

LIST OF PRODUCTS

- * Digital Multimeter
- * AC Clamp Adaptor
- * Thermo Anemometer
- * Distance Meter
- * Network Cable Tester
- * Earth Resistance Tester
- * DC Power Supplies
- * Calibrators
- * Frequency Counter
- * Phasing Sticks
- * Waterproof Pen Testers
- * 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
- * Digital AC & AC/DC Clampmeter
- * AC/DC Current Adaptor
- * Thermo Hygrometer
- * Digital Lux Meter
- * Power Factor Regulator
- * Digital Panel Meters
- * High Voltage Detector
- * Gas Analysers
- * Function Generator
- * Battery Tester
- * Solar Power Meter



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AN ISO 9001:2015 COMPANY

AC TRMS DIGITAL MULTIMETER

MODEL - KM 239R

OPERATION MANUAL

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, burnt PCB's, 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.

KUSAM-MECO[®]

AC TRMS DIGITAL MULTIMETER MODEL - KM 239R

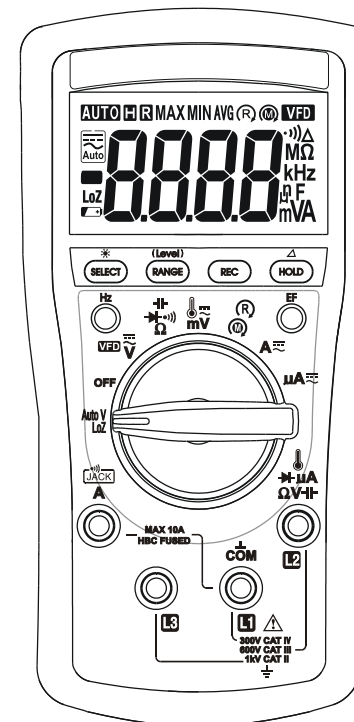


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MUMBAI

TEST CERTIFICATE**AC TRMS 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 239R**

SERIAL NO. _____

DATE: _____

**ISO 9001:2015
REGISTERED**

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** button momentarily and release, 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

5) MAINTENANCE

WARNING

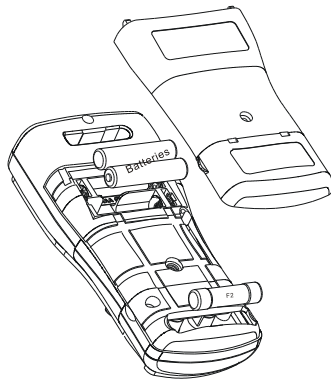
To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case. Do not operate with open case. Install only the same type of fuse or equivalent

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, fuse, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual



Battery use :

1.5V AAA Size battery x 2

Fuse use :

Fuse F2 for A current input:
11A/1000V DC/AC, IR 20kA
F fuse or better; Dimension :
10 x 38mm

Battery and Fuse replacement:

Loosen the screw from the access cover of the case bottom. Lift the access cover. Replace the batteries or fuse. Re-fasten the screw.

I. SAFETY :

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

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.

WARNING :

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. The meter is intended only for indoor use.

Keep your hands/fingers behind the hand/finger barriers (of the meter and the test probe assembly, where applicable) that indicate the limits of safe access of the hand-held parts during measurements. Inspect lead wires, connectors, and probes for damaged insulation or exposed metal before using the meter. If any defects are found, replace them immediately. Only use the probe assembly provided with the meter or a UL Listed Probe Assembly to the same meter ratings or better.

IEC 61010-031 requires exposed conductive test probe tips to be $\leq 4\text{mm}$ for CAT III & CAT IV ratings. Refer to the category markings on your probe assemblies as well as on the add-on accessories (like detachable Caps or Alligator Clips), if any, for applicable rating changes.

Observe proper safety precautions when working with voltages above 33 Vrms, 46.7 Vpeak or 70 VDC. These voltage levels pose In other words, the meter will intelligently avoid entering the APO

a potential shock hazard to the user. Before and after hazardous voltage measurements, check the voltage function on a known source such as line voltage to determine proper meter functioning.

CAUTION

Disconnect the test leads from the test points before changing functions.

Brief Information about Measurement Categories

Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation. Examples are measurements on devices installed before the main fuse or circuit breaker in the building installation.

Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation. Examples are measurements on distribution boards (including secondary meters), 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 such as stationary motors with permanent connection to the fixed installation.

Measurement Category II is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation. Examples are measurements on MAINS CIRCUITS of household appliances, portable tools and similar equipment.

CENELEC DIRECTIVES :

The instruments conform to CENELEC Low-voltage directive 2014/35/EC, Electromagnetic compatibility directive 2004/108/CU and RoHS directive 2011/65/EU.

Hold

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

Relative Zero (Δ) 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 feature readings. Press the button for one second or more to toggle Relative Zero mode.

Manual or Auto-ranging

For most auto-ranging functions (LCD **AUTO** turns on by default), press the **RANGE** button momentarily to select manual-ranging override. The meter will remain in the range it was in, the LCD **AUTO** turns off. Press the button momentarily again to select the next range. Press and hold the button for 1 second or more to resume auto-ranging.

Note: Manual-ranging feature is not available to AutoV, Capacitance & Hz functions.

Beep-Jack™ Input Warning

meter beeps as well as displays "InEr" to warn the user against possible damage to the meter due to improper connections to the A, mA, or A input jacks when another function, especially a voltage function, is selected.

Intelligent Auto-Power-Off (APO)

The Auto-Power-off (APO) mode turns the meter off automatically to extend battery life after approximately 32 minutes of no specified activities, where applicable:

- 1) Rotary switch or push button operations
- 2) Significant measuring readings of above 8.5% of ranges
- 3) Non-OL readings for Resistance, Continuity or Diode function
- 4) Non-zero readings for Hz function
- 5) Electric field signal present for EF function
- 6) Significant movement indication as in Phase Rotation functions

motor, speed-spin it clockwise to generate sufficient signal strength for proper meter detection. If the meter indicates a clockwise movement, the motor leads connected to L1, L2 and L3 of the meter are L1, L2 and L3 (also known as R, S and T) respectively. If the meter indicates a counter-clockwise movement, swap any two connects between the meter and motor. Then retest.

Using the Regular-sensitivity mode (R) for MAINS (Electricity Supplies) :

Connect to the MAINS as illustrated. If the meter indicates a clockwise movement, the phases connected to L1, L2 and L3 of the meter are L1, L2 and L3 (also known as R, S and T) respectively. If the meter indicates a counter-clockwise movement, swap any two connects between the meter and phases. Then retest. Connect the above mentioned L1, L2 and L3 of a Motor and that of the MAINS respectively should be able to get a clockwise motor movement.

Using the Complementary Beeper feature:

The Complementary Beeper feature is selected in Power-up option. Press and hold the **REC** button while turning the meter on to enable. If the segments indicate a clockwise movement, the beeper sounds a single long beep per segment cycle. If the segments indicate a counter clockwise movement, the beeper sounds 3 short beeps per segment cycle.










MAX/MIN/AVG Record mode

Press **REC** button momentarily to activate MAX/MIN/AVG recording mode. The LCD "MAX MIN AVG" turn on. The meter beeps when new MAX (maximum) or MIN (minimum) reading is updated. Press the button momentarily to read the MAX, MIN, 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.

Backlighted LCD display

Press the **SELECT** button for 1 second or more to toggle the LCD backlight. The backlight will also be turned off automatically after 10 minutes to extend battery life.

INTERNATIONAL ELECTRICAL SYMBOLS :

-  Marking of Electrical and Electronic Equipment (EEE). Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler
-  Caution ! Refer to the explanation in this Manual
-  Caution ! Possibility of electric shock
-  Earth (Ground)
-  Meter protected throughout by Double Insulation or Reinforced insulation
-  Fuse
-  DC--Direct Current
-  AC--Alternating Current
-  3~ 3 Phase Alternating Current

SPECIAL FEATURES :

- AutoV (LoZ)
- 3-Phase Rotation detection
- BeepLit™ Continuity
- Backlighted LCD
- EF-Detection (NCV)
- BeepJack™ on A terminal
- VFD
- Auto-ranging MAX/MIN/AVG Record
- Auto-ranging Relative Zero mode
- Display Hold

IV. GENERAL SPECIFICATIONS :

Display : 3-5/6 digits 6,000 counts

Update Rate : 5 per second nominal

Operating Temperature : -10°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 Altitude : Operating below 2000m

Storage Temperature : -20oC ~ 60oC, < 80% R.H. (with battery removed)

Temperature Coefficient : Nominal 0.15 x (specified accuracy)/oC @ (-10°C ~ 18°C or 28°C ~ 45°C), or otherwise specified

Sensing : True RMS sensing

Ingress Protection : IP40

Pollution Degree : 2

Safety : Certified per IEC/UL/EN61010-1 Ed. 3.0, IEC/UL/EN61010-2-030 Ed. 1.0, IEC/UL/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 and the corresponding

CAN/CSA-C22.2 regulations to Measurement Categories:

CAT II 1000V, CAT III 600V and CAT IV 300V AC & DC

Transient Protection: 6.0kV (1.2/50s surge)

E.M.C. : Meets EN61326-1:2013

In an RF field of 3V/m:

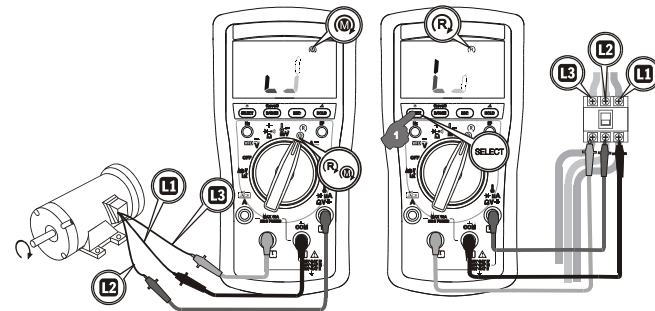
Temperature function is not specified

Ⓜ & Ⓡ 3-Phase Rotation function

Inputs are made via the test lead terminals **L1/L2/L3**. Phase Rotation directions are indicated as symbolic movements by the LCD segments. Press **SELECT** button when toggles between Ⓜ and Ⓡ modes. Last selection will be saved as power up default for repeat measurement convenience.

Ⓜ: Hi-sensitivity mode, which detects relatively low signal outputs generated from motor spinning, for checking phase connections of Motors.

Ⓡ: Normal-sensitivity mode for identifying phase sequence of Electricity Supply.

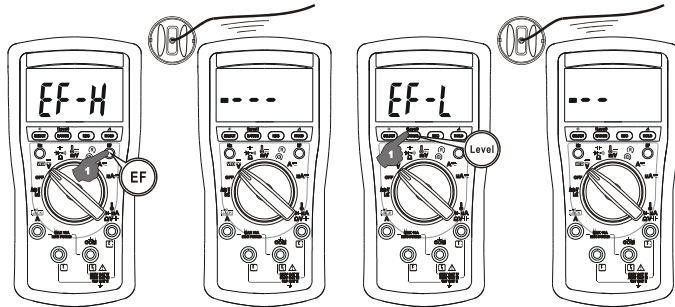


CAUTION

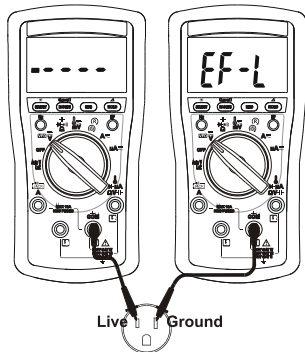
Proper Rotation detection relies on solid signal connection to all three test lead terminals simultaneously. Any single disconnection will lead to detection failure and may produce false indication. To verify signal connection and hence proper meter indication, swap any two connects (to the meter) to check for meter indication of reverse movement

Using the Hi-sensitivity mode Ⓜ for Motors:

Connect to the Motor as illustrated. Be sure the electricity supply is removed. From the perspective of looking down the shaft of the



- **Non-Contact EF-Detection** : An antenna is located along the top-left end of the meter, which detects electric field surrounding energized live conductors. It is ideal for tracing live wiring connections, locating wiring breakages and to distinguish between live and earth connections.
- **Probe-Contact EF-Detection** : For more precise indication of live wires, such as distinguishing between Live and Ground connections, use direct contact testing with one single test-probe via the input terminal COM or V. The COM terminal (Black) has the best sensitivity.



Ohm function :

Total Accuracy = Specified Accuracy + 15 digits

Other functions :

Total Accuracy = Specified Accuracy

Performance above 3V/m is not specified

Overload Protection :

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

V, AutoV & L3 : 1100V DC/AC rms

mV, Ohm & others : 1000V DC/AC rms

Low Battery : Below approx. 2.5V

Power Supply : 1.5V AAA Size battery X 2

Power Consumption (typical) : 3.2mA

APO Consumption (typical) : 10A

APO Timing : Idle for 30 minutes

Dimension : 161*80*50mm L*W*H (With Holster)

Weight : Approx. 334 gm (With Holster)

Accessories : Test lead set; Holster, Alligator clip set; Batteries installed, BKP60 banana plug type-K Thermocouple, User manual

Optional Accessories : BKB32 banana plug to type-K socket plug adaptor, MH-01 magnetic hanger; BMP-25x soft carrying pouch

ELECTRICAL SPECIFICATIONS :

Accuracy is given as (% of reading digits + number of digits) or otherwise specified @ 23°C 5°C ACV & ACA accuracies are specified from 1 % to 100 % of range or otherwise specified. Maximum Crest Factor <2:1 at full scale & <4:1 at half scale, and with frequency components fall within the meter specified frequency bandwidth for non-sinusoidal waveforms

AC VOLTAGE

Range	Resolution	Accuracy
50Hz ~ 60Hz		
6.000V ¹⁾	0.001	0.7% + 3 d
60.00V	0.01	
600.0V	0.1	
1000 V	1	
40Hz ~ 440Hz		
6.000V ¹⁾	0.001	2.0% + 3 d
60.00V	0.01	
600.0V	0.1	
1000 V	1	

Input Impedance: 10M, 54pF nominal

1)<5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range and accuracy

For gas or oil flames (Minipeeper):

- Low supply voltage
- Detector location
- Defective detector wiring
- Dirty viewing windows
- Faulty Minipeeper

For oil flames (Photocell):

- Detector location & wiring
- Smoky flame or poorly adjusted air shutter
- Faulty Photocell
- Temperature over 165 oF (74 oC) at photocell

For gas flames (Flame Rod):

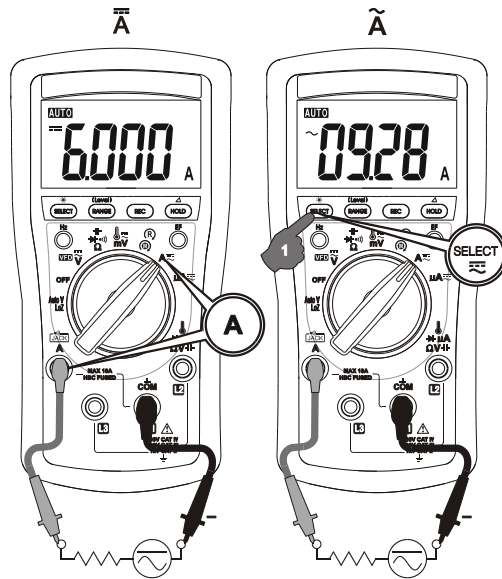
- Ignition interference (A flame signal current difference with the ignition both on and off greater than 0.5A indicates the presence of ignition interference)
- Insufficient ground (must be at least 4 times the detector area)
- Flame lifting off burner head (ground), or not continuously in contact with the flame rod
- Temperature in excess of 600 oF (316 oC) at the flame electrode insulator causing short to ground.

Electric Field EF-Detection

Press the **EF** button momentarily to toggle EF-Detection feature. The meter displays "**EF-H**" when it is ready. If it is too sensitive for your applications, press (**Level**) button momentarily toggles to lower sensitivity "**EF-L**". The detected Electric Field strength is indicated as a series of bar-graph segments on the display plus variable beep tones.

μA Current function

Press **SELECT** button momentarily to toggle between DC and AC. Last selection will be saved as power up default for repeat measurement convenience.



Application notes for flame sensors:

DCμA function is useful for HVAC/R flame sensor applications. The 0.1μA resolution can identify the minute current changes in flame detector applications. Flame signal current check should indicate steady flame signal of at least 2μA for a rectification type, or 1.5μA for an ultraviolet type (8μA for self checking systems). If a flame signal current with inadequate strength or fluctuation beyond 10%, check the following to avoid the risk of unwanted flame relay dropout :

ACmV

Range	Resolution	Accuracy
10Hz ~ 500Hz		
60.00mV ¹⁽²⁾	0.01	1% + 3d
600.0mV ³⁾	0.01	
500Hz ~ 800Hz		
60.00mV ¹⁽²⁾	0.01	2% + 3d
600.0mV ³⁾	0.01	

Input Impedance : 10M, 54pF nominal

- 1) <5d non-zero residue may appear when back light is on, which will not affect the specified measuring range and accuracy
- 2) Signal peak absolute values, including DC bias, less than 130mVpeak
- 3) Signal peak absolute values, including DC bias, less than 1300mVpeak

DC VOLTAGE

Range	Resolution	Accuracy
60.00mV	0.01	0.3% + 2d
600.0mV	0.1	
6.000V	0.001	0.4% + 2d
60.00V	0.01	
600.0V	0.1	0.3% + 2d
1000V	1	0.4% + 2d

Input Impedance : 10M, 54pF nominal

VFD_ACV (with Low Pass Filter)

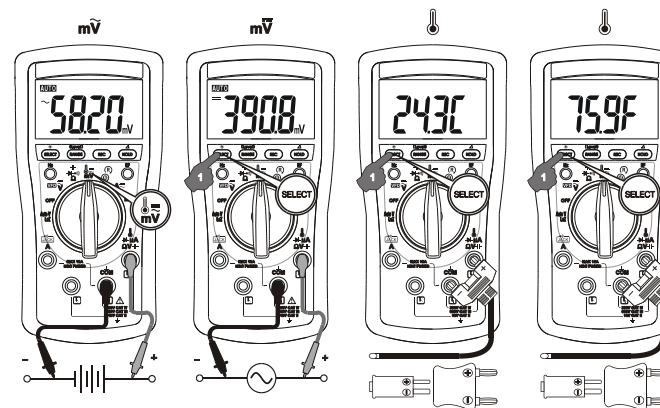
Range	Resolution	Accuracy
10Hz ~ 100Hz (Fundamental)		
600.0V,	0.1	1.0% + 3 d
1000V	1	
100Hz ~ 400Hz (Fundamental)		
600.0V	0.1	10% + 3 d ²⁾
1000V	1	

- 1) Not specified for fundamental frequency > 400Hz
- 2) Accuracy linearly decreases from 1% + 3d @100Hz to 10% + 3d @400Hz

AutoV_ACV

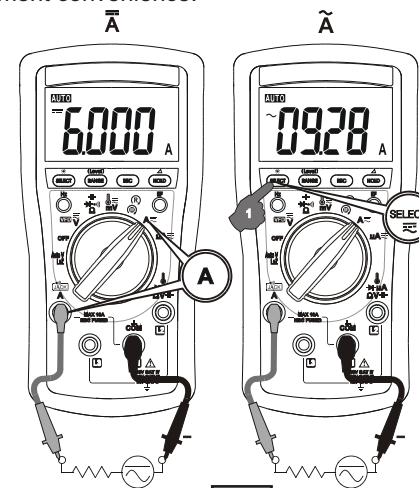
Range	Resolution	Accuracy
45Hz ~ 440Hz		
600.0V	0.1	2.0%+3d
1000V	1	

- 1) Not specified at <1VAC
- Threshold : > 1VAC nominal
- Input Impedance : Initially approx. 2.1k, 164pF 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:
 12k@100V
 100k@300V
 240k@600V
 580k@1000V



A Current function

Press **SELECT** button momentarily to toggle between DC and AC. Last selection will be saved as power up default for repeat measurement convenience.



») **BeepLit™ Continuity** function is having improved convenience for checking wiring connections and operation of switches. A continuous beep tone together with flashing display backlight indicate a complete wire. Such audible and visible indications improve continuity readabilities in noisy working environments.

In **Diode** function, the 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).

CAUTION

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

CAUTION

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

A Current function

Press **SELECT** button momentarily to toggle between DC and AC. Last selection will be saved as power up default for repeat measurement convenience.

ACmV & DCmV; Temperature °C & °F

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: 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.

AutoV_DCV

Range	Resolution	Accuracy
600.0V	0.1	2.0%+3d
1000V	1	

1) Not specified at <1VDC

Threshold : > +1.0VDC or < -1.0VDC nominal

Input Impedance:

Initially approx. 2.1k, 164pF 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:

- 12k@100V
- 100k@300V
- 240k@600V
- 580k@1000V

Ohm

Range	Resolution	Accuracy
600.0Ω	0.1	0.3% + 3d
6.000kΩ	0.001	
60.00kΩ	0.01	0.5% + 3d
600.0kΩ	0.1	
6.000MΩ ²⁾	0.001	0.9% + 3d ⁴⁾
60.00MΩ ³⁾	0.01	

1) Open Circuit Voltage : 1.6VDC typical

2) Constant Test Current : 0.2A Typical

3) Constant Test Current : 0.02A Typical

4) 5%+20d @ >30MΩ

BeepLit™ Continuity Tester

Continuity Threshold : Between 30Ω and 480Ω
 Continuity ON Response Time : <15ms
 Audible Indication : Beep sound
 Visible Indication : LCD Backlight

Capacitance

Range	Resolution	Accuracy
2000nF	1	1.5% + 2d
20.00μF	0.01	
2000μF	1	4.5% + 10d
10.00nF	0.01	

Accuracies with film capacitor or better

Diode Tester

Range	Resolution	Accuracy
3.000V	0.001	0.9% + 2d

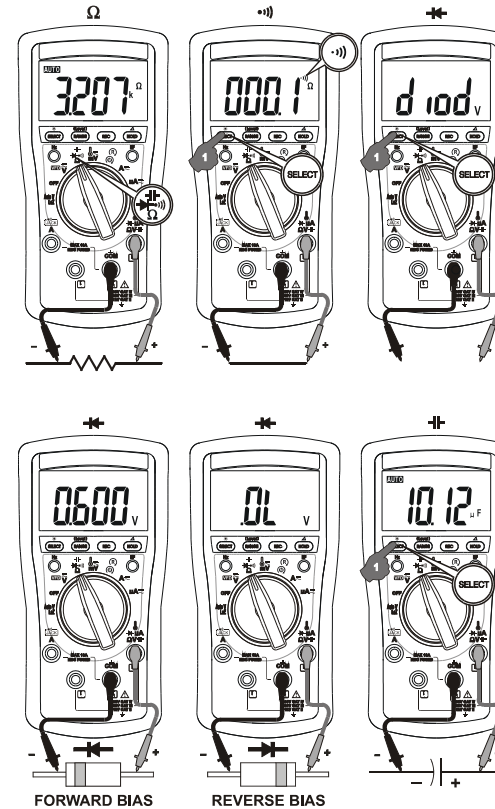
Test Current : 0.3mA typical
Open Circuit Voltage : < 3.2VDC typical

DCA & ACA

Range	Resolution	Accuracy	Burden Voltage
DCA			
6.000 A	0.001	0.7% + 3d	0.04V/A
10.00A ⁽¹⁾	0.001		

**Resistance, BeepLit™ Continuity & Diode ;
 Capacitance**

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 :

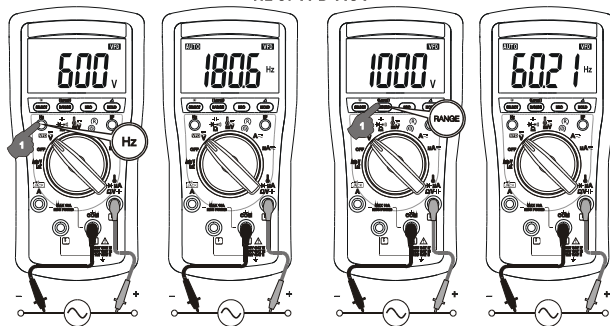
VFD-ACV and the associated **Hz** are equipped with digital low-pass filter (DSP), and are capable of handling **VFD** (Variable Frequency Drives) signals for fundamental V & Hz readings. It also improves ACV and Hz reading stability when being used in most noisy electrical environments.

Line Frequency functions

Press the **Hz** push-button momentarily to toggle Hz function. It is only available to Voltage and Current related ranges.

Input sensitivity varies automatically with the function range selected while activating the Hz function. 6V function range has the highest and the 1000V range has the lowest. When activated under DCV, ACV or VFD-ACV voltage function, the trigger voltage range will be displayed right before starting the Hz readings. Press momentarily the **RANGE** button can manually select another trigger voltage range (not available to current ranges). It is recommended to first measure the signal voltage (or current) level and activate Hz function in that range to get the most appropriate trigger level. If the Hz reading becomes unstable, select lower sensitivity to avoid electrical noise. If the reading shows zero, select higher sensitivity.

Hz of VFD-ACV



ACA (50Hz ~ 400Hz)			
6.000A ²⁾	0.001	0.7% + 3d	0.04V/A
10.00A ¹⁾			

1) 10A continuous, >10A to 20A for 30 seconds max with 5 minutes cool down interval

2) <5d non-zero residue may appear when backlight is on, which will not affect the specified measuring range and accuracy

DC μ A & AC μ A

Range	Resolution	Accuracy	Burden Voltage ¹⁾
DCμA			
200.0 μ A	0.1 μ A	0.7% + 3d	2.5mV/ μ A
2000 μ A	1 μ A		
ACμA(50Hz~400Hz)			
200.0 μ A	0.1 μ A	1.0% + 3d	2.5mV/ μ A
2000 μ A	1 μ A		

1)Combination PTC protective impedance is being used

Temperature

Range	Accuracy ¹⁾
-40.0°C ~ 99.9°C	1% + 1°C
-100°C ~ 400°C	
-40.0°F ~ 99.9°F	1% + 2°F
-100°F ~ 752°F	

1)Accuracies assume meter interior and the ambient have reached the same temperature (isothermal stage) for a correct junction voltage compensation. Allow enough settling time for a significant change of ambient temperature. It can take up to an hour for changes > 5°C.

2)Type-K thermocouple range & accuracy not included

Line Frequency

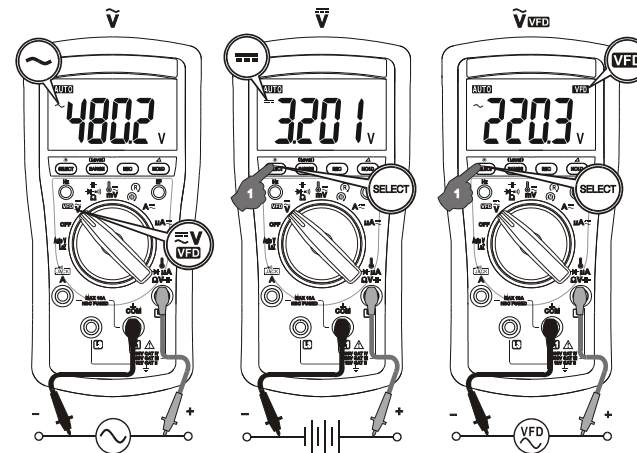
Function	Sensitivity (Sine RMS)	Range
60mV	50mV	10Hz - 50kHz
600mV		
6V	5V	10Hz - 50kHz
60V	10V	10Hz - 50kHz
600V	50V	10Hz - 1kHz
1000V	500V	10Hz - 1kHz
VFD 600V	50V	10Hz - 1kHz
VFD1000V	500V	10Hz - 1kHz
200 μ A ⁽¹⁾	500 μ A	10Hz - 5kHz
2000 μ A ⁽¹⁾		
6A	8A	50Hz - 1kHz
10A		

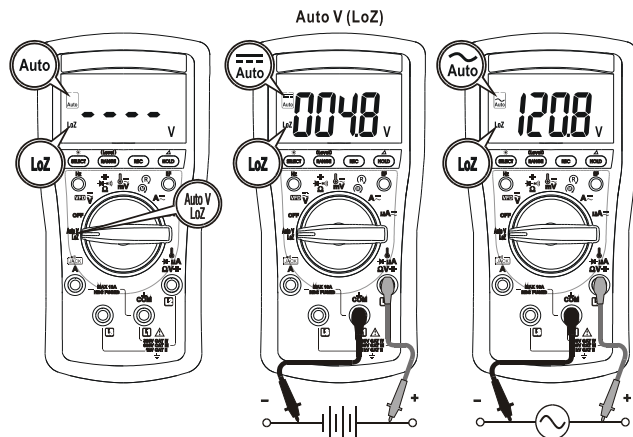
WARNING :

AutoV mode input impedance increases abruptly from initial 2.1k Ω to a few hundred k Ω '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 673mA (1000V x 1.414 / 2.1k Ω), decreasing abruptly to approx. 2.4mA (1000V x 1.414 / 580k Ω) within a fraction of a second. Do not use **AutoV** mode on circuits that could be damaged by such low input impedance. Instead, use rotary selector \tilde{V} or \bar{V} high input impedance voltage modes to minimize loading for such circuits.

ACV, DCV & VFD-ACV 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.





- With no input, the meter displays “- - - -” when it is ready.
- When a signal above the voltage threshold of 1V DC or 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 :

***Ghost-voltage Buster:** Ghost-voltages are unwanted stray signals coupled from adjacent hard signals, which confuse common multimeter voltage measurements. The **AutoV** mode provides low (ramp-up) input impedance (approx. 2.1kΩ 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.

*Only **HOLD, EF & Backlight** push-button features are available in AutoV mode.

Non-Contact EF-Detection

Bar-Graph Indication	EF-H (Hi Sensitivity)	EF-L (Lo Sensitivity)
	Typical Voltage (Tolerance)	
-	10V (3V ~ 19V)	10Hz - 50kHz
--	20V (10V ~ 38V)	10Hz - 50kHz
---	40V (21V ~ 79V)	10Hz - 50kHz
----	80V (40V ~ 156V)	10Hz - 1kHz
-----	160V (>80V)	10Hz - 1kHz

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

Detection Frequency : 50/60Hz

Detection Antenna : Top-left end of the meter

Probe-Contact EF-Detection : For more precise indication of live wires, such as distinguishing between live and ground connections, use direct contact testing with one single test-probe via the input terminal COM or V. The COM terminal (Black) has the best sensitivity.

Ⓜ & Ⓡ 3-Phase Rotation function

Hi-sensitivity mode Ⓜ

Voltage range: 0.4V ~ 1000V

Frequency range: 3Hz ~ 400Hz

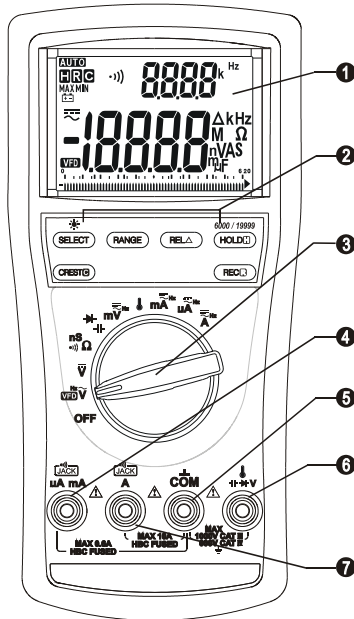
Normal-sensitivity mode Ⓡ

Voltage range: 65V ~ 1000V

Frequency range: 35Hz ~ 400Hz

V. PRODUCT DESCRIPTION :

Note : Top of the line model is used as representative for illustration purposes. Please refer to your particular model for function availability.



1. 3-5/6 digits 6000 counts LCD display
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. Input Jack for mA/μA function positive input
6. Common (Ground reference) Input Jack for all functions
7. Additional input Jack for Phase Rotation function only

True RMS :

RMS (Root-Mean-Square) is a term used to describe the effective or equivalent DC value of an AC signal. True RMS is the 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 1.414. A badly distorted sinusoidal waveform normally has a much higher Crest Factor.

4) OPERATION

CAUTION

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

AutoV (LoZ) mode

AutoV automatically selects measurement function of DCV or ACV, based on their input levels via the test leads. The input also provides a low ramp-up impedance (LoZ) to drain ghost voltages*.