into I2 by using measuring clamp I2, and turn the rotary switch to parameter U1I2 to measure the angle that the current lags the voltage. Under measurement, you can turn the rotary switch clockwise to different measure ranges in I2 region to measure current or turn the rotary switch anticlockwise to different measure ranges in U1 region to measure voltage.

You can also input the voltage into U2, input the current into I1 by using measuring clamp I1, and turn the rotary switch to parameter I1U2 to measure the angle that the voltage lags the current. Under measurement, in the same way, you can turn the rotary switch to measure I1 or U2.

6. Judge phase sequence of the three-phase three-wire distribution system

Turn the rotary switch to U1U2. Connect phase A of three-phase three-wire system into jack U1, connect phase B to jack “±” that match with U1 and “±” that match with U2, and connect phase C to jack U2. If the measured phase value is approximately 300° , then the measured system is positive phase sequence; if the measured phase value is approximately 60° , then the measured system is negative phase sequence.

Another method: Connect phase A into jack U1, connect phase B to jack “±” that match with U1 and jack U2, and connect phase C to jack “±” that match with U2. If the measured phase value is 120° , then the measured system is positive phase sequence; if the measured phase value is 240° , then the measured system is negative phase sequence.

7. Judge phase sequence of the three-phase four-wire system

Turn the rotary switch to U1U2, connect phase A to jack U1, connect phase B to jack U2, connect Zero Line to the two input loop jacks “±”. If the measured phase value is approximately 120°, it is positive phase sequence. If the measured phase value is approximately 240°, it is negative phase sequence.

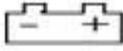
8. Judge inductive load and capacitive load

Turn the rotary switch to U1U2. Connect load voltage to input jack U1, and connect load current into jack I2 with measuring clamp. If the phase value ranges from 0 °~ 90 °, then the measured load is inductive ; If the phase value ranges from 270 °~ 360 °, then the measured load is capacitive.

VIII. Adjust the display

If you want to change the angle of the display screen, press the lock button on the top of the display screen, and adjust the screen to the most appropriate angle for observation.

IX. Battery replacement

When the symbol  appears on the LCD, it indicates the battery power is low. You should replace the battery.

Before replacing the battery, please disconnect the input signal and turn off power supply. Loosen the screw secured on the rear case and remove them, then you can replace the battery.

