

## LIST OF PRODUCTS

- |  |                                 |
|--|---------------------------------|
| * Digital Multimeter   | * Digital AC & AC/DC Clampmeter |
| * AC Clamp Adaptor   | * AC/DC Current Adaptor         |
| * Thermo Anemometer  | * Thermo Hygrometer             |
| * Distance Meter   | * Digital Lux Meter             |
| * Network Cable Tester   | * Power Factor Regulator        |
| * Earth Resistance Tester  | * Digital Panel Meters          |
| * DC Power Supplies  | * High Voltage Detector         |
| * Calibrators  | * Gas Analysers                 |
| * Frequency Counter  | * Function Generator            |
| * Phasing Sticks   | * Battery Tester                |
| * Waterproof Pen Testers   | * Solar Power Meter             |
| * EMF Detector   |                                 |
| * Wood, Paper & Grain Moisture Meter   |                                 |
| * Transistorised Electronic Analog & Digital Insulation Resistance Testers(upto 10 KV) |                                 |
| * Digital Sound Level Meter & Sound Level Calibrator                                   |                                 |
| * Digital contact & Non-contact Type Tachometer  |                                 |
| * Digital Non-contact (infrared) Thermometer   |                                 |
| * Maximum Demand Controller/Digital Power Meter  |                                 |
| * Digital Hand Held Temperature Indicators   |                                 |



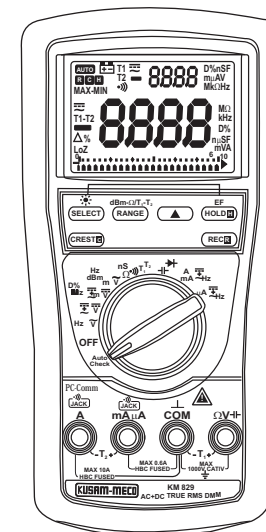
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Website : www.kusamelectrical.com



AN ISO 9001:2015 COMPANY

## TRMS DIGITAL MULTIMETER MODEL - KM 829



## OPERATION MANUAL

### **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. THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. "KUSAM-MECO" SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE WHATSOEVER.

All transaction are subject to Mumbai Jurisdiction.

### **TAKE MEASUREMENTS 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 low 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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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. **KM 829**

SERIAL NO. \_\_\_\_\_

DATE: \_\_\_\_\_

**ISO 9001  
REGISTERED**



## Battery and Fuse replacement

**Battery use :** Single 9V battery.

**Fuse use :**

Fuse (FS1) for  $\mu$ A mA current input :  
0.44A/1000Vac & Vdc, IR 10kA, or better,  
F fuse ; Dimension : 10 x 38 mm

Fuse (FS2) for A current input :  
11A/1000Vac & Vdc, IR 20kA, or better,  
F fuse ; Dimension : 10 x 38 mm

### ***Battery replacement :***

Loosen the 2 screws from the battery access door of the case bottom. Lift the battery access door and thus the battery compartment up. Replace the battery. Re-fasten the screws.

### ***Fuse replacement :***

Loosen the 4 screws from the case bottom. Lift the end of the case bottom nearest the input jacks until it unsnaps from the case top. Replace the blown fuse(s). Replace the case bottom, and ensure that all the gaskets are properly seated and the two snaps on the case top (near the LCD side) are engaged. Re-fasten the screws.

## 1) SAFETY

### 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.

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. The meter is intended only for indoor use.

The meter protection rating, against the users, is double insulation per IEC/UL/EN61010-1 Ed. 3.0, IEC/EN61010-2-030 Ed. 1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL61010-031 Ed. 1.1 and CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to Category IV 1000V AC & DC.

Terminals (to COM) measurement category:

V / mA  $\mu$ A / A : Category IV 1000VAC & VDC

Per IEC61010-1 2nd Ed. (2001) Measurement Category

**Measurement Category IV (CAT IV)** is for measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.

**Measurement Category III (CAT III)** is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

**Measurement Category II (CAT II)** is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

#### **WARNING**

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60 VDC or 30 VAC rms. These voltage levels pose a potential shock hazard to the user. Do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured. Keep your fingers behind the finger guards of the test leads during measurement. Inspect test leads, connectors, & probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately.

## **5) MAINTENANCE**

### **WARNING**

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent.

### **Cleaning and Storage**

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately.

### **Trouble Shooting**

If the instrument fails to operate, check battery, fuses, leads, etc., And replace as necessary. Double check operating procedure as described in this user's manual.

If the instrument voltage-resistance input terminal has subjected to high voltage transient (caused by lightning or switching surge to the system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this terminal will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the WARRANTY section for obtaining warranty or repairing service.

### Manual or Auto-ranging

Press the **RANGE** button momentarily to select manual-ranging, and the meter will remain in the range it was in, the LCD **AUTO** turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging.

Note : Manual ranging feature is not available in Hz function.

### Set Beeper Off

Press the **RANGE** button while turning the meter on to temporarily disable the Beeper feature. Turn the rotary switch OFF and then back on to resume.

### Auto-Power off (APO)

The Auto-Power-off (APO) mode turns the meter off automatically to extend battery life after approximately 30 minutes of no activities. Activities are specified as : 1) Rotary switch or push button operations, and 2) Significant measuring readings of above 512 counts or non-OL  $\Omega$  readings. In other words, the meter will intelligently avoid entering the APO mode when it is under normal measurements. To wake up the meter from APO, press the **SELECT, RANGE, RELATIVE or HOLD** button momentarily or turn the rotary switch OFF and then back on. Always turn the rotary switch to the OFF position when the meter is not in use.

### Disabling Auto-Power off








Press the **SELECT** button while turning the meter on to temporarily disable the Auto-Power-Off feature. Turn the rotary switch OFF and then back on to resume.

Do not measure any current that exceeds the current rating of the protection fuse. Do not attempt a current measurement to any circuit where the open circuit voltage is above the protection fuse voltage rating. Suspected open circuit voltage should be checked with voltage functions. Never attempt a voltage measurement with the test lead inserted into the  $\mu A/mA$  or A input jack. Only replace the blown fuse with the proper rating as specified in this manual.

### CAUTION

Disconnect the test leads from the test points before changing functions. Always set the instrument to the highest range and work downward for an unknown value when using manual ranging mode.

### INTERNATIONAL ELECTRICAL SYMBOLS

	Caution ! Refer to the explanation in this Manual
	Caution ! Risk of electric shock
	Earth (Ground)
	Double Insulation or Reinforced insulation
	Fuse
	AC--Alternating Current
	DC--Direct Current

### 2) CENELEC DIRECTIVES

The instruments conform to CENELEC Low-voltage directive 2006/95/EC and Electromagnetic compatibility directive 2004 /108 / EC

## SPECIFICATIONS :

### GENERAL SPECIFICATIONS :

- Display** : 4 Digit 9999 counts: ACV, DCV, Hz & nS  
6000 counts for mV,  $\mu$ A, mA, A, Ohm &  
Capacitance with Backlight.
- Polarity** : Automatic
- Update Rate** : Digital Display: 5 per second nominal;  
41 Segments Bar-graph: 60 per second max
- Low Battery** : Below approx. 7V
- Operating Temperature:** 0°C to 45°C
- Relative Humidity** : Maximum relative humidity 80% for  
temperature up to 31°C decreasing  
linearly to 50% relative humidity at 45°C
- Pollution degree** : 2
- Storage Temperature** : -20°C to 60°C, < 80% R.H.  
(With battery removed)
- Altitude** : Operating below 2000m

### 1ms CREST capture mode

Press **CREST** button momentarily to activate CREST (Instantaneous Peak-Hold) mode to capture voltage or current signal duration as short as 1ms. The LCD "C" & "MAX" turn on. The meter beeps when new MAX (maximum) or MIN (minium) reading is updated. Press the button momentarily to read the MAX, MIN and MAX-MIN (Vp-p) readings in sequence. Press the button for 1 second or more to exit CREST mode. Auto-ranging (up range) remains, and Auto-Power-Off is disabled automatically in this mode.

### Backlight display

Press **SELECT** button for 1 second or more to toggle the LCD backlight. The backlight will also be turned off automatically after 32 seconds to extend battery life.

### Beep-Jack™ Input Warning

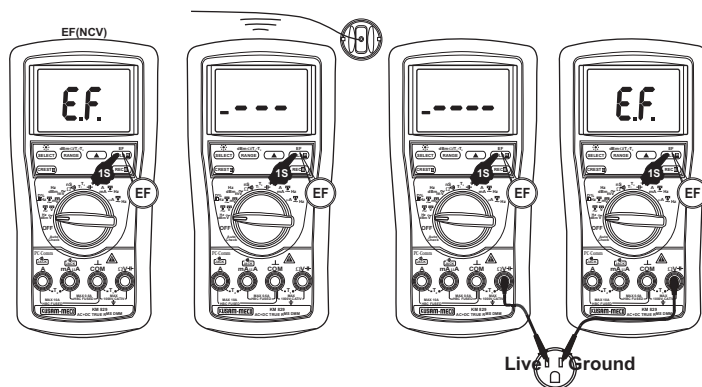
The meter beeps as well as displays "InEr" to warn the user against possible damage to the meter due to improper connections to the  $\mu$ A, mA or A input jacks when other function (like voltage function) is selected.

### Hold

The hold feature freezes the display for later view. Press the **HOLD** button momentarily to toggle the hold feature.

### △ Relative Zero mode

Relative zero allows the user to offset the meter consecutive measurements with the displaying reading as the reference value. Practically all displaying readings can be set as relative reference value including MAX/MIN/AVG\* readings. Press the △ Button momentarily to toggle relative zero mode.



### PC COMPUTER INTERFACE CAPABILITIES

The instrument equips with an optical isolated interface port at the meter back for data communication. Optional purchase PC USB interface kit **BU-82X** is required to connect the meter to the PC computer.

### MAX/MIN/AVG\* (REC) at fast 20/s measurement mode

Press **REC** button momentarily to activate MAX/MIN/AVG\* recording mode. The LCD "R" & "MAX MIN AVG\*" turn on, and the reading update rate will be increased to 20/second. The meter beeps when new MAX (maximum) or MIN (minimum) reading is updated. AVG\* (Average) reading is calculated over time. Press the button momentarily to read the MAX, MIN, MAX-MIN and AVG\* readings in sequence. Press the button for 1 second or more to exit MAX/MIN/AVG\* recording mode. Auto-ranging remains, and Auto-Power-Off is disabled automatically in this mode.

**Temperature Coefficient** : nominal 0.15 x (specified accuracy) /  
°C @(0°C ~ 18°C or 28°C ~ 45°C), or otherwise specified.

**Sensing**: AC+DC True RMS

**Safety** : Double insulation per IEC/UL/EN61010-1 Ed. 3.0, IEC/EN 61010-2-030 Ed. 1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL/ EN61010-031 Ed. 1.1 and CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to Category IV 1000V AC & DC.

**Transient protection**:12kV (1.2/50µs surge)

**Terminals (to COM) Measurement Category**:

V / mAµA / A : Category IV 1000VAC & VDC

**Overload Protections**:

µA & mA : 0.44A / 1000V DC/AC rms, IR 10kA, F fuse

A : 11A / 1000V DC/AC rms, IR 20kA, F fuse

V : 1100V DC/AC rms

mV, Ω , & others : 1000V DC/AC rms

**E.M.C.** :Meets EN61326-1:2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11)



In an RF field of 3V/m:

Capacitance function is not specified

Other function ranges:

Total Accuracy = Specified Accuracy + 100 digits

Performance above 3V/m is not specified

**Power Supply:** Single 9V battery.

**Power Consumption:** 5 mA typical

**APO Timing:** Idle for 30 minutes

**APO Consumption:** 50 $\mu$ A typical

**Dimension:** 208(L) X 103(W) X 64.5(H) mm with holster

**Weight:** 635 gm with holster

**Accessories:** Test lead pair, Holster, battery installed, user's manual, BKP60 banana plug type-K thermocouple(250°C).

**Optional purchase accessories:** USB interface kit BU-86X; BMH-01 Magnetic Hanger; BKB32 banana plug to type-K socket plug adaptor Current Clamp Adaptor CA500, CA1000, Ca2000, High Voltage Probe PD-28.

\* Note : When measuring a 3-phase system, special attention should be taken to the phase-to-phase voltage which is significantly higher than the phase-to-earth voltage. To avoid exceeding the voltage rating of the protection fuse(s) accidentally, always consider the phase-to-phase voltage as the working voltage for the protection fuse(s).

### ELECTRIC FIELD EF-DETECTION

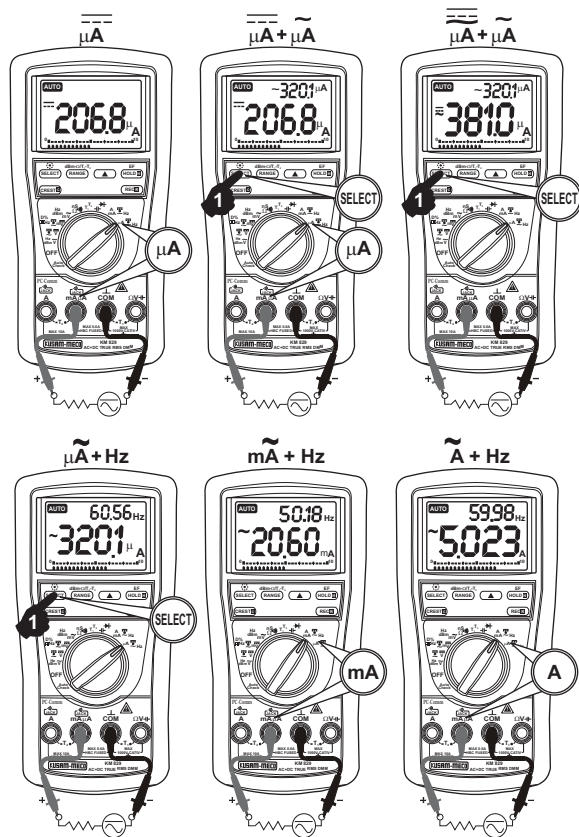
At any function, press the **EF** button for one second or more to toggle to EF-Detection feature. The meter displays "E.F." When it is ready. Signal strength is indicated as a series of bar-graph segments on the display plus variable beep tones.

- **Non-Contact EF-Detection** : An antenna is located along the top of the meter, which detects electric field surrounds current-carrying conductors. It is ideal for tracing live wiring connections, locating wiring breakage and to distinguish between live or earth connections.

- **Probe-Contact EF-Detection** : For more precise indication of live wires, such as distinguishing between live and ground connections, use the Red (+) test probe for direct contact measurements.

### $\mu$ A, mA AND A CURRENT FUNCTIONS

Press the **SELECT** button momentarily to select DC, DC <sup>+AC</sup>, DC+AC <sup>+AC</sup> & AC <sup>+Hz</sup>. Last selection will be saved as power up default for repeat measurement convenience.



### ELECTRICAL SPECIFICATIONS :

Accuracy is (% reading digits + number of digits) or otherwise specified, at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  & less than 75% relative humidity. True RMS voltage & current accuracies are specified from 10 % to 100 % of range or otherwise specified. Maximum Crest Factor < 2:1 at full scale & < 4:1 at half scale, and with frequency components within the specified frequency bandwidth for non-sinusoidal waveforms.

#### AC VOLTAGE

FUNCTION	RANGE	ACCURACY
50Hz ~ 60Hz		
mV	60.00mV, 600.0mV	0.5% + 3d
V	9.999V, 99.99V, 999.9V	
40Hz ~ 500Hz		
mV	60.00mV, 600.0mV	0.8% + 4d
V	9.999V, 99.99V	1.0% + 4d
	999.9V	2.0% + 4d
500Hz ~ 1kHz		
mV	60.00mV, 600.0mV	2.0% + 3d
V	9.999V, 99.99V	1.0% + 4d
	999.9V	2.0% + 4d
1kHz ~ 3kHz		
mV	60.00mV, 600.0mV	2.0% + 3d
V	9.999V, 99.99V, 999.9V	3.0% + 4d
3kHz ~ 20kHz		
mV	60.00mV <sup>1)</sup> , 600.0mV <sup>1)</sup>	2% + 3d
V	9.999V <sup>2)</sup> , 99.99V	3dB
	999.9V	Unspec'd

<sup>1)</sup>Specified from 30% to 100% of range.

<sup>2)</sup>For range 9.999V 3KHz ~ 15KHz only

Input Impedance : 10M $\Omega$ , 50pF nominal (80pF nominal for mV range)

Residual reading less than 5 digits with test leads shorted.

#### AUTOCHECK™ (ACV)

RANGE <sup>1)</sup>	ACCURACY
<b>50Hz ~ 60Hz</b>	
9.999V, 99.99V, 999.9V	1.0% + 4d

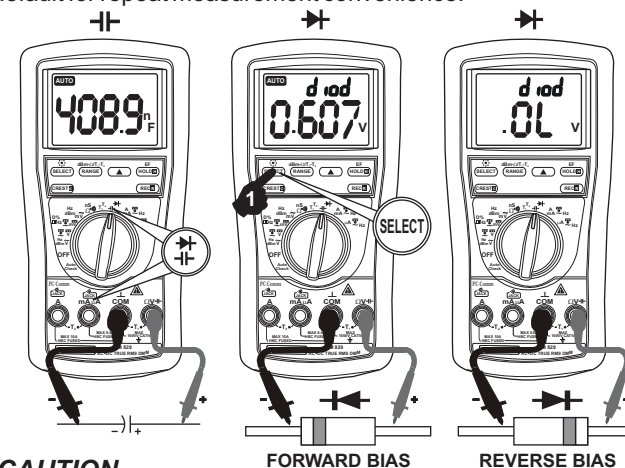
Lo-Z ACV Threshold : > 3VAC (50/60Hz) nominal  
 Lo-Z ACV Input Impedance : Initially approx. 3.0k $\Omega$ , 150pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:  
 18k $\Omega$ @ 100V 125k $\Omega$ @ 300V  
 320k $\Omega$ @ 600V 460k $\Omega$ @ 1000V

#### dBm

At 600 $\Omega$ , -11.76 dBm to 54.25 dBm,  
 Accuracy :  $\pm 0.25$  dB + 2d (@40Hz -- 20kHz)  
 Input Impedance : 10M $\Omega$ , 50pF nominal  
 Selectable reference impedance of 4, 8, 16, 32, 50, 75, 93, 110, 125, 135, 150, 200, 250, 300, 500, 600, 800, 900, 1000, 1200 $\Omega$ .

#### ⚡ CAPACITANCE, ⚡ DIODE TEST FUNCTIONS

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



#### CAUTION

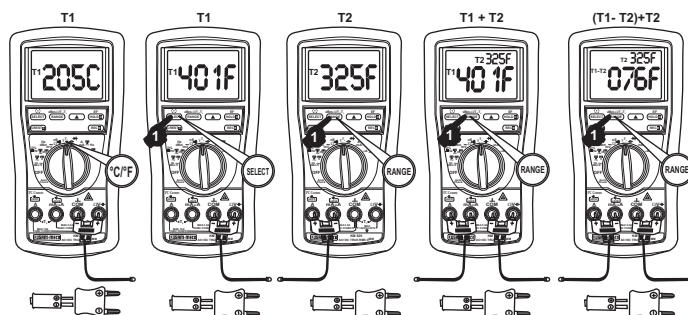
Discharge capacitors before making any measurement. Large value capacitors should be discharged through an appropriate resistance load.

Normal forward voltage drop (forward biased) for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective). An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The digital display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

## Temperature functions

Press SELECT button momentarily to toggle between °C and °F readings. For Dual channel Temperature function, press **T1-T2 (RANGE)** button momentarily can select T1, T2, T1<sup>+T2</sup> or T1-T2<sup>+T2</sup> readings. Last selection will be saved as power up default for repeat measurement convenience.

Note : Be sure to insert the banana plug type-K temperature bead probe Bkp60 with correct **+** **-** polarities. You can also use a plug adapter Bkb32 (Optional purchase) with banana pins to type-K socket to adapt other standard type-K mini plug temperature probes.



## DC VOLTAGE

FUNCTION	RANGE	ACCURACY
mV	60.00mV	0.12% + 2d
	600.0mV	0.06% + 2d
V	9.999V, 99.99V, 999.9V	0.08% + 2d

Input Impedance : 10MΩ, 50pF nominal (80pF nominal for 600mV range)

## OHMS / CONDUCTANCE

RANGE	ACCURACY
600.0Ω, 6.000kΩ, 60.00kΩ, 600.0kΩ	0.1% + 3d
6.000MΩ	0.4% + 3d
60.00MΩ	1.5% + 5d
99.99nS	0.8% + 10d

Open Circuit Voltage: < 1.2VDC (< 1.0VDC for 60MΩ range)

## AUTOCHECK™ (OHMS)

RANGE	ACCURACY
600.0Ω, 6.000kΩ, 60.00kΩ, 600.0kΩ	0.5% + 4d
6.000MΩ	0.8% + 3d
60.00MΩ <sup>1)</sup>	2.0% + 5d

<sup>1)</sup> Temperature Coefficient 0.6 x (specified accuracy)/°C @ (0°C ~ 18°C or 28°C ~ 45°C)

Open Circuit Voltage: < 1.2VDC (< 1.0VDC for 60MΩ range)

### DC CURRENT

RANGE	ACCURACY	BURDEN VOLTAGE
600.0μA, 6000μA	0.2% + 4d	0.08mV / μA
60.00mA		2.1mV / mA
600.0mA		
6.000A, 10.00A <sup>1)</sup>		0.02V / A

<sup>1)</sup> 10A continuous, > 10A to 20A for 30 second max with 5 minutes cool down interval.

### AC & AC + DC CURRENT

RANGE	ACCURACY	BURDEN VOLTAGE
<b>50Hz ~ 60Hz</b>		
600.0μA, 6000μA	0.6% + 3d	0.08mV / μA
60.00mA		2.1mV / mA
600.0mA	1.0% + 3d	
6.000A, 10.00A <sup>1)</sup>	0.8% + 6d	0.02V / A
<b>40Hz ~ 1kHz</b>		
600.0μA, 6000μA	0.8% + 4d	0.08mV / μA
60.00mA		2.1mV / mA
600.0mA	1.0% + 4d	
6.000A, 10.00A <sup>1)</sup>	0.8% + 6d	0.02V / A

<sup>1)</sup> 10A continuous, > 10A to 20A for 30 second max with 5 minutes cool down interval.

### AUDIBLE CONTINUITY TESTER

Audible threshold : between 20Ω and 300Ω;  
Response time < 100μs

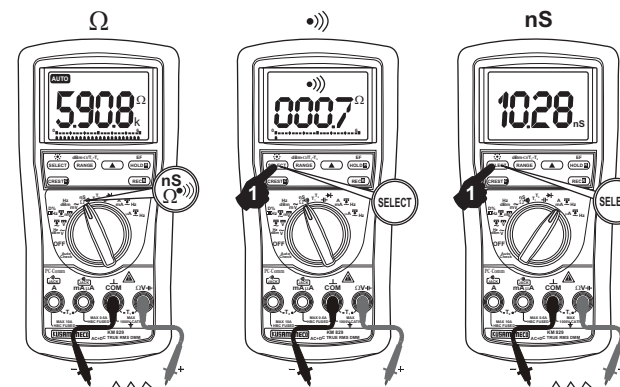
### nS Conductance, Ω Resistance, ∩)) Continuity functions

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.

Note :

Conductance (unit-Siemens) is the inverse of Resistance, that is  $S=1/\Omega$  or  $nS=1/G\Omega$ . It virtually extends the Resistance measurements to the order of Giga-Ohms for leakage measurements.

∩)) Continuity function is convenient for checking wiring connections and operation of switches. A continuous beep tone indicates a complete wire.

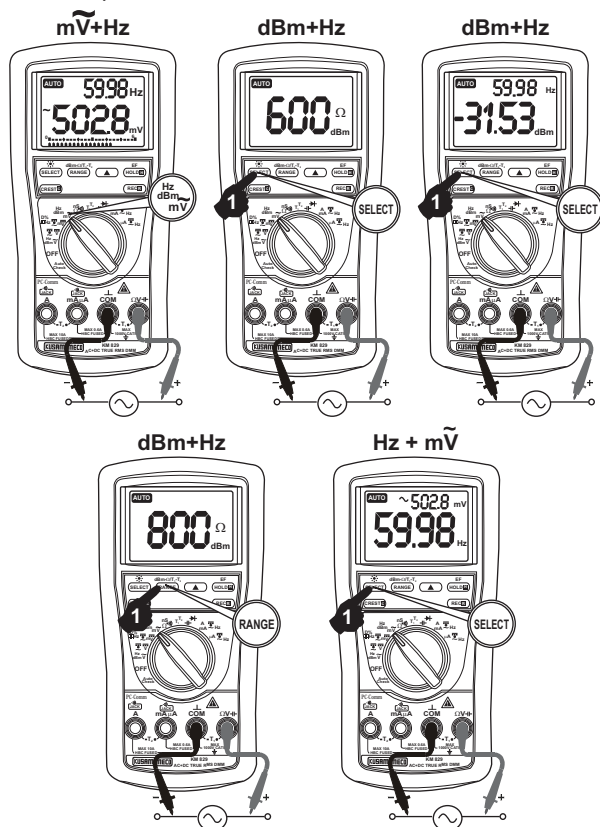


### CAUTION

Using resistance and continuity function in a live circuit will produce false results & may damage the instrument. In many cases the suspected component must be disconnected from the circuit to obtain an accurate reading.

### ACmV <sup>+Hz</sup>, dBm <sup>+Hz</sup>, Hz <sup>+ACmV</sup> functions

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



### AUTOCHECK™ (DCV)

RANGE	ACCURACY
9.999V, 99.99V, 999.9V	0.5% + 3d

Lo-Z DCV Threshold : > +1.5VDC or < -1.0VDC nominal

Lo-Z DCV Input Impedance :

Initially approx. 3.0kΩ, 165pF nominal; Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are:

- 18kΩ @100V
- 125kΩ @ 300V
- 320kΩ @ 600V
- 500kΩ @ 1000V

### CAPACITANCE

RANGE	ACCURACY <sup>1)</sup>
60.00nF, 600.0nF	0.8% + 3d
6.000μF	1.0% + 3d
60.00μF	2.0% + 3d
600.0μF <sup>2)</sup>	3.5% + 5d
6.000mF <sup>2)</sup>	5.0% + 5d
25.00mF <sup>2)</sup>	6.5% + 5d

<sup>1)</sup>Accuracies with film capacitor or better

<sup>2)</sup>In manual-ranging mode, measurements not specified below 50.0μF, 0.54mF and 5.4mF for 600.0μF, 6.000mF and 25.00mF ranges respectively.

### RECORD MODE:

Accuracy : Specified accuracy adds 10 digits for changes > 100ms in duration.

**LINE LEVEL FREQUENCY (~Hz)**

FUNCTION RANGE	FREQUENCY	SENSITIVITY (SINE RMS)
AC 60.00mV	15.00 ~ 50.00kHz	40mV
AC 600.0mV		60mV
AC 9.999V	15.00 ~ 10.00kHz	2.5V
AC 99.99V		25V
AC 999.9V		100V
AC 600.0μA	15.00 ~ 3.000kHz	200μA
AC 6000μA		600μA
AC 60.00mA		40mA
AC 600.0mA		60mA
AC 6.000A		4A
AC 10.00A		6A

**Accuracy : 0.04% + 4d**

**TEMPERATURE**

RANGE	ACCURACY
-50°C to 1000°C	0.3% + 2°C
-58°F to 1832°F	0.3% + 5°F

Type-K thermocouple range & accuracy not included

**DIODE TESTER**

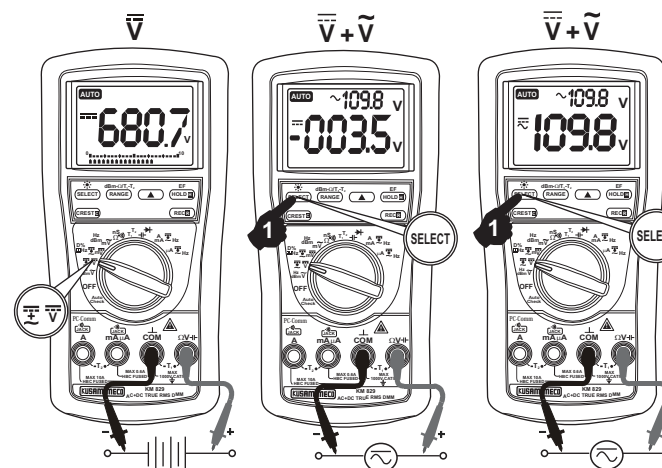
RANGE	ACCURACY
2.000V	1.0% + 1d

**Test Current (Typically) : 0.4mA**

**Open Circuit Voltage : < 3.5V DC**

**DC + ACV <sup>+ACV</sup>, DCV, DCV <sup>+ACV</sup> functions**

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



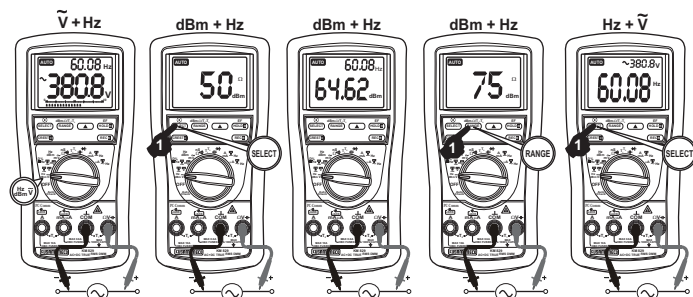
**DCmV, DCmV <sup>+ACmV</sup>, DC+ACmV <sup>+ACmV</sup>, Logic-Level  $\square$  Hz & Duty%**

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



**$\text{dBm}^{+Hz}$ ,  $\text{Hz}^{+ACV}$   $\text{ACV}^{+Hz}$  functions**

Press the **SELECT** button momentarily to select the subject functions in sequence. Last selection will be saved as power up default for repeat measurement convenience.



Note :  $\text{Hz}$  Input sensitivity varies automatically with voltage (current function alike) range selected. 1V range has the highest and the 1000V range has the lowest. Auto-ranging measurements normally set the most appropriate trigger level. You can also press the **RANGE** button momentarily to select another trigger level (Voltage range) manually. If the  $\text{Hz}$  reading becomes unstable, select higher voltage range to avoid electrical noise. If the reading shows zero, select lower voltage range.

Note : In  $\text{dBm}^{+Hz}$  function, power up default reference impedance will be displayed for 1 second before displaying the  $\text{dBm}$  readings. Press  **$\text{dBm}-\Omega$  (RANGE)** button momentarily to select different reference impedance of 4,8,16,32,50,75,93,110,125,135, 150,200,250,300,500,600,800,900,1000, up to 1200 $\Omega$ . Last selection will be saved as power up default for repeat measurement convenience. Manual trigger level selection on  $\text{Hz}$  reading is not available.

**CREST MODE (INSTANTANEOUS PEAK HOLD)**

**Accuracy** : Specified accuracy adds 250 digits for changes > 1.0 ms in duration

**LOGIC LEVEL FREQUENCY & DUTY CYCLE (D%)**

@DCmV FUNCTION	RANGE	ACCURACY <sup>1)</sup>
Frequency	5.00Hz ~ 1.000MHz	0.04% + 4d
Duty Cycle	0.00% ~ 100.0%	3d/kHz + 2d <sup>2)</sup>

<sup>1)</sup> **Sensitivity** : 2.5Vp (Square wave) for 3V & 5V Logic Family

<sup>2)</sup> **Specified Frequency** : 5Hz ~ 10kHz

**NON-CONTACT EF-DETECTION**

TYPICAL VOLTAGE	BAR GRAPH INDICATION
20V (tolerance : 10V ~ 36V)	—
55V (tolerance : 23V ~ 83V)	— —
110V (tolerance : 59V ~ 165V)	— — —
220V (tolerance : 124V ~ 330V)	— — — —
440V (tolerance : > 250V)	— — — — —

Indication : Bar graph segments & audible beep tones proportional to the field strength

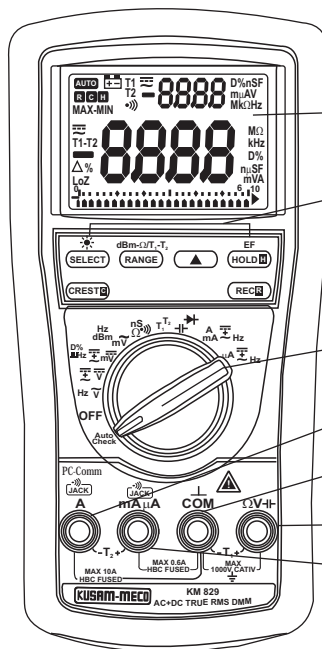
Detection Frequency : 50/60Hz

Detection Antenna : Top end of the meter

Probe-Contact EF-Detection : For more precise indication of live wires, such as distinguishing between live and ground Connections, use the Red (+) test probe for direct contact measurements.



### 3) PRODUCT DESCRIPTION



- 1) 4 digits 9999 counts dual displays
- 2) Push-buttons for special functions & features
- 3) Selector to turn the Power On or Off and Select a function
- 4) Input Jack for 10A (20A for 30sec) current function
- 5) Common (Ground reference) Input Jack for all functions
- 6) Input Jack for all functions EXCEPT current ( $\mu A$ , mA, A) functions
- 7) Input Jack for milli-amp & micro-amp current functions

#### Analog bar-graph

The analog bar graph provides a visual indication of measurement like a traditional analog meter needle. It is excellent in detecting faulty contacts, identifying potentiometer clicks, and indicating signal spikes during adjustments.

**\*As Hazardous-Alert:** When making resistance measurements in AutoCheck™ mode, an unexpected display of voltage readings alerts you that the object under test is being energized.

**\*Ghost-voltage Buster:** Ghost-voltages are unwanted stray signals coupled from adjacent hard signals, which confuse common multimeter voltage measurements. Our AutoCheck™ mode provides low (ramp-up) input impedance (approx.  $3k\Omega$  at low voltage) to drain ghost voltages leaving mainly hard signal values on meter readings. It is an invaluable feature for precise indication of hard signals, such as distinguishing between hot and open wires (to ground) in electrical installation applications.

#### WARNING:

AutoCheck™ mode input impedance increases abruptly from initial  $3k\Omega$  to a few hundred  $k\Omega$ 's on high voltage hard signals. "LoZ" displays on the LCD to remind the users of being in such low impedance mode. Peak initial load current, while probing 1000VAC for example, can be up to 471mA ( $1000V \times 1.414 / 3k\Omega$ ), decreasing abruptly to approx. 3.1mA ( $1000V \times 1.414 / 460k\Omega$ ) within a fraction of a second. Do not use AutoCheck™ mode on circuits that could be damaged by such low input impedance. Instead, use rotary selector V or  $\bar{V}$  high input impedance voltage modes to minimize loading for such circuits.

**AUTOCHECK™ MODE**

This innovative **AutoCheck™** feature automatically selects measurement function of DCV, ACV or Resistance ( $\Omega$ ) based on the input via the test leads.

- With no input, the meter displays "Auto" when it is ready.
- With no voltage signal but a resistance below  $60M\Omega$  is present, the meter displays the resistance value. When below "Audible Threshold" is present, the meter further gives a continuity beep tone.
- When a signal above the threshold of 1.5V DC or 3V AC up to the rated 1000V is present, the meter displays the voltage value in appropriate DC or AC, whichever larger in peak magnitude.

**Note:**

**\*Range-Lock and Function-Lock Feature:** When a measurement reading is being displayed in AutoCheck™ mode, press the RANGE or SELECT button momentarily 1 time can lock the range or function it was in. Press the button momentarily repeatedly to step through the ranges or functions.

**Average sensing RMS calibrated**

RMS (Root-Mean-Square) is the term used to describe the effective or equivalent DC value of an AC signal. Most digital multimeters use average sensing RMS calibrated technique to measure RMS values of AC signals. This technique is to obtain the average value by rectifying and filtering the AC signal. The average value is then scaled upward (calibrated) to read the RMS value of a sine wave. In measuring pure sinusoidal waveform, this technique is fast, accurate and cost effective. In measuring non-sinusoidal waveforms, however, significant errors can be introduced because of different scaling factors relating average to RMS values.

**True RMS**

True RMS is a term which identifies a DMM that responds accurately to the effective RMS value regardless of the waveforms such as: square, sawtooth, triangle, pulse trains, spikes, as well as distorted waveforms with the presence of harmonics. Harmonics may cause :

- 1)Overheated transformers, generators and motors to burn out faster than normal.
- 2)Circuit breakers to trip prematurely
- 3)Fuses to blow
- 4)Neutrals to overheat due to the triplen harmonics present on the neutral
- 5)Bus bars and electrical panels to vibrate

### Crest Factor

Crest Factor is the ratio of the Crest (instantaneous peak) value to the True RMS value, and is commonly used to define the dynamic range of a True RMS DMM. A pure sinusoidal waveform has a Crest Factor of 1.4. A badly distorted sinusoidal waveform normally has a much higher Crest Factor.

### NMRR (Normal Mode Rejection Ratio)

NMRR is the DMM's ability to reject unwanted AC noise effect that can cause inaccurate DC measurements. NMRR is typically specified in terms of dB (decibel). This series has a NMRR specification of >60dB at 50 and 60Hz, which means a good ability to reject the effect of AC noise in DC measurements.

### CMRR (Common Mode Rejection Ratio)

Common mode voltage is voltage present on both the COM and VOLTAGE input terminals of a DMM, with respect to ground. CMRR is the DMM's ability to reject common mode voltage effect that can cause digit rolling or offset in voltage measurements. This series has a CMRR specifications of >60dB at DC to 60Hz in ACV function; and >120dB at DC, 50 and 60Hz in DCV function. If neither NMRR nor CMRR specification is specified, a DMM's performance will be uncertain.

## 4) OPERATION

### AutoCheck™ $\tilde{V} \cdot \bar{V} \cdot \Omega$

### CAUTION

Before and after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

