# Auto Range Multimeter
# with USB / LAN wire

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# 1. GENERAL INSTRUCTIONS

This instrument complies with IEC 61010-1: 2001, CAT Ⅲ 1000V and CAT Ⅵ 600V overvoltage standards. See Specifications.

To get the best service from this instrument, read carefully this user's manual and respect the detailed safety precautions.

International symbols used on the Meter and in this manual are explained in chapter 1.2.

## 1.1 Precautions safety measures

### 1.1.1 Preliminary

* As the possibilities of high transient overvoltages occurred in today's power systems increase, more stringent safety standards are set for the electrical test equipment. Transients on electrical systems(power grid, feeder or branch circuits) will trigger a series of incidents that may result in serious personal injury. To protect you against transients, safety must be built into the test equipment.

| Overvoltage category | In brief | Examples |
|---|---|---|
| CAT Ⅰ | Electronic | • Protected electronic equipment.<br>• Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriately low level.<br>• Any high-voltage, low-energy source derived from a highwinding resistance transformer, such as the high-voltage section of a copier. |
| CAT Ⅱ | Single-phase receptacle connected loads | • Appliance, portable tools, and other household and similar loads.<br>• Outlet and long branch circuits.<br>• Outlets at more than 10 meters (30 feet) from CAT III source.<br>• Outlets at more that 20 meters (60 feet) from CAT IV source. |
| CAT Ⅲ | Three-phase distribution, including single-phase commercial lighting | • Equipment in fixed installations, such as switchgear and polyphase motors.<br>• Bus and feeder in industrial plants.<br>• Feeders and short branch circuits, distribution panel devices.<br>• Lighting systems in larger buildings.<br>• Appliance outlets with short connections to service entrance. |
| CAT Ⅵ | Three-phase at utility connection, any outdoor conductors | • Refers to the “origin of installation”; i.e., where low-voltage connection is made to utility power.<br>• Electricity meters, primary overcurrent protection equipment.<br>• Outside and service entrance, service drop from pole to building, run between meter and panel.<br>• Overhead line to detached building, underground line to well pump. |

* When using this Multimeter, the user must observe all normal safety rules concerning:
— protection against the dangers of electric current.
— protection of the Multimeter against misuse.
* For your own safety, only use the test probes supplied with the instrument. Before use, check that they are in good condition.

### 1.1.2 During use

* If the meter is used near noise generating equipment, be aware that display may become unstable or indicate large errors.
* Do not use the meter or test leads if they look damaged.
* Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
* Use extreme caution when working around bare conductors or bus bars.
* Do not operate the meter around explosive gas, vapor, or dust.
* Verify a Meter's operation by measuring a known voltage. Do not use the Meter if it operates abnormally. Protection may be impaired. When in doubt, have the Meter serviced.
* Uses the proper terminals, function, and range for your measurements.
* When the range of the value to be measured is unknown, check that the range initially set on the multimeter is the highest possible or, wherever possible, choose the autoranging mode.
* To avoid damages to the instrument, do not exceed the maximum limits of the input values shown in the technical specification tables.
* When the multimeter is linked to measurement circuits, do not touch unused terminals.
* Caution when working with voltages above 60Vdc or 30Vac rms. Such voltages pose a shock hazard.
* When using the probes, keep your fingers behind the finger guards.
* When making connections, connect the common test lead before connecting the live test lead; when disconnecting, disconnect the live test lead before disconnecting the common test lead.
* Before changing functions, disconnect the test leads from the circuit under test.
* For all dc functions, including manual or auto-ranging, to avoid the risk of shock due to possible improper reading, verify the presence of any ac voltages by first using the ac function. Then select a dc voltage range equal to or greater than the ac range.
* Disconnect circuits power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
* Never perform resistance or continuity measurements on live circuits.
* Before measuring current, check the meter's fuse and turn off power to the circuit before connecting the meter to the circuit.
* In TV repair work, or when carrying out measurements on power switching circuits, remember that high amplitude

voltage pulses at the test points can damage the multimeter. Use of a TV filter will attenuate any such pulses.

* Use just one 6F22 battery, properly installed in the Meter's battery case, to power the Meter.
* Replace the battery as soon as the battery indicator ( ) appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
* Do not measure voltages above 1000V in Category III, or 600V in Category Ⅳ installations.
* When in REL mode, the "**REL"** symbol is displayed. Caution must be used because hazardous voltage may be present.
* Do not operate the Meter with the case (or part of the case) removed.

## 1.2 Symbols:

Symbols used in this manual and on the instrument:

| | |
|---|---|
| ⚠ | ***Caution*****:** refer to the instruction manual. Incorrect use may result in damage to the device or its components. |
| ~ | AC (Alternating Current) |
| ⎓ | DC (Direct Current) |
| ≂ | AC or DC |
| ⏚ | Earth ground |
| ⧈ | Double insulated |
| ⎓ | Fuse |
| CE | Conforms to European Union directives |

## 1.3 Instructions

* Remove test leads from the Meter before opening the Meter case or battery cover.
* When servicing the Meter, use only specified replacement parts.
* Before opening up the instrument, always disconnect from all sources of electric current and make sure you are not charged with static electricity, which may destroy internal components.
* Any adjustment, maintenance or repair work carried out on the meter while it is live should be carried out only by

appropriately qualified personnel, after having taken into account the instructions in this present manual.

* A "qualified person" is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He is trained and authorized to energize and de-energize circuits and equipment in accordance with established practices.
* When the instrument is opened up, remember that some internal capacitors can retain a dangerous potential even after the instrument is switched off.
* If any faults or abnormalities are observed, take the instrument out of service and ensure that it cannot be used until it has been checked out.
* If the meter is not going to be used for a long time, take out the battery and do not store the meter in high temperature or high humidity environment.

## 2. DESCRIPTION

### 2.1 Instrument Familiarization

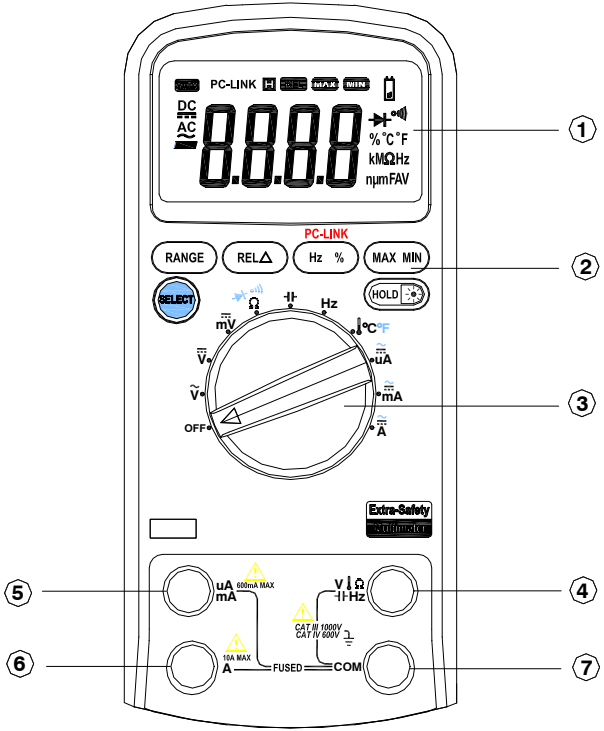



**Figure 2-1**

**The front panel is shown as in Figure 2-1, explanation being as follows:**

① LCD display
Used for displaying the measuring results and various symbols.

② Keypad
Measurement function keys.

③ Rotary switch
Used for selecting measurement functions.

④ V Ω
Hz

Terminal receiving the red test lead for voltage, resistance, capacitance, frequency, Temperature, diode and continuity measurements.

⑤ uA/mA
Terminal receiving the red test lead for μA, mA measurements.

⑥ A
Terminal receiving the red test lead for 6A,10A measurements.

⑦ COM
Terminal receiving the black test lead as a common reference.

## 2.2 LCD Display

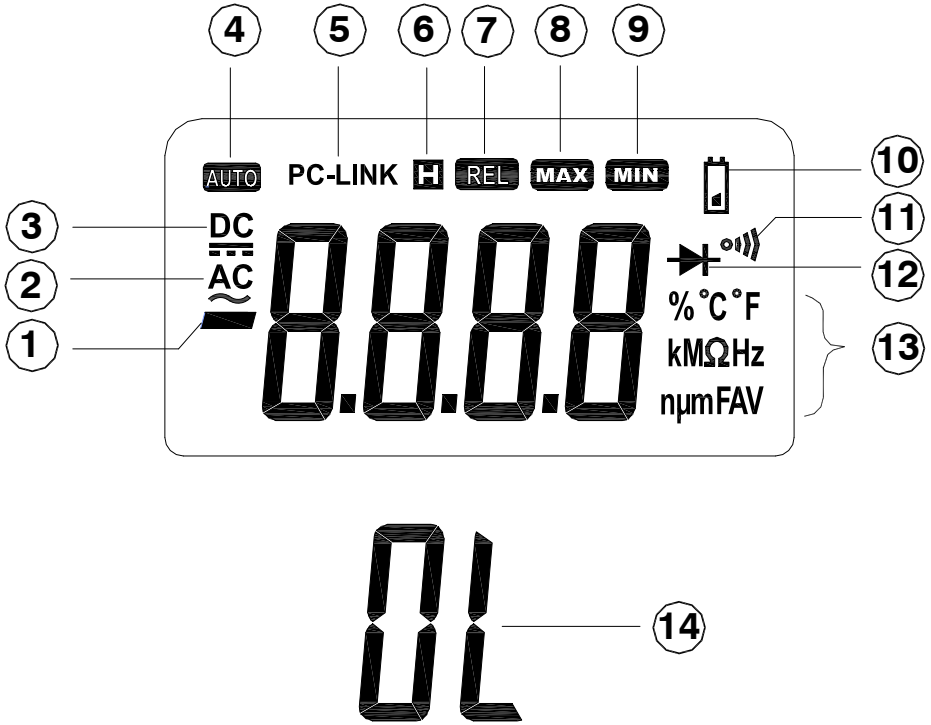



Figure 2-2

LCD screen is shown as in Figure 2-2, with its every symbol's meaning shown as in the Table 1:

| No. | Symbol | Meaning |
|---|---|---|
| 1 |  | Indicates negative readings |
| 2 | AC | Indicator for AC voltage or current |
| 3 | DC | Indicator for DC voltage or current |
| 4 | **AUTO** | The meter is in the Autorange mode in which the meter automatically selects the range with the best resolution. |
| 5 | **PC-LINK** | The Meter is in the data transmission mode. |
| 6 | **H** | The meter is in Data Hold mode. |
| 7 | **REL** | The meter is in Relative Measurement mode. |
| 8 | **MAX** | Display maximum data |
| 9 | **MIN** | Display minimum data |
| 10 |  | Low battery indication |
| 11 |  | The meter is in Continuity Check mode. |
| 12 |  | The meter is in Diode Test mode. |
| 13 | **%℃℉ KMΩHz nμmFAV** | Measurement units |
| 14 | OL | This symbol means that the input is too large for the selected range. |

## 2.3 Keypad

2.3.1 **SELECT**

1. At Ω⊣◄ position
   Switches between Resistance measurement, Diode Test and Continuity check.
2. At **A mA μA** position
   Switches between dc and ac current.
3. Power-up Option
   Disables automatic power-off feature.

2.3.2 HOLD

Press it to enter and exit the Data Hold mode. Press it and hold 2 seconds, backlight on; if press it and hold for 2 seconds again, backlight off.

2.3.3 **RANGE**

At V~, V⎓, Ω, A, mA and μA.

1. Press **RANGE** to enter the manual ranging mode.
2. Press **RANGE** to step through the ranges available for the selected function.
3. Press and hold **RANGE** for 2 seconds to return to autoranging.

2.3.4 **REL△**

Press **REL△** to enter and exit the Relative measurement mode. (Except Hz/Duty)

2.3.5 **Hz %**

At V~, A, mA and μA.

1. Press it to start the frequency counter.
2. Press it again to enter duty (load factor) mode.
3. Press it again to exit the frequency counter mode.
4. Hold down this key while turning the meter on to enter the the data transmission mode.

2.3.6 **MAX/MIN**

This key is for measuring maximum value and minimum value.

1. Press it to enter Max/Min mode.

2. Press it again; the LCD will display the Maximum Value.
3. Press it again; the LCD will display the Minimum Value.
4. Press and hold it for two seconds, the meter will return to normal measurement state.
   (Except Hz/Duty and Capacitance)

# 3. FUNCTION DESCRIPTION

## 3.1 General Functions

### 3.1.1 DATA HOLD mode

Data Hold mode makes the meter stop updating the display. Enabling Data Hold function in autorange mode makes the meter switch to Manual ranging mode, but the full-scale range remains the same. Data Hold function can be cancelled by changing the measurement mode, pressing **RANGE** key, or push HOLD key again.

To enter and exit the Data Hold mode:

1. Press HOLD key (short press). Fixes the display on the current value, **H** is displayed.
2. A second short press returns the meter to normal mode.

### 3.1.2 Manual ranging and Autorange mode

The Meter has both manual ranging and autorange options.

* In the autorange mode, the Meter selects the best range for the input detected. This allows you to switch test points without having to reset the range.
* In the manual ranging mode, you select the range. This allows you to override autorange and lock the meter in a specific range.
* The Meter defaults to the autorange mode in measurement functions that have more than one range. When the Meter is in the autorange mode, **AUTO** is displayed.

To enter and exit the manual range mode:

1. Press **RANGE** key. The Meter enters the manual ranging mode. **AUTO** turns off. Each presses of **RANGE** key increments the range. When the highest range is reached, the Meter wraps to the lowest range.

**NOTE:** If you manually change the measurement range after entering the Data Hold modes, the Meter exits this mode.

2. To exit the manual ranging mode, press and hold down **RANGE** key for two seconds. The Meter returns to the autorange mode and **AUTO** is displayed.

### 3.1.3 Battery Saver

The Meter enters the "sleep mode" and blanks the display if the Meter is on but not used for 30 minutes.

Press the 

key or rotate the rotary switch to wake the meter up.

To disable the Sleep mode, hold down the **SELECT** key while turning the meter on.

### 3.1.4 Relative measurement mode

The Meter will display relative measurement in all functions except frequency.

To enter and exit the relative measurement mode:

1. With the Meter in the desired function, touch the test leads to the circuit on which you want future measurement to be based.
2. Press **REL△** key to store the measured value and activate the relative measurement mode. The difference between the reference value and subsequent reading is displayed.
3. Press **REL△** key for more than 2 seconds to return the Meter to normal operation.

### 3.1.5 TRUE RMS measurement

All the measurement values of the true RMS meter on the AC voltage and AC current are true root-mean-square values. The basic meter can only measure the AC average value.

## 3.2 Measurement Functions

### 3.2.1 AC and DC Voltage measurement

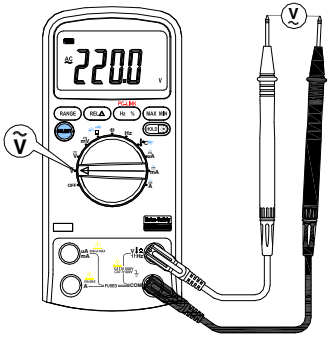
> ⚠ ***To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 1000Vdc or 1000Vac rms.***
> ***To avoid electrical shock and/or damage to the instrument, do not apply more than 1000Vdc or 1000Vac rms between the common terminal and the earth ground.***

The Meter's voltage ranges are 600.0mV, 6.000V, 60.00V, 600.0V and 1000V.
To measure ac or dc voltage (set up and connect the Meter as shown in Figure 3-1):

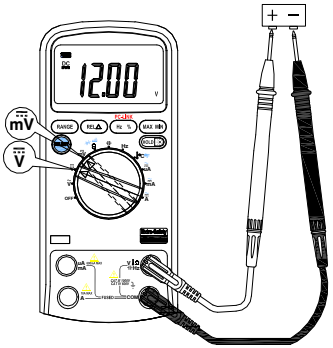
1. Set rotary switch to the DCV, ACV or DCmV range.
2. Connect the black and red test leads to the COM and V terminals respectively.
3. Connect the test leads to the circuit being measured
4. Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.

**NOTE:**

- Unstable display may occur especially at 600mV range, even though you do not put test leads into input terminals
- For better accuracy when measuring the dc offset of an ac voltage, measure the ac voltage first. Note the ac voltage range, then manually select a dc voltage range equal to or higher than the ac range. This improves the accuracy of the dc measurement by ensuring that the input protection circuits are not activated.




AC Voltage




DC Voltage

Figure3-1 Measuring AC and DC Voltage

### 3.2.2 Resistance measurement

> ⚠ ***To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.***

The Meter's resistance ranges are 600.0Ω, 6.000kΩ, 60.00kΩ, 600.0kΩ, 6.000MΩ and 60.00MΩ.
To measure resistance (set up the Meter as shown in figure 3-2):
1. Set the rotary switch to Ω→|◄ range.
2. Connect the black and red test leads to the COM and VΩ terminals respectively.
3. Connect the test leads to the circuit being measured and read the displayed value.

**Some tips for measuring resistance:**

- The measured value of a resistor in a circuit is often different from the resistor's rated value. This is because the Meter's test current flows through all possible paths between the probe tips.
- In order to ensure the best accuracy in measurement of low resistance, short the test leads before measurement and memory the test probe resistance in mind. This necessary to subtract for the resistance of the test leads.
- The resistance function can produce enough voltage to forward-bias silicon diode or transistor junctions, causing them to conduct. To avoid this, do not use the 60MΩ range for in-circuit resistance measurements.
- On 60MΩ range, the meter may take a few seconds to stabilize reading. This is normal for high resistance measuring.
- When the input is not connected, i.e. at open circuit, the figure "OL" will be displayed for the overrange condition.

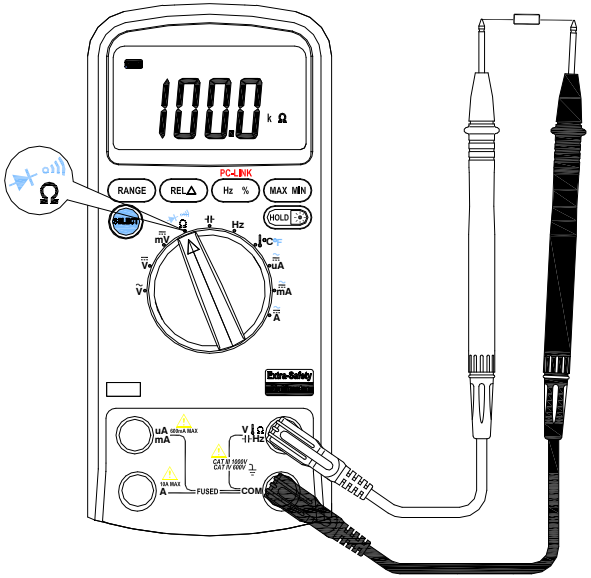



Figure 3-2 Measuring Resistance

### 3.2.3 Diode Test

> ⚠ ***To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.***

To test a diode out of a circuit (set up the Meter as shown in Figure 3-3):
1. Set the rotary switch to Ω ⊣◀ range.
2. Press the **SELECT** key once to activate Diode Test.
3. Connect the black and red test leads to the COM and VΩ terminals respectively.
4. For forward-bias readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.
5. The meter will show the approx. forward voltage of the diode.

In a circuit, a good diode (Si) should still produce a forward bias reading of 0.5V to 0.8V; however, the reverse-bias reading can vary depending on the resistance of other pathways between the probe tips.

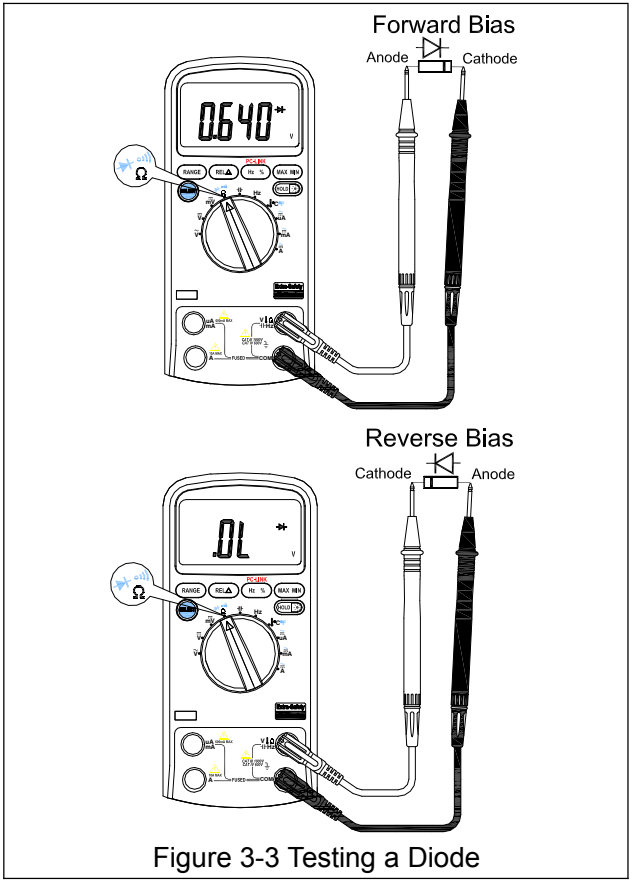



Figure 3-3 Testing a Diode

### 3.2.4 Continuity Check

⚠ ***To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.***

To test for continuity (set up the Meter as shown in Figure 3-4):
1. Set the rotary switch to Ω ⊣◀ range.
2. Press the **SELECT** key twice to activate Continuity Check.
3. Connect the black and red test leads to the COM and Ω terminals respectively.
4. Connect the test leads to the resistance in the circuit being measured.
5. When the test lead to the circuit is below 40Ω, a continuous beeping will indicate it.

**NOTE:**
●Continuity test is available to check open/short of the circuit.

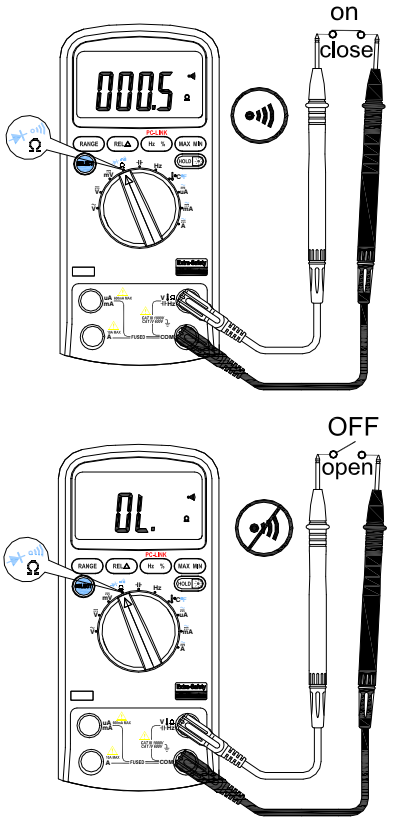



Figure 3-4 Checking the Continuity

### 3.2.5 Capacitance measurement

⚠ ***To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the dc voltage function to confirm that the capacitor is discharged.***

The Meter's capacitance ranges are 60.00nF, 600.0nF, 6.000μF, 60.00μF and 300.0μF.

To measure capacitance (set up the Meter as shown in Figure 3-5):
1. Set the rotary switch to ⊣⊢ range.
2. Connect the black and red test leads to the COM and ⊣⊢ terminals respectively (or you can use capacitor test lead).
3. Connect the test leads to the capacitor being measured and read the displayed value.

**Some tips for measuring capacitance:**

- The meter may take a few seconds(>30 seconds in 300.0uF range) to stabilize reading. This is normal for high capacitance measuring.
- To improve the accuracy of measurements less than 60nF, subtract the residual capacitance of the Meter and leads.
- Below 600pF, the accuracy of measurements is unspecified.

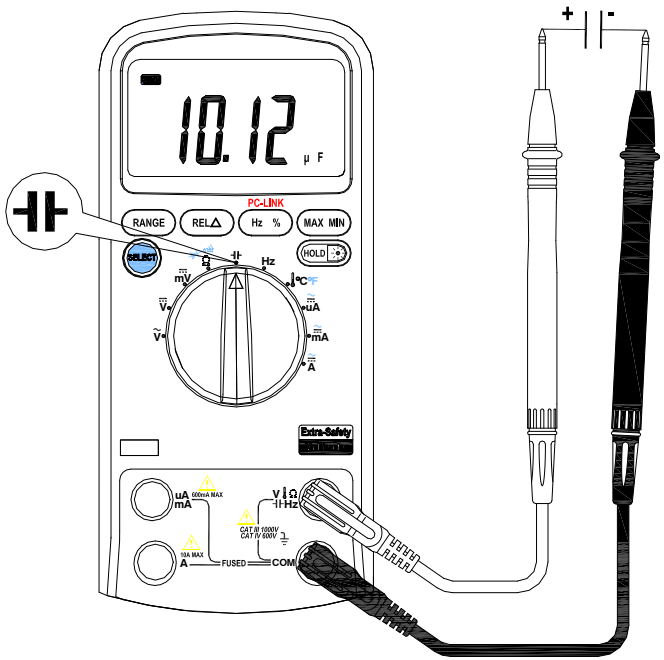



Figure 3-5 Measuring Capacitance

### 3.2.6 Frequency and Duty Cycle measurement

⚠ ***Do not measure Frequency on high voltage (>1000V) to avoid electrical shock hazard and/or damage to the instrument.***

The Meter can measure Frequency or Duty Cycle while making either an AC Voltage or AC Current measurement.
To measure frequency or Duty Cycle:
1. With the meter in the desired function (AC Voltage or AC Current), press the Hz % key.
2. Read the frequency of the AC signal on the display.
3. To make a duty cycle measurement, press the Hz % key again.
4. Read the percent of duty cycle on the display.
5. Set the rotary switch to the Hz range.
6. Insert the black and red test leads into the COM and Hz input terminals.
7. Connect the test leads tip in parallel with the circuit to be measured. And don't touch any electrical conductors.
8. At frequency measuring status, press Hz % one time then meter enters duty cycle measuring status, press it again then return to frequency measuring status.
9. Read the result directly from the display.

**NOTE:**
In noisy environment, it is preferable to use shield cable for measuring small signal

### 3.2.7 Temperature measurement

⚠ ***To avoid electrical shock and/or damage to the instrument, do not apply more than 250Vdc or 220Vac rms between the °C/ °F terminal and the COM terminal.***
***To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 60v dc or 24v rms. Ac.***
***To avoid damage or burns. Do not make temperature measurement in microwave ovens.***

To measure temperature:
1. Set the rotary switch to ℃/ ℉ range and the LCD will show the current environment temperature.
2. Insert 'K' type thermocouples into the COM terminal and ℃/ ℉ terminal (or you can insert it by using Multi Function Socket)，Takings care to observe the correct polarity.
3. Touch the object with the thermocouple probe for measurement.
4. Read the stable reading from LCD.

### 3.2.8 Current measurement

⚠ ***To avoid damage to the Meter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1000V.***
***To avoid damage to the meter, check the meter's fuse before proceeding. Use the proper terminals, function, and range for your measurement. Never place the probes in parallel with a circuit or component when the leads are plugged into the current terminals.***

The Meter's current ranges are 600.0μA, 6000μA, 60.00mA, 600.0mA, 6.000A and 10.00A.
To measure current (set up the Meter as shown in Figure 3-6):
1. Turn off power to the circuit. Discharge all high voltage capacitors.
2. Set the rotary switch to the μA, mA or A range.
3. Press the **SELECT** key to select DCA or ACA measuring mode.
4. Connect the black test lead to the COM terminal and the red test leads to the mA terminal for a maximum of 600mA. For a maximum of 10A, move the red test lead to the A terminal.
5. Break the circuit path to be tested.
Touch the black probe to the more negative side of the break; touch the red probe to the more positive side of the break. (Reversing the leads will give a negative reading, but will not damage the Meter.)
6. Turn on power to the circuit; then read the display. Be sure to note the measurement units at the right side of the display ( μA, mA or A). When only the figure "OL" displayed, it indicates overrange situation and the higher range has to be selected.
7. Turn off power to the circuit and discharge all high voltage capacitors. Remove the Meter and restore the circuit to normal operation.

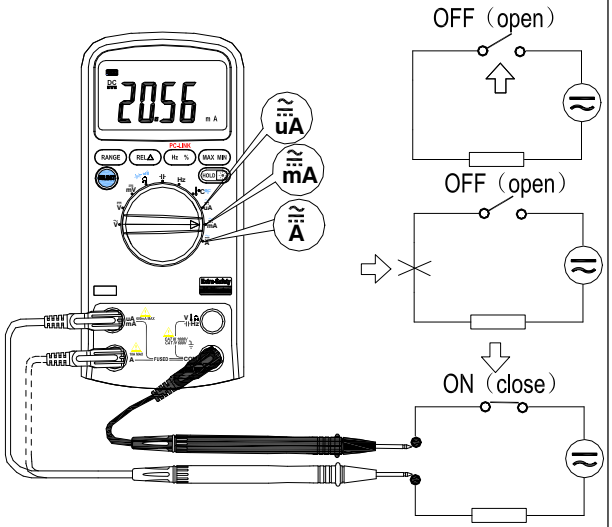



Figure 3-6 Measuring Current

**3.2.9 PC Link**

The meter has serial data output function. It can be connected with PC by USB interface, so the measured data can be recorded, analyzed, processed and printed by PC. Before use this function, you need install the PC-Link software and USB driver in your PC.

Press the **Hz%** key while turn on the meter, the meter enter PC-Link mode, the symbol "PC-LINK" will appear on LCD, and the serial data output function is active.

**PC-LINK SOFT OPERATING MANUAL**

1. Make sure the two **Install USB driver** and **Install software** files in the attached CD successfully installed before any measurement.
2. Keep the meter in **"OFF"** status, pressing the **Hz%** key while turn on the meter and the symbol "**PC-LINK**" will appear on the LCD if the serial data output function is active. (To disable the auto power off function, hold down the **SELECT** key and **Hz%** key while turning the meter on.)

**NOTE**: If we want to enable the serial data output function during measuring, **we have to turn off the meter first**, then operate according to step2.

3. Connect the meter's OPTICAL PORT and computer USB port with the USB line.
4. Run the **PC-LINK** software, click the **SET** menu. Select the **System Set**. Thenselect the proper COM port in the **Serial Port Select**. As for the proper COM port, we can view it in the Device Manager by following these steps:

- Right-click the **My Computer** icon on the Windows desktop, and then click **Properties**.
- Click the **Hardware** tab and then click **Device Manager**.
- Scroll through the list of installed devices till you locate the **Ports (Com and LPT)** entry. Click the **plus (+)** beside this entry to view the installed ports, If no errors occur, the Sunplus USB to Serial COM Port (COM x) will appear, COM x is just the proper port, here x is a specific number.

5. Select the default sampling rate or you can select other desired sampling rate.
6. Now press the **Start** in the PC-LINK SOFT to measure and view the synchronic data or graph in the software interface.
7. To disable the serial data output function, switch the meter to OFF location first.
8 .More information about the PC-LINK SOFT, please refer to the Help topic including in the software or enter our website：www.mastech.com.cn

# 4. TECHNICAL SPECIFICATIONS

## 4.1 General specifications

Environment conditions:
1000V CAT Ⅲ and 600V CAT Ⅳ
Pollution degree: 2
Altitude < 2000m
Operating temperature: 0~40℃, 32℉~104℉(<80% RH, <10℃/ <50℉ non-condensing)
Storage temperature: -10~60 ℃, 14℉~140℉(<70% RH, battery removed)
Temperature Coefficient: 0.1×(specified accuracy) / ℃/ ℉ (<18℃ or >28℃/<64.4℉or >82.4℉)
MAX. Voltage between terminals and earth ground: 1000V AC rms or 1000V DC.
Fuse Protection: μA and mA: F 0.63A/1000V ∅10.3×38; A: F 10A/1000V ∅10.3×38.
Sample Rate: 3 times/sec for digital data.
Display: 3 5/6 digits LCD display. Automatic indication of functions and symbols.
Range selection: automatic and manual.
Over Range indication: LCD will display "OL".
Low battery indication: The "" is displayed when the battery is under the proper operation range.
Polarity indication: "–" displayed automatically.
Power source: 9V ⎓
Battery type: 6F22.
Dimension (L x W x H) and Weight: 190×90×40 mm (7.48 x 3.54 x 1.57 inch)
500g. Approx. (battery included) (17.63 Ounces)

## 4.2 Measurement specifications

Accuracy is specified for one year after calibration, at operating temperatures of 18℃ to 28℃ (64.4℉ to 82.4℉), with relative humidity at less than 80%.
Accuracy specifications take the form of: ± (% of Reading + Number of Least Significant Digits)

### 4.2.1 Voltage

DCV:

| Range | Resolution | Accuracy |
|---|---|---|
| 600mV | 0.1mV | ±(0.5% of rdg +5 digits) |
| 6V | 1mV | ±(0.8% of rdg +5 digits) |
| 60V | 10mV | |
| 600V | 100mV | |
| 1000V | 1V | ±(1.0% of rdg +2 digits) |

ACV:

| Range | Resolution | Accuracy |
|---|---|---|
| 600mV | 0.1mV | ±(1.0% of rdg + 5 digits) |
| 6V | 1mV | |
| 60V | 10mV | |
| 600V | 100mV | |
| 1000V | 1V | ±(1.5% of rdg + 5 digits) |
| Above accuracies can be guaranteed within 5%~100% of the full range.<br>The true RMS meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement. | | |

1. Frequency Range for ACV: 40Hz~400Hz.
2. Response for ACV: Average, calibrated in rms of sine wave.
3. Overload Protection: 1000V dc or 1000V ac rms.
4. Input Impedance (Nominal): DC voltage: >10MΩ; AC voltage: >10MΩ

### 4.2.2 Frequency

**Logic frequency (1Hz-1MHz)**

| Range | Resolution | Accuracy |
|---|---|---|
| 99.99Hz | 0.01 Hz | ±(0.1% of rdg+3digits) |
| 999.9Hz | 0.1 Hz | |
| 9.999kHz | 0.001kHz | |
| 99.99kHz | 0.01kHz | |
| 999.9kHz | 0.1kHz | |

**Linear frequency （6HZ~10KHZ）**

| Range | Resolution | Accuracy |
|---|---|---|
| 99.99Hz | 0.01 Hz | ±(0.05% of rdg+8digits) |
| 999.9Hz | 0.1 Hz | |
| 9.999kHz | 0.001kHz | |
| Above accuracies can be guaranteed within 10%~100% of the full range. | | |

### 4.2.3 Resistance

| Range | Resolution | Accuracy |
|---|---|---|
| 600.0Ω | 0.1Ω | ±(0.5% of rdg+3 digits) |
| 6.000kΩ | 1Ω | ±(0.5% of rdg+2 digits) |
| 60.00kΩ | 10Ω | |
| 600.0kΩ | 100Ω | |
| 6.000MΩ | 1kΩ | |
| 60.00MΩ | 10kΩ | ±(1.5% of rdg+5 digits) |

### 4.2.4 Diode Test

| Range | Resolution | Test Condition |
|---|---|---|
| 1 V | 0.001V | Forward DC current approximately 1mA. Reversed DC voltage approximately 1.5V. |

### 4.2.5 Continuity Check

| Range | Resolution | Test Condition |
|---|---|---|
| 600Ω | 0.1Ω | Open circuit voltage: approx. 0.5V |

Description: Continuity beeper≤30Ω

### 4.2.6 Capacitance

| Range | Resolution | Accuracy |
|---|---|---|
| 60nF | 10pF | <10nF:±[5.0% of (rdg -50 digits)+20 digits]<br>±(3.0% of rdg +10 digits) |
| 600nF | 100pF | ± (5.0% of rdg+10 digits) |
| 6μF | 1nF | |
| 60μF | 10nF | |
| 300μF | 100nF | |

### 4.2.7 Temperature

| Range | Resolution | Accuracy |
|---|---|---|
| -55℃~0℃ (-67~32℉) | 0.1℃ (32.18℉) | ±(5.0% of rdg + 4℃/ 39.2℉) |
| 1℃~400℃ (33.8~752℉) | | ±(2.0% of rdg+ 3℃/ 37.4℉) |
| 401℃~1000℃<br>(753.8℉~1832℉) | 1℃ (33.8℉) | ±2.0% of rdg |

Note: The specifications of temperature don't include thermocouple errors.

### 4.2.8 Current

DCA:

| Range | Resolution | Accuracy |
|---|---|---|
| 600μA | 0.1μA | ±(1.5% of rdg+3 digits) |
| 6000μA | 1μA | |
| 60mA | 0.01mA | ±(1.5% of rdg+3 digits) |
| 600mA | 0.1mA | |
| 6A | 1mA | ±(1.5% of rdg+5 digits) |
| 10A | 10mA | |

ACA:

| Range | Resolution | Accuracy |
|---|---|---|
| 600μA | 0.1μA | ±(1.8% of rdg+5 digits) |
| 6000μA | 1μA | |
| 60mA | 0.01mA | ±(1.8% of rdg+5 digits) |
| 600mA | 0.1mA | |
| 6A | 1mA | ±(3.0% of rdg+8 digits) |
| 10A | 10mA | |
| Above accuracies can be guaranteed within 5%~100% of the full range.<br>The true RMS meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement. | | |

1. Frequency Range for ACA: 40Hz-400Hz
2. Overload protection: F 10A/1000V fuse for 10A
   Overload protection: F 0.63A/1000V fuse for μA and mA ranges.
3. Maximum input current: 600mA dc or 600mA ac rms for μA and mA ranges, 10A dc or 10A ac rms for 10A ranges.
4. For measurements>6A, 4 minutes maximum ON to measure 10 minutes OFF; Above 10A unspecified.

## 5. MAINTENANCE

This section provides basic maintenance information, including fuse and battery replacement instructions.
Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

### 5.1 General Maintenance

⚠ ***To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case***

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.
Dirt or moisture in the terminals can affect readings.
To clean the terminals:
Turn the meter off and remove all test leads.
Shake out any dirt that may be in the terminals.
Soak a new swab with a cleaning and oiling agent (such as WD-40).
Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.

### 5.2 Fuse replacement

⚠ ***Before replacing the fuse, disconnect test leads and/or any connectors from any circuit under test. To prevent damage or injury replace the fuse only with specified ratings.***

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the four screws on the rear cover.
4. Take out the rear cover from the meter.
5. Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket.

6. Install the replacement fuses only with specified ratings: F 0.63A/1000V ∅10.3×38 and F 10A/1000V ∅10.3×38
7. Rejoin the rear cover and tighten the screws.

### 5.3 Battery replacement

⚠ ***To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator ( ) appears.***
***Before replacing the battery, disconnect test leads and/or any connectors from any circuit under test, turn the meter off and remove test leads from the input terminals.***

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the two screws on the battery cover.
4. Take out the battery cover from the meter.
5. Remove the used battery.
6. Replace with one new 9V battery (6F22).
7. Rejoin the battery cover and tighten the screws.

## 6. ACCESSORIES

Delivered with the multimeter:

| | |
|---|---|
| User's manual | One piece |
| Test leads | One piece |
| "K" type Thermocouple | One piece |

| | |
|---|---|
| Multi-function socket | One piece |
| USB line | One piece |
| PC-Link software CD | One piece |

If there are some changes in accessories, please refer to the real product as standard.

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