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KUSAM-MECO

**OPERATION MANUAL
DIGITAL
MULTIMETER
KM 6030**

**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 20A. 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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OVERVIEW**⚠ Warning**

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

Digital Multimeter Model - 6030 (hereafter referred to as "the Meter") is a 3½ 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, Range & function selection & backlight 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	Temperature Probe	1 piece

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

FEATURES :

- Test lead jack mechanical protection function & full Range over-load protection function.
- Low power consumption CMOS double integration, A/D transform integrated circuit.
- Back light display.
- Auto Zero Calibration.
- Auto Polarity display.
- Low Battery & Over range indication.
- Selected range displayed on LCD.
- Instant continuity Buzzer.
- Recessed safety designed Input jacks.
- " DATA HOLD " switch freezes reading.

GENERAL SPECIFICATIONS :

- Sensing** : Average Sensing
- Display** : 3½ digit 1999 counts LCD display, with automatic sign and Function annunciators.
- Digital Size** : 28mm(H)
- Over range indication** : Highest digit of (1) or (-1) is displayed.
- Polarity** : Automatic (-) negative polarity indication.
- 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 40°C; (32°F to 104°F)
- Storage temperature** : -10°C to 50°C; (14°F to 122°F)
- Auto Power Off** : The meter will shut off automatically about 15 Minutes after power is ON if the meter is not in use.
- Power** : Single 9 V Battery.
- Dimension** : 192mm(L), 88mm(W), 42mm(H)
- Weight** : Approx (600 grams) including battery
- Accessories** : Test leads, Operators Manual, Battery, Carrying Case, Protective Holster, Temp. Probe.

ELECTRICAL SPECIFICATION :

DC VOLTAGE

Range	Resolution	Accuracy
200 mV	100 µV	±(0.5%rdg + 3dgts)
2 V	1 mV	
20 V	10 mV	
200 V	100 mV	±(1.0%rdg + 5dgts)
1000 V	1 V	

Input Impedance : 10MΩ
Overload Protection : 200mV is 250V DC or AC RMS.
 All other ranges 1000VDC or AC rms.

AC VOLTAGE

Range	Resolution	Accuracy
2 V	1 mV	±(1.0% rdg + 5 dgts)
20 V	10 mV	
200 V	100 mV	
750 V	1 V	±(1.2% rdg + 5 dgts)

Input Impedance : 200mV : 1MΩ, **Other ranges** : 10MΩ
Frequency : 40Hz-400Hz.
Overload protection : 200mV is 250VDC or AC RMS.
 All other ranges is 1000V DC or AC RMS.
Display : Average Value (RMS of Sine Wave).

AC CURRENT

Range	Resolution	Accuracy
2 mA	1 µA	±(1.2% rdg +5dgts)
20 mA	10 µA	
200 mA	100 µA	±(2.0% rdg + 5 dgts)
20 A	10 mA	

Overload Protection : 0.2A/250V Fuse (No fuse on 20A range).
Max Input Current : 20A (above 10A for 15 sec. maximum).
Frequency : 40Hz - 400Hz.
Display : Average value (RMS of Sine Wave).

DC CURRENT

Range	Resolution	Accuracy
2 mA	1 μ A	
20 mA	10 μ A	$\pm(1.0\% \text{ rdg} + 3\text{dgts})$
200 mA	100 μ A	$\pm(1.5\% \text{ rdg} + 5\text{dgts})$
20 A	10 mA	$\pm(2.0\% \text{ rdg} + 10\text{dgts})$

Overload Protection : 0.2A/250V Fuse (No fuse on 20A range).

Max Input Current : 20A (above 10A for 15 sec. maximum).

Measuring Voltage Drop : Full range is 200mV.

RESISTANCE

Range	Resolution	Accuracy
200 Ω	0.1 Ω	$\pm(1.0\% \text{ rdg} + 5 \text{ dgts})$
2 K Ω	1 Ω	
20 K Ω	10 Ω	$\pm(1.0\% \text{ rdg} + 2 \text{ dgts})$
200K Ω	100 Ω	
2 M Ω	1 K Ω	
20 M Ω	10 K Ω	$\pm(1.0\% \text{ rdg} + 15 \text{ dgts})$

Voltage at Open Circuit : < 700mV (200M Ω range, open circuit voltage around 3V).

Voltage at Open Circuit : All ranges 250VDC or AC RMS. At 200 Ω range, the resistance value caused by short circuit of test load should be deducted from the measured reading during measuring.

CAPACITANCE

Range	Resolution	Accuracy
2 nF	1 pF	
20 nF	10 pF	$\pm(4.0\% \text{ rdg} + 3 \text{ dgts})$
200 nF	100 pF	
2 μ F	1 η F	
200 μ F	100 η F	$\pm(5.0\% \text{ rdg} + 3 \text{ dgts})$

Testing frequency and voltage : around 400Hz 40mVrms.

Overload Protection : Maximum 36V DC or AC RMS.

TEMPERATURE

Range	Resolution	Accuracy
-40°C~0°C		$\pm(5.0\% \text{ rdg} + 5\text{dgts})$
0°C~400°C	1°C	$\pm(1.0\% \text{ rdg} + 3\text{dgts})$
400°C~1000°C		$\pm(3.0\% \text{ rdg} + 4\text{dgts})$

FREQUENCY

Range	Resolution	Accuracy
2 KHz	1 Hz	$\pm(2.0\% \text{ rdg} + 5\text{dgts})$



Overload Protection : 250V DC or AC rms.

Input Sensitivity : >200mV rms

TRANSISTOR hFE PARAMETER MEASUREMENT

Range	Description	Measuring condition
hFE	Can measure NPN or PNP transistor hFE. Range : 0~1000 β	Basic polarity current abt 10 μ A, Vce abt 2.8V.

DIODE AND CONTINUITY MEASUREMENT

		Comment	Measuring Condition
	1mV	Display diode forward voltage	Forward DC Current about 1mA Backward DC Voltage about 2.8V
	-	Beeper sounds if Continuity Resistance < 70 Ω \pm 20 Ω .	Open circuit Voltage about 2.8V












Overload Protection : 250V DC or AC RMS.

Rules For Safe Operation

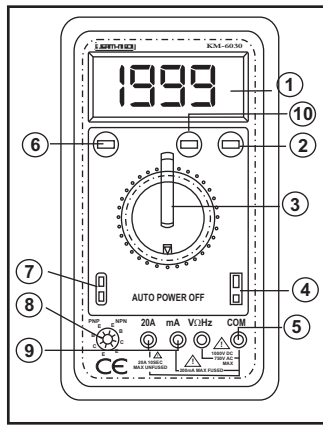
- ✍ The meter comply with IEC 1010-1 CAT I 1000V, CAT II 600V and CAT III 300V over voltage standards. Use the Meter only as specified in this manual, otherwise the protection provided by the Meter may be impaired.
- ✍ Do not operate the Meter before the cabinet has been closed and screwed safety as terminal can carry voltage.
- ✍ Make sure before each measurement the Meter is set to the suitable range.
- ✍ Before using the Meter, Please inspect the cabinet and test leads for damaged insulation or exposed metal.
- ✍ Connect the red and black test lead to the correct measuring input jack properly.
- ✍ Do not input values over the maximum range of each measurement, otherwise the Meter could be destroyed. Make sure to use fuses with proper rating in stead of bad fuses.
- ✍ To avoid electric shock or damages, do not apply more than 1000V between the "COM" terminal and "⌚" earth ground.
- ✍ Use caution when working with voltages above 60V(DC) or 30Vrms(AC). These voltages pose shock hazard.
- ✍ 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 off the Meter once finished measuring, fetch out the battery, when the meter will not be used for long period.

- ✍ Do not operate the Meter under adverse environmental humid area. To avoid damages and dangerous, do not change the circuit.
- ✍ Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

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.

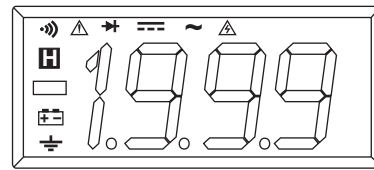
The Multimeter Structure (see figure 1)



(Figure 1)

- 1) Liquid Crystal Display
- 2) Data hold switch
- 3) Rotary switch
- 4) Temperature jack or inductance jack
- 5) Common Input jack
- 6) ON/OFF Switch
- 7) Capacitance jack
- 8) Transistor jack
- 9) Input jack for General Measurement
- 10) ON/OFF Backlight

Display Symbols (see figure 2)



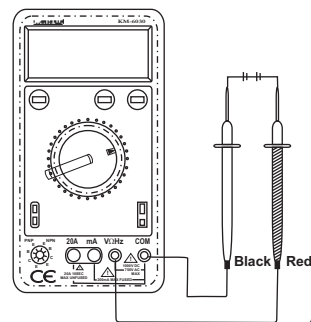
(Figure 2)

No.	Symbol	Meaning
1	⚡	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.
11	Ω , $k\Omega$,	Ω : Ohm. The unit of resistance. $k\Omega$: kilohm. 1×10^3 or 1000 ohms.
12	$^{\circ}C$	$^{\circ}C$: The unit of temperature.
13	$\eta F, \mu F$	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 harms to you or damages to the Meter from electric shock, please do not attempt to measure voltages higher than 1000VDC or 750V rms although readings may be obtained.

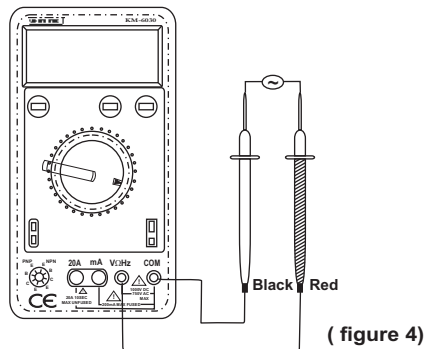
The DC Voltage ranges are :200mV, 2V, 20V, 200V, 1000V. To measure DC voltage, connect the Meter as follows :

- 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.

⚠ 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. $10M\Omega$. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to $10k\Omega$, 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)



⚠ 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 750V rms although readings may be obtained.

The AC Voltage measurement has 4 measurement positions on the rotary switch : 2V, 20V, 200V and 750V

To measure AC Voltage, connect the Meter as follows :

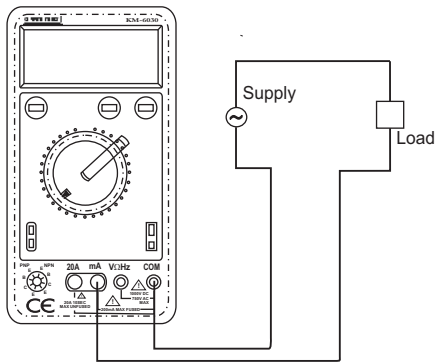
- 1) Insert the red test lead into the $V\Omega$ terminal and the black test lead into the **COM** terminal.
- 2) Set the rotary switch to an appropriate measurement position in $V \sim$ range.
- 3) Connect the test leads across with the object being measured.
The measured value is shown on the display, which is effective value of sine wave (mean value response).

⚠ Caution :

- If the value of voltage to be measured is unknown, use the maximum measurement position (750V) 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 Voltage measurement has been completed, disconnect the connection between the testing leads and the circuit under test.

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

C. AC Current Measurement (see figure 5)



Warning : (figure 5)

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 4 measurement positions on the rotary switch : 2mA, 20mA, 200mA, 20A.

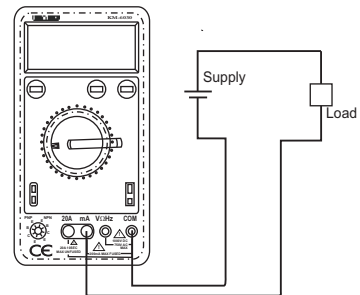
To measure AC Current, connect the meter as follows :

- 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.

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.
- When current measurement has been completed, 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.

The DC current measurement has 4 measurement positions on the rotary switch : 2mA, 20mA, 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.

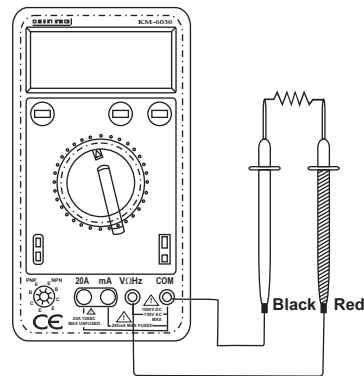
Caution

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

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 6 measurement positions on the rotary switch : 200Ω, 2KΩ, 20KΩ, 200KΩ, 2MΩ, 20MΩ.

To measure resistance, connect the meter as follows

- 1) Insert the red test lead into the $V\Omega$ 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 resistance 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. 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.

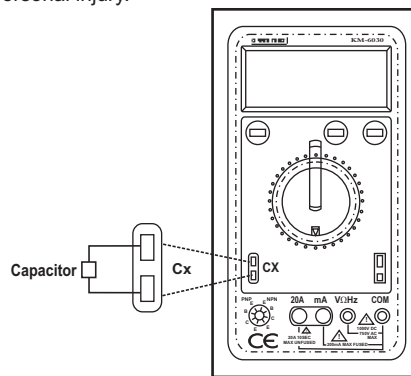
⚠ Caution :

- 1) Never connect high voltage to the input sockets with the switch in Resistance range.
- 2) 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.

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.



(figure 8)

Capacitance measurement has 5 measurement positions on the rotary switch : 2nF, 20nF, 200nF, 2 μ F and 200 μ F.

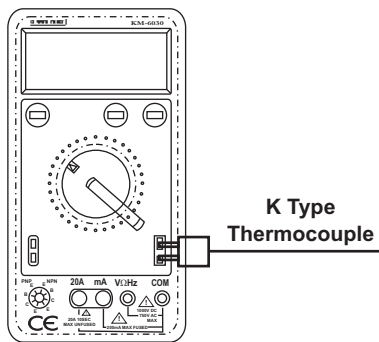
To measure capacitance, connect the Meter as follows

- 1) Set the function/range switch on the range position needed.

⚠ Caution :

- 1) Never connect high voltage to the input Sockets with the switch in Capacitance range.
- 2) Using Capacitance 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.

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:

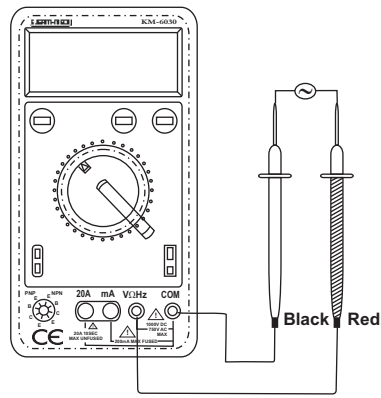
- 1) Set the function switch on the "°C" measurement position.
- 2) Insert the thermocouple plug into the meter's temperature socket.
- 3) The temp. probe supplied along with the instrument can measure temp. Upto 250°C. To measure temp. above 250°C please request for higher temp. measurement probe.

- 3) Insert the plug with the positive polarity in the positive socket and the negative polarity in the negative socket.
- 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 10)

The frequency measurement range is 2kHz.
To measure frequency, connect the Meter as follows :

- 1) Insert the red test lead into the **V Ω** terminal and the black test lead into the **COM** Terminal.
- 2) Set the rotary switch in the 2kHz 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)

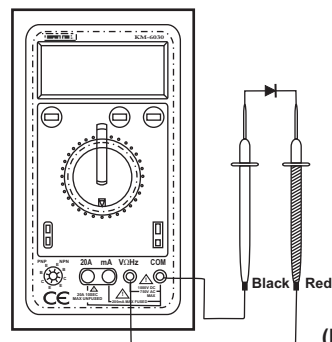
⚠ Warning

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.

Testing Diodes

Use the diode test function to check diodes, The diode test sends a current through the Semiconductor 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 **V Ω** 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 Semiconductor 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.
- 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.

Testing for Continuity

To test for continuity, connect the Meter as below :

1. Insert the red test lead into **V Ω** 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 50 Ω .
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 transistor (NPN or PNP) in the sockets provided.
2. The measured value is shown on the LCD Display.

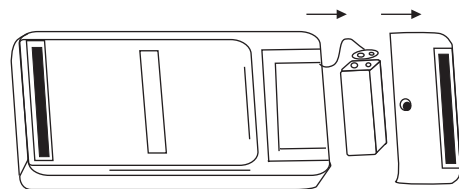
MAINTENANCE

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 screws from the battery compartment, and separate the battery compartment from the case bottom
- Remove the battery from the battery compartment.
- Replace the battery with a new Standard 9V Battery.
- Rejoin the battery compartment and the case bottom, and install the screw.



KUSAM-MECO

MUMBAI

TEST CERTIFICATE

DIGITAL MULTIMETER

This Test Certificate warrants 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. KM 6030

SERIAL NO. _____

DATE: _____

ISO 9001
REGISTERED



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KUSAM-MECO

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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