EAGLOTEST

S230B

3PH MULTIFUNCTION PM





USER MANUAL

CATALOG

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SECTION 1

Safety Warnings

- Danger! Users of this equipment must be trained, certified/ licensed, and evaluated by accredited organizations
- Do not operate this equipment until you are sure that you are completely familiar with the safe operation of the equipment, all accessories, and safety equipment. Improper use can lead to severe injury. This manual defines the proper use of this equipment. Before using this equipment for any other use, please consult Eaglotest. Contact Eaglotest if you do not understand any procedure or operation concerning this equipment or this manual.
- Before using the instrument, make sure that the instrument, accessories, as well as the insulation layer of the test leads, are in good condition. Do not use the instrument if it is damaged, exposed, or broken in any way.
- Please be aware of the surrounding environments and the measurement range of the instrument.
- Please do not press 2 or more buttons on the instrument at the same time, as it is an invalid command.
- While conducting the tests, please do not connect the unused test leads to the instrument to avoid interference.
- **To ensure the accuracy of the measurements, please connect I1, I2, I3 clamp to its respective port.**
- DO NOT use the instrument on conductors that exceed 600V or 30A.
- Do not use the instrument if the battery cover is not properly secured.
- Ensure the test leads are securely plugged in.
- Do not replace the battery in environments with high humidity.
- Do not use the instrument in hazardous environments.
- The test leads must be removed from the conductor before removing from the instruments. Do not touch the output ports, as it may cause an electric shock.

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SECTION 1

- Do not use the instrument in environments with a strong electromagnetic field, this will interfere with the instrument.
- Please stop using the instrument immediately if the housing or test lead is exposed.
- The instrument must not be used if any part of it is damaged.

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- Do not place or store the instrument in places with high temperature, humidity, condensation, or under direct sunlight.
- The clamp jaws of the instrument must be periodically cleaned and inspected, do not use clean the clamp jaws with corrosive or abrasive material.
- Please handle the instrument with care.
- If the instrument is not in use for a long period, please remove or charge the battery periodically to ensure the battery's proper function.
- Please be aware of the polarity when replacing the battery. Please contact Eaglotest if the battery cannot be replaced.
- Disassembly and periodic maintenance of this instrument must be operated by authorized personnel.
- Stop using the instrument immediately in case of any danger caused by continued usage of it. Please safely seal the equipment and hand it to an authorized organization to dispose of it.

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SECTION 2

Introduction

The S230B is an intelligent 3-phase multifunction power meter designed for on-site testing. It consists of a main unit, three current clamps, and four test leads. The main unit features a 3.5-inch true-color LCD with a graphical menu interface and vector diagram display, giving clear readings at a glance. The integrated-handle design of the current clamps makes the instrument easy to operate and well suited to locations with densely packed cables.

Without opening the circuit under test, the instrument can simultaneously measure three-phase AC voltage, current, voltage-to-voltage phase angle, current-to-current phase angle, voltage-to-current phase angle, frequency, phase sequence, active power, reactive power, apparent power, power factor, and current vector sum. It can identify transformer wiring groups and inductive or capacitive circuits, test the secondary circuit and busbar differential protection system, read the phase relationship between the CTs of each differential protection group, verify the wiring of watt-hour meters, and assist with the inspection and maintenance of line equipment.

It provides electrical inspection personnel with a safe, accurate, and convenient instrument. The S230B is widely used in the power, petrochemical, metallurgy, railway, meteorology, industrial and mining, scientific research, and metrology sectors. It is especially suited to electricity-billing systems and relay protection systems.

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SECTION 3

Specification

S230B Baseline and operating conditions

	Baseline condition	Operating conditions	Remarks
Temperature	23℃±1℃	-10℃ ~ 40℃	/
Humidity	40% ~ 60%	＜80%	/
Signal waveform	Sine wave	Sine wave	B=0.01
Signal frequency	50Hz±1Hz	45Hz ~ 65Hz	/
Instrument working voltage	7.4V±0.5V	7.4V±1V	/
Current Range when Measuring Phase Frequency and Sequence	1A±0.1A	1mA ~ 30A	See general specifications
Voltage Range when Measuring Phase Frequency and Sequence	100v±10v	1v ~ 600v	/
Current Range when Measuring Power Factor	1A±0.1A	10mA ~ 30A	/
Voltage Range when Measuring Power Factor	100v±10V	10v ~ 600V	/
External Electric Field and Magnetic Field	Should be avoided		
Position of Conductor	The conductor should be positioned in the middle of the clamp.		

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General Specifications

Function	Simultaneously measures the current, voltage, phase angle, frequency, phase sequence, active power, reactive power, apparent power, power factor, and current vector sum in a three-phase 380V/220V power system. Identifies transformer wiring groups and inductive or capacitive circuits, tests the secondary circuit and busbar differential protection system, reads the phase relationship between the CTs of each differential protection group, verifies the wiring of watt-hour meters, and supports the inspection and maintenance of line equipment.
Power Supply	DC 7.4V, 3000mAh rechargeable lithium battery; USB charging port; approx. 10 hours of continuous operation when fully charged
Rated Current	Approx. 180mA Max
Display	3.5-inch true-color LCD
Instrument Dimensions	207mm × 101mm × 45mm (L × W × H)
Clamp Jaw Size	Φ7.5mm × 13mm
Sampling Rate	Approx. 3 times per second
Measurement Range	AC Voltage: 0.00V – 600V AC Current: 0.0mA – 30A Phase Angle: 0.0° – 360.0° Frequency: 45.00Hz – 65.00Hz Active Power: 0.0W – 12kW Reactive Power: 0.0VAR – 12kVAR Apparent Power: 0.0VA – 12kVA Power Factor: -1 to +1 Current Vector Sum: 0mA – 60A

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Resolution	Voltage: AC 0.01V Current: AC 0.1mA Phase Angle: 0.1° Frequency: 0.01Hz Active Power: 0.1W Reactive Power: 0.1VAR Apparent Power: 0.1VA Power Factor: 0.001 Current Vector Sum: 1mA

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Accuracy (at baseline conditions)	Voltage: ±(0.5% of range) Current: ±(0.5% of range) Phase Angle: ±1°. Phase error under operating conditions: ±3° for 10mA–30A, and ±5° below 10mA. When the current is below 5mA, do not perform voltage measurement, so that current-to-current phase measurement stays accurate. For a voltage-to-current phase test, the voltage must be at least 5V and the current at least 5mA to ensure measurement accuracy. Active Power: ±(1.0% of range) Reactive Power: ±(1.0% of range) Apparent Power: ±(1.0% of range) Frequency: ±(1.0% of range) Power Factor: ±0.03
Phase Sequence	Positive sequence: the U1, U2, U3 or I1, I2, I3 cursors flash in turn from left to right. Negative sequence: the U1, U2, U3 or I1, I2, I3 cursors flash in turn from right to left.
Detection Rate	Approx. 2 seconds per measurement
Data Hold	Press HOLD during a test to hold the reading; the “HD” symbol is displayed.
Data Storage	99 sets
Charging Port	USB charging port
Automatic Shutdown	The instrument shuts down automatically about 15 minutes after power-on, to reduce battery consumption.
Backlight	Yes; backlight brightness is adjustable.
Low Battery Detection	When the battery voltage is low, the low-battery symbol is displayed to prompt charging, and the instrument shuts down automatically within 10 seconds.
Instrument Weight	Main unit: approx. 447g (with battery) Current clamps: approx. 178g × 3 Test leads: approx. 162g × 2 Total weight: approx. 3.429kg
Test Lead Length	1.5m
Current Clamp Lead Length	2m
Operating Temperature and Humidity	-10°C to 40°C; below 80% RH

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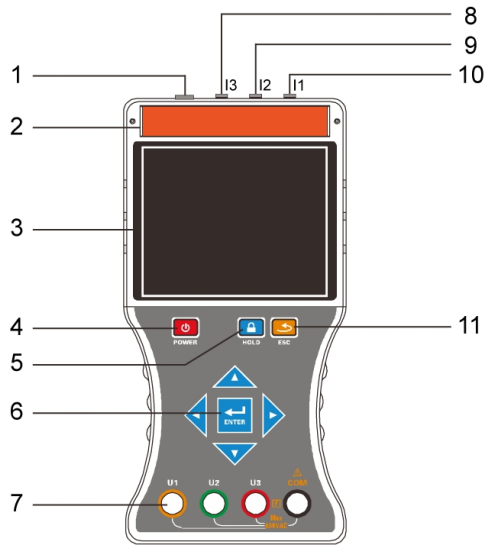
Storage Temperature and Humidity	-10°C to 60°C; below 70% RH
Input Impedance	Test voltage input impedance: 1MΩ
Withstand Voltage	The instrument circuitry withstands 1000V/50Hz sinusoidal AC voltage to the housing for 1 minute.
Insulation	≥100MΩ between the instrument circuitry and the protective housing.
Structure	Double insulation, with an insulating shock-proof jacket.

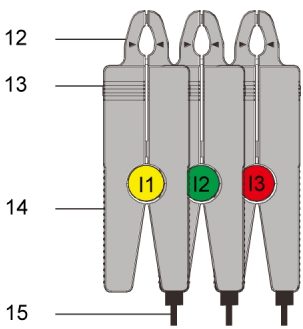
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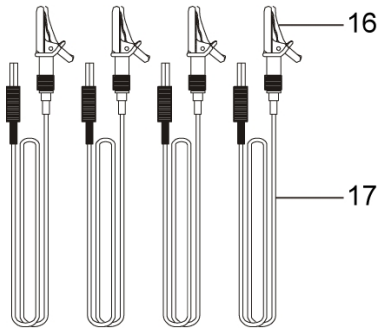
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SECTION 4

Structure







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SECTION 4

1. Charging Port
2. Product Model
3. LCD
4. Power Button
5. HOLD Button
6. Arrow & Enter Button
7. Voltage Input Jack
8. I3 Current Input Jack
9. I2 Current Input Jack
10. I1 Current Input Jack
11. ESC Button
12. Clamp Jaw
13. Current Clamp
14. Trigger
15. Current Clamp Lead
16. Voltage Test Clip
17. Voltage Test Lead

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Basic Operation

Press the POWER Button to turn on and off the instrument. The LCD will start flashing once the instrument has been turned on for 15 minutes; indicating that it will automatically power down soon, press the POWER button to keep the instrument on. Once the instrument is on, there will be 3 functions for you to select, Testing, View Data, and Delete Data. Press the Up and Down arrows to select the desired function, and press ESC to return to the previous page.

In Testing Mode, by default it is, displaying the result of the voltage, current, phase angle, and a vector diagram (shown in diagram A). Press the right arrow once to switch to voltage frequency, current, frequency, current vector diagram, and phase sequence of voltage and current (shown in diagram B). Press the right arrow again to switch active power, reactive power, apparent power, and power factor (shown in diagram C). Pressing the left button will also switch to different modes, but it will be in the reversed order.
By pressing the HOLD button, the data will be locked on-screen and data will be saved. A “HD” symbol will display on the screen to indicate the function is turned on. Up to 99 sets of data can be saved.

To adjust the backlight brightness of the LCD, simply press the up and down arrows.

On the view data page, a "RD" symbol will be displayed. Press the left and right arrow keys to select the increment or decrement step value of the data set (indicated by the "SP" symbol), and the step range is either 1 or 10. Press the up and down arrow keys to browse the rest of the data.

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SECTION 5

To delete data, enter the Delete Data page from the home screen, press the left and right arrows to select, and press the ENTER key to confirm. Select "Yes" to delete all stored data, select "No" to exit the current page. Note: Data cannot be restored after deleted, please operate with caution.

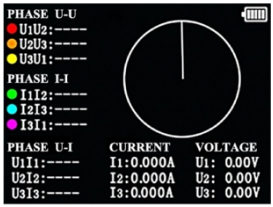


Diagram A

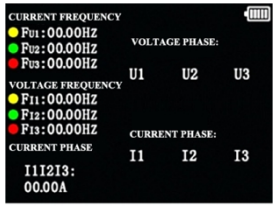


Diagram B



Diagram C

Caution	High voltage, extremely dangerous! It must be operated by trained and authorized personnel. The operator must strictly abide by the safety rules, otherwise, there is a danger of electric shock, causing personal injury or casualties.
	Danger! Do not use the instrument on cables that exceed 1000V or 500A. It can damage the instrument and may cause severe injury.
	Before testing, please connect the test leads to the instrument first before connecting it to the conductor
	U1、U2、U3 port corresponds with I1、I2、I3 on the clamps, respectively.
	I1, I2, and I3 must be strictly arranged based on the instruction manual, it should not be mixed up.
	When measuring the phases, the input direction of the current should follow the arrow direction on the clamp.
	The phase relationship on this instrument: U1U2, U2U3, U3U1, I1I2, I2I3, I3I1, U1I1, U2I2, U3I3 are all the phases of the previous signal surpassing the following signal.
	After the test is done, the test leads must be removed from the conductor before removing it from the instrument.

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SECTION 5

This instrument can test voltage, current, the phase between voltages, the phase between currents, the phase between voltage and current, frequency, active power, reactive power, apparent power, power factor, three-phase current vector sum, distinguish phase sequence, and Inductive and capacitive circuits of a three-phase AC system.

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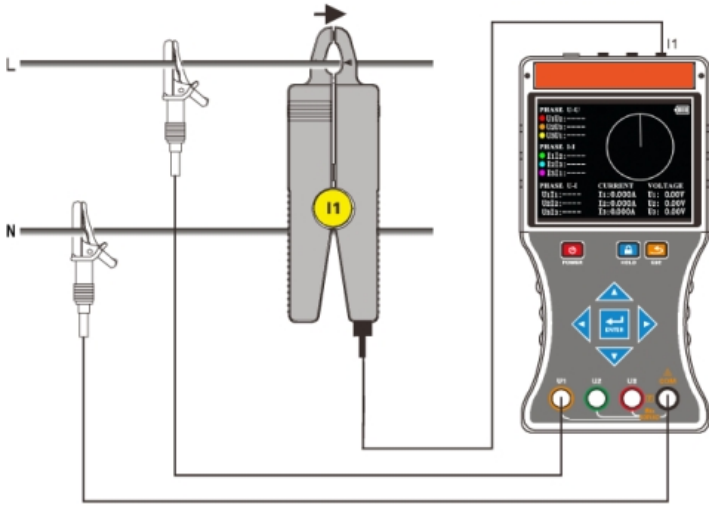
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Test Set-Up

Single-Phase Test:

Connect the voltage lines L and N to the respective U1 yellow and COM black port of the meter, then use the current clamp I1 to clamp the L line. You can also use the U2 green or U3 red port, but it must be paired with COM black and its corresponding current port. (i.e. U2 and COM black must be paired with I2, and U3 and COM black must be paired with I3).



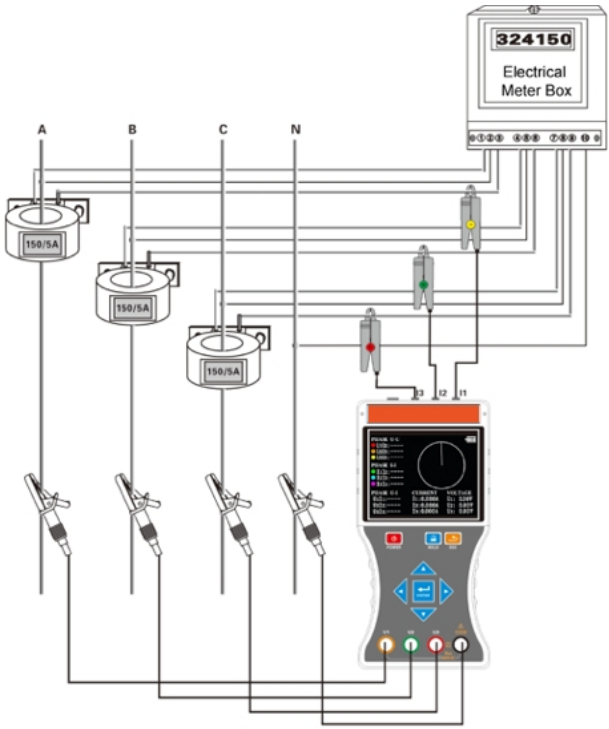
Single-Phase (Voltage, Current, Phase Sequence, Frequency, And Power Factor)

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Three-Phase Four-Wire Test:

Connect the tested voltage wires UA yellow, UB green, UC red, and N black to the U1 yellow, U2 green, U3 red, and COM black of the meter, respectively, and use the current clamps I1, I2, and I3 to Clamp the corresponding lines IA, IB, and IC.



Three-Phase Four-Wire (Voltage, Current, Phase Sequence, Frequency, And Power Factor)

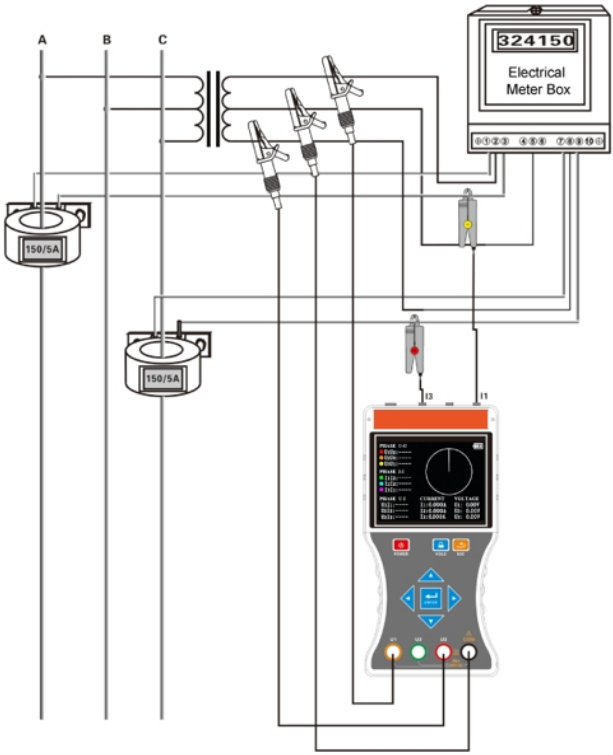
Three-Phase Three-Wire Test:

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SECTION 5

Connect the tested voltage wires UA yellow, UC red, and UB green to the U1 yellow, U3 red, and COM black ports of the meter, respectively. Then use current clamps I1 and I3 clamp the corresponding tested circuits IA and IC.



Three-Phase Three-Wire (Voltage, Current, Phase Sequence, Frequency, And Power Factor)

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Refer To The Setup Diagrams Above.

During the test, the inductive/capacitive load, phase sequence, and polarity can be determined based on the various phase relationships. If the phase of U1I1 is displayed in the range of 0° ~ 90°, the load under test is inductive, whereas if it is in the range of 270° ~ 360°, then the load under test is capacitive. If the displayed phases are close to 120°, it is a positive phase sequence, with the same polarity. However, if the displayed phases are close to 120° and 300°, it is a positive phase sequence, but with opposite polarity. It should be noted that if the current clamp is reversed or the wiring is reversed it can produce similar results. In the rest of the scenarios or results, it suggests that it is a negative phase sequence (assuming phase loss is out of consideration).

In the phase sequence test display mode, when U1, U2, U3, or I1, I2, I3 are in a positive phase sequence, the cursor flashes from left to right. Whereas when it detects a negative phase sequence, U1, U2, U3 or I1, I2, I3 The cursor flashes sequentially from right to left. If the cursors corresponding to U1, U2, U3, or I1, I2, I3 are not flashing, it may be lack of phase or signal strength is too low.

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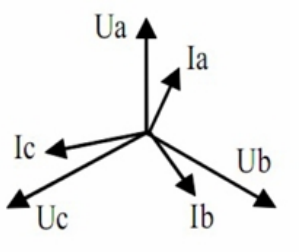
Three-Phase Four-Wire (When The Load Of The Three-Phase Balanced)

Phase Sequence	Phase Angle	Phase Sequence	Phase Angle
Ua-Ub	120°	Ia-Ib	120°
Ub-Uc	120°	Ib-Ic	120°
Uc-Ua	120°	Ic-Ia	120°
Ua-Uc	240°	Ia-Ic	240°

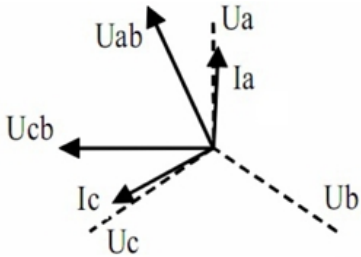
Three-Phase Three-Wire (When The Load Of The Three-Phase Balanced)

Phase Sequence	Phase Angle	Phase Sequence	Phase Angle
Uab-Ucb	300°	Ia-Ic	240°
Uab-Ia	30°	Ucb-Ic	330°

Three-Phase Four-Wire Vector Diagram And Three-Phase Three-Wire Vector Diagram



3-Phase 4-Wire Vector Graph



3-Phase 3-Wire Vector Graph

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Battery Warnings

- Do not disassemble or modify the battery. The battery contains safety and protection devices that, if damaged, may cause the battery to generate heat, rupture, or ignite.
- Do not place the battery near any heat. Store the Battery in a dry place at normal room temperature.
- Do not pierce or damage the battery in any way.
- Do not subject the battery to strong impacts/shocks.
- Do not expose the battery to water, salt water, or allow the battery to get wet.
- In the event of a battery cell leakage, do not allow the liquid to come into direct contact with the skin or eyes. If contact has been made, wash the affected area with water and immediately seek medical advice.
- Keep cells and batteries out of reach of children
- Seek medical advice if a cell or battery has been swallowed.
- Do not leave a battery on prolonged charge when not in use.
- Retain the original product literature for future references.

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Instrument	1
Toolbox	1
Test Clamps	3
Test Leads	4
USB Charger	1
Lithium Battery	1
Manual, Warranty, Certificate of Conformity	1

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