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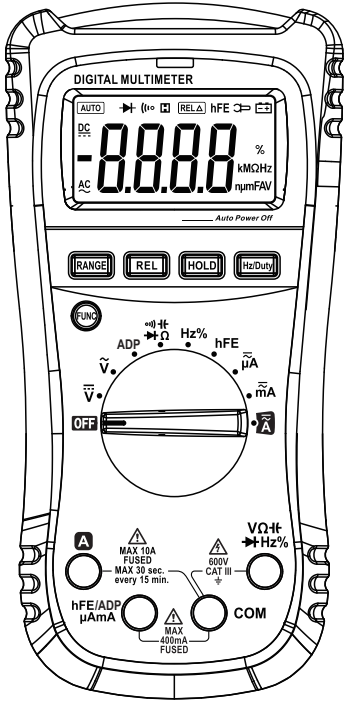
MY78

# Digital Multimeter




CAT III 600V

C ETL US LISTED Intertek

CE

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## 1.Introduction

This digital multimeter complies with international safety standards EN61010-1 electrical safety requirements for electronic measuring instruments and handheld digital multimeters; CAT III 600V and pollution degree of 2. Read all instructions carefully before using the meter and follow all relevant safety standards.

### 1.1 Safety Guidelines

#### 1.1.1 Safety Category Information

- Category III measurements (CAT III) are measurements done inside the infrastructure of a building.
  **Example:** fixed equipment switchboards, circuit breakers, wiring, including cables, bus bars, junction boxes , switches, sockets, output terminals on devices for industrial use and other equipment.
- Category II measurements (CAT II) are measurements done between the wall socket and a device.
  **Example:** measurements on household appliances, portable tools and similar equipment.
- Category I measurements (CAT I) are measurements done at the component level.
  **Example:** surface mounted devices on a circuit board.

#### 1.1.2 Precautions

- Allow the meter to warm up for 30 sec. before use.
- Do not place meter in a strong magnetic field; this may cause false readings.
- Do not place the meter in any environment with high pressure, high temperature, dust, explosive gas or vapor.
- Inspect the case before use. Check for cracks in the casing and the insulation around the input sockets.
- Only use the test leads provided with the meter.If leads are damaged or need to be replaced, use similar leads with matching specifications.



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- Ensure the meter works properly by testing a known voltage source first.If not working properly, the protective equipment may be damaged; have the meter serviced before using.
- Make sure the test leads are in the correct input jacks before measurement.
- Do not perform a voltage test using the 10A input jack.
- Always be careful when working with voltages above 60V dc or 30V ac rms. Keep fingers behind the probe barriers when making voltage measurements.
- Never exceed the protection limit values indicated in the specifications for each range of measurement.
- Choose the highest range when the value to be measured is unknown beforehand.
- When connecting the test leads to a measurement circuit, connect the common lead first, then the live lead. Reverse when disconnecting.
- Disconnect leads from circuit before switching functions/ranges.
- In order to avoid incorrect readings and avoid electric shock injury, for DC measurements test the circuit using AC mode to check for the presence of AC voltage then return to DC mode for measurement.
- Turn off power to circuit and discharge all capacitors before making resistance, continuity or diode measurements.
- Disconnect leads from circuit before testing transistors.
- Before making current measurements, turn off power to the circuit, break the circuit, connect the leads in series across the break, then turn the power back on for measurement.
- When the "  "symbol appears, replace the batteries to avoid incorrect readings.

### 1.1.3 Safety Symbols

| | |
|---|---|
| ⚠ | Note-Important safety information, refer to the instruction manual. |
| ⚠ | Caution, possibility of electric shock |
| ⧈ | Equipment protected throughout by double insulation or reinforced insulation. |
| c ETL us Intertek | Conforms to UL STD. 61010-1, 61010-2-032, 61010-2-033; Certified to CSA STD C22.2 NO. 61010-1, 61010-2-032,61010-2-033 |
| CE | Complies with European (EU) safety standards |
| ⏚ | Earth (ground) TERMINAL |
| ⎓ | Direct current |
| ~ | Alternating current |
| ⊣⊢ | Fuse |

### 1.1.4 Maintenance

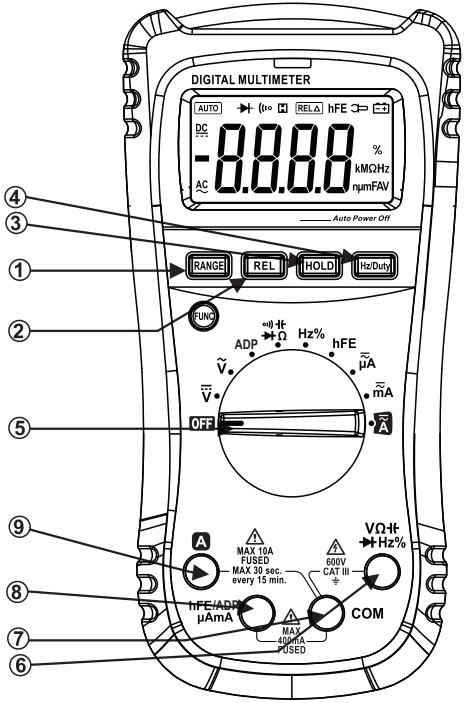
- Maintenance/calibration should only be performed by professionals.
- For continued protection against fire, replace fuse only with the specified voltage and current ratings listed in the manual: F1 400mA/600V and F2: 10A/600V
- Before opening the case, always disconnect test leads from all energized circuits.
- Never use the meter unless the back cover is in place and fastened securely.
- If any abnormality is observed, stop using the meter and send it in for repair.
- If the meter is not going to be used for an extended period of time, remove the batteries and avoid storing in a hot/humid environment.





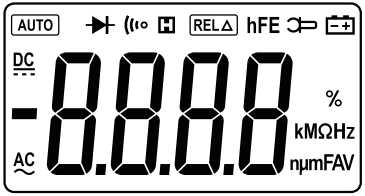
## 2.Instrument Description

### 2.1 Front Panel



1.Range: switches between ranges in manual mode
2.Rel: shows current measurement as compared to measurement when button is pressed.
3.Hold: keeps current reading on display
4.Hz/Duty: switches between frequency/duty cycle
5.Rotary switch
6.V/Ω/ ⊣⊢ /Hz input jack
7.COM input jack
8.μA/mA/ADP/hFE input jack
9.10A input jack

## 2.2 Display




| Symbol | Description |
|---|---|
| | Battery charge is low.<br>⚠To avoid false readings which could lead to personal injury or damage to the meter, replace battery when symbol appears. |
| — | Negative polarity (DC) |
| AC | Alternating current |





| | | |
|---|---|---|
| DC | Direct current | |
| AUTO | Auto-range | |
| | Diode mode | |
| hFE | transistor gain mode | |
| | Continuity mode | |
| H | Reading hold | |
| V, mV | V :<br>mV: | Volts (voltage units)<br>millivolts: $1x10^{-3}$ V or 0.001V |
| A, mA, μA | A :<br>mA:<br>μA: | Amps (current units)<br>milliamps: $1x10^{-3}$ A or 0.001A<br>microamps:$1x10^{-6}$ A or 0.000001A |
| Ω,kΩ,MΩ | Ω :<br>kΩ:<br>MΩ: | Ohms (resistance)<br>kilohms:.$1x10^{3}$ Ω or 1000Ω<br>megaohms: $1x10^{6}$ Ω or 1,000,000Ω |
| Hz,kHz,MHz | Hz:<br>kHz:<br>MHz: | Hertz (frequency)<br>Kilohertz:$1x10^{3}$ Hz or 1000 Hz<br>Megahertz:$1x10^{6}$ Hz or 1,000,000Hz |
| μF, nF | F:<br>μF:<br>nF: | Farads (capacitance)<br>microfarads: $1x10^{-6}$ F or 0.000001F<br>nanofarads: $1x10^{-9}$ F or 0.000000001F |
| OL | Overload (need to select a higher range) | |
| REL△ | Relative measurement | |
| ADP | Current clamp attachment measurement | |

## 2.3 Buttons

| Button | Function | Description |
|---|---|---|
| FUNC | ⊣ ◦)) ⊣( Ω ADP、A、mA and μA Hold when turning on meter | Switch between functions switch between AC/DC Turns off auto power off |
| RANGE | ~V、V、Ω、ADP、mA、μA and A | 1.Press **RANGE** to enter manual range.<br>2.Each press increases the range.<br>3.Hold **RANGE** to return to auto-range. |
| HOLD | Any function | Press **HOLD** to keep current reading on the display.Press again to release the hold. |
| REL | Any function except Hz/% | Press **REL** to show current reading relative to the reading when the button was pressed. |
| HZ/Duty | ~V、V、ADP mA, μA、A、Hz% | Switch between frequency and duty cycle measurements. |





## 2.4 Rotary Switch

| Position | Function |
|---|---|
| $\tilde{V}$ | AC Voltage |
| $\overline{\tilde{V}}$ | DC Voltage |
| Ω ⊣( ⊣ ◦)) | Resistance/Capacitance/ Diode/Continuity |
| Hz% | Frequency/Duty Cycle |
| hFE | hFE Transistor Gain |
| ADP | For optional current clamp attachment |
| μA | μA current |
| mA | mA current (up to 400mA) |
| A | A current (up to 10A) |
| OFF | Off position |

## 2.5 Input Jacks

| Jack | Description |
|---|---|
| COM | DC Voltage |
| VΩ ⊣( ⊣ Hz% | Input for voltage, resistance, capacitance, diodes, continuity, frequency, duty cycle |
| hFE ADP μA mA | Input for μA/mA current below 400mA, transistor, current clamp attachment |
| A | Input for current above 400mA |

### 2.6 Accessories

| | | |
|---|---|---|
| 1 | Manual | 1 piece |
| 2 | Test leads | 1 pair |
| 3 | Case | 1 piece |

## 3. Operating Instructions

### 3.1 General Instructions

#### 3.1.1 Data Hold

Press **HOLD** to keep the current reading on the display. To release the hold, press **HOLD** again or switch functions on the rotary switch to return to normal readings.

#### 3.1.2 Manual/Auto Range

- The meter's default range is auto-range.The meter will automatically pick the appropriate range for measurement.
- In manual range, the range is specified by the user, locking the display into one specific range.

**To enter manual range:**

1.Press the **RANGE** button.
"AUTO" will disappear from the display. Each press of the button will increase the range and return to the lowest range once pressed at the highest range.

**Note**: If you press RANGE while in data hold mode, the meter will release the hold.

2.To return to auto-range mode, hold **RANGE** until "AUTO" appears on the display.

#### 3.1.3 Auto Power off

After 20 minutes of non-use the meter will turn itself off. Press **HOLD** or turn the rotary switch to any position to turn the meter back on.



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### 3.2 Measurement Operation

#### 3.2.1 DC/AC Voltage

> **⚠Warning**
> **To prevent personal injury or damage to the meter, do not measure voltages that might exceed 600V DC/AC rms.**

DC voltage ranges: 400.0mV. 4.000V, 40.00V, 400.0V, 600V. AC voltage ranges: 400.0mV. 4.000V, 40.00V, 400.0V, 600V. (400.0mV range only available in manual range)

To measure DC/AC voltage:

1.Turn the rotary switch to the DC or AC voltage position; press RANGE for manual range if needed.
2.Connect the red test lead to the V input jack and the black test lead to the COM jack.
3.Connect the test leads in parallel to the circuit under test.
4.Read the measured voltage on the display. When measuring DC voltage, the display will show the polarity of the red lead.

**Note:**

In small voltage ranges, the display may show a reading before leads are connected.This is normal because of the high sensitivity of the meter.Once the leads are connected to a circuit, the true voltage will be displayed.

### 3.2.2 Resistance

**⚠Warning**
**Turn off all power and discharge all capacitors before making resistance measurements.**

Resistance ranges are: 400.0Ω, 4.000kΩ, 40.00kΩ, 400.0kΩ, 4.000MΩ, 40.00MΩ.

To measure resistance:

1. Turn the rotary switch to the position. The default mode is resistance.
2. Connect the red test lead to the Ω input jack and the black test lead to the COM jack.
3. Connect the leads to the resistance or circuit under test.
4. Read the measured resistance on the display.

**Tips for measuring resistance:**

- Measured resistance and a components rated resistance often differ slightly. This is normal due to the test current flowing through all possible paths between the leads.
- When measuring low resistances, short the test leads and record the measurement. Then connect the leads to the resistance to be measured and subtract the shorted resistance from the measured resistance.
- When the measured resistance is greater than 1MΩ, wait a few seconds for readings to stabilize. This is normal for high resistance measurements.
- When the circuit is open or leads not connected, the display will show 'OL'.



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### 3.2.3 Diodes

**⚠Warning**
**Turn off all power and discharge all capacitors before testing diodes.**

To test a diode:

1. Turn the rotary switch to the position. Press (FUNC) once to switch to diode mode.
2. Connect the red test lead to the input jack and the black test lead to the COM jack.
3. Connect the red lead to the anode (+) and the black lead to the cathode (-) of the diode.
4. The display will show the forward biased voltage drop. If the leads are reversed, the display will show 'OL'.

In a circuit, a good diode will produce a voltage drop between .05~0.8V. Reverse bias readings will depend on the resistance of the pathways between the leads.

### 3.2.4 Continuity

**⚠Warning**
**Turn off all power and discharge all capacitors before testing continuity.**

To test continuity:

1. Turn the rotary switch to the position. Press (FUNC) twice to switch to continuity mode.
2. Connect the red test lead to the Ω input jack and the black test lead to the COM jack.
3. Connect the leads to the circuit under test.
4. If the measured resistance is less than 50±20Ω , the buzzer will sound.

### 3.2.5 hFE Transistor Gain

**⚠Warning**
**Remove the transistor under test from any circuit to prevent damage to the meter.**

To measure transistor gain:
1.Turn the rotary switch to the hFE position.
2.Connect the multi-function socket to the hFE (+) input jack and the COM jack.
3.Connect the transistor to the appropriate holes in the multi-function socket depending on the type of transistor (NPN or PNP).
4.The display will show the measured transistor gain.

### 3.2.6 Capacitance

**⚠Warning**
**Turn off all power and discharge all capacitors before testing capacitance.**

Capacitance ranges are: 4.000nF, 40.00nF, 400.0nF, 4.000μF, 40.00μF, 200μF.
To measure capaciatance:
1.Turn the rotary switch to the position.Press (FUNC) 3 times to switch to capacitance mode.
2.Connect the red test lead to the input jack and the black test lead to the COM jack.
3.Connect the leads to the circuit under test.
4.Read the measured capacitance on the display.
Tips for measuring capacitance:
When measuring large capacitances,wait a few seconds for readings to stabilize.This is normal for high capacitance measurements.





### 3.2.7 Frequency

**⚠Warning**
**To prevent personal injury or damage to the meter, do not measure frequency with larger than 250V AC rms present.**

To measure frequency:
1.Turn the rotary switch to the Hz% position.
2.Connect the red test lead to the Hz% input jack and the black test lead to the COM jack.
3.Connect the test leads in parallel to the circuit under test.
4.Read the measured frequency on the display.
**Note:**
In electrically noisy environments, use shielded test leads to make small frequency measurements.

### 3.2.8 Clamp Current

**⚠Warning**
**To prevent personal injury or damage to the meter, do not measure with voltages present that might exceed 250V DC/AC rms.**

1.Turn the rotary switch to the **ADP** position.Press (FUNC) to switch between AC/DC modes.
2.Connect the red lead of the clamp attachment to the **ADP** input jack and the black lead to the COM jack.
3. Open the clamp head and clamp it around the conductor under test.
4.Read the measured current on the display.When measuring DC current, the display will show the polarity of the red lead.If the display shows “OL”the input has exceed the selected range; select a higher range.

### 3.2.9 DC/AC Current

**⚠Warning**
**Do not measure current when voltages might exceed 250V to avoid blowing the fuses which can lead to personal injury or damage to the meter.**

Current ranges are: 400.0μA, 4000μA, 40.00mA, 400.0mA, 10.00A.
To measure current:
1.Turn off power to circuit and discharge all capacitors.
2.Turn the rotary switch to the μA, mA or A position.
3.Press (FUNC) to switch between DC/AC modes.
4.Connect the red test lead to the μAmA input jack if measured current is less than 400mA, the A input jack for measurements above 400mA and the black test lead to the COM jack.
5.Break the circuit and connect the leads in series across the break with the red lead at the higher voltage side and the black lead on the lower voltage side.
6.Turn on power to the circuit and read the measured current on the display.If the display shows“OL” the measured value has exceed the selected range.Move the rotary switch to the next higher current position.





## 4. Specifications

### 4.1 General Specifications

| Function | Range |
|---|---|
| Safety Rating | 600V CAT.III |
| Pollution degree | 2 |
| Operating Altitude | <2000m |
| Operating Temperature/ Humidity | 0~40°C, (<80% RH) |
| Storage Temperature/ Humidity | -10~60°C, (<70% RH, remove battery) |
| Temperature coefficient | 0.1xaccuracy/0°C (>18°C or <28°C) |
| Max. Input between terminals and earth ground | 600V DC or AC rms |
| Fuse Protection | F1 400mA/1000V<br>F2 10A/600V |
| Sample Rate | Approx. 3 times/sec, |
| Display | 3 ½ digit LCD display,max. reading: 3999. |
| Over-range Indication | display shows“OL” |
| Low Battery Indication | When battery voltage drops below the normal operating voltage,“ ”will appear on the display. |
| Polarity Indication | Display automatically displays “-“ |
| Power | 1x 9V battery NEDA 1604 or 6F22 |
| Dimensions | 189(L)91(W)31.5(H) mm. |
| Weight | approx. 420g (including battery) |

## 4.2 Technical Specifications

Accuracy: ±(% of reading + digits) at 18°C~28°C with a relative humidity of <80%; guaranteed for a period of one year.

### 4.2.1 DC Voltage

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 400mV | 0.1mV | ±(0.7% of reading +2 digits) |
| 4V | 1mV | |
| 40V | 10mV | |
| 400V | 100mV | |
| 600V | 1V | ±(0.8% of reading +2 digits) |

Input impedance: 10MΩ
Max. input voltage: 600V DC or AC rms.

### 4.2.2 AC Voltage

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 400mV | 0.1mV | ±(3.0% of reading +3 digits) |
| 4V | 1mV | ±(0.8% of reading +3 digits) |
| 40V | 10mV | |
| 400V | 100mV | |
| 600V | 1V | ±(1.2% of reading +3 digits) |

Input Impedance: 10MΩ
Max. Input Voltage: 600V DC or AC rms.
Frequency Response: 4V range: 40Hz~400Hz;
other ranges: 40Hz~1kHz rms sine wave (avg. responding)



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### 4.2.3 hFE Transistor Gain

| Function | Description | |
|---|---|---|
| hFE | Displays approx. hFE transistor gain (0-1000) | Base current: approx. 10μA Vce: approx. 2.8V |

### 4.2.4 Resistance

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 400Ω | 0.1Ω | ±(1.2% of reading +2 digits) |
| 4kΩ | 1Ω | |
| 40kΩ | 10Ω | |
| 400kΩ | 100Ω | |
| 4MΩ | 1kΩ | |
| 40MΩ | 10kΩ | ±(2.0% of reading +5 digits) |

Open circuit voltage: approx. 250mV
Overload protection: 250V DC or AC rms.

### 4.2.5 Continuity

| Function | Description |
|---|---|
|  | The buzzer will sound if the measured resistance is less than50±20Ω. |

Open circuit voltage: approx. 0.5V
Overload Protection: 250V DC or AC rms

### 4.2.6 Diodes

| Function | Resolution | Description |
|---|---|---|
|  | 1mV | The display shows the approx. forward voltage drop. |

Forward DC current: approx. 1mA
Reverse DC voltage: approx. 1.5V
Overload Protection: 250V DC or AC rms

### 4.2.7 Capacitance

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 4nF | 1pF | ±(4.0% of reading +25digits) |
| 40nF | 10pF | ±(4.0% of reading +15digits) |
| 400nF | 100pF | |
| 4μF | 1nF | |
| 40μF | 10nF | |
| 200μF | 100nF | |

Overload protection: 250V DC or AC rms.



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### 4.2.8 Frequency

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 9.999Hz | 0.001Hz | ±(2.0% of reading +5 digits) |
| 99.99Hz | 0.01Hz | |
| 999.9Hz | 0.1Hz | |
| 9.999kHz | 1Hz | |
| 99.99kHz | 10Hz | |
| 199.9kHz | 100Hz | |
| >200kHz | 100Hz | For reference only |

Overload protection: 250V DC or AC rms.
Input voltage range: 0.6V~3V AC rms (as frequency increases, input voltage increases)
Frequency response: 10Hz~200kHz sine wave; 0.5Hz~200kHz square wave.

### 4.2.9 Clamp Current

| Measuring range | Resolution | Accuracy |
|---|---|---|
| DC40A | 1A/1mV | ±(0.8% of reading +3 digits) |
| DC400A | 1A/1mV | |
| AC40A | 1A/1mV | ±(1.0% of reading +3 digits) |
| AC400A | 1A/1mV | |

Input Impedance: 1MΩ
Max. Input Voltage: 250V DC or AC rms.

#### 4.2.10 DC Current

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 400μA | 0.1μA | ±(1.2% of reading +3 digits) |
| 4000μA | 1μA | |
| 40mA | 0.01mA | |
| 400mA | 0.1mA | |
| 10A | 10mA | ±(2.0% of reading +5digits) |

Overload Protection: F1 400mA/1000V; F2 10A/600V
Max. Input Current: μA/mA: 400mA DC or AC rms.
10A: 10A (do not exceed 4 min.)

#### 4.2.11 AC Current

| Measuring range | Resolution | Accuracy |
|---|---|---|
| 400μA | 0.1μA | ±(1.5% of reading +5 digits) |
| 4000μA | 1μA | |
| 40mA | 0.01mA | |
| 400mA | 0.1mA | |
| 10A | 10mA | ±(3.0% of reading +7 digits) |

Overload Protection: F1 400mA/1000V; F2 10A/600V
Max. Input Current: μA/mA: 400mA DC or AC rms.
10A: 10A (do not exceed 4 min.)
Frequency Response: 40Hz~400Hz rms sine wave (avg. responding)

#### 4.2.12 DUTY CYCLE

| Range | Resolution | Accuracy |
|---|---|---|
| 5%~95% | 0.1% | ±(2.0% + 5) |





## 5. Maintenance

### 5.1 Cleaning Meter

**⚠Warning**
**Before opening the back cover, turn off the meter and disconnect test leads from any circuit.**

Clean meter with a damp cloth and mild detergent; do not use chemical solvents on the meter.Dirt or moisture on the input jacks can affect the reading of the meter.

**To clean the input jacks:**

- Turn the rotary switch to OFF and remove test leads.
- Remove all dirt from the input jacks.
- Use a detergent or lubricant with a cotton swab to clean the jacks.Use a new cotton swab for each jack to prevent cross contamination.

### 5.2 Changing Battery/Fuses

**⚠Warning**
**To avoid electric shock and personal injury, turn off the meter and remove the test leads before opening the battery cover.**
**Replace fuses with ones that have the exact same ratings: F1:F400mA/1000V;F2:F10A/600V**

To replace battery and fuses:

1. Turn off the meter.
2. Disconnect test leads from input jacks.
3. Use a screwdriver and remove the back cover from the meter.
4. Remove used battery and replace with a new 9V battery.
5. Remove and replace blow fuses with new ones.
6. Replace back cover before using meter again.

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