

sanwa

AU-32

MULTITESTER

INSTRUCTION MANUAL

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AUTO RANGE MULTITESTER MODEL AU-32


1. INTRODUCTION


To correctly and safely use this instrument, thoroughly read these particularly important parts of this manual, "SAFETY PRECAUTIONS", "MEASURING PROCEDURES", and "MAINTENANCE SERVICE."

Carefully keep this instruction manual for future reference and use the product for long.


2. SAFETY PRECAUTIONS


The symbols used on this unit and in the instruction manual have the following meanings:


 Be careful of the application of high voltage.

 Be careful that an accident resulting in injury or death or damage to the equipment may occur.

(1) To prevent accidents from electric shocks:

 • Never use this unit with a high power or high voltage circuit.

 • Never use the unit with a wet hand or in places with high humidity because of possible accidents due to electric shocks.

 (2) Never do the following things to prevent damage to not only this unit but also the equipment under test.

• Mounting an unrated fuse.

• Using any test lead other than those supplied.

• Changing the function switch position with the test leads connected to the equipment under test.

3. PRODUCT OUTLINE

3-1 Uses and Features

(1) Uses

Used for testing general electric circuits such as small communication equipment, household electric appliances, lamp cord voltage, and various batteries.

(2) Features

1) Auto range

For measuring voltage and resistance, the real fully automatic range system makes range selection unnecessary and automatically sets the optimum range.

2) DC-AC auto switching

For measuring voltage and current, it automatically discriminates between DC and AC and you do not have to select a range.

3) Auto polarity

It permits measurement of DC voltage and current by automatically identifying the polarities of positive and negative.

4) High input resistance

For measuring voltage, the high input resistance of as high as 10M ohms for both DC and AC eliminates measurement loss.

5) Free of zero ohm adjustment

Unlike conventional multimeters, no zero ohm adjustment is necessary when measuring resistance.

3-2 Appearance and Names of Components

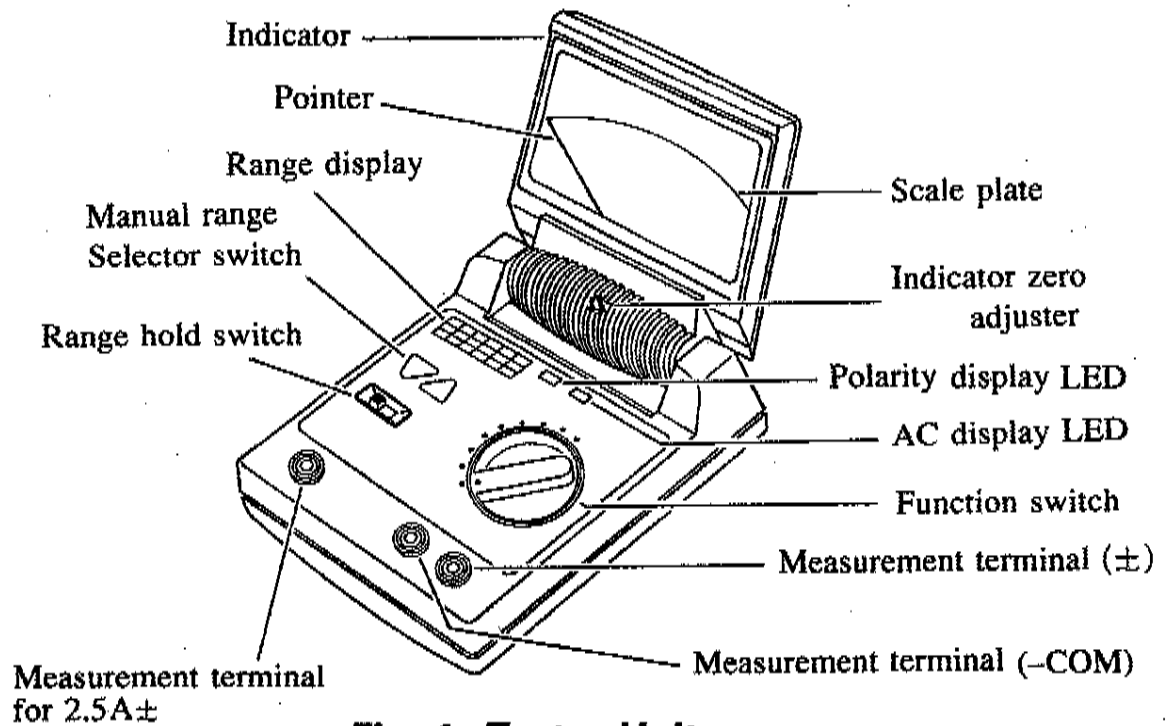


Fig. 1 Tester Unit

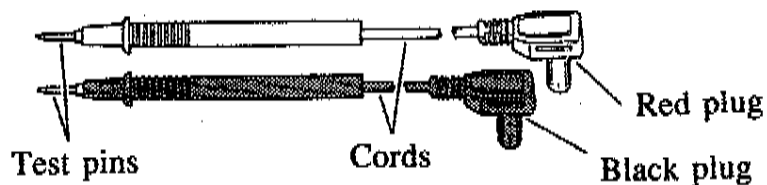


Fig. 2 Test Leads

4. MEASURING PROCEDURES

4-1 How to Read the Scale

Unlike most multimeters, this unit adopting the auto range system does not indicate the present range value by a function switch position. It indicates such a value on the range display instead. To read the range, see the column with the range display LED on at the top on the same row (V, Ω , OTHERS) as set by the function switch. Then read a value indicated by the pointer in the following manner.

Table 1

Range	LED Indication	Scale to Be Read	Multiplication Factor	Value to Be Read
V	V 2.5	V scale 0~2.5	x1	0~2.5V
	10	0~10	x1	0~10V
	50	0~50	x1	0~50V
	250	0~2.5	x100	0~250V
	500	0~50	x10	0~500V
Ω	Ω x10k	Ω scale 0~ ∞	x10k	Center 2M Ω
	x1k	0~ ∞	x1k	Center 200k Ω
	x0.1k	0~ ∞	x100	Center 20k Ω
	x10	0~ ∞	x10	Center 2k Ω
	x1	0~ ∞	x1	Center 200 Ω
250mV	OTHERS •	V scale 0~2.5	x100	0~250mV
250 μ A	OTHERS •	A scale 0~2.5	x100	0~250 μ A
2.5mA	OTHERS •	A scale 0~2.5	x1	0~2.5mA
25mA	OTHERS •	A scale 0~2.5	x10	0~25mA
250mA/ 2.5A	OTHERS •	A scale 0~2.5	x100	0~250mA
	OTHERS •		x1	0~2.5A

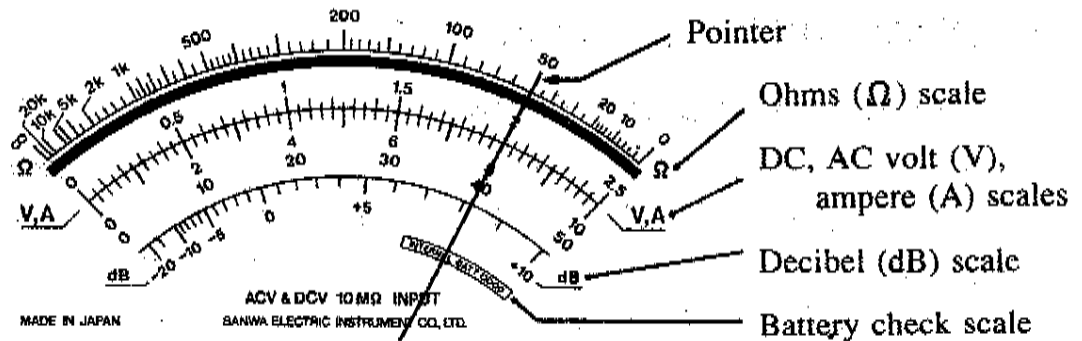


Fig. 3 Scale Plate

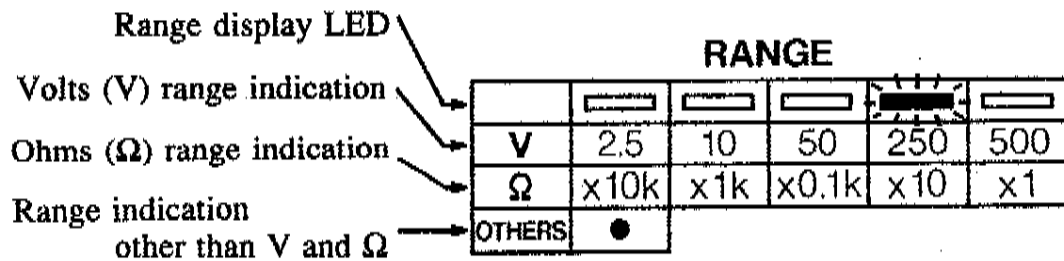


Fig. 4 Range Display and Measuring Example

(Example of measurement)

- (1) Function switch: Set at "V".
- (2) Indication of range display: Lamp lit above 250
(see Fig. 4).
- (3) Pointer of indicator: Indicates as shown in Fig. 3.
 - Reading 1 ... Read as 200V DC since the value to be read is 0 to 250V as shown in Table 1.
 - Reading 2 (when the polarity LED lamp is lit)
... Read as -200V DC.
 - Reading 3 (when the AC indicator LED lamp is lit)
... Read as 200V AC.

4-2 Fixing the Range

You can fix the range using the range hold switch. It is used when measuring in volts and ohms.

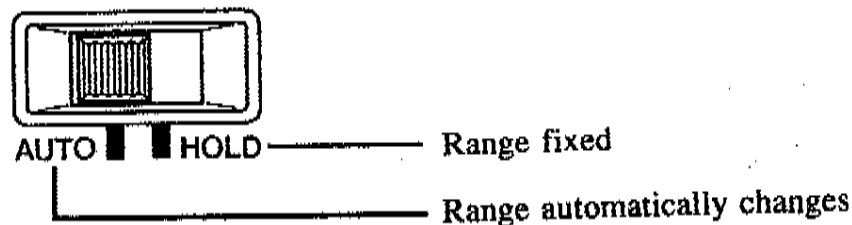


Fig. 5 Range Hold Switch

4-3 Manual Range Selection

You can change the range by pressing the manual range selector switches. It is used for measuring in volts and ohms.

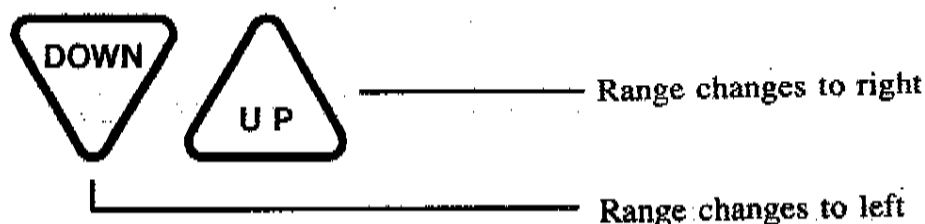


Fig. 6 Manual Range Selector Switch

These switches operate regardless of the setting of the range hold switch and should be used for reading in a different range. However, they operate only when the function switch is set at "V" or " Ω ".

4-4 Preparations Before Measuring

! Before measuring, be sure to check the position of the function switch, measurement terminals to be used, and test lead mounted condition to the tester, to ensure safe use.

After measuring, be sure to return the function switch to "POWER OFF" to prevent the waste of the internal batteries. On this unit, the power switch is designed to be automatically turned off in case the indicator section is closed by folding without doing the above operation.

(1) Meter Zero Check

If the pointer is off the 0V line at the left end of the scale, turn the indicator zero adjuster with a screwdriver to align the pointer with the 0V line.

(2) Checking the Internal Batteries

This unit operates with four R03 batteries. Before measurement, check the battery capacity. When the function switch is turned to the internal battery check range ("INTERNAL BATT CHECK"), the pointer should move to the right. Check if it is in the bottom zone (INTERNAL BATT GOOD) on the scale. If the pointer is to the left of the zone, it means the battery is used up. Replace the batteries in the procedures described in para. 5-2.

4-5 Measuring the Voltage (Auto Range)

• Measuring 0 to $\pm 500\text{V}$ DC and 0 to 500V AC

Measure a DC voltage or sign wave AC voltage of less than 500V.

⚠ To ensure safe measurement, never apply a voltage beyond $\pm 500\text{V}$ DC and 500V AC.

⚠ Do not apply an excessive voltage with the range fixed (more than 100 times the maximum value for the range).

After completing the preparations in para. 4-4, do the following:

(1) Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminals (\pm).

(For AC voltage, the distinction between the red and black plugs does not matter.)

(2) Set the function switch at "V".

(3) Set the range hold switch to "AUTO".

(4) Measure the voltage by touching the equipment to be tested with the test pins.

(5) Read the indication by referring to the range display. This value will be the voltage value to be measured.

(AC voltage is applied to the measurement terminals when the AC display LED lamp is on, and DC voltage when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (\pm).)

- (6) After measurement, remove the test pins from the equipment under test.
- (7) Return the function switch to "POWER OFF".

4-6 Measuring the Resistance (Auto Range)

Measuring a DC resistance of less than 200M ohms.

⚠ Never apply external voltage, or the unit may be damaged.

Example: • If the circuitry is in operation, turn off the power and then measure.
• Check that no voltage is applied to the equipment under test.

After completing the preparations in para. 4-4, do the following:

- (1) Connect the test lead plugs to the measurement terminals (-COM) and (\pm).
- (2) Set the function switch at "Ω".
- (3) Set the range hold switch to "AUTO".
- (4) Measure the resistance by touching the equipment to be tested with the test pins.
- (5) Read the indication by referring to the range display. This value will be the resistive value to be measured.
- (6) After measurement, remove the test pins from the equipment under test.
- (7) Return the function switch to "POWER OFF".

- **Zero Ohm Adjuster** (See Fig. 8 in para. 5-1)

This unit requires no zero ohm adjustment in general measurement because the constant-voltage method is used for resistance measurement.

However, for measurement by canceling the resistance of the test leads in the $\times 1\Omega$ range, turn clockwise or counter-clockwise the zero ohm adjuster in the battery case with the test pins shorted, to align the pointer with the 0Ω line at the right end of the ohms scale. Also align the pointer with the 0Ω line in the same manner as above if the zero ohm point has fluctuated after many years of use.

- **Applied Voltage and Current When Measuring Resistance**

Resistance is measured by using the internal power supply of this unit. For the polarities at this time, a positive output of about 1.2 volts appears at the measurement terminal (-COM), and a negative output of about 1.2 volts at the measurement terminal (\pm).

The currents at this time are listed in the following table. Use this table when measuring polarized resistance such as of transistors, diodes and a resistive value that changes depending on the flowing current.

Table 2

Range	$\times 10k$	$\times 1k$	$\times 0.1k$	$\times 10$	$\times 1$
Voltage (terminals open)	1.2V constant				
Current (terminals shorted)	$0.6\mu A$	$6\mu A$	$60\mu A$	$600\mu A$	$6mA$

4-7 Measuring 250mV (Fixed Range)

- **Measuring 0 to $\pm 250\text{mV}$ DC and 0 to 250mV AC**
Measure a DC voltage or sign wave AC voltage of less than 250mV.

⚠ To ensure safe measurement, never apply an excessive voltage (more than 100V AC, DC).

After completing the preparations in para. 4-4, do the following:

- (1) Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminal (\pm).
(For AC voltage, the distinction between the red and black plugs does not matter.)
- (2) Set the function switch at "**250mV**".
- (3) Measure the voltage by touching the equipment to be tested with the test pins.
- (4) Read the indication by referring to the range display. This value will be the voltage value to be measured.
(AC voltage is applied to the measurement terminals when the AC display LED lamp is on, and DC voltage when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (\pm .)
- (5) After measurement, remove the test pins from the equipment under test.
- (6) Return the function switch to "**POWER OFF**".

4-8 Measuring the Current (Fixed Range)

- **Measuring 0 to $\pm 2.5A$ DC and 0 to 2.5A AC**

Measure a DC current or sign wave AC current of less than 2.5A.

Table 3

Current Range of function switch	Measuring Range	
	DCA	ACA
250 μ A	0~ $\pm 250\mu$ A	0~250 μ A
2.5mA	0~ ± 2.5 mA	0~2.5mA
25mA	0~ ± 25 mA	0~25mA
250mA/2.5A	0~ ± 250 mA	0~250mA
	0~ ± 2.5 A	0~2.5A

⚠ To prevent damage or accident, do not measure the current in a circuit to which a voltage of more than 450 volts is applied.

After completing the preparations in para. 4-4, do the following:

- (1) Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminal (\pm) (connect the red plug to the measurement terminal for 2.5A \pm when measuring 0 to $\pm 2.5A$ DC and 0 to 2.5A AC). (For AC current, the distinction between the red and black plugs does not matter.)
- (2) Set the function switch at the current range suitable for the measuring range in Table 3.
(Example: When measuring 0 to 25mA, set the function switch at "25mA".)
- (3) Measure the current by touching the equipment to be tested with the test pins.

- (4) Read the indication by referring to the range display. This value will be the current value to be measured. (AC current is applied to the measurement terminals when the AC display LED lamp is on, and DC current when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (\pm).)
- (5) After measurement, remove the test pins from the equipment under test.
- (6) Return the function switch to "POWER OFF".

Current Measuring Circuit (Both DC and AC)

! When measuring current, connect this unit in series with the equipment under test as shown below.

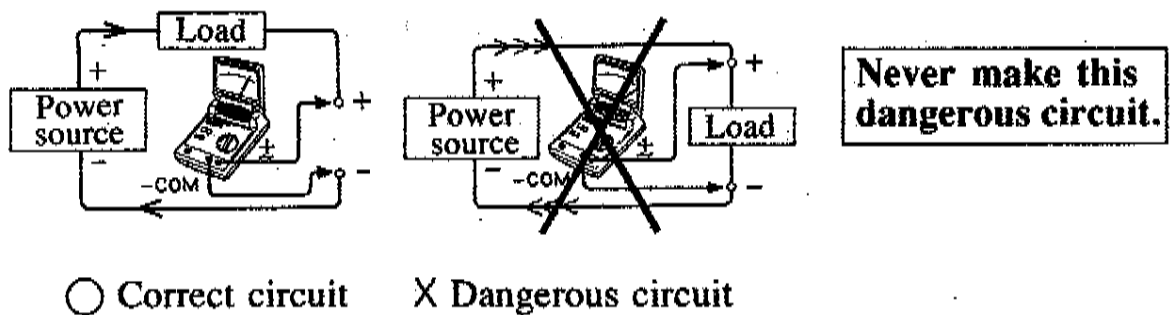


Fig. 7

Protection Circuit

! This unit has a fuse at the input to protect against misoperation when measuring resistance and current. However, be careful not to perform misoperation to ensure safety.

NOTE: A fuse is provided for the measurement terminal for $2.5A_{\pm}$ for safety purpose. Should the fuse blow, send it to us as a repair part.

4-9 Measuring the Low Frequency Output (dB)

The dB scale of this unit is provided for the 2.5V AC range. Only when the impedance is 600 ohms, the output value can be directly read assuming $0 \text{ dB} = 1 \text{ mW}$.

($0 \text{ dB} = 1 \text{ mW} = 0.775 \text{ V}$, 600 ohms)

- (1) The measuring procedures are the same as for AC voltage.
- (2) Read the indication by adding the dB value on the scale to the following dB value according to the ACV range.

Table 4

AC voltage range	250mV	2.5V	10V	50V	250V	500V
dB value to add	-20	0	+12	+26	+40	+46

5. MAINTENANCE SERVICE

5-1 Internal Fuse Replacement (See Fig. 8)

⚠ Before removing the battery case cover, disconnect the test leads from all the circuits to prevent accidents due to electric shocks.

- (1) Remove the battery case cover.
- (2) Replace the fuse (5 dia. by 20mm mini fuse rated at 250V AC, 0.3A).
- (3) Mount the battery case cover.

5-2 Internal Battery Replacement (See Fig. 8)

If the pointer moves below the scale zone of "INTERNAL BATT GOOD" with the function switch at "INTERNAL BATT CHECK", replace the batteries.

⚠ Before removing the battery case cover, disconnect the test leads from all the circuits to prevent accidents due to electric shocks.

- (1) Remove the battery case cover on the reverse side of this unit.
- (2) Replace the four R03 batteries (UM-4SG). (Note the polarities of the batteries.)
- (3) Mount the battery case cover.

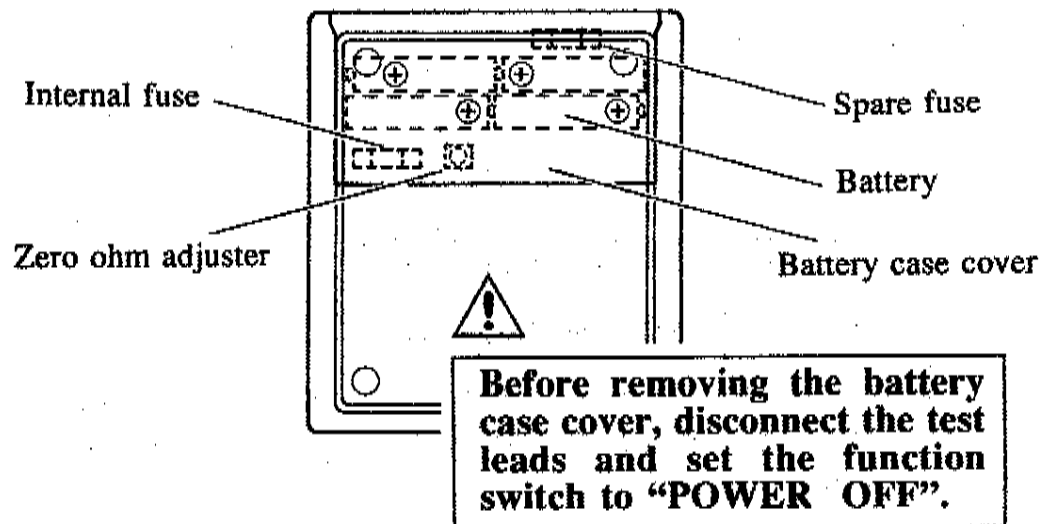


Fig. 8 Specified Locations of Batteries and Fuses

5-3 General Precautions

- ⚠ (1) Avoid leaving this unit in a place subject to excessive shock, vibration, high temperature (over 60°C), high humidity (over 85%) or dew condensation for a long period of time.
- ⚠ (2) To clean this unit, just lightly wipe with a brush or cloth. Do not use thinner or alcohol.
- ⚠ (3) Do not rub the meter cover hard with a dry cloth, etc., or the static charge prevention effect will be reduced. If the unit tends to be easily charged after many years of use, apply a neutral-detergent-and-water solution to the meter cover surface as an emergency measure.

We are not responsible for any trouble due to maintenance service other than stated in this instruction manual or modification.

6. BEFORE CALLING FOR SERVICE

If the unit fails to operate normally despite operation conforming to the instructions, check the following three points.

- (1) Check if the battery capacity is sufficient and if the mounted polarities are correct.
- (2) Check if the internal fuse has blown.
- (3) Check if the test leads are open.

7. SPECIFICATIONS

Table 5

Type of Measurement	Max. Scale	Allowance	Remarks
DC voltage ±DCV	250mV	±3% of max. scale.	Input resistance approx. 1MΩ
	2.5/10/50/250/500V	±3% of max. scale.	Input resistance 10MΩ min.
	25kV (by use of optional probe)	±10% of max. scale.	Probe resistance 1000MΩ
AC voltage ACV	250mV	±3% of max. scale. Frequency characteristic 40Hz~10kHz ±5%	Input resistance approx. 1MΩ Full wave rectification
	2.5/10/50/250/500V	±3% of max. scale.	Input resistance 10MΩ min. Full wave rectification
Low frequency output dB	-10/+10/+22/+36/ +50/+56dB 0dB=0.775V(1mW) (600Ω)	±3% of max. scale length.	Input resistance 10MΩ min. Full wave rectification
DC current ±DCA	250μ/2.5m/25m/ 250m/2.5A	±3% of max. scale.	Shunt voltage drop 200mV
AC current ACA	250μ/2.5m/25m/ 250m/2.5A	±3% of max. scale.	Shunt voltage drop 200mV
Resistance Ω	Range Center Max x1 200Ω 20kΩ x10 2kΩ 200kΩ x0.1k 20kΩ 2MΩ x1k 200kΩ 20MΩ x10k 2MΩ 200MΩ	±3% of max. scale length.	Terminal open voltage 1.2V DC

- **Standard operating temperature**
: 23 ±2°C
- **Standard operating frequency**
: 50 Hz to 60 Hz
- **Standard operating humidity**
: 45 to 75% RH
- **Operating temperature range**
: 0 to 40°C
- **Operating humidity range**
: Less than 80% RH (no-condensation)
- **Dimensions and weight**
: 110(W) × 124(D) × 48(H) mm, 290g
- **Accessories** : Instruction Manual,
A pair of test leads (type TL-61G),
Fuse (5 dia. by 20mm, 250V-0.3A)
- **Internal battery**
: 1.5V × 4 (R03 or UM-4SG)
- **Battery life** : About 100 hours of operation based
on 8 hours of use per day
- **Optional accessories**
: Probe for 25kVDC (type HV-50),
Carrying case (type C-AU)



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