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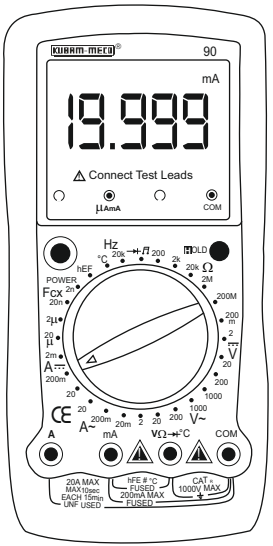
Digital Multimeter
Model - 90



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TAKE MEASUREMENT CAREFULLY AND YOU'LL SPARE YOUR METER AND YOURSELF, SOME PAIN

Nearly every electrical engineer has a hand held Multimeter. We sometimes take them for granted, until we damage them or "burn them out" if you incorrectly connect your DMM to a circuit or have the DMM on wrong setting, you damage the meter and possibly hurt yourself. You can also get into trouble if you try to measure the voltage across a charged capacitor.

DMM users frequently burn their meters by trying to measure current the same way as they measure voltage, Remember, you measure voltage across a circuit, and current through a circuit. When you use the current input, your DMM becomes a lower impedance circuit element. If you accidentally connect this low impedance path across your circuit, you'll effectively short-circuit it. You can, therefore send high current through your meter and severely damage it. Unless the meter has a fused input, you can even get an explosion or fire.

Even if you correctly insert your DMM into the circuit, you can still damage your meter. Don't try to measure current in excess of your meter's capacity. Handheld DMMs usually have a maximum current rating of 10A or 20A.

If you are measuring current in industrial environment, you can easily exceed those ratings. The best way to avoid damage is to use a clamp meter or to connect a clamp attachment to your DMM.

To prevent excess current from flowing through your meter, always disconnect the test leads from the circuit under test whenever you change DMM functions, Set your meter to the correct function, say current and its highest range for the setting, say 10A. Next, connect the test leads before you apply power to the circuit. To be safe, start by setting your meter to its highest range first.

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WARRANTY

Each "KUSAM-MECO" product is warranted to be free from defects in material and workmanship under normal use & service. The warranty period is one year (12 months) and begins from the date of despatch of goods. In case any defect occurs in functioning of the instrument, under proper use, within the warranty period, the same will be rectified by us free of charges, provided the to and fro freight charges are borne by you.

This warranty extends only to the original buyer or end-user customer of a "KUSAM-MECO" authorized dealer.

This warranty does not apply for damaged Ic's, fuses, disposable batteries, carrying case, test leads, or to any product which in "KUSAM-MECO's" opinion, has been misused, altered, neglected, contaminated or damaged by accident or abnormal conditions of operation or handling.

"KUSAM-MECO" authorized dealer shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of "KUSAM-MECO".

"KUSAM-MECO's" warranty obligation is limited, at option, free of charge repair, or replacement of a defective product which is returned to a "KUSAM-MECO" authorized service center within the warranty period.

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MUMBAI

TEST CERTIFICATE

DIGITAL MULTIMETER

This Test Certificate warranties that the product has been inspected and tested in accordance with the published specifications.

The instrument has been calibrated by using equipment which has already been calibrated to standards traceable to national standards.

MODEL NO. **DMM90**

SERIAL NO. _____

DATE: _____

ISO 9001:2015
REGISTERED

QC
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PASS

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Table of Contents

Overview

⚠ Warning

To avoid electric shock or personal injury, read the "Rules for Safe Operation"carefully before using the Meter.

Digital Multimeter Model - 90 (hereafter referred to as "the Meter") is a 4½ digits Multimeter with steady operations, and highly reliable hand-held measuring instrument having different measurement positions. The Multimeter not only can measure AC/DC Voltage, AC/DC Current, Resistance, Capacitance, Frequency, Temperature, Transistor hFE Test, Diode Test, but also has Data Hold, Full Icon Display.

Terms in this manual

⚠ **Warning :** Identifies conditions and actions that could result in serious injury or even death to the user.

⚠ **Caution :** Identifies conditions and actions that could cause damage or malfunction in the instrument.

Unpacking Inspection

Open the package case and take out the Multimeter. Check the following items carefully to see any missing or damaged part :

Item	Description	Qty.
1	English Operating Manual	1 piece
2	Test Lead	1 pair
3	Test Clip	1 pair
4	Temperature Probe	1 piece

In the event you find any Part missing or damaged, please contact your dealer immediately.

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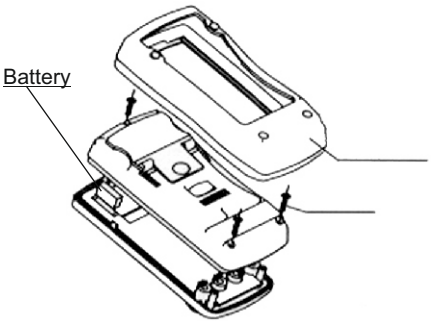
Maintenance

⚠ Warning

To avoid false reading, replace the battery as soon as the battery indicator [-+] appears.

To replace battery :

- Disconnect the connection between the testing leads and the circuit under test, and remove the testing leads away from the input terminals of the Meter.
- Turn the Meter OFF.
- Remove the protective holster.
- Remove the screws from the back case & separate the back case from front case.
- Remove the battery from the battery compartment.
- Replace the battery with a new Standard 9V Battery.
- Rejoin the back case and front case and install the screw.
- Put the protective holster back again.



- Connect the test leads to the proper terminals as said above, to avoid error display. The LCD will display "1" indicating open-circuit for wrong connection. The unit of diode is Volt (V), displaying the positive connection voltage-drop value.
- When diode testing has been completed, disconnect the connection between the testing leads and the circuit under test.

Test for Continuity

To test for continuity, connect the Meter as below :

1. Insert the red test lead into VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to ⊣⊢ position
3. Connect the test leads across with the object being measured.

   The buzzer sounds if the resistance of a circuit under test is less than 50Ω.

   The LCD displays the resistance value of a circuit under test.

⚠ Caution :

- The LCD displays "1" indicating the circuit being tested is open.
- When continuity testing has been completed, disconnect the connection between the testing leads and the circuit under test.

J. Transistor Testing

To test the Transistors, connect the Meter as below :

1. Insert the red test lead in the VΩ terminal & black test lead in COM terminal.
2. Connect the test leads across the transistor whose value is to be measured.
3. The measured value is shown on the display.

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FEATURES :

- **Low power consumption CMOS double integration, A/D transform integrated circuit, Auto Zero Calibration, Auto Polarity display, Data Hold, Low Battery & Over range indication.**
- **Display :** 4½ digit (19999 Counts) with display height 53 mm and digit height 20mm and function / units sign annunciators.
- **Selected Range displayed on LCD.**
- **Polarity :** Automatic (-) negative polarity indication.
- **Auto Power Off :** The meter will shut off automatically about 15 minutes after power is ON if the meter is not in use.
- **High Accuracy - Digital Reading.**
- **Instant Continuity Buzzer.**
- **Overload Protection in all Ranges.**
- **Recessed Safety Designed Input Jacks.**
- **"DATA - HOLD" switch freezes reading.**
- **DMM - 90 has a unique feature wherein the LCD display shows the terminals where the test leads are to be inserted to avoid wrong connection and damage to the meter.**

GENERAL SPECIFICATIONS :

Display	: 4½ digit LCD. Maximum reading 19999 with automatic sign and Function annunciators.
Overrange indication	: Highest digit of (1) or (-1) is displayed.
Low battery	: The "⊟" sign is displayed when the battery voltage drops below the operating Voltage.
Measurement rate	: 2.5 measurements per second, nominal.
Operating temperature	: 0°C to + 50°C, <70% RH.
Storage temperature	: -20°C to 60°C, <80% RH with battery removed.
Accuracy	: Accuracy specifications at 23 ± 5°C less than 75% R.H.
Power	: Single 9 V Battery.
Dimension	: 179mm (L),88mm(W), 39mm(H)
Weight	: Approx (380 grams) including battery
Alarm	: Buzzer Sounds when the lead is connected to the Wrong input terminals.
Accessories	: Test leads, User Manual, Batteries installed, Carrying Case, Protective Holster, Thermocouple Plug Test Clip.

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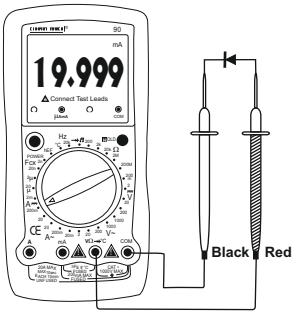
Testing Diodes

Use the diode test function to check diodes, The diode test sends a current through the Semi-conductor junction, and then measures the voltage drop across the junction. A good silicon junction drops between 0.5V and 0.8V.

To test a diode out of a circuit, connect the Meter as follows :



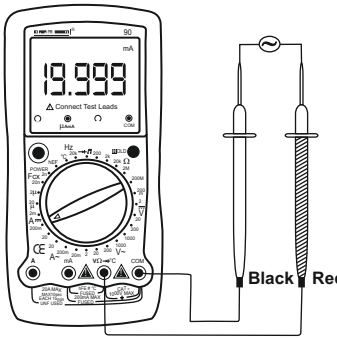
(Figure 11)

1) Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2) Set the rotary switch to →|– position.
3) For forward voltage drop reading on any Semi-conductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.

   The measured value is shown on the display.

⚠ Caution :

- In a circuit, a good diode will produce a forward voltage drop reading of 0.5V to 0.8V; However ; the reverse voltage drop reading can vary depending on the resistance of other pathways between the probe tips.



(Figure 10)

The frequency measurement range is 20kHz.

To measure frequency, connect the Meter as follows :

1) Insert the red test lead into the VΩ terminal and the black test lead into the COM Terminal.
2) Set the rotary switch in the 20kHz range.
3) Connect the test leads across with the object being measured.

The measured value is shown on the display.

⚠ Caution

- When Hz measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

I. Measuring Diodes & Continuity

(See figure 11)

⚠ Warning

To avoid damage to the Meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring diodes and continuity.

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ELECTRICAL SPECIFICATION :

DC Voltage

Range	Resolution	Accuracy
200m V	0.01m V	±(0.05%rdg+3dgts)
2 V	0.0001 V	±(0.1%rdg+3dgts)
20 V	0.001 V	
200 V	0.01 V	
1000 V	0.1 V	±(0.15%rdg+5dgts)

Input impedance : 10MΩ

Overload protection :

200mV range - 250 AC/DC

1000V range - 1000Vrms

AC Voltage

Range	Resolution	Accuracy
2 V	0.0001 V	±(0.5%rdg+10dgts)
20 V	0.001 V	
200 V	0.01 V	
1000 V	0.1 V	±(1%rdg+10dgts)

Input impedance : 2MΩ

Overload protection :

200mV range - 250 AC/DC

1000V range - 1000Vrms

DC Current

Range	Resolution	Accuracy
2 mA	0.0001 mA	±(0.5%rdg+5dgts)
200 mA	0.01 mA	±(0.8%rdg+5dgts)
20 A	0.001 A	±(2%rdg+10dgts)

Overload protection :

0.5A/250V fuse for 200 mA range

20A unfused max. 10 sec.

AC Current

Range	Resolution	Accuracy
20 mA	0.001 mA	±(0.8%rdg+10dgts)
200 mA	0.01 mA	±(1.2%rdg+10dgts)
20 A	0.001 A	±(2.5%rdg+10dgts)

Overload protection :
0.5A/250V fuse for 200 mA range
20A unfused max. 10 sec.

Resistance

Range	Resolution	Accuracy
200 Ω	0.01 Ω	±(0.5%rdg+10dgts)
2 kΩ	0.0001 kΩ	±(0.3%rdg+1dgts)
20 kΩ	0.001 kΩ	
2 MΩ	0.0001 MΩ	
200 MΩ	0.01 MΩ	±(5%rdg+10dgts)

Overload protection : 250V rms

Capacitance

Range	Resolution	Accuracy
2 nF	0.0001 nF	±(3%rdg+40dgts)
20 nF	0.001 nF	±(4%rdg+10dgts)
2 µF	0.0001 µF	
20 µF	0.001 µF	

Overload protection : 250V rms
Test Frequency : 400Hz/40mV rms

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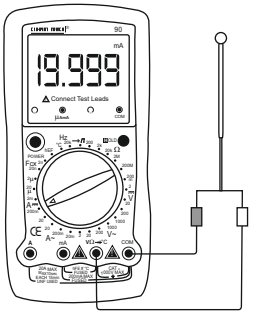
G. Temperature Measurement (see figure 9)



(Figure 9)

Temperature measurement range is from - 40°C to 1000°C.

To measure temperature, connect the Meter as follows:

1) Set the function switch on the "°C" measurement position.
2) Insert the thermocouple plug into the meter's temperature socket.
3) Insert the plug with the positive polarity in the VΩ terminal and the negative polarity in the COM terminal.
4) Set the measurement end of the thermocouple on the temperature measurement point.

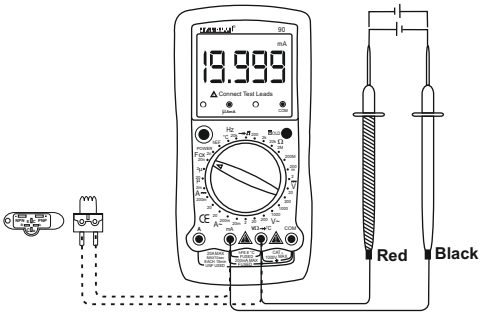
The measured value is shown on the display.

H. Frequency Measurement (see figure 10)

⚠ Warning :

To avoid harm to you or damages to the Meter, do not attempt to measure voltages higher than 60V in DC or 30V rms in AC although reading may be obtained.

When the frequency signal to be tested is higher than 30V rms, the Meter cannot guarantee accuracy of the measurement.



(Figure 8)

Capacitance measurement has 4 measurement positions on the rotary switch : 2nF, 20nF, 2μF and 20μF.

To measure capacitance, connect the Meter as follows :

1) Set the function/range switch on the range position needed.
2) Insert the red test clip or red test lead into the VΩ terminal & the black test leads into the mA terminal.
3) Connect the test leads across with the object being measured.

The measured value shows on the display.

Caution :

Never connect high voltage to the input sockets with the switch in Capacitance range.

Using Capacitance measurement function in a Live circuit will produce false results and may

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Frequency

Range	Resolution	Accuracy
20kHz	1Hz	±(1.5%rdg+3dgts)

Overload protection 250V rms

Temperature

Range	Resolution	Accuracy
~40°C~0°C	0.1°C	±(3%rdg+40dgts)
0°C~400°C		±(1%rdg+30dgts)
400°C~1000°C		±(2%rdg+50dgts)

Overload protection : 250V rms

Transistor Test

Range	Test Voltage	Basic DC Current
0 to 1000	2.8 V	10μA

Overload Protection : 250V rms

Continuity Test

Audible Buzzer	Less than 100Ω

Overload Protection : 250V DC or AC rms

Diode Test

Test Current	Open Circuit Volts
1.0mA	3.3V DC Typical

Overload Protection : 250V DC or AC rms

Rules For Safe Operation (1)

⚠ Warning

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under test, adhere to the following rules :

- Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for Continuity. Replace damaged test leads with identical electrical Specifications before using the Meter.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and grounding.
- The rotary switch should be placed in the right position and no any changeover of range shall be made while measurement is conducted to prevent damage of the Meter.
- When measurement is taken at an effective voltage over 60V in DC or 30V rms in AC, special care should be taken for there is danger of electric shock.
- Use the proper terminals, function, and range for your measurements.
- Do not use or store the Meter in an environment of high temperature, humidity, explosive, inflammable and strong magnetic field. The performance of the Meter may deteriorate after the meter is dampened.
- When using the test leads, keep your fingers behind the finger guards.

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Then use the equation :
Measured resistance value (Y) - (X) = precision Reading of resistance.

- When there is no input, for example in open circuit condition, the Meter displays “1”.
- When resistance measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

⚠ Caution :

- Never connect high voltage to the input sockets with the switch in Resistance range.
- Using Resistance measurement function in a Live circuit will produce false results and may damage the instrument. In many cases the suspect component must be disconnected from the circuit to obtain an accurate reading.

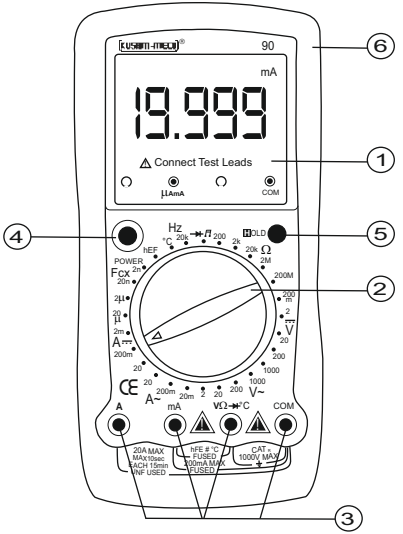
In 200MΩ range, kindly deduct the offset value (when test leads are shorted) to get the actual value when ever readings are taken.

F. Capacitance Measurement (see figure 8)

⚠ Warning

To avoid damages to the Meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor is discharged. Never attempt to input over 60V in DC or 30V rms in AC to avoid personal injury.

The Multimeter Structure (see figure 1)



(Figure 1)

1) **LCD DISPLAY :**
A 4½ digit display (maximum reading 19999) indicates measured values, and features symbols indicating function, Low Battery, Continuity, Diode. It has a unique feature wherein it displays the terminals in which the test leads are to be inserted for any function measurement

2) **FUNCTION SELECTOR :**
To Select ACV, DCV, ACA, DCA, Resistance, Capacitance, Temperature, Frequency, Diode, Continuity & Transistor Test functions.

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The DC current measurement has 3 measurement positions on the rotary switch : 2mA, 200mA, 20A.

To measure DC Current, connect the meter as follows :

1) Turn off power to the circuit. Discharge all High - Voltage capacitors.
2) Insert the red test lead into the mA or 20A terminal and the black test lead into the COM terminal
3) Set the rotary switch to an appropriate measurement position in Current range.
4) Break the current path to be tested. Connect the red test lead to the positive side of the path and the black test lead to the negative side of the path.
5) Turn on power to the circuit.
   The measured value is shown on the display.

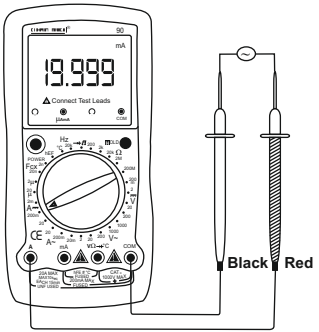
⚠ Caution

- If the value of current to be measured is unknown, use the maximum measurement position (20A) and 20A terminal, and reduce the range step by step until a satisfactory reading is obtained.
- The LCD displays “1” indicating the existing selected range is overloaded, it is required to select a higher range in order to obtain a correct Reading.
- When current measurement has been completed, switch off the power in the circuit disconnect the connection between the testing leads and the circuit under test.

⚠ Caution

- If the value of current to be measured is unknown, use the maximum measurement position (20A) and 20A terminal, and reduce the range step by step until a satisfactory reading is obtained.
- The LCD displays "1" indicating the existing selected range is overloaded, it is required to select a higher range in order to obtain a correct Reading.
- When AC Current measurement has been Completed, switch off power in the circuit, disconnect the connection between the testing leads and the circuit under test.

D. DC Current Measurement (see figure 6)



(Figure 6)

⚠ Warning :

Never attempt an in - circuit current measurement where the open circuit voltage between terminals and ground is greater than 60V DC or 30V rms. If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

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3) INPUT JACKS (VΩ, mA, A and COM) :
Test leads are inserted into these jacks for Voltage, Resistance, Capacitance, Temperature, Current measurements, Continuity & Diode Checks.

4) POWER SWITCH :
A push button (ON/OFF) POWER switch will switch ON or switch OFF the meter.

5) DATA HOLD SWITCH :
A push button (ON/OFF) Data-Hold switch will freeze reading when pressed.

6) PROTECTIVE HOLSTER :
Prevents the instrument from damage.

Functional Buttons

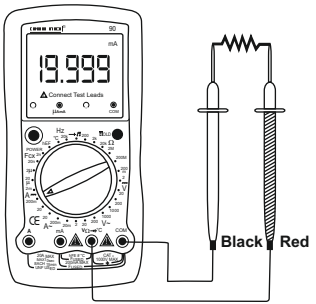
Below table indicates the functional button operations

BUTTONS	OPERATION PERFORMED
POWER (Yellow Button)	Switch the Meter on and off. ● Press the POWER button to switch on the Meter. ● Press the POWER button to switch off the Meter.
HOLD (Blue Button)	● Press **HOLD** once to enter hold mode. ● Press **HOLD** again to exit hold mode. ● In Hold mode, **H** is displayed and the present value is shown.

E. Resistance Measurement (see figure 7)

⚠ Warning

To avoid damages to the Meter or to the devices under test, disconnect circuit power and discharge all the high-voltage capacitors before measuring resistance.



(Figure 7)

The resistance range has 5 measurement positions on the rotary switch : 200Ω, 2KΩ, 20KΩ, 2MΩ, 200MΩ.

To measure resistance, connect the meter as follows

1) Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2) Set the rotary switch to an appropriate measurement position in Ω range.
3) Connect the test leads across with the object being measured.

The measured value is shown on the display.

Note :

- The test leads can add 0.1Ω to 0.3Ω of error to the Resistance measurement. To obtain precision readings in low-resistance, that is the range of 200Ω, short-circuit the input terminals beforehand and record the reading obtained (call this reading as X). (X) is the additional resistance from the test lead.

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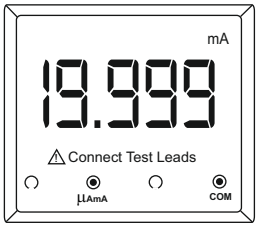
Rules For Safe Operation (2)

- Disconnect circuit power and discharge all high -voltage capacitors before testing resistance, continuity, diodes, or current.
- 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.
- Turn the Meter power off when it is not in use and take out the battery when not using for a long time.
- Constantly check the battery as it may leak when it has not been used for some time, replace the battery as soon as leaking appears. A leaking battery will damage the Meter.

International Electrical Symbols

~	AC (Alternating Current).
⎓	DC (Direct Current).
≂	Both DC & AC.
⏚	Grounding.
⧈	Double Insulated.
- +	Deficiency of Built-In Battery.
•)))	Continuity Test.
→|	Diode.
▭	Fuse.
⚠	Warning ! Refer to the Operating Manual.
⚠	Caution ! Risk of Electric Shock.

Display Symbols (see figure 2)



(Figure 2)

No.	Symbol	Meaning
1	ϟ	Dangerous Voltages.
2	- +	The battery is low. ⚠ Warning : To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
3	~	Indicator for AC voltage or current, The displayed value is the mean value.
4	—	Indicates negative reading.
5	⊣▶⊢	Test of diode.
6	▣	Data Hold is active.
7	♫	The continuity buzzer is on.
8	**mA, A**	A : Amperes (amps). The unit of current.
9	**mV, V**	V : Volts. The unit of voltage.
10	**Hz**	Hz : The unit of frequency.

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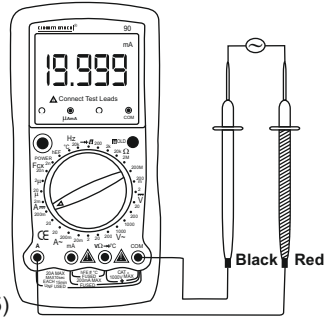
C. AC Current Measurement (see figure 5)



(Figure 5)

⚠ Warning :

Never attempt an in-circuit current measurement where the open circuit voltage between terminals and ground is greater than 60V DC or 30V rms. If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement. When the testing leads are connected to the current terminals, do not parallel them across any circuit.

The AC current measurement has 3 measurement positions on the rotary switch : 20mA, 200mA, 20A.

To measure AC Current, connect the meter as follows :

1) Turn off power to the circuit. Discharge all High - Voltage capacitors.
2) Insert the red test lead into the mA or 20A terminal and the black test lead into the COM terminal
3) Set the rotary switch to an appropriate measurement position in Current range.
4) Break the current path to be tested. Connect the red test lead to the positive side of the path and the black test lead to the negative side of the path.
5) Turn on power to the circuit.
   The measured value is shown on the display.

The AC Voltage ranges are : 2V, 20V, 200V, 1000V. To measure AC voltage, connect the Meter as follows :

1) Insert the red test lead into the VΩ input terminal and the black test lead into the COM input terminal
2) Set the rotary switch to an appropriate measurement position in V~ range.
3) Connect the test leads across with the object being measured.

The measured value is shown on the display which is effective value sine wave (mean value response)

⚠ Caution :

- If the value of voltage to be measured is unknown, use the maximum measurement position (1000V) and reduce the range step by step until a satisfactory reading is obtained.
- The LCD displays "1" indicating the existing selected range is overloaded, it is required to select a higher range in order to obtain a correct reading.
- In each range, the Meter has an input impedance of approx. 10MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ , the error is negligible (0.1% or less).
- When AC voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

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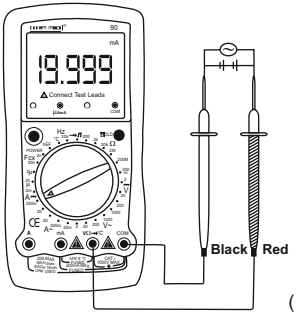
Display Symbols (see figure 2)

No.	Symbol	Meaning
11	Ω, kΩ, MΩ	Ω : Ohm. The unit of resistance. KΩ : kilohm. 1 x 10^3 or 1000 ohms MΩ : mega Ohm 1 x 1^6 ohms..
12	°C	°C : The unit of temperature.
13	nF, μF	nF, μF : The unit of Capacitance

Measurement Operation

- Make sure the Low Battery display [- +] is not on, otherwise false readings may be provided.
- Pay extra attention to the ⚠ symbol which is located besides the input terminals of the Meter before carrying out measurement.

A. DC Voltage Measurement (see figure 3)



(figure 3)

⚠ **Warning :**

To avoid harm to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 1000V or 1000V rms although readings may be obtained.

The DC Voltage measurement has 5 measurement positions on the rotary switch : 200mV, 2V, 20V, 200V and 1000V

To measure DC Voltage, connect the Meter as follows :

1) Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2) Set the rotary switch to an appropriate measurement position in V⎓ range.
3) Connect the test leads across with the object being measured.

   The measured value is shown on the display,

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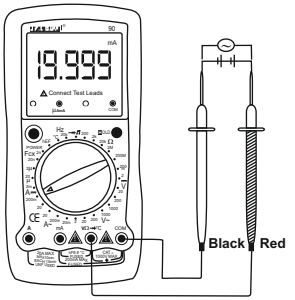
⚠ **Caution :**

- If the value of voltage to be measured is unknown, use the maximum measurement position (1000V) and reduce the range step by step until a satisfactory reading is obtained.
- The LCD displays " 1 " indicating the existing selected range is overloaded, it is required to select a higher range in order to obtain a correct reading.
- In each range, the Meter has an input impedance of approx. 10MΩ. This leading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less)
- When DC Voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

B. AC voltage measurement (see figure 4)



(Figure 4)

⚠ **Warning**

To avoid harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 1000V or 1000V rms although readings may be obtained.