Handheld Digital Multimeter

GDM-531

USER MANUAL

ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

The information in this manual was correct at the time of printing. However, Good Will continues to improve products and reserves the rights to change specification, equipment, and maintenance procedures at any time without notice.

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SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to ensure your safety and to keep the instrument in the best possible condition.

Safety Standards

- EN 61326-1; EN 61326-2-2
- EN 61010-1; EN 61010-2-030; EN 61010-2-033
- CAT III 600V, double insulation standard, over voltage standard, and RoHS, pollution grade II

Electrical Symbols

These safety symbols may appear in this manual or on the instrument.

	Low battery
	Direct current
	Alternating current
	Warning
	Double insulation
	Caution, possibility of electric shock
	Grounding
	Comply with European Union Standards
CAT III	It is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.

Safety Instructions

- Do not use the device if the rear cover is not covered up or it will pose a shock hazard
- Do not use the device if the device or test leads appear damaged or if you suspect that the device is not operating properly. Pay particular attention to the insulation layers.
- During measurement, keep your fingers behind the finger guard.
- Do not input over 600V voltage between the device and the grounding.
- Use caution to measure voltage >DC 60V or AC 30Vrms.
- Never input voltage and current exceeding the value listed on the device.
- Functional dial should be switched to proper position.
- Do not switch the functional dial during measuring.
- Do not change the internal circuit of the device in order to avoid the damage to the device and users.
- Replace the fuse with the specified model.
- To avoid false reading, replace the battery when the battery indicator  appears.
- Do not use or store the device in high temperature, high humidity, flammable, explosive or strong magnetic field environments.
- Use damp cloth to clean the case; do not use detergent containing solvents or abradants.
- Before each use verify meter operation by measuring a known voltage or current. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

GETTING STARTED

This chapter describes the GDM-531 in a nutshell, including its main features and front/ rear panel introduction.

GDM-531 Overview

Overview

GDM-531 is a 6000 count palm sized multimeter with auto and manual range respectively. These CE certified multimeters are CAT III 600V, which can withstand 6000kV surge voltage. GDM-531 is designed with high voltage warning and over range alarm, making this series great for a wide range of measurement needs.

Features

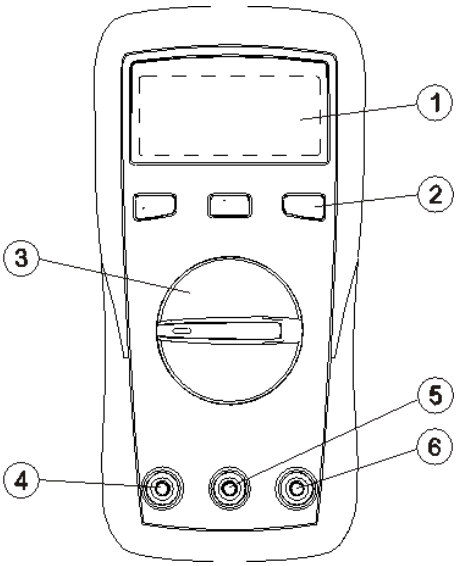
- Smart appearance with comfy handle
- Pass 2-meter drop test
- Large LCD screen with 6000 counts display, RMS measurement, fast ADC digital converter (3 times/s)
- Overload protection with alert
- Extensive range for capacitance measurement, short response time. E.g. When measuring ≤10mF,response time ≤6s
- Support NCV and battery measurement.
- Support up to 600V/10A AC/DC current and voltage measurement.
- Backlight installed for dim occasions.
- Energy saving

Accessories

Before using the GDM unit, check the package contents to make sure all the accessories are included.

Standard Accessories	Description
	User manual*1 pc
	Test leads*1 pair
	1.5V AAA Battery*2

External Structure



Item Index	Description
1	LCD display
2	Functional buttons
3	Functional dial
4	10A input terminal
5	COM input terminal
6	Other input terminals

Function Buttons

Button	Description
HOLD/SELECT:	Press to turn on/off data hold function (except at continuity/diode position)
REL	The capacitance mode, press this button to remove the base.
LIGHT:	Press this button to turn on/off the backlight.

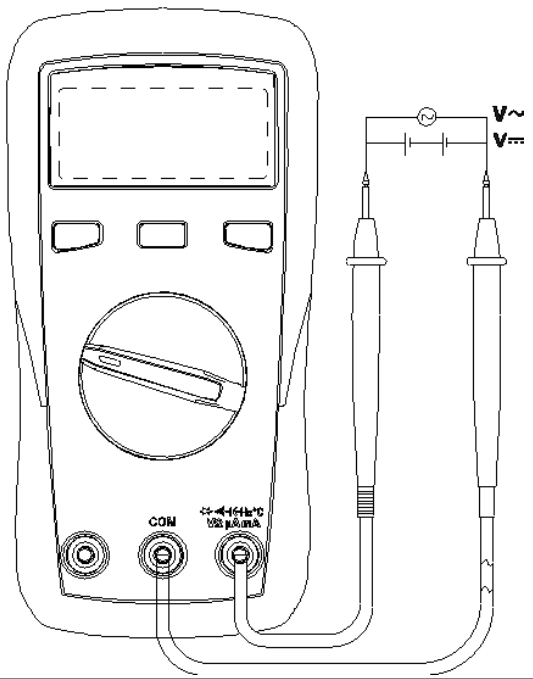
OPERATION

Operating Instructions

To avoid false reading, replace the battery if the battery low power symbol appears. Also pay special attention to the warning sign ⚠ besides the test lead housing, indicating that the tested voltage or current must not exceed the values listed on the device.

AC/DC Voltage Measurement

Wire Connection Diagram



Steps of Measurement

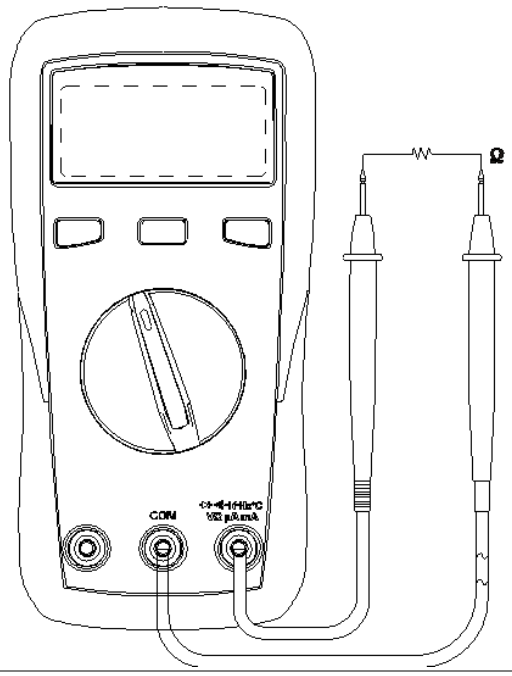
1. Switch the dial to ACV or DCV position
2. Insert the red test lead to VΩmA jack, black to COM jack.
3. Connect test leads with the load in parallel.
4. At mV position, press SELECT to enter frequency measurement (10Hz~1MHz).
5. Reading is displayed.

- Do not input voltage over 600Vrms, or it may pose shock hazard.
- Be cautious when measuring high voltage

- Before using the device, if the voltage is unknown, switch the dial to the maximum range position and reduce the range according to the practical reading.
- Test a known voltage to verify the device.
- When input impedance about 10MΩ, there may be errors when measurement high voltage. Input impedance≤10kΩ, measurement errors can be ignored (≤0.1%)

Resistance Measurement

Wire Connection Diagram



Steps of Measurement

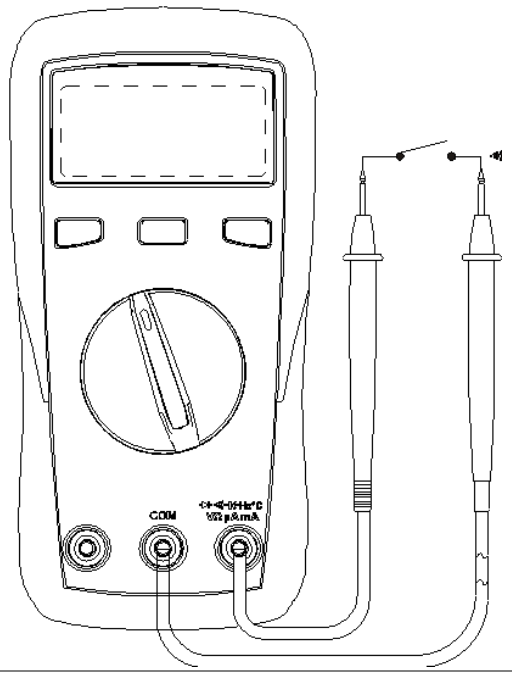
1. Switch the dial to resistance position.
2. Insert the red test lead to VΩmA jack, black to COM jack.
3. Connect test leads with the load in parallel.
4. Reading is displayed.

Note

- If the resistor is open or over the range, the "OL" symbol will be displayed on the screen.
- Before measuring resistance, switch off the power supply of the circuit, and fully discharge all capacitors.
- When measuring low resistance, the test leads will produce 0.1Ω~0.2Ω measurement error. To obtain accurate measurement, short the test leads and use REL function.
- If the resistance when shorted is more than 0.5Ω, please check if test leads are loosened or damaged.
- Resistance measurement can be used to inspect device's internal fuses.
- Do not input over 60V DC or 30V AC or it will pose shock hazard.

Continuity Measurement

Wire Connection Diagram



Steps of Measurement

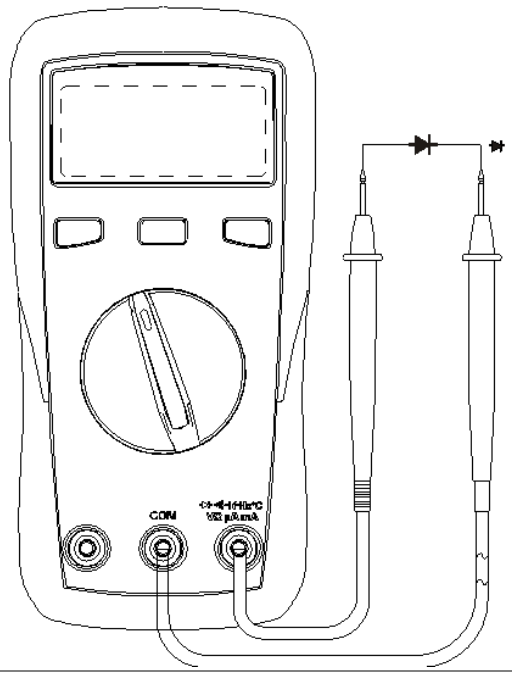
1. Switch the dial to continuity position.
2. Insert the red test lead to VΩmA jack, black to COM jack.
3. Connect test leads with the load in parallel.
4. Reading is displayed. Measured resistance >51Ω, circuit is in open status.
   Measured resistance ≤10Ω, circuit is in good conduction status, buzzer will go off.

Warnings

- Switch off the power supply to the circuit, and fully discharge all capacitors

Diode Measurement

Wire Connection Diagram



Steps of Measurement

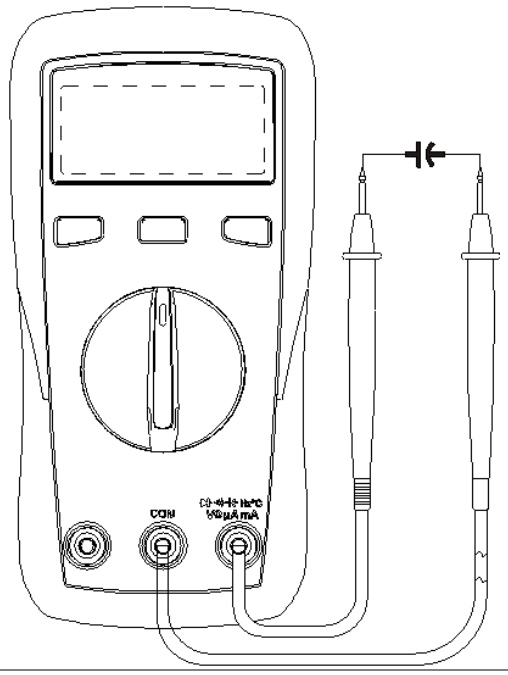
1. Switch the dial to diode position.
2. Insert the red test lead to VΩmA jack, black to COM jack.
3. Red test lead to positive pole, black to negative pole.
4. Reading is displayed.
5. "OL" symbol appears when the diode is open or polarity is reversed. For silicon PN junction, normal value: 500 ~ 800mV (0.5 ~ 0.8V).

Note

- Switch off the power supply to the circuit, and fully discharge all capacitors Voltage for testing diode is about 4.0V/1.5mA.

Capacitance Measurement

Wire Connection Diagram



Steps of Measurement

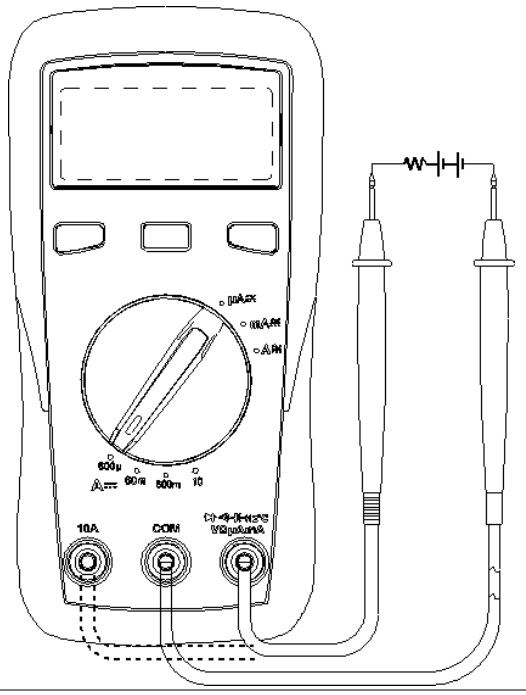
1. Switch the dial to capacitance measurement.
2. Insert the red test lead to VΩmA jack, black to COM jack.
3. Reading is displayed.

Note

- Switch off the power supply to the circuit, and fully discharge all capacitors
- Before measuring capacitors (especially for high voltage capacitors), please fully discharge them.
- If the tested capacitor is shorted or its capacity is over the specified range "OL" symbol will be displayed on the screen.
- When measuring large capacitors, it may take a few seconds to obtain steady readings.
- When there is no input, the device displays a fixed value (intrinsic capacitance).
- For small capacitance measurement, to ensure measurement accuracy, the measured value must be subtracted from intrinsic capacitance. Or users can measure small capacity capacitors with relative measurement function (REL) (the device will automatically subtract the intrinsic capacitance)

DC Current Measurement

Wire Connection Diagram



Steps of Measurement

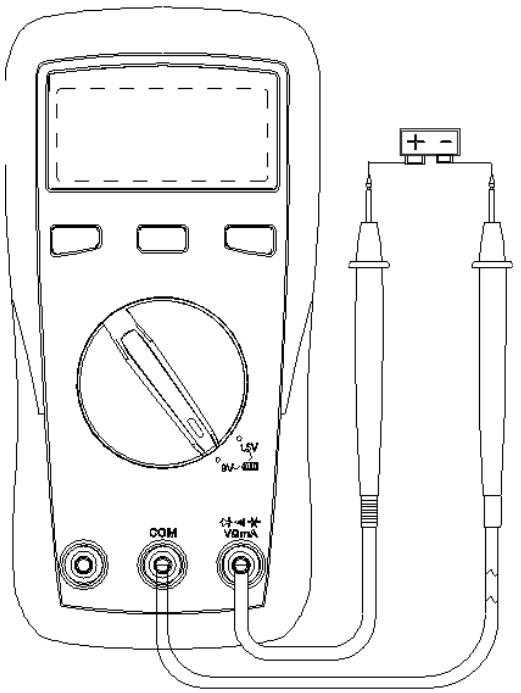
1. Switch the dial to DC current position.
2. According to the current being measured. Insert the red test lead to VΩmA jack or 10A jack, black to COM jack.
3. Connect test leads with the circuit in series.
4. Reading is displayed.

Note

- Before measuring, switch off the power supply of the circuit.
- If the range of the measured current is unknown, select the maximum range and then accordingly reduce.
- There are fuses inside VΩmA jack and 10A jack. Do not connect the test leads with any circuits in parallel.
- If the tested current is about 10A, each measurement time is about 10 seconds(less than 30s) and the next test should be after 15 minutes.

Battery Measurement

Wire Connection Diagram

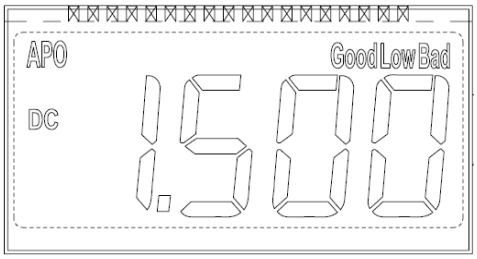


Steps of Measurement

1. Switch the dial to battery position.
2. Insert the red test lead to VΩmA jack or 10A jack, black to COM jack.
3. Connect red test lead to + pole of the battery, black to – pole.
4. Reading is displayed (Good-normal status; Low-low power; Bad-need replacement).
5. LCD display of battery status

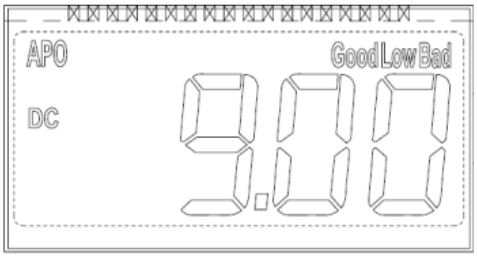
1.5V battery: resistance=30Ω

Indication	Voltage
Good	≥1.31
Low	0.95V~1.3V
Bad	≤0.94V



9V battery: resistance=900Ω

Indication	Voltage
Good	≥7.8
Low	5.7V~7.7V
Bad	≤5.6V

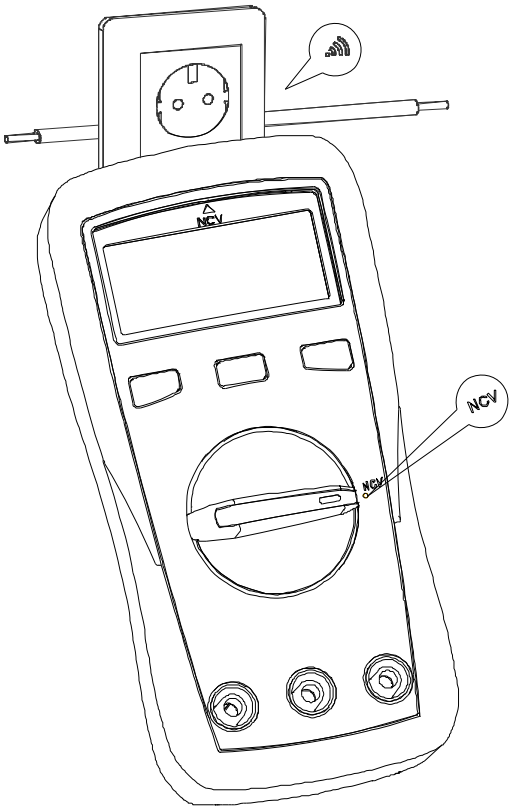


Note

- When the display shows Bad, you need to replace the battery
- If the battery voltage <0.2V, there is no indication on the display, LCD only shows the flashing voltage value
- Do not input over 60V DC or 30V AC voltage.

NCV Measurement

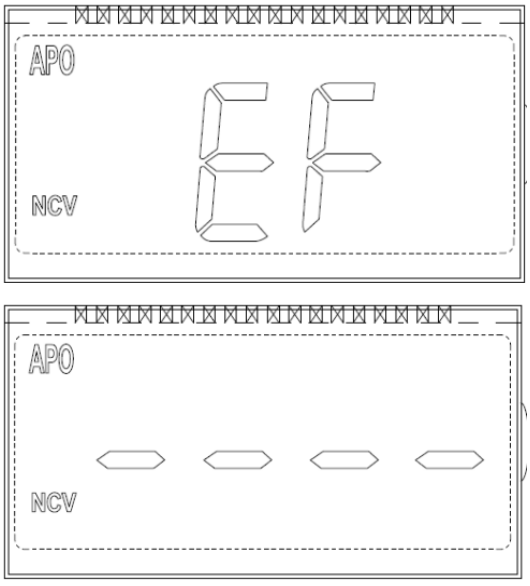
Wire Connection Diagram



Steps of Measurement

1. Switch the dial to NCV position.
2. Place the device near the measured object. "-"symbol indicates the intensity of the electric field. More "-"and the higher the buzzer frequency, the higher the electric field intensity.

3. Intensity of electric field.
   * "EF": 0 ~ 50mV
   * "-": 50 ~ 100mV
   * "--": 100 ~ 150mV
   * "---": 150 ~ 200mV
   * "----":>200mV



Others

Additional Notes	▪ The device enters measurement status in 2 seconds after startup. Restart the device if"ErrE" appears. ▪ The device automatically shuts down if there is no operation for 15 minutes. You can wake up the device by pressing any key. To disable auto shutdown: switch the dial to OFF position and long press SELETE button until the device turn on.
Buzzer Notification	▪ Input voltage ≥600V (AC/DC), buzzer will continuously beep indicating measure range is at limit. ▪ Input current >10A (AC/DC), buzzer will continuously beep indicating measure range is at limit. ▪ The buzzer will go off five times continuously 1 minute before auto-off.
Low Power Warnings	▪ Voltage of the battery < 2.5V,  symbol appears

SPECIFICATIONS

General Specifications

1 Max voltage between input terminal and earth grounding: 600Vrms

2 Fuse Type:
10A Jack: F 10A H 600V Fuse Φ6x25mm (or Φ6×32mm)
mA/µA Jack: F 600mA H 600V Fuse Φ6x32mm

3 Display count: 6000
Overload indication: OL, refresh 3 times/s

Others

1 Range: Manual

2 Backlight: Manual, shutdown after 30s.

3 Polarity: – for negative pole

4 Data hold indication: H

5 Low power indication:

6 Operating temperature: 0˚C~40˚C (32˚F~104˚F)
Storage temperature: -10˚C~50˚C (14˚F~122˚F)
Relative humidity: ≤75% at 0˚C~30˚C; ≤50% at 30˚C~40˚C

7 Operating altitude: 0~2000m

8 Battery type: AAA 1.5V×2

9 Dimension: 155mm×76.5mm×49mm

10 Weight: 250g(with batteries)

11 Electromagnetic compatibility:
RF≤1V/m, overall accuracy=specified accuracy+5% of range.
RF>1V/m, no specified calculation.

Technical Specifications

Accuracy: ± (% of reading + numerical value in least significant digit slot), 1 year warranty

Ambient temperature: 23˚C ± 5˚C (73.4˚F ± 9˚F)

Ambient humidity: ≤75% RH

Note

- To ensure accuracy, operating temperature should be within 18˚C ~ 28˚C.
- Temperature Coefficient= 0.1*(specified accuracy)/˚C (<18 ˚C or >28˚C)

Technical Specifications Index

DC Voltage

Range Position	Resolution	Accuracy
600.0mV	0.1mV	±(0.7%+3)
6.000V/6000mV	0.001V/1mV	±(0.7%+3)
60.00V	0.01V	±(0.7%+3)
600.0V	0.1V	±(0.7%+3)

- Input impedance: About 10MΩ.
- Results might be unstable at mV range when no load is connected. The value becomes stable once the load is connected. Least significant digit ≤±3
- Max input voltage: ±600V, when the voltage≥610V, "OL" symbol appears and the buzzer goes off.
- Overload protection: 600Vrms (AC/DC)

AC Voltage

Range Position	Resolution	Accuracy
600.0V	0.1V	±(1.2%+3) [5%~100% of the Range]

- Input impedance: about 10MΩ
- Display: RMS
- Frequency response: 40Hz ~ 400Hz
- Max input voltage: 600Vrms. when the voltage≥610V, "OL" symbol appears and the buzzer goes off.
- Overload protection: 600Vrms (AC/DC)
- Frequency Sensitivity about 300mV

Resistance Measurement

Range Position	Resolution	Accuracy
600.0Ω	0.1Ω	±(1.0%+2)
6.000kΩ/6000Ω	0.1kΩ/1Ω	±(0.8%+2)
60.00kΩ	0.01kΩ	±(0.8%+2)
600.0kΩ	0.1kΩ	±(0.8%+2)
60.00MΩ	0.01MΩ	±(2.0%+5)

- Measurement result = reading of resistor – reading of shorted test leads
- Overload protection: 600Vrms

Continuity, Diode

Position	Resolution	Remark
•))	0.1Ω	Set Value Open circuit: resistance>50Ω, no beep. Well-connected circuit: resistance≤10Ω, continuous beeps.
▶|	0.001V	Open circuit voltage: 2.1V, test current: about 1mA Silicon PN junction voltage: 0.5 ~ 0.8V.

- Overload protection: 600Vrms

Capacitance

Range	Resolution	Accuracy
9.999nF	0.001nF	REL mode：±(4%+10)
99.99nF	0.01nF	±(4%+5)
999.9nF	0.1nF	±(4%+5)
9.999μF	0.001μF	±(4%+5)
99.99μF	0.01μF	±(4%+5)
999.9μF	0.1μF	±(4%+5)
9.999mF	0.001mF	±10%

- Overload protection: 600V-PTC
- Test capacitance≤200nF, adapt REL mode.

DC Current

Range Position	Resolution	Accuracy
600.0μA	0.1μA	±(1.0%+3)
60.00mA	0.01mA	±(1.0%+3)
600.0mA	0.1mA	±(1.0%+3)
10.00A	0.01A	±(1.2%+5)

- Overload protection: 600Vrms
- μA mA range: F1 Fuse Φ6×32mm F 600mA H 600V
- 10A range: F2 Fuse Φ6×25mm (or Φ6×32mm) F 10A H 600V
- Input current≥10A, buzzer goes off; input current>10.10A "OL" symbol appears

MAINTENANCE

WARNING

- To avoid electric shock, make sure the probes are disconnected from the measured circuit before removing the rear cover. Make sure the rear cover is tightly screwed before using the instrument.

General Maintenance

- Clean the case with a damp cloth and detergent. Do not use abradants or solvents
- If there is any malfunction, stop using the device and send it to maintenance.
- The maintenance and service must be implemented by qualified professionals or designated departments.

Replacements

Battery Replacement

- To avoid false reading, replace the battery when the battery indicator appears.
- Battery Specification: AAA 1.5V x 2

Steps of Replacement

1. Switch the dial to "OFF "position and remove the test leads from the input terminal.
2. Take off the protective case. Loosen the screw on battery cover; remove the cover to replace the battery. Please identify the positive and negative pole.

Fuse Replacement

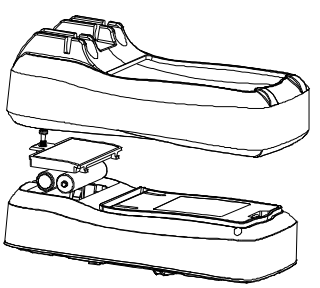
Steps of Replacement

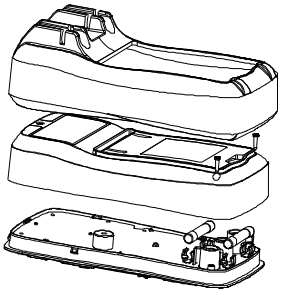
1. Switch the dial to "OFF "position and remove the test leads from the input terminal.
2. Loosen the both screws on the rear cover, and then remove the rear cover to replace the fuse.

Fuse Specification

- F1 Fuse Φ6×32mm F 600mA H 600V
- F2 Fuse Φ6×25mm (or Φ6×32mm) F 10A H 600V

Replacement Figures





Test Probe Replacement

- If insulation on probe is damaged, replace it.

WARNING

- If the test leads need to be replaced, you must use a new one which should meet EN 61010-031 stan dard, rated CAT III 600V, 10A or better.