

# Handheld Digital Multimeter

GDM-541/533

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## USER MANUAL



ISO-9001 CERTIFIED MANUFACTURER

**GW INSTEK**

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# S 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.

## Electrical Symbols

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

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Warning or Caution



Caution, possibility of electric shock



Both direct and alternating current



Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION



Earth (ground) Terminal



Complies with European Union standards

CAT III

It is applicable to testing and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.


CAT IV                      It is applicable to testing and measuring circuits connected at the source of the building's low-voltage MAINS installation.

## Safety Instructions

The meter is designed and manufactured according to IEC61010-1 safety standard, and conforms to CAT III 1000V, CAT IV 600V, and pollution degree 2. If the meter is used in a manner not specified by the manufacturer, the protection provided by the meter may be impaired.

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- Before use, please check if there is any item which is damaged or behaving abnormally. If any abnormal item (such as bare test lead, damaged meter casing, broken LCD, etc.) is found, please do not use the meter.
- Do not use the meter if the rear cover or the battery cover is not completely covered up, or it may pose a shock hazard!
- Damaged test leads must be replaced with ones of the same model or same electrical specifications.
- During measurement, do not touch any exposed wires, connectors, unused inputs or circuits being measured.
- Use caution when working with voltages above AC 30Vrms, 42Vpeak or DC 60V. Keep fingers behind the finger guards of the test leads to prevent electric shock.
- If the range of the measured value cannot be determined, the meter must be operated at the maximum range.
- Do not apply more than the rated voltage or current marked on the meter between the terminals or between any terminal and earth ground.

- Place the function dial in the correct position before measurement.
- Before measuring resistance, diode, continuity, or capacitance, switch off the power supply of the circuit, and fully discharge all capacitors.
- Before measuring current, make sure the fuses are intact.
- Do not use or store the meter in high temperature, high humidity, flammable, explosive, or strong magnetic field environments.
- Do not change the internal circuit of the meter to avoid damage to the meter or user!
- When “ ” is displayed, please replace the batteries in time to ensure measurement accuracy.
- Turn off the meter in time after measurement. If the meter is not in use for a long time, please remove the batteries.

# GETTING STARTED

This chapter describes the GDM-541/533 in a nutshell, including its main features and front / rear panel introduction.


**GDM-541**

**GDM-533**

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## GDM-541/533 Overview

### Overview

The GDM-541/533 is a handheld true RMS digital multimeter with high reliability and security (GDM-533: 6000 counts; GDM-541: 22000 counts). With large screen, high resolution analog pointer display, full scale overload protection, and unique appearance design, it becomes a new practical electrical measuring meter. The meter can measure AC/DC voltage/current, resistance, diode, transistor hFE (GDM-541), continuity, capacitance, frequency, duty ratio, temperature (GDM-533), etc. Featuring data transmission, data hold, relative value measurement, peak measurement, internal temperature alarm, low battery indication, backlight, auto power off, and NCV functions, the meter is an ideal measuring tool for many application fields.

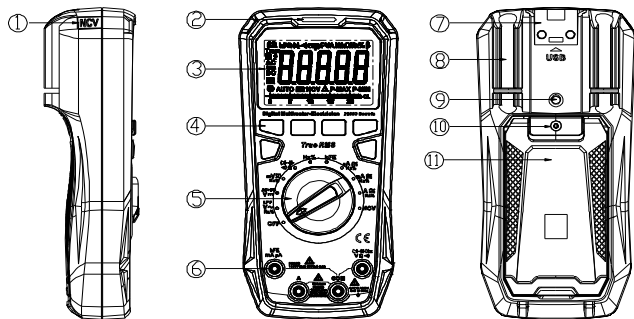
### Accessories

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                  |
|                      | Adapter socket*1 pc                |
|                      | K-type thermocouple (GDM-533)*1 pc |
|                      | USB cable*1 pc                     |
|                      | 1.5V AAA batteries*4               |

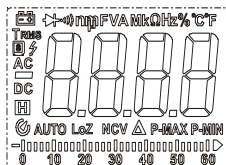


## External Structure

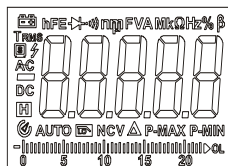


| Item Index | Description                      |
|------------|----------------------------------|
| 1          | NCV detector                     |
| 2          | Indicator light                  |
| 3          | LCD display                      |
| 4          | Function buttons                 |
| 5          | Function dial                    |
| 6          | Input terminals                  |
| 7          | USB access port                  |
| 8          | Test lead slots                  |
| 9          | Nut for external holder          |
| 10         | Battery compartment fixing screw |
| 11         | Tilt stand                       |

## LCD Display





GDM-533



GDM-541

| Symbol                             | Description  |
|------------------------------------|--|
|                                    | Measured voltage is >30V (AC or DC)                  |
|                                    | Data hold  |
|                                    | Negative reading                                     |
| AC/DC                              | AC/DC measurement                                    |
|                                    | Low battery indication                               |
| AUTO                               | Auto range   |
|                                    | Diode test   |
|                                    | Continuity test                                      |
| $\Delta$                           | Relative value measurement                           |
| k $\Omega$ , M $\Omega$ , $\Omega$ | Resistance units: ohm, kilohm, megaohm               |
| mV, V                              | Voltage units: millivolt, volt                       |
| $\mu$ A, mA, A                     | Current units: microampere, milliampere, ampere      |
| nF, $\mu$ F, mF                    | Capacitance units: nanofarad, microfarad, millifarad |
| Hz, %                              | Frequency, duty ratio                                |
|                                    | Low pass filter                                      |








|   |  |
|---|--|
|  | Data transmission                              |
| $\beta$   | Transistor magnification (GDM-541)             |
| NCV   | Non-contact voltage detection                  |
| P-MAX/P-MIN   | Peak measurement                               |
| MAX/MIN   | Maximum/Minimum measurement                    |
| °C/°F   | Celsius/Fahrenheit (GDM-533)                   |
| LoZ   | Low impedance measurement (GDM-533)            |
| hFE   | Transistor magnification measurement (GDM-541) |
|  | Auto power off                                 |
| T <sub>RMS</sub>  | True RMS                                       |

## Function Dial and Function Buttons

### Function Dial

| Dial Position                         | Description   |
|---------------------------------------|---|
| <b>OFF</b>                            | Power off   |
| <b>LPF</b><br><b>V~</b><br><b>Hz%</b> | AC voltage measurement/Low pass filter measurement/Frequency and duty ratio measurement (GDM-541) |
| <b>AC+DC</b><br><b>V—</b>             | DC voltage measurement/AC+DC measurement (GDM-541)  |
| <b>V~</b><br><b>Hz%</b>               | AC voltage measurement/Frequency  |
| <b>V⎓</b><br><b>Hz%</b>               | AC/DC voltage measurement/Frequency and duty ratio measurement (GDM-533)                          |
| <b>mV⎓</b><br><b>Hz%</b>              | AC/DC millivolt voltage measurement/Frequency and duty ratio measurement                          |
| <b>· ) Ω</b><br><b>→ ←</b>            | Diode test/Continuity test/Resistance measurement/Capacitance measurement                         |
| <b>hFE</b>                            | Transistor magnification measurement (GDM-541)  |
| <b>Hz%</b>                            | Frequency and duty ratio measurement  |
| <b>μA ≈</b><br><b>Hz%</b>             | AC/DC microampere current measurement/Frequency and duty ratio measurement                        |
| <b>mA ≈</b><br><b>Hz%</b>             | AC/DC milliampere current measurement/Frequency and duty ratio measurement                        |
| <b>A ≈</b><br><b>Hz%</b>              | AC/DC ampere current measurement/Frequency and duty ratio measurement                             |
| <b>NCV</b>                            | Non-contact voltage detection   |

## Function Buttons



| Button  | Description   |
|---|---|
|  | Short press to switch between functions in each compound function position.   |
|  | Short press to enter the manual range mode and change the range.<br><br>Long press to exit the manual range mode.   |
|  | Short press to switch between frequency and duty ratio measurement.<br><br>Long press to turn on/off data communication (note: only available when USB communication module is inserted into the casing).   |
|  | Short press to enter/exit the relative value measurement mode.  |
|  | Short press to cycle through the measured maximum and minimum.<br><br>Long press to cycle through the peak maximum and peak minimum   |
|  | Short press to hold the measurement on the display and “  ” will be displayed.<br><br>Short press again to cancel data hold.<br><br>Long press to turn on/off the backlight. |

# PERATION

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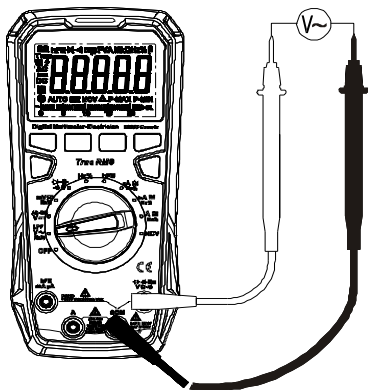
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## Operating Instructions

Please check the internal batteries first. If “” is displayed, replace the batteries in time. Please also pay attention to the warning sign “” beside the input terminals, which indicates that the measured voltage or current must not exceed the values marked on the meter.

## AC Voltage Measurement

Wire Connection Diagram



Steps of Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{Hz}^{\circ}\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\text{V}\overline{\sim}$ ,  $\text{V}\sim_{\text{Hz}\%}$ , or  $\text{LPF V}\sim_{\text{Hz}\%}$  position.

3. Short press the SELECT button to switch to AC voltage measurement or LPF ACV measurement (GDM-541, manual maximum range by default) if required.
4. Connect the test leads with the measured load or power supply in parallel.
5. Read the voltage value on the display (if the voltage is >1000V, the red indicator light will be on and the buzzer will sound an alarm).
6. Short press the  $\frac{\text{Hz}\%}{\text{USB}}$  button to display the frequency/duty ratio of the measured voltage.



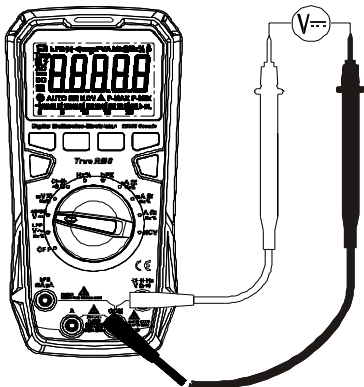
Caution

- Do not input a voltage over 1000V or it may damage the meter.
- Be cautious to avoid electric shock when measuring high voltages.
- After completing the measurement, disconnect the test leads from the circuit under test.



## DC Voltage Measurement

Wire Connection  
Diagram



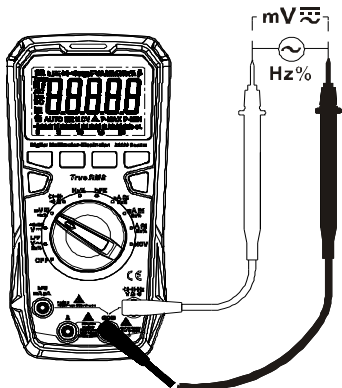
Steps of  
Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{Hz}\text{ }^{\circ}\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\text{V}\text{---}$ ,  $\text{V}\text{AC}$ ,  $\text{Hz}\%$ , or  $\text{V}\text{AC+DC}$  position.
3. Short press the SELECT button to switch to DC voltage SELECT measurement if required.
4. Connect the test leads with the measured load or power supply in parallel.
5. Read the voltage value on the display (if the voltage is  $>1000\text{V}$ , the red indicator light will be on and the buzzer will sound an alarm).



## AC/DC Millivolt Voltage Measurement

Wire Connection  
Diagram



Steps of  
Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{ }^\circ\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\text{mV}$   $\text{Hz}\%$  position.
3. Short press the SELECT button to switch to AC/DC millivolt voltage measurement if required.
4. Connect the test leads with the measured load or power supply in parallel.
5. Read the voltage value on the display.
6. When measuring AC millivolt voltage, short press the  $\text{Hz}\%$   $\text{USB}$  button to display the frequency/duty ratio of the measured voltage.

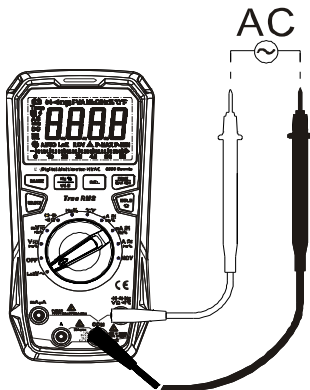


## Caution

- Do not input a voltage over 1000V or it may damage the meter.
- Be cautious to avoid electric shock when measuring high voltages.
- After completing the measurement, disconnect the test leads from the circuit under test.
- Before each use, verify meter operation by measuring a known voltage.
- The input impedance of the AC mV range is about 10M $\Omega$ . This load effect may cause measurement errors in high-impedance circuits. In most cases, if the impedance of the circuit is below 10k $\Omega$ , the error can be ignored ( $\leq 0.1\%$ ).
- The input impedance of the DC mV range is infinite (about 1G $\Omega$ ), and it does not attenuate when measuring weak signals, so the measurement accuracy is high. When the test leads are open, there may be a value on the screen, but this is normal and will not affect the measuring result.
- Frequency measurement at 60mV range (AC voltage) is for reference only.

## LoZ (low impedance) ACV Measurement (GDM-533)

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the **LoZV~** position.
3. Connect the test leads with the measured load or power supply in parallel.
4. Read the voltage value on the display.
5. Short press the  $\frac{\text{Hz}\%}{\text{USB}}$  button to display the frequency/duty ratio of the measured voltage.

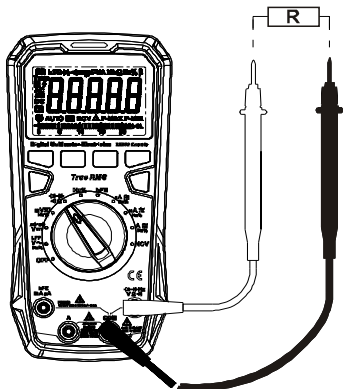


## Caution

- Do not input a voltage over 1000V or it may damage the meter.
- Be cautious to avoid electric shock when measuring high voltages.
- After completing the measurement, disconnect the test leads from the circuit under test.
- Before each use, verify meter operation by measuring a known voltage.
- After using the LoZ function, wait 3 minutes before next operation.
- LoZ ACV measurement eliminates ghost voltage for more accurate measurement.

## Resistance Measurement

Wire Connection  
Diagram



Steps of  
Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{Hz}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\Omega$  or  $\Omega$  position.
3. Touch the probes to the test points in the circuit.
4. Read the resistance value on the display.



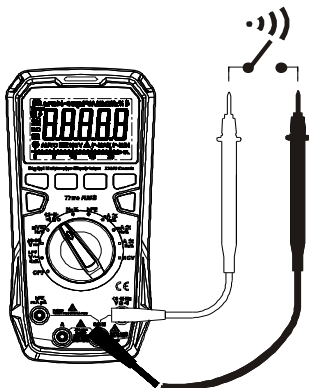
## Caution

- Use caution when working with voltages above AC 30Vrms, 42Vpeak or DC 60V. Such voltages pose a shock hazard.
- If the measured resistor is open or the resistance exceeds the maximum range, the LCD will display "OL".
- 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~0.3Ω measurement error. To obtain accurate measurement, short-circuit the test leads and use the relative value measurement (REL) mode.
- If the resistance is not less than 0.5Ω when the test leads are short-circuited, please check if the test leads are loose or abnormal.
- When measuring high resistance, it is normal to take a few seconds to stabilize the reading.



## Continuity Test

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{ }^{\circ}\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\Omega$  or  $\Omega$  position.
3. Short press the SELECT button to switch to continuity test.
4. Touch the probes to the test points in the circuit.
5. Measured resistance  $<50\Omega$ : The circuit is in good conduction status; the buzzer beeps continuously and the green indicator light is on.

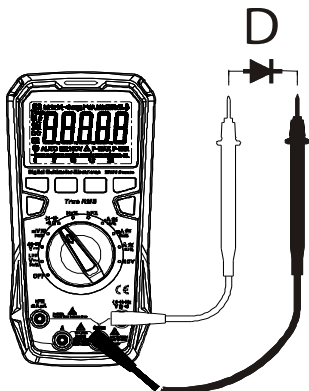


Caution

- Use caution when working with voltages above AC 30Vrms, 42Vpeak or DC 60V. Such voltages pose a shock hazard.
- Before testing continuity, switch off the power supply of the circuit, and fully discharge all capacitors.

## Diode Test

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the  $\nabla \Omega \text{ Hz}$  or  $\nabla \Omega \text{ } ^\circ\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\nabla \nabla$  or  $\nabla \Omega$  position.
3. Short press the SELECT button to switch to diode test if required.
4. Connect the red probe with the diode anode, and black probe with the diode cathode.
5. Read the forward bias value on the display.

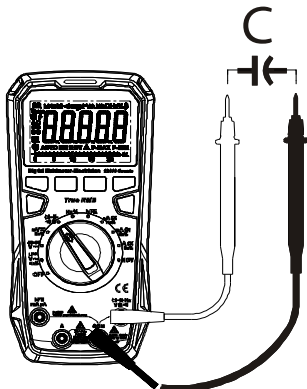
6. Measured value  $<0.12\text{V}$ : The diode may be damaged; the red indicator light is on.  
Measured value within  $0.12\text{V}\sim 2\text{V}$ : The diode is normal; the green indicator light is on (for reference only).
7. If the diode is open or its polarity is reversed, the LCD will display "OL". For silicon PN junction, the normal value is generally about  $500\sim 800\text{ mV}$ .
  - Use caution when working with voltages above AC  $30\text{V}_{\text{rms}}$ ,  $42\text{V}_{\text{peak}}$  or DC  $60\text{V}$ . Such voltages pose a shock hazard.
  - Before testing the diode, switch off the power supply of the circuit, and fully discharge all capacitors.



Caution

## Capacitance Measurement

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the  $\text{V}\Omega\text{Hz}$  or  $\text{V}\Omega\text{ }^{\circ}\text{C}$  terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\text{C}$  or  $\Omega$  position.
3. Short press the SELECT button to switch to capacitance measurement.
4. Touch the probes to the capacitor pins.
5. Read the capacitance value on the display after it gets steady.



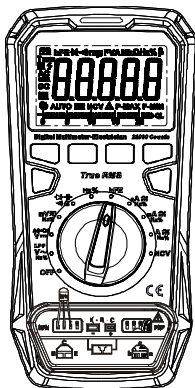
## Caution

- Use caution when working with voltages above AC 30Vrms, 42Vpeak or DC 60V. Such voltages pose a shock hazard.
- Before measuring, fully discharge all capacitors (especially high-voltage capacitors) to avoid damage to the meter and user.
- If the measured capacitor is short-circuited or the capacitance exceeds the maximum range, the LCD will display “OL”.
- When measuring high capacitance, it is normal to take a few seconds to stabilize the reading.
- For small capacitance measurement, the REL mode should be used to avoid the influence coming from distributed capacitance so as to obtain the correct reading.

## Transistor Magnification (hFE) Measurement (GDM-541)

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### Wire Connection Diagram

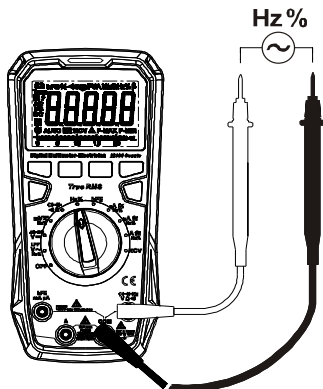


### Steps of Measurement

1. Turn the function dial to the hFE position.
2. Insert the adapter socket into the input terminals.
3. Insert the three pins of the transistor under test into the corresponding holes of the adapter socket.
4. Read the magnification of the measured transistor.

## Frequency/Duty Ratio Measurement

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the  $\text{Hz} \%$  or  $\text{V} \Omega \text{ } ^\circ\text{C}$  terminal, and black test lead into the COM terminal.
  2. Turn the function dial to the **Hz%** position.
  3. Short press the  $\frac{\text{Hz} \%}{\text{USB}}$  button to switch to frequency/duty ratio measurement if required.
  4. Read the frequency/duty ratio value on the display.
- Use caution when working with voltages above AC 30Vrms, 42Vpeak or DC 60V. Such voltages pose a shock hazard.

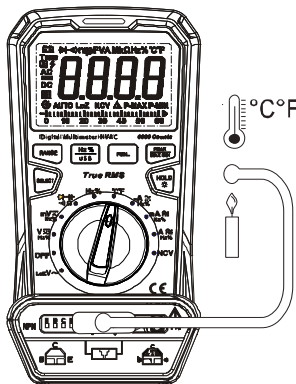


Caution



# Temperature Measurement (GDM-533)

Wire Connection  
Diagram



Steps of  
Measurement

1. Turn the function dial to the °C/°F position.
2. Insert the K-type thermocouple into the adapter socket, and then insert the adapter socket into the input terminals.
3. Bring the temperature sensing end of the thermocouple close to the object surface under test.
4. Read the Celsius temperature value on the display after it gets steady.
5. Short press the SELECT button to switch between °C and °F.

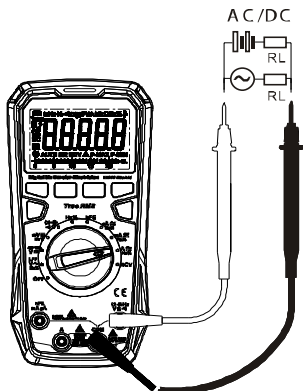


Caution

- Only K-type thermocouple is applicable.
- The LCD displays “OL” when the meter is turned on.
- The measured temperature should be less than 230°C/446°F ( $^{\circ}\text{F} = ^{\circ}\text{C} \times 1.8 + 32$ )

## AC/DC Current Measurement

Wire Connection  
Diagram



### Steps of Measurement

1. Insert the red test lead into the mA/μA or A terminal, and black test lead into the COM terminal.
2. Turn the function dial to the  $\mu A \frac{AC}{Hz}$ ,  $mA \frac{AC}{Hz}$ , or  $A \frac{AC}{Hz}$  position.
3. Short press the SELECT button to switch to AC/DC current measurement if required.
4. Connect the test leads with the measured load or power supply in series.
5. Read the current value on the display (if the current is >10A, the red indicator light will be on and the buzzer will sound an alarm).

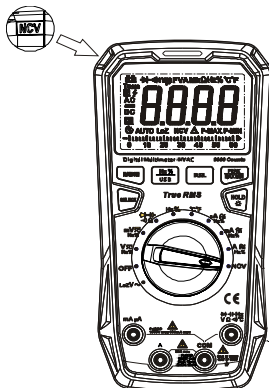


Caution

6. When measuring AC current, short press the  $\frac{\text{Hz}\%}{\text{USB}}$  button to display the frequency/duty ratio of the measured current.
  - To prevent possible electric shock, fire, or personal injury, switch off the power supply of the circuit, and then connect the meter with the circuit in series before measuring the current.
  - If the range of the measured current is unknown, select the maximum range and then accordingly reduce.
  - There are fuses inside mA/ $\mu$ A and A input terminals. Do not connect the test leads with any circuit in parallel.
  - When the measured current is  $>5\text{A}$ , each measurement time should be  $\leq 10\text{s}$  and the rest interval should be  $\geq 15$  minutes.
  - When the temperature in the meter is  $\geq 75^{\circ}\text{C}$  after measurement of large current, the yellow indicator light will be on, the buzzer will beep, and the LCD will display "CUT". When the temperature drops to  $< 40^{\circ}\text{C}$ , the yellow indicator light will be off, and the measurement can be made.

## Non-Contact Voltage (NCV) Detection

Wire Connection  
Diagram



Steps of  
Measurement

1. Turn the function dial to the NCV position.
2. Bring the NCV detector (top left corner of the meter) close to the wire (AC) under test.
3. If the voltage of the wire is  $\geq 50V_{rms}$  (frequency: 50Hz/60Hz), the red indicator light will be on and the buzzer will beep. If no voltage is detected, the LCD will display "EF". As the intensity of the detected voltage increases, more segments "-" will be displayed, and the frequency for buzzer beeping and red indicator light flashing will be higher.



Caution

- The detected voltage level varies with the distance between the NCV detector and the wire under test.
- The detected voltage level is for reference only, not for specific measurement. The frequency of the detected voltage should be 50Hz/60Hz.
- Hold the meter casing for non-contact voltage detection.

## USB Data Transmission

### Wire Connection Diagram

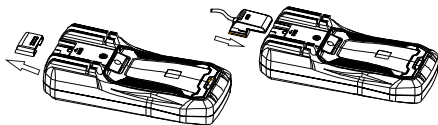


Figure A

Figure B


### Steps of Measurement

1. Pull out the USB sealing cover at the back of the meter (Figure A).
2. Insert the USB communication module into the USB access port of the meter and the LCD will display "S" (Figure B).
3. If USB data transmission is not needed during measurement, long press the  $\frac{\text{Hz}}{\text{USB}}\%$  button or pull out the USB module to disable data transmission, and "S" will disappear.
4. To recover this function, long press the  $\frac{\text{Hz}}{\text{USB}}\%$  button or insert the USB module.
5. The USB communication software can be downloaded from the official website of GW INSTEK ([www.gwinstek.com](http://www.gwinstek.com)).

## Others

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### Steps of Measurement

1. Auto power off: During measurement, if there is no operation for 15 minutes, the meter will automatically shut down to save power; before the automatic shutdown, the buzzer will beep for warning. Users can wake the meter up by pressing the SELECT button. To disable the auto-off function, press and hold the SELECT button in the off state, and then turn on the meter. To recover the function, restart the meter.
2. Buzzer alarm during measurement: When the input voltage >1000V or current >10A, the buzzer will sound an alarm.
3. Low battery indication: When the battery voltage is  $\leq 4.6V \pm 0.2V$ , "" will be displayed.



# SPECIFICATIONS

## General Specifications

- 1 Max voltage between the input terminal and COM terminal: Please refer to the description of input protection voltage for each range.
- 2 mA/ $\mu$ A input terminal protection: (CE) 600mA 1000V fast-acting fuse,  $\Phi$ 6x32mm
- 3 A input terminal protection: (CE) 11A 1000V fast-acting fuse,  $\Phi$ 10x38mm
- 4 Max display: 22000 (GDM-541), 6000 (GDM-533)
- 5 Analog bar: 46 segments (GDM-541) (conversion rate: 30 times/s), 31 segments (GDM-533)
- 6 Refresh rate: 2~3 times/s
- 7 Range: Auto/Manual
- 8 Polarity display: Auto
- 9 Over-range Indication: OL
- 10 Low battery indication: " " is displayed.
- 11 Operating temperature: 0°C~40°C (32°F~104°F)
- 12 Storage temperature: -10°C~50°C (14°F ~122°F)
- 13 Relative humidity:  $\leq$ 75% at 0°C~30°C;  $\leq$ 50% at 30°C~40°C
- 14 Operating altitude:  $\leq$ 2000m
- 15 Electromagnetic compatibility: Conforms to EN61326-1:2006 and EN61326-2-2:2006 standards
- 16 Battery: 4x1.5V AAA
- 17 Dimensions: 186mmx89mmx49mm
- 18 Weight: 420g (GDM-541), 400g (GDM-533) (with battery)
- 19 Safety standard: IEC 61010-1: CAT III 1000V/CAT IV 600V
- 20 Certification: CE
- 21 Pollution degree: 2
- 22 Information of usage: Indoor and outdoor

## Electrical specifications

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Accuracy:  $\pm (a\% \text{ of reading} + b \text{ digits})$ , 1 year warranty

Ambient temperature:  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ( $73.4^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ) Relative humidity:  $\leq 75\%$

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Caution

- To ensure measurement accuracy, the operating temperature should be within  $18^{\circ}\text{C} \sim 28^{\circ}\text{C}$  and the fluctuation range should be within  $\pm 1^{\circ}\text{C}$ . When the temperature is  $< 18^{\circ}\text{C}$  or  $> 28^{\circ}\text{C}$ , add temperature coefficient error:  $0.1 \times (\text{specified accuracy}) / ^{\circ}\text{C}$ .

## Technical Specifications Index

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## DC Voltage

| GDM-541  |            |                  |
|----------|------------|------------------|
| Range    | Resolution | Accuracy         |
| 220.00mV | 0.01mV     | $\pm (0.1\%+5)$  |
| 2.2000V  | 0.1mV      | $\pm (0.05\%+5)$ |
| 22.000V  | 1mV        |                  |
| 220.00V  | 10mV       |                  |
| 1000.0V  | 0.1V       | $\pm (0.1\%+5)$  |

| GDM-533 |            |                 |
|---------|------------|-----------------|
| Range   | Resolution | Accuracy        |
| 60.00mV | 0.01mV     | $\pm (0.8\%+5)$ |
| 600.0mV | 0.1mV      | $\pm (0.8\%+3)$ |
| 6.000V  | 0.001V     | $\pm (0.5\%+3)$ |
| 60.00V  | 0.01V      | $\pm (0.5\%+3)$ |
| 600.0V  | 0.1V       |                 |
| 1000V   | 1V         | $\pm (1.0\%+3)$ |

- Input impedance: About  $1G\Omega$  for mV range, about  $10M\Omega$  for other ranges
- Accuracy guarantee: 1%~100% of range; short circuit allows least significant digit  $\leq 5$
- Max input voltage: 1000V (if the voltage is  $>1000V$ , the red indicator light will be on and the buzzer will sound an alarm; if the voltage is  $>1010V$ , the LCD will display "OL")
- Overload protection: 1000V

## AC Voltage

| GDM-541  |            |                    |                  |
|----------|------------|--------------------|------------------|
| Range    | Resolution | Frequency Response | Accuracy         |
| 220.00mV | 0.01mV     | 40Hz~1kHz          | $\pm (1.0\%+10)$ |
|          |            | 1kHz~10kHz         | $\pm (1.5\%+30)$ |
| 2.2000V  | 0.1mV      | 40Hz~1kHz          | $\pm (0.8\%+10)$ |
|          |            | 1kHz~10kHz         | $\pm (1.2\%+50)$ |
|          |            | 40Hz~100Hz (LPF)   | $\pm (1.2\%+50)$ |
| 22.000V  | 1mV        | 40Hz~1kHz          | $\pm (0.8\%+10)$ |
|          |            | 1kHz~10kHz         | $\pm (1.2\%+50)$ |
|          |            | 40Hz~100Hz (LPF)   | $\pm (1.8\%+50)$ |
| 220.00V  | 10mV       | 40Hz~1kHz          | $\pm (0.8\%+10)$ |
|          |            | 1kHz~10kHz         | $\pm (2.0\%+50)$ |
|          |            | 40Hz~100Hz (LPF)   | $\pm (2.0\%+50)$ |
| 1000.0V  | 0.1V       | 40Hz~1kHz          | $\pm (1.2\%+10)$ |
|          |            | 1kHz~10kHz         | $\pm (3.0\%+50)$ |
|          |            | 40Hz~100Hz (LPF)   |                  |

| GDM-533        |            |                    |                 |
|----------------|------------|--------------------|-----------------|
| Range          | Resolution | Frequency Response | Accuracy        |
| 60.00mV        | 0.01mV     | 40Hz~1kHz          | $\pm (1.2\%+5)$ |
| 600.0mV        | 0.1mV      | 40Hz~1kHz          | $\pm (1.2\%+5)$ |
| 6.000V         | 0.001V     | 40Hz~1kHz          | $\pm (1.0\%+3)$ |
| 60.00V         | 0.01V      | 40Hz~1kHz          | $\pm (1.0\%+3)$ |
| 600.0V         | 0.1V       | 40Hz~1kHz          | $\pm (1.0\%+3)$ |
| 1000V          | 1V         | 40Hz~1kHz          | $\pm (1.2\%+5)$ |
| LoZ ACV 600.0V | 0.1V       | 40Hz~1kHz          | $\pm (2.0\%+5)$ |
| LoZ ACV 1000V  | 1V         | 40Hz~1kHz          | $\pm (2.0\%+5)$ |

- Input impedance: About 10M $\Omega$
- Display: True RMS
- Frequency response: 40Hz~1kHz (GDM-533), 40Hz~10kHz (GDM-541)
- Accuracy guarantee (GDM-533): 2%~100% of 60mV range, 1%~100% of other ranges; short circuit allows least significant digit  $\leq 3$
- Accuracy guarantee (GDM-541): 1%~100% of range at 40Hz~1kHz, 10%~100% of range at 1kHz~10kHz; short circuit allows least significant digit  $\leq 10$
- The AC crest factor can be  $\leq 3.0$  at 3000 counts, and can only be  $\leq 1.5$  at 6000 counts. The additional error should be added according to the crest factor of a non-sinusoidal wave as follows (GDM-533):
  - a) Add 4% when crest factor is 1~2
  - b) Add 5% when crest factor is 2~2.5
  - c) Add 7% when crest factor is 2.5~3
- The AC crest factor can be  $\leq 2.0$  at 10000 counts, and can only be  $\leq 1$  at 22000 counts. The additional error should be added according to the crest factor of a non-sinusoidal wave as follows (GDM-541):
  - a) Add 4% when crest factor is 1~2
  - b) Add 5% when crest factor is 2~2.5
  - c) Add 7% when crest factor is 2.5~3
- Frequency measurement range: 40Hz~1kHz (GDM-533), 40Hz~10kHz (GDM-541); input amplitude:  $\geq 10\%$  of voltage range Duty ratio is for reference only.
- Frequency accuracy:  $\pm (0.1\%+4)$ , resolution: 0.1Hz (GDM-533)
- Frequency accuracy:  $\pm (0.01\%+5)$ , resolution: 0.01Hz (GDM-541)
- Max input voltage: 1000V (if the voltage is >1000V, the red indicator light will be on and the buzzer will sound an alarm; if the voltage is >1010V, the LCD will display "OL")
- Overload protection: 1000V

## AC+DC Voltage

| GDM-541 |            |                    |                  |
|---------|------------|--------------------|------------------|
| Range   | Resolution | Frequency Response | Accuracy         |
| 2.2000V | 0.1mV      | 40Hz~500Hz         | $\pm (1.8\%+70)$ |
| 22.000V | 1mV        | 40Hz~500Hz         | $\pm (1.8\%+70)$ |
| 220.00V | 10mV       | 40Hz~500Hz         | $\pm (1.8\%+70)$ |
| 1000.0V | 0.1V       | 40Hz~500Hz         | $\pm (4.0\%+70)$ |

- AC voltage display: True RMS
- Input impedance: About 10M $\Omega$
- Accuracy guarantee: 10%~100% of range
- For AC voltage, short circuit allows least significant digit  $\leq 200$
- Overload protection: 1000V



## Resistance

| GDM-541  |            |             |
|----------|------------|-------------|
| Range    | Resolution | Accuracy    |
| 220.00Ω  | 0.01Ω      | ± (0.5+10)  |
| 2.2000kΩ | 0.1Ω       |             |
| 22.000kΩ | 1Ω         |             |
| 220.00kΩ | 10Ω        |             |
| 2.2000MΩ | 100Ω       | ± (0.8+10)  |
| 22.000MΩ | 1kΩ        | ± (1.5%+10) |
| 220.00MΩ | 10kΩ       | ± (3.0%+50) |

| GDM-533 |            |            |
|---------|------------|------------|
| Range   | Resolution | Accuracy   |
| 600.0Ω  | 0.1Ω       | ± (1.2%+2) |
| 6.000kΩ | 1Ω         | ± (1.0%+2) |
| 60.00kΩ | 10Ω        |            |
| 600.0kΩ | 100Ω       |            |
| 6.000MΩ | 1kΩ        | ± (1.2%+2) |
| 60.00MΩ | 10kΩ       | ± (2.0%+5) |

- Measurement result = displayed value – resistance of shorted test leads
- Open circuit voltage: About 1V
- Accuracy guarantee: 1%~100% of range
- Overload protection: 1000V

## Continuity and Diode

| Range   | Resolution | Remarks   |
|---|------------|---|
|  | 0.1Ω       | Broken circuit: Resistance $\geq 70\Omega$ , no beep<br>Well-connected circuit: Resistance $< 50\Omega$ , audio/visual alarm                |
|  | 0.001V     | Open circuit voltage: About 3V<br>For normal diodes, the buzzer will beep once.<br>For short circuit, the buzzer will beep for a long time. |

- Overload protection: 1000V
- When the forward voltage drop is within 0.12V~2V, the buzzer will beep once. When the forward voltage drop is  $< 0.12\text{V}$ , the buzzer will beep for a long time.

## Transistor Magnification (GDM-541)

| GDM-541 |            |   |
|---------|------------|---|
| Range   | Resolution | Remarks   |
| 1000β   | 1β         | I <sub>b0</sub> : About 1.8μA; V <sub>ce</sub> : About 2.5V |

- The displayed value of the transistor magnification is for reference only.



## Capacitance

| GDM-541        |            |                 |
|----------------|------------|-----------------|
| Range          | Resolution | Accuracy        |
| 22.000nF       | 1pF        | $\pm (3.0\%+5)$ |
| 220.00nF       | 10pF       |                 |
| 2.2000 $\mu$ F | 100pF      |                 |
| 22.000 $\mu$ F | 1nF        |                 |
| 220.00 $\mu$ F | 10nF       | $\pm (4.0\%+5)$ |
| 2.2000mF       | 100nF      |                 |
| 22.000mF       | 1 $\mu$ F  | $\pm (10\%+5)$  |
| 220.00mF       | 10 $\mu$ F | $\pm (20\%+5)$  |

| GDM-533       |            |                |
|---------------|------------|----------------|
| Range         | Resolution | Accuracy       |
| 60.00nF       | 10pF       | $\pm (3\%+5)$  |
| 600.0nF       | 100pF      |                |
| 6.000 $\mu$ F | 1nF        |                |
| 60.00 $\mu$ F | 10nF       |                |
| 600.0 $\mu$ F | 100nF      |                |
| 6.000mF       | 1 $\mu$ F  | $\pm (10\%+5)$ |
| 60.00mF       | 10 $\mu$ F |                |

- Overload protection: 1000V
- Measurement result = displayed value - capacitance of open-circuit test leads
- For capacitance  $\leq 1\mu\text{F}$  (GDM-533) and  $\leq 22\text{nF}$  (GDM-541), it is recommended to use the REL mode to deduct the open circuit reading.
- Accuracy guarantee: 1%~100% of range
- For ranges of 2.2 $\mu\text{F}$  and below, when the accuracy is  $\leq 3\%$ , 10 digits should be added (GDM-541).
- For ranges of 60mF (GDM-533) and 220mF (GDM-541), the measurement time is about 20s.

## Temperature (GDM-533)

| Range      |            | Resolution | Accuracy     |
|------------|------------|------------|--------------|
| -40~1000°C | -40~0°C    | 0.1°C~1°C  | ± (1.0%+3°C) |
|            | 0~300°C    |            | ± (1.0%+2°C) |
|            | 300~1000°C |            | ± (1.0%+3°C) |
| -40~1832°F | -40~32°F   | 0.2°F~2°F  | ± (1.0%+6°F) |
|            | 32~572°F   |            | ± (1.0%+4°F) |
|            | 572~1832°F |            | ± (1.0%+6°F) |

- The measured temperature should be less than 230°C/446°F.

## DC Current

| GDM-541  |            |             |
|----------|------------|-------------|
| Range    | Resolution | Accuracy    |
| 220.00μA | 0.01μA     | ± (0.5%+10) |
| 2200.0μA | 0.1μA      |             |
| 22.000mA | 1μA        |             |
| 220.00mA | 10μA       |             |
| 20.000A  | 1mA        | ± (1.2%+50) |

| GDM-533 |            |            |
|---------|------------|------------|
| Range   | Resolution | Accuracy   |
| 600.0μA | 0.1μA      | ± (1.0%+2) |
| 6000μA  | 1μA        |            |
| 60.00mA | 10μA       | ± (1.0%+3) |
| 600.0mA | 0.1mA      |            |
| 6.000A  | 1mA        | ± (1.2%+5) |
| 20.00A  | 10mA       |            |

- Overload protection:  
mA/ $\mu$ A range: F1 Fuse 600mA 1000V  $\Phi$ 6x32mm  
A range: F2 Fuse 11A 1000V  $\Phi$ 10x38mm
- Open circuit allows least significant digit  $\leq 5$  (GDM-533) and  $\leq 10$  (GDM-541).
- Accuracy guarantee: 1%~100% of range

## AC Current

| GDM-541      |              |                    |                  |
|--------------|--------------|--------------------|------------------|
| Range        | Resolution   | Frequency Response | Accuracy         |
| 220 $\mu$ A  | 0.01 $\mu$ A | 40Hz~1kHz          | $\pm (0.8\%+10)$ |
|              |              | 1kHz~10kHz         | $\pm (3\%+50)$   |
| 2200 $\mu$ A | 0.1 $\mu$ A  | 40Hz~1kHz          | $\pm (0.8\%+10)$ |
|              |              | 1kHz~10kHz         | $\pm (3\%+50)$   |
| 22mA         | 1 $\mu$ A    | 40Hz~1kHz          | $\pm (1.2\%+10)$ |
|              |              | 1kHz~10kHz         | $\pm (3\%+50)$   |
| 220mA        | 10 $\mu$ A   | 40Hz~1kHz          | $\pm (1.2\%+10)$ |
|              |              | 1kHz~10kHz         | $\pm (3\%+50)$   |
| 20A          | 1mA          | 40Hz~1kHz          | $\pm (1.2\%+10)$ |
|              |              | 1kHz~10kHz         | $\pm (3\%+50)$   |

| GDM-533       |             |                    |                 |
|---------------|-------------|--------------------|-----------------|
| Range         | Resolution  | Frequency Response | Accuracy        |
| 600.0 $\mu$ A | 0.1 $\mu$ A | 40Hz~1kHz          | $\pm (1.2\%+5)$ |
| 6000 $\mu$ A  | 1 $\mu$ A   | 40Hz~1kHz          |                 |
| 60.00mA       | 10 $\mu$ A  | 40Hz~1kHz          | $\pm (1.5\%+5)$ |
| 600.0mA       | 0.1mA       | 40Hz~1kHz          |                 |
| 6.000A        | 1mA         | 40Hz~1kHz          | $\pm (2.0\%+5)$ |
| 20.00A        | 10mA        | 40Hz~1kHz          |                 |

- Display: True RMS
- Frequency response: 40Hz~1kHz (GDM-533), 40Hz~10kHz (GDM-541)
- Accuracy guarantee (GDM-533): 5%~100% of 600.0 $\mu$ A range, 1%~100% of other ranges; open circuit allows least significant digit  $\leq 5$
- Accuracy guarantee (GDM-541): 1%~100% of range at 40Hz~1kHz, 10%~100% of range at 1kHz~10kHz (the minimum measured current at  $\mu$ A ranges is 30 $\mu$ A); open circuit allows least significant digit  $\leq 10$
- The AC crest factor can be  $\leq 3.0$  at 3000 counts, and can only be  $\leq 1.5$  at 6000 counts. The additional error should be added according to the crest factor of a non-sinusoidal wave as follows (GDM-533):
  - a) Add 4% when crest factor is 1~2
  - b) Add 5% when crest factor is 2~2.5
  - c) Add 7% when crest factor is 2.5~3
- The AC crest factor can be  $\leq 2.0$  at 10000 counts, and can only be  $\leq 1$  at 22000 counts. The additional error should be added according to the crest factor of a non-sinusoidal wave as follows (GDM-541):
  - a) Add 4% when crest factor is 1~2
  - b) Add 5% when crest factor is 2~2.5
  - c) Add 7% when crest factor is 2.5~3
- Frequency measurement range: 40Hz~1kHz (GDM-533), 40Hz~10kHz (GDM-541); input amplitude:  $\geq 50\%$  of current range. Duty ratio is for reference only.
- Frequency accuracy:  $\pm (0.1\%+4)$ , resolution: 0.1Hz (GDM-533)
- Frequency accuracy:  $\pm (0.01\%+5)$ , resolution: 0.01Hz (GDM-541)
- Overload protection: Same as that for DC current

## Frequency/Duty Ratio

| GDM-541     |                |                  |
|-------------|----------------|------------------|
| Range       | Resolution     | Accuracy         |
| 10Hz~220MHz | 0.01Hz~0.01MHz | $\pm (0.01\%+5)$ |
| 0.1%~99.9%  | 0.1%           | $\pm (2\%+5)$    |

| GDM-533          |                |                 |
|------------------|----------------|-----------------|
| Range            | Resolution     | Accuracy        |
| 10.00Hz~10.00MHz | 0.01Hz~0.01MHz | $\pm (0.1\%+4)$ |
| 0.1%~99.9%       | 0.1%           | $\pm (2\%+5)$   |

- Frequency input amplitude:
  - $\leq 100\text{kHz}$ :  $200\text{mVrms} \leq \text{input amplitude} \leq 20\text{Vrms}$
  - $>100\text{kHz} \sim 1\text{MHz}$ :  $600\text{mVrms} \leq \text{input amplitude} \leq 20\text{Vrms}$
  - $>1\text{MHz}$  (GDM-533):  $1\text{Vrms} \leq \text{input amplitude} \leq 20\text{Vrms}$
  - $>1\text{MHz} \sim 40\text{MHz}$  (GDM-541):  $1\text{Vrms} \leq \text{input amplitude} \leq 20\text{Vrms}$
  - $>40\text{MHz}$  (GDM-541): Not specified
- Duty ratio measurement is only applicable to square waves.
  - $1\text{Vpp} \leq \text{input amplitude} \leq 20\text{Vpp}$
  - Frequency  $\leq 10\text{kHz}$ , duty ratio: 10.0% ~ 90.0%
- Overload protection: 1000V

## Indicator Light

| Function  | Status     | Description   |
|---|------------|---|
| NCV   | Off        | <36V  |
|   | On, red    | 50V~1000V (the red indicator light flashes from slow to fast)                             |
| Continuity  | Off        | OL  |
|   | On, red    | No continuity ( $\geq 70\Omega$ )   |
|   | On, green  | Continuity ( $< 50\Omega$ )   |
| Diode   | Off        | >2V   |
|   | On, red    | Breakdown ( $< 0.12V$ )   |
|   | On, green  | Conduction ( $0.12V \sim 2V$ )  |
| AC/DC voltage   | Off        | $\leq 1000V$  |
|   | On, red    | $> 1000V$   |
| Current   | Off        | $\leq 10A$  |
|   | On, red    | $> 10A$   |
| Internal temperature during AC/DC current measurement | Off        | The temperature in the meter drops to $< 40^{\circ}C$ after measurement of large current. |
|   | On, yellow | The temperature in the meter is $\geq 75^{\circ}C$ after measurement of large current.    |

# M AINTENANCE



Caution


- Before opening the rear cover or battery cover of the meter, switch off the power supply and remove the test leads.

## General Maintenance

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- Clean the meter casing with a damp cloth and mild detergent. Do not use abrasives or solvents!
- If there is any malfunction, stop using the meter and send it for maintenance.
- The maintenance and service must be implemented by qualified professionals or designated departments.

## Battery/Fuse Replacement

- Battery: 4×1.5V AAA batteries
- Fuse: F1 Fuse 600mA 1000V  $\Phi 6 \times 32$ mm (mA/ $\mu$ A input terminal)  
F2 Fuse 11A 1000V  $\Phi 10 \times 38$ mm (A input terminal)
- When “” is displayed, please replace the batteries in time to ensure measurement accuracy.
- Resistance measurement can be used to check the built-in 600mA and 11A fuses. Operation: Insert the red test lead into the  $\frac{500}{V \Omega \rightarrow 10}$  or  $\frac{500}{V \Omega \rightarrow 10}^{\circ C}$  terminal. Insert the red probe into the mA/ $\mu$ A input terminal to measure the resistance. If the LCD displays “OL”, the 600mA fuse is blown. Insert the red probe into the A input terminal to measure the resistance. If the LCD displays “OL”, the 11A fuse is blown.

### Steps of Replacement

1. Turn the function dial to the "OFF" position, and remove the test leads.
2. Unscrew and remove the battery cover to replace the batteries and fuses.

