KUSAM-MECO®

An ISO 9001:2008 Company

AC / DC TRMS Clamp-On Multimeter with VFD, EF-Detection & PC Interface

Model KM 2777 - TRUE RMS SENSING

SPECIAL FEATURES :

- AutoCheck ™ Voltage & Ohms
- VFD-V & VFD-Hz function
- 5ms CREST-MAX capture mode (Peak Hold)
- Autoranging Relative -Zero mode
- Display Hold function
- EF-Detection (NCV)
- Backlight LCD Display
- Auto Power Off
- Diode Test & Continuity Test
- PC Interface (Optional)

Preliminary Data

GENERAL SPECIFICATIONS :

- ✶ **Sensing :** TRMS sensing
- ✶ **Jaw Opening :** 55mm max.
- ✶ **Display :** 3-5/6 digits 6000 counts & 3½ digits 1,999 counts for Hz.
- ✶ **Update Rate :** 5 per second nominal
- ✶ **Polarity :** Automatic
- ✶ **Low Battery :** Below approx 2.4V
- ✶ **Operating Temperature :** 0°C to 40°C
- ✶ **Relative Humidity :** Maximum 80% R. H. for temperature upto 31°C decreasing linearly to 50% Relative Humidity at 40°C
- ✶ **Storage Temperature :** -20°C to 60°C, < 80% R.H. (With battery removed)
- ✶ **Altitude :** Operating below 2000m
- ✶ **Temperature Coefficient :** nominal 0.15 x (specified accuracy) / °C @ (0°C--18°C or 28°C--40°C), or otherwise specified
- ✶ **Power supply :** Standard 1.5V AAA Battery x 2.
- ✶ **Power Consumption :** Typical 14mA for Current function, & 5.2mA for others.
- ✶ **APO Timing :** Idle for 34 minutes
- ✶ **APO Consumption :** 10µA typical
- ✶ **Dimension :** 264(L) x 97(W) x 43(H) mm
- ✶ **Weight :** Approx. 608gm.
- ✶ **Accessories :** Test leads (pair), user's manual, Bkp60 banana plug K-type Thermocouple x 1 & carrying case.
- ✶ **Optional Accessories :** USB interface kit BRUA-19X, BKB32 banana plug to type-K socket plug adaptor

SAFETY :

- Double insulation per IEC/EN61010-1 2nd Ed., UL61010-1 2nd Ed., & CAN/CSA C22.2 No.61010.1-0.92 to Category CAT IV 1000V AC & DC.
- **Transient Protection :** 12 kV (1.2/50µs surge)
- **Overload Protection :**
  Clamp-on jaws : 2000A rms continuous
  " + " & COM Terminals (all other functions) : 1000V rms.
- **Pollution degree :** 2
- **EMC :** 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 + 200 digits
  Performance above 3V/m is not specified.

ELECTRICAL SPECIFICATIONS : KM 2777

Accuracy is ± (% readings digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 75% R.H.
True RMS Model KM 2777 voltage accuracies are specified from 5% to 100% of range or otherwise specified.
Maximum Crest Factor <1.4:1 at full scale & <2.8:1 at half scale, & with frequency components within the specified frequency bandwidth for non-sinusoidal waveforms.

ACA CURRENT(Clamp on)

Range	Resolution	Accuracy[1]
50Hz – 60Hz		
200.0 A	100 mA	±(2.0%rdg + 5dgts)
0 ~ 500 A	1 A	±(2.5%rdg + 5dgts)
500~2000 A	1 A	±(3.0%rdg + 5dgts)
40Hz~50Hz & 60Hz~400Hz		
200.0 A	100 mA	±(2.5%rdg + 5dgts)
0 ~ 500 A	1 A	±(3.0%rdg + 5dgts)
500~1000 A	1 A	±(3.5%rdg + 5dgts)
1000~2000 A	1 A	Unspecified

True RMS Crest Factor :
< 1.4:1 at full scale & <2.8:1 at half scale
[1] Induced error from adjacent current carrying conductor : <0.1A/A

DCA CURRENT(Clamp on)

Range	Resolution	Accuracy[1][2]
200.0 A	100 mA	±(2.0%rdg + 5dgts)
0 ~ 500 A	1 A	±(2.0%rdg + 5dgts)
500~2000 A	1 A	±(2.5%rdg + 5dgts)

[1] Induced error from adjacent current carrying conductor : <0.1A/A
[2] Specified with Relative Zero Δ mode applied to offset the non-zero residual readings, if any.

DC + ACA CURRENT(Clamp on)

Range	Resolution	Accuracy[1][2]
DC, 50Hz ~ 60Hz		
200.0 A	100 mA	±(3.0%rdg + 8dgts)
2000 A	1 A	
40Hz ~ 50Hz & 60Hz ~ 400Hz		
200.0 A	100 mA	±(3.5%rdg + 8dgts)
0 ~ 1000 A	1 A	
1000~2000 A	1 A	Unspecified

True RMS Crest Factor :
< 1.4:1 at full scale & <2.8:1 at half scale
[1] Induced error from adjacent current carrying conductor : <0.1A/A
[2] Specified with Relative Zero Δ mode applied to offset the non-zero residual readings, if any.

Note: All Specification are Subject to change without prior notice.

ELECTRICAL SPECIFICATIONS : KM 2777

DC VOLTAGE

Range	Resolution	Accuracy
6.000 V	1 mV	±(0.5%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

AC VOLTAGE

Range	Resolution	Accuracy
50Hz ~ 400Hz		
6.000 V	1 mV	±(1.2%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

AC + DC VOLTAGE

Range	Resolution	Accuracy
DC, 50Hz ~400Hz		
6.000 V	1 mV	±(1.4%rdg + 7dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

VFD_ ACV (with Low Pass Filter)

Range	Resolution	Accuracy [1]
10Hz ~ 20Hz		
6.000 V	1 mV	±(4%rdg + 80dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
20Hz ~ 200Hz		
6.000 V	1 mV	±(2%rdg + 60dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
200Hz~420Hz[2]		
6.000 V	1 mV	±(7%rdg + 80dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

[1] Not specified for fundamental frequency > 400Hz

[3] Accuracy linearly decreases from 2% + 50d @ 200Hz to 7% + 80d @ 400Hz

AUTOCHECK™_ACV

Range	Resolution	Accuracy [1]
50Hz ~ 60Hz		
6.000 V	1 mV	±(1.5%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

AutoCheck™ Lo-Z ACV Threshold : >1.5V (50/60Hz) nominal.

AutoCheck™ Lo-Z ACV input impedance :

Initially approx. 2.5kΩ, 600pF 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 :

10 kΩ @ 100V
60 kΩ @ 300V
200kΩ @ 600V
420kΩ @ 1000V

AUTOCHECK™_DCV

Range	Resolution	Accuracy
6.000 V	1 mV	±(1.3%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

AutoCheck™ Lo-Z DCV Threshold : >+1.5VDC & <-1.5VDC nominal.

AutoCheck™ Lo-Z DCV input impedance :

Initially approx. 2.5kΩ, 600pF 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 :

10 kΩ @ 100V
60 kΩ @ 300V
200kΩ @ 600V
420kΩ @ 1000V

CAPACITANCE

Range	Resolution	Accuracy [1]
60.00 nF	10 pF	±(2.0%rdg + 5dgts)
600.0 nF	100 pF	
6.000 µF	1 nF	
60.00 µF	10 nF	±(3.5%rdg + 5dgts)[2]
600.0 µF	100 nF	
2000 µF	1 µF	±(4.0%rdg + 5dgts)[2]

[1] Accuracies with film capacitor or better

[2] Temperature Coefficient : 0.25 x (specified accuracy) / °C @ (0°C ~ 18°C or 28°C ~ 40°C)

NON-CONTACT EF-DETECTION

Typical Voltage	Bar-Graph Indication
20V (tolerance : 10V ~ 36V)	-
55V (tolerance : 23V ~ 85V)	- - -
110V (tolerance : 59V ~ 600V)	- - - - -

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

Detection Frequency : 50/60Hz

Detection Antenna : Top side of the stationary jaw

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 measurement.

~Hz LINE LEVEL FREQUENCY

Function	Sensitivity (Sine RMS)	Range
6 V	2 V	40Hz ~ 1999Hz
60 V	20 V	40Hz ~ 1999Hz
600 V	100 V	40Hz ~ 1999Hz
1000 V	600 V	40Hz ~ 1999Hz
200 A	10 A	20Hz ~ 400Hz
2000 A	40 A	20Hz ~ 400Hz
VFD 6 V[1]	1 V ~ 2 V	10Hz ~ 400Hz
VFD 60 V[1]	6 V ~ 20 V	10Hz ~ 400Hz
VFD 600 V[1]	60 V ~ 200 V	10Hz ~ 400Hz

Accuracy : 0.1% + 4d

[1] VFD sensitivity linearly decreases from 10% F.S. @ 200Hz to 40% F.S. @ 400Hz

TEMPERATURE

Range	Resolution	Accuracy
-50°C ~ 1000°C	1°C	±(0.3%rdg + 4dgts)
-58°F ~ 1832°F	1°F	±(0.3%rdg + 6dgts)

K-type Thermocouple range & accuracy not included

OHM & AUTOCHECK™ _OHM[1]

Range	Resolution	Accuracy
600.0 Ω	0.1 Ω	±(0.5%rdg + 5dgts)
6.000 KΩ	1 Ω	
60.00 KΩ	10 Ω	
600.0 KΩ	100 Ω	±(0.8%rdg + 5dgts)
6.000 MΩ	1 KΩ	±(1.2%rdg + 5dgts)
40.00 MΩ	10 KΩ	±(2.3%rdg + 5dgts)

Open Circuit Voltage : 0.45VDC typical.

[1] **AutoCheck™ OhmThreshold :** <10.00MΩ nominal.

CREST-MAX CAPTURE MODE

Accuracy :
Specified accuracy plus 250 digits for changes > 5ms in duration

AUDIBLE CONTINUITY TESTER

Audible Threshold	Response Time
between 10Ω and 200Ω	32ms approx.

DIODE TESTER

Range	Test Current (Typical)	Open Circuit Voltage
1.000V	0.56mA	<1.8V DC typical

Accuracy : 1.0% + 3d

Note: All Specification are Subject to change without prior notice.

KUSAM-MECO®
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WHAT IS DC + AC TRUE RMS

DC AC TRUE RMS

DC AC True RMS is a term which identifies a DMM that responds accurately to the total effective RMS value regardless of the waveform, and is given by the expression :

$$\sqrt{DC^2 + (AC\ rms)^2}$$

DC + AC True RMS voltage is the total effective voltage having the same heating value corresponding a DC voltage. With DC + AC True RMS voltage measurement, you can accurately measure the voltage values regardless of the waveforms such as: square, sawtooth, triangle, pulse trains, spikes, as well as distorted waveforms with the presence of harmonics and DC components / Harmonics and DC components may cause:

1) Overheated transformers, generators and motors to burn out faster than their rated life
2) Circuit breakers to trip prematurely
3) Fuses to blow
4) Neutrals to overheat due to triplen harmonics present on the neutral (180Hz)
5) Bus bars and electrical panels to vibrate

Only AC or True RMS and Average responding meters can introduce significant errors in many applications.

See TABLE 2 for typical example.

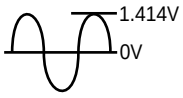
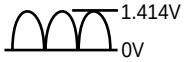
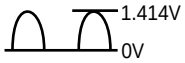
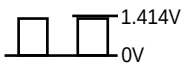
INPUT WAVEFORM	DC + AC TRMS	AC RMS	AVERAGE RESPONSE
Sine 	1.000V ERROR= 0% CF=1.414	1.000V ERROR= 0% CF=1.414	1.000V ERROR= 0%
Full wave rectified Sine 	1.000V ERROR= 0% CF=1.414	0.436V ERROR= 56.4% CF=3.247	0.421V ERROR= 57.9%
Half wave rectified Sine 	0.707V ERROR= 0% CF=2.000	0.546V ERROR= 22.7% CF=2.591	0.550V ERROR= 22.2%
50% duty pulse train 	1.000V ERROR= 0% CF=1.414	0.707V ERROR= 29.3% CF=2.000	0.785V ERROR= 21.5%

TABLE 2. WAVEFORMS AND CREST FACTORS

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USE TRUE RMS WHEN MEASURING AC WAVEFORMS

The waveforms on today's AC power lines are anything but clean. Electronic equipment such as office computers, with their switching power supplies, produce harmonics that distort power-line waveforms. These distortions make measuring AC voltage inaccurate when you use an averaging DMM.

Average voltage measurements work fine when the signal you're measuring is a pure sine wave, but errors mount as the waveform distorts. By using true RMS measurements, however, you can measure the equivalent heating effect that a voltage produces, including the heating effects of harmonics. Table 1 shows the difference between measurements taken on averaging DMMs & those taken on true RMS DMMs. In each case, the measured signal's peak-to-peak value is 2V. Therefore, the peak value is 1V.

For a 1-V peak sine wave, the average & RMS values are both 0.707V. But when the input signal is no longer a sine wave, differences between the RMS values & the average readig values occur. Those errors are most prominent when you are measuring square waves & pulse waveforms, which are rich in harmonics.

Table 1. Average versus true RMS comparison of typical waveforms.

Waveform	Actual Pk-Pk	True RMS Reading	Average Reading	Reading Error
Sine Wave	2.000	0.707	0.707	0%
Triangle Wave	2.000	0.577	0.555	-3.8%
Square Wave	2.000	1.000	1.111	+11.1%
Pulse (25% duty Cycle)	2.000	0.433	0.416	-3.8%
Pulse (12.5% duty Cycle)	2.000	0.331	0.243	-26.5%
Pulse (6.25% duty Cycle)	2.000	0.242	0.130	-46.2%

One limitation to making true RMS measurements is crest factor, and you should consider crest factor when making AC measurements. Crest factor is the ratio of a waveform's peak ("crest") voltage to its RMS voltage. Table 2 shows the crest factors for ideal waveforms.

Table 2. Crest factors of typical waveforms.

Waveform	Crest Factor
DC	1.000
Square Wave	1.000
Sine Wave	1.414
Triangle Wave	1.732
Pulse (25% duty Cycle)	1.732
Pulse (12.5% duty Cycle)	2.646
Pulse (6.25% duty Cycle)	3.873

A DMM's specifications should tell you the maximum crest factor that the meter can handle while maintaining its measurement accuracy. True RMS meters can handle higher crest factors when a waveform's RMS voltage is in the middle of the meter's range setting. Typically, a DMM may tolerate a crest factor of 3 near the top of its scale but it might handle a crest factor of 5 that's in the middle of the range. Therefore, if you're measuring waveforms with high crest factors (greater than 3), you should adjust the DMM so the measured voltage is closest to the center of the measurement range.

Another limitation of true RMS is speed. If you're measuring relatively clean sine waves, then you can save time & money by using as averaging DMM. True RMS meters cost more than averaging meters and can take longer to produce measurements, especially when measuring millivolt-level AC signals. At those low levels, true RMS meters can take several seconds to stabilize a reading. Averaging meters won't leave you waiting.

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

KUSAM-MECO®

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Sales Direct: (022)24156638 **Tel.:**(022) 2412 4540, 2418 1649
Fax: 91-22-2414 9659 **E-mail :** kusam_meco@vsnl.net,
Website : www.kusamelectrical.com; www.kusam-meco.co.in

KUSAM-MECO®

AN ISO 9001:2008 COMPANY

AC / DC Clamp-On Multimeter with VFD, EF-Detection & PC Interface

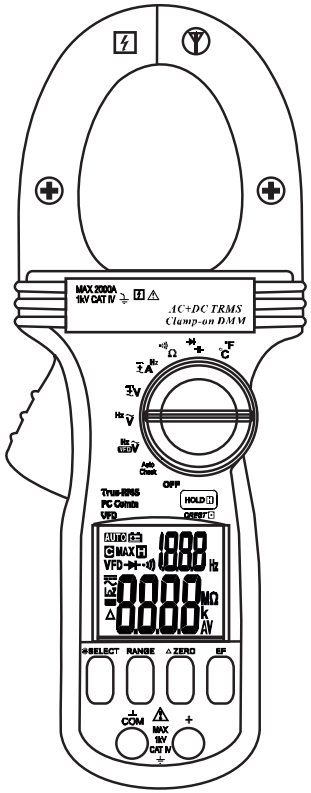
MODEL - KM 2777

OPERATION MANUAL

KUSAM-MECO

AC / DC TRMS Clamp-On Multimeter with VFD, EF-Detection & PC Interface

MODEL - KM 2777



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

Nearly every electrical engineer has a hand held digital clamp meter (Tongtester). We sometimes take them for granted, until we damage them or "burn them out". If you incorrectly connect your clamp meter to a circuit, or if you have the clamp meter 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.

Clamp meter 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 clamp meter becomes a low impedance circuit element.

Even if you correctly insert your clamp meter in to the circuit, you can still damage your meter. Don't try to measure current in excess of your meter's capacity. Check the current capacity of the Clamp meter.

If you are measuring current in industrial environment to prevent excess current from flowing through your meter, always disconnect your test leads from the circuit under test whenever you change Clamp meter functions. Set your meter to the correct function, say current, and its highest range for the setting. If the reading is small, change the range to the next lower range till the reading can be read with the best possible accuracy. When measuring voltage, connect the test leads before your apply power to your circuit. To be safe, start by setting your meter to its highest range first.

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1) SAFETY INFORMATION

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 protection rating, against the users, is double insulation per IEC/EN61010-1 2nd Ed., UL61010-1 2nd Ed., CAN/CSA C22.2 No. 61010.1-0.92, IEC/EN61010-2-032, UL61010B-2-032, CAN/CSA C22.2 No. 61010-2-032-04 & IEC/EN61010-031:2002/A1:2008:

Measurement Category IV 1000V AC & DC.

Per IEC61010-1 (2010) OVERVOLTAGE CATEGORY

OVERVOLTAGE CATEGORY II (CAT II) is for equipment intended to be supplied from the building wiring. It applies both to plug-connected equipment and to PERMANENTLY CONNECTED EQUIPMENT.

OVERVOLTAGE CATEGORY III (CAT III) is for equipment intended to form part of a building wiring installation. Such equipment includes socket outlets, fuse panels, and some MAINS installation control equipment.

OVERVOLTAGE CATEGORY IV (CAT IV) is for equipment installed at or near the origin of the electrical supply to a building, between the building entrance and the main distribution board. Such equipment may include electricity tariff meters and primary overcurrent protection devices.

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.

To avoid electrical shock hazard, observe the proper safety precautions when working with voltages above 60 VDC or 30VAC rms. These voltage levels pose a potential shock hazard to the user. Before & after hazardous voltage measurements, test the voltage function on a known source such as line voltage to determine proper meter functioning.

Keep your hands/fingers behind the hand/finger barriers (of the meter and the test leads) that indicate the limits of safe access of the hand-held part during measurement. Inspect test leads, connectors, and probes for damaged insulation or exposed metal before using the instrument. If any defects are found, replace them immediately. Only use the test lead provided with the equipment or UL Listed Probe Assembly rated CAT IV 1000V or better.

This Clamp-on meter is designed to apply around or remove from uninsulated hazardous live conductors. But still, individual protective equipment must be used if hazardous live parts in the installation where measurement is to be carried out could be accessible.

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

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
⚠	Application around and removal from hazardous live conductors is permitted

2) CENELEC Directives

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

SPECIAL FEATURES:

- AutoCheck ™ Voltage & Ohms
- VFD-V & VFD-Hz function
- 5ms CREST-MAX capture mode (Peak Hold)
- Autoranging Relative -Zero mode
- Display Hold function
- EF-Detection (NCV)
- Backlight LCD Display
- Auto Power Off
- Diode Test & Continuity Test
- PC Interface (Optional)

3) SPECIFICATIONS :

GENERAL SPECIFICATIONS :

✶ **Sensing :** TRMS sensing

✶ **Jaw Opening :** 55mm max.

✶ **Display :** 3-5/6 digits 6000 counts & 3½ digits 1,999 counts for Hz.

✶ **Update Rate :** 5 per second nominal

✶ **Polarity :** Automatic

✶ **Low Battery :** Below approx 2.4V

✶ **Operating Temperature :** 0°C to 40°C

✶ **Relative Humidity :** Maximum 80% R. H. for temperature upto 31°C decreasing linearly to 50% Relative Humidity at 40°C

✶ **Storage Temperature :** -20°C to 60°C, < 80% R.H. (With battery removed)

✶ **Altitude :** Operating below 2000m

✶ **Temperature Coefficient :** nominal 0.15 x (specified accuracy) / °C @ (0°C--18°C or 28°C--40°C), or otherwise specified

✶ **Power supply :** Standard 1.5V AAA Battery x 2.

✶ **Power Consumption :** Typical 14mA for Current function, & 5.2mA for others.

✶ **APO Timing :** Idle for 34 minutes

✶ **APO Consumption :** 10mA typical

✶ **Dimension :** 264(L) x 97(W) x 43(H) mm

✶ **Weight :** Approx. 608gm.

✶ **Accessories :** Test leads (pair), user's manual, Bkp60 banana plug K-type Thermocouple x 1 & carrying case.

✶ **Optional Accessories :** USB interface kit BRUA-19X, BKB32 banana plug to type-K socket plug adaptor

SAFETY :

- Double insulation per IEC/EN61010-1 2nd Ed., UL61010-1 2nd Ed., & CAN/CSA C22.2 No.61010.1-0.92 to Category CAT IV 1000V AC & DC.
- **Transient Protection :** 12 kV (1.2/50μs surge)
- **Overload Protection :**
  Clamp-on jaws : 2000A rms continuous
  " + " & COM Terminals (all other functions) : 1000V rms.
- **Pollution degree :** 2
- **EMC :** 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 + 200 digits
  Performance above 3V/m is not specified.

ELECTRICAL SPECIFICATIONS :

Accuracy is ± (% readings digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 75% R.H.

True RMS Model KM 2777 voltage accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor <1.4:1 at full scale & <2.8:1 at half scale, & with frequency components within the specified frequency bandwidth for non-sinusoidal waveforms.

ACA CURRENT(Clamp on)

Range	Resolution	Accuracy[1)]
50Hz – 60Hz		
200.0 A	100 mA	±(2.0%rdg + 5dgts)
0 ~ 500 A	1 A	±(2.5%rdg + 5dgts)
500~2000 A	1 A	±(3.0%rdg + 5dgts)
40Hz~50Hz & 60Hz~400Hz		
200.0 A	100 mA	±(2.5%rdg + 5dgts)
0 ~ 500 A	1 A	±(3.0%rdg + 5dgts)
500~1000 A	1 A	±(3.5%rdg + 5dgts)
1000~2000 A	1 A	Unspecified

True RMS Crest Factor :
< 1.4:1 at full scale & <2.8:1 at half scale
[1)]Induced error from adjacent current carrying conductor :
<0.1A/A

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DCA CURRENT(Clamp on)

Range	Resolution	Accuracy[1)2)]
200.0 A	100 mA	±(2.0%rdg + 5dgts)
0 ~ 500 A	1 A	±(2.0%rdg + 5dgts)
500~2000 A	1 A	±(2.5%rdg + 5dgts)

[1)]Induced error from adjacent current carrying conductor :
<0.1A/A
[2)]Specified with Relative Zero Δ mode applied to offset the non-zero residual readings, if any.

DC + ACA CURRENT(Clamp on)

Range	Resolution	Accuracy[1)2)]
DC, 50Hz ~ 60Hz		
200.0 A	100 mA	±(3.0%rdg + 8dgts)
2000 A	1 A	
40Hz ~ 50Hz & 60Hz ~ 400Hz		
200.0 A	100 mA	±(3.5%rdg + 8dgts)
0 ~ 1000 A	1 A	
1000~2000 A	1 A	Unspecified

True RMS Crest Factor :
< 1.4:1 at full scale & <2.8:1 at half scale
[1)]Induced error from adjacent current carrying conductor :
<0.1A/A
[2)]Specified with Relative Zero Δ mode applied to offset the non-zero residual readings, if any.

DC VOLTAGE

Range	Resolution	Accuracy
6.000 V	1 mV	±(0.5%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

AC VOLTAGE

Range	Resolution	Accuracy
50Hz ~ 400Hz		
6.000 V	1 mV	±(1.2%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

AC + DC VOLTAGE

Range	Resolution	Accuracy
DC, 50Hz ~400Hz		
6.000 V	1 mV	±(1.4%rdg + 7dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

Input Impedance : 10MΩ, 50pF nominal

VFD_ ACV (with Low Pass Filter)

Range	Resolution	Accuracy [1]
10Hz ~ 20Hz		
6.000 V	1 mV	±(4%rdg + 80dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
20Hz ~ 200Hz		
6.000 V	1 mV	±(2%rdg + 60dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
200Hz~420Hz [2]		
6.000 V	1 mV	±(7%rdg + 80dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

[1] Not specified for fundamental frequency > 400Hz

[3] Accuracy linearly decreases from 2% + 50d @ 200Hz to 7% + 80d @ 400Hz

CREST-MAX CAPTURE MODE

Accuracy :
Specified accuracy plus 250 digits for changes > 5ms in duration

NON-CONTACT EF-DETECTION

Typical Voltage	Bar-Graph Indication
20V (tolerance : 10V ~ 36V)	-
55V (tolerance : 23V ~ 85V)	- - -
110V (tolerance : 59V ~ 600V)	- - - - -

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

Detection Frequency : 50/60Hz

Detection Antenna : Top side of the stationary jaw

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 measurement.

CAPACITANCE

Range	Resolution	Accuracy [1]
60.00 nF	10 pF	±(2.0%rdg + 5dgts)
600.0 nF	100 pF	
6.000 μF	1 nF	
60.00 μF	10 nF	±(3.5%rdg + 5dgts)[2]
600.0 μF	100 nF	
2000 μF	1 μF	±(4.0%rdg + 5dgts)[2]

[1] Accuracies with film capacitor or better

[2] Temperature Coefficient : 0.25 x (specified accuracy) / °C @ (0°C ~ 18°C or 28°C ~ 40°C)

AUTOCHECK™_DCV

Range	Resolution	Accuracy
6.000 V	1 mV	±(1.3%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

AutoCheck™ Lo-Z DCV Threshold : >+1.5VDC & <-1.5VDC nominal.

AutoCheck™ Lo-Z DCV input impedance :

Initially approx. 2.5kΩ, 600pF 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 :

10 kΩ @ 100V

60 kΩ @ 300V

200kΩ @ 600V

420kΩ @ 1000V

OHM & AUTOCHECK™ _OHM[1]

Range	Resolution	Accuracy
600.0 Ω	0.1 Ω	±(0.5%rdg + 5dgts)
6.000 KΩ	1 Ω	
60.00 KΩ	10 Ω	
600.0 KΩ	100 Ω	±(0.8%rdg + 5dgts)
6.000 MΩ	1 KΩ	±(1.2%rdg + 5dgts)
40.00 MΩ	10 KΩ	±(2.3%rdg + 5dgts)

Open Circuit Voltage : 0.45VDC typical.

[1] **AutoCheck™ OhmThreshold :** <10.00MΩ nominal.

~Hz LINE LEVEL FREQUENCY

Function	Sensitivity (Sine RMS)	Range
6 V	2 V	40Hz ~ 1999Hz
60 V	20 V	40Hz ~ 1999Hz
600 V	100 V	40Hz ~ 1999Hz
1000 V	600 V	40Hz ~ 1999Hz
200 A	10 A	20Hz ~ 400Hz
2000 A	40 A	20Hz ~ 400Hz
VFD 6 V[1)]	1 V ~ 2 V	10Hz ~ 400Hz
VFD 60 V[1)]	6 V ~ 20 V	10Hz ~ 400Hz
VFD 600 V[1)]	60 V ~ 200 V	10Hz ~ 400Hz

Accuracy : 0.1% + 4d

[1)]VFD sensitivity linearly decreases from 10% F.S. @ 200Hz to 40% F.S. @ 400Hz

DIODE TESTER

Range	Test Current (Typical)	Open Circuit Voltage
1.000V	0.56mA	<1.8V DC typical

Accuracy : 1.0% + 3d

AUTOCHECK™_ACV

Range	Resolution	Accuracy [1)]
50Hz ~ 60Hz		
6.000 V	1 mV	±(1.5%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	

AutoCheck™ Lo-Z ACV Threshold : >1.5V (50/60Hz) nominal.

AutoCheck™ Lo-Z ACV input impedance :

Initially approx. 2.5kΩ, 600pF 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 :

10 kΩ @ 100V
60 kΩ @ 300V
200kΩ @ 600V
420kΩ @ 1000V

TEMPERATURE

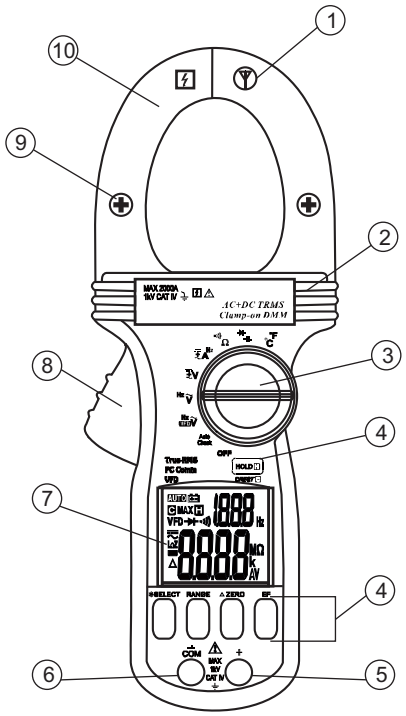
Range	Resolution	Accuracy
-50°C ~ 1000°C	1°C	±(0.3%rdg + 4dgts)
-58°F ~ 1832°F	1°F	±(0.3%rdg + 6dgts)

K-type Thermocouple range & accuracy not included

AUDIBLE CONTINUITY TESTER

Audible Threshold	Response Time
between 10Ω and 200Ω	32ms approx.

PRODUCT DESCRIPTION



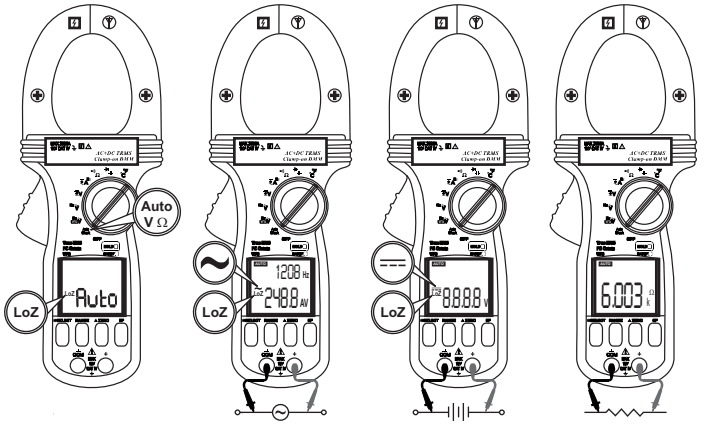
1) Antenna for Non-Contact EF-Detection
2) Hand/Finger Barrier to indicate the limits of safe access of the meter during measurement
3) Rotary-switch Selector to turn the power ON/OFF and Select a function
4) Push-buttons for special functions & features.
5) Input Jack for all functions EXCEPT non-invasive DCA & ACA current functions
6) Common (Ground reference) Input Jack for all functions EXCEPT non-invasive DCA & ACA current functions
7) 3-5/6 digits 6000 counts & 3-1/2 digits 2000 counts dual numeric LCD display
8) Jaw trigger for opening the clamp jaw
9) Jaw center (& DCA polarity) Indicator, at where best DCA & ACA accuracy is specified
10) Hall-effect Clamp Jaw for AC & DC current magnetic field pick up.

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.*

AutoCheck™ mode

This innovative **AutoCheck™** feature automatically selects measurement function of **ACV**^{Hz}, **DCV**, or **Resistance ()** based on the input via test leads.



- With no input, the meter displays “Auto” when it is ready.
- With no voltage signal but a resistance below 10M (nominal) is present, the meter displays the resistance value. When the resistance is below the “Audible Threshold”, the meter further gives a continuity beep tone.
- When a signal above the voltage threshold of 1.5V DC or AC up to the rated 1000V is present, the meter displays the voltage value in appropriate DCV or ACV, 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.

***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. 2.5kΩ 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 2.5kΩ to a few hundred kΩ'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 566mA (1000V x 1.414 / 2.5kΩ), decreasing abruptly to approx. 3.37mA (1000V x 1.414 / 420kΩ) 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-switch selector $\tilde{V}$ or $\overline{\tilde{V}}$ high input impedance voltage modes to minimize loading for such circuits.

VFD-ACV^{Hz} & ACV^{Hz} functions

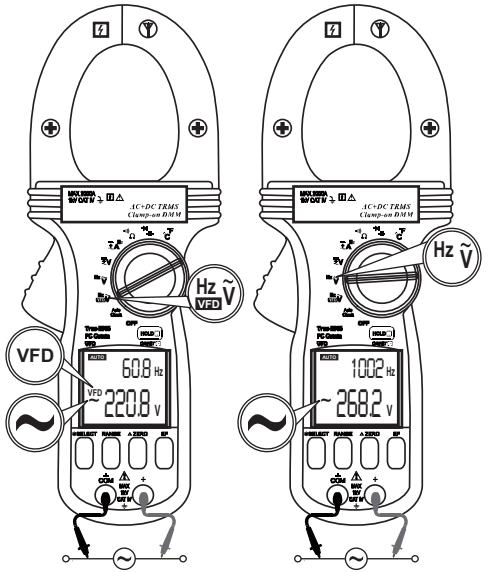
Inputs are made through the test leads terminals.

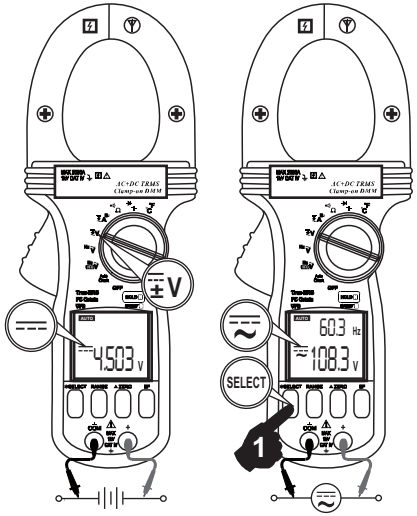
VFD-ACV^{Hz} function is to deal with VFD (Variable Frequency Device) signals. It, however, further pre-selects the most appropriate voltage-ranges and thus the Hz trigger levels to best cope with most VFD-Voltage and VFD-Frequency applications.

Note: The Hz trigger level is determined by the **AC/DC+AC Voltage or Current** function-range being in use. Press **RANGE** button to select different function-ranges and thus trigger levels manually.

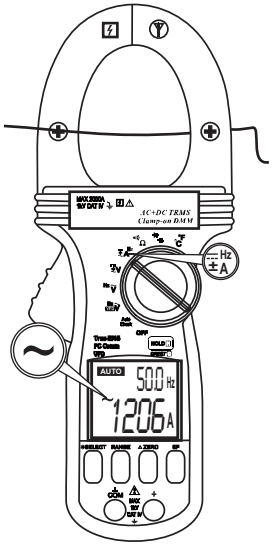
DCV & DC+ACV^{Hz} functions

Inputs are made through the test leads terminals. Defaults at **DCV** Function. Press **SELECT** button momentarily and release to select **DC+ACV^{Hz}**.

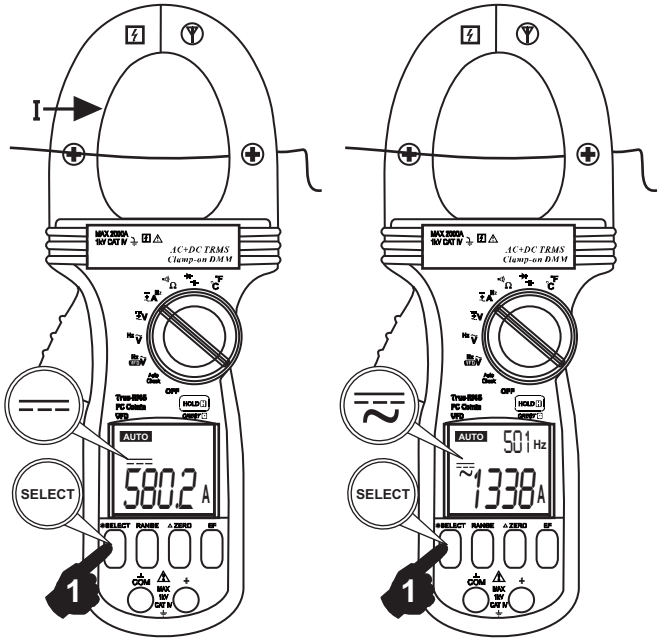




ACA ^{Hz}, DCA & DC+ACA ^{Hz} (Model KM 2777) functions



Input is made through the clamp jaws for non-invasive current measurements. Defaults at **ACA** ^{Hz} function. Press **SELECT** button momentarily & release to select the subject functions in sequence.



CAUTION (Application and removal of the Clamp-on meter)

For non-invasive current measurements, press the jaw trigger and clamp the jaws around conductor(s) of only one single pole of a circuit for load current measurement. Make sure the jaws are completely closed, or else it will introduce measurement errors. Enclosing conductor(s) of more than one pole of a circuit may result in differential current (like identifying leakage current) measurement. Locate the conductor(s) at the Jaws center as much as possible to get the best measuring accuracy. For removal, press the jaw trigger and remove the jaws from the conductor(s).

Adjacent current-carrying devices such as transformers, motors and conductor wires will affect measurement accuracy. Keep the jaws away from them as much as possible to minimize influence.

Ω Resistance & •)) Continuity Functions

Inputs are made through the test leads terminals. Defaults at Ω **RESISTANCE**. Press **SELECT** button momentarily and release to select. •)) Continuity.

⊣⊢ Capacitance & ⊣▶ Diode functions

Inputs are made through the test lead terminals. Defaults at ⊣⊢ Capacitance. Press **SELECT** button momentarily and release to select ⊣▶ Diode.

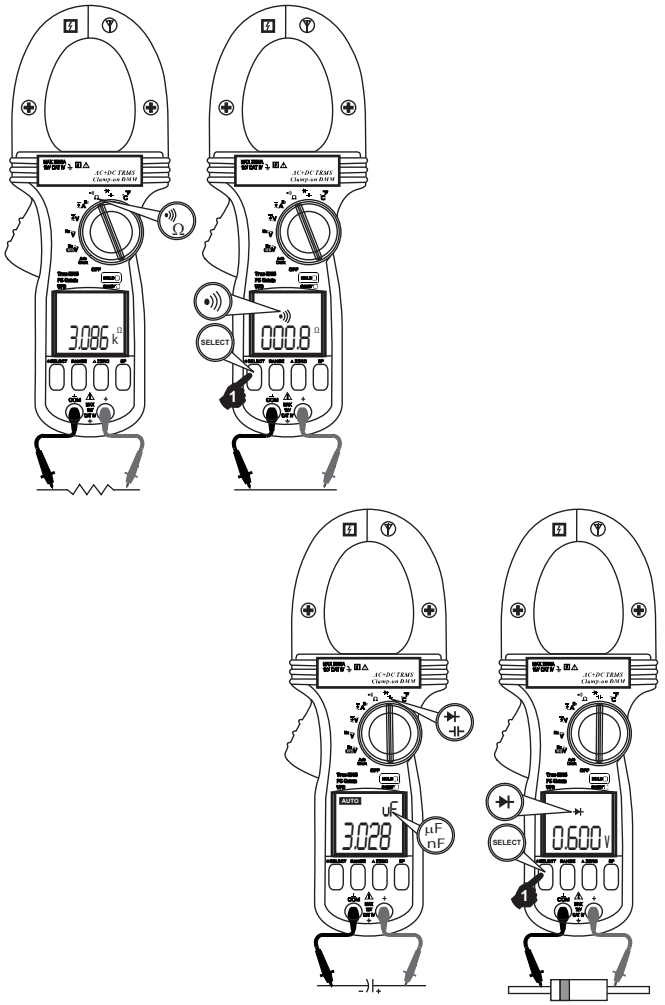
Note

When using Diode test function, 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).

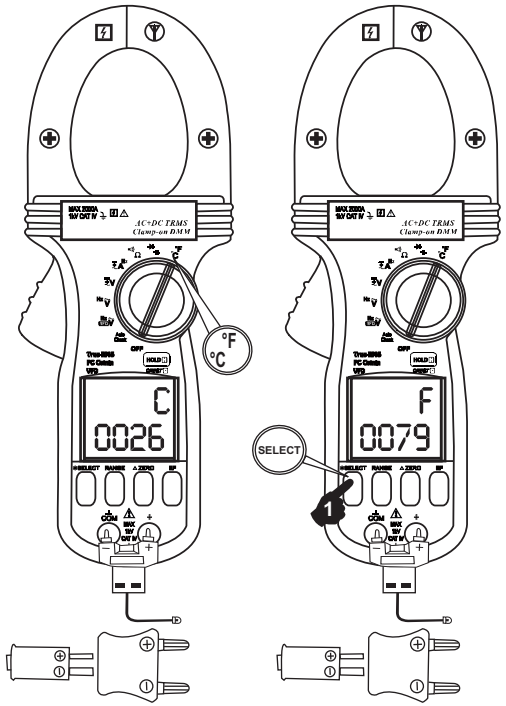
CAUTION

1. Using Resistance, Continuity, Diode or Capacitance function in a live circuit will produce false results and may damage the meter. In many cases the suspected component (s) must be disconnected from the circuit to obtain an accurate measurement reading.

2. When using Capacitance function, discharge capacitor(s) before making any measurements. Large value capacitors should be discharged through an appropriate resistance load

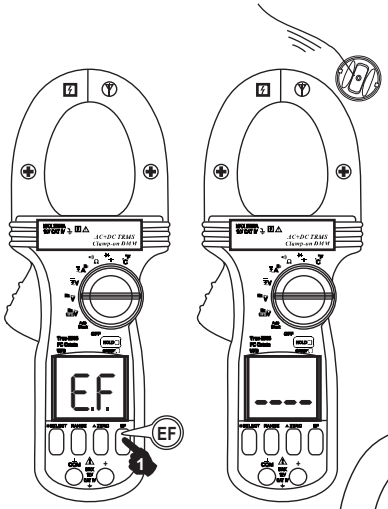


Temperature Function

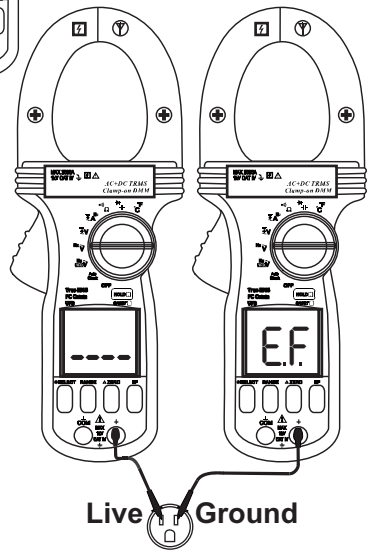


Defaults at °C (Celsius) readings. Press SELECT button momentarily and release to select °F (Fahrenheit) readings. Inputs are made through the test leads terminals. Be sure to insert the banana plug type-K temperature bead probe Bkp60 with correct ± polarities. You can also use a plug adapter bkb32 (optional purchase) with banana pins to type-k socket to adapt other type-k standard mini plug temperature probes.

Electric Field EF-Detection



In Voltage or Current function, press the EF button for one second or more and release 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 together with variable beep tones.



•Non-Contact EF-Detection: An antenna is located along the top-right end of the clamp jaw, which detects electric field surrounds energized 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.

PC computer interface capabilities

The instrument equips with an optical isolated interface port at the meter back for data communication. Optional purchase PC interface kit BRUA-19X is required to connect the meter to the PC computer RS232 or USB ports. Press and hold the **HOLD** button while turning the meter on to enable meter PC-COMM output.

Hold

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

5ms CREST-MAX capture mode

Press **CREST** (HOLD) button for one second or more and release to activate CREST-MAX capture (Instantaneous Peak-Hold) mode to capture signal peak of voltage or current in duration as short as 5ms. The LCD "**C**" & "**MAX**" turn on. Press again the button momentarily and release can toggle the combination use of HOLD feature. Press the button for 1 second or more and release to exit CREST-MAX capture mode. Auto-ranging and Auto-Power-Off are disabled automatically in this mode.

Backlighted LCD display (Model KM 2777)

Press the **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.

Relative-Zero (Δ) mode

Relative-Zero allows the user to offset the meter consecutive measurements with the main display displaying reading as the reference value. Press the **REL** button momentarily and release to toggle Relative-Zero mode.

Manual or Auto-ranging

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

Note: manual-ranging feature is not available in **Hz** and ⊣⊢ function ranges.

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 34 minutes of no rotary switch or push button operations. 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.

Disabling Auto-Power-Off

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

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.

Trouble Shooting

If the instrument fails to operate, check batteries and test 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 under test) by accident or abnormal conditions of operation, the protective impedance components in series might be

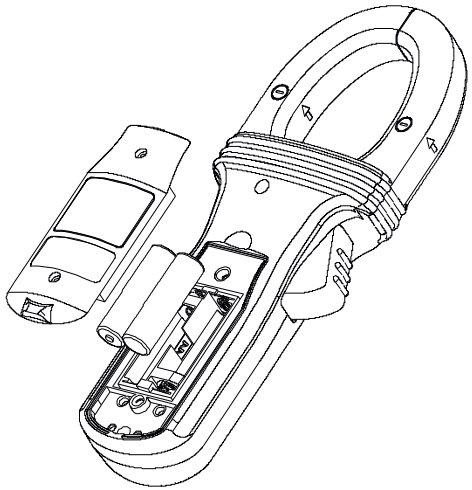
blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this terminal will then be open circuit.

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 batteries and store them separately.

Battery Replacement

The meter uses standard 1.5V AA Size (IEC LR6) battery X 2
Loosen the 2 captive screws from the battery cover case. Lift the battery cover case. Replace the batteries. Replace battery cover case. Re-fasten the screws.



KUSAM-MECO

MUMBAI

TEST CERTIFICATE

AC/DC CLAMP-ON MULTIMETER

This Test Certificate warrantees 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 2777**

SERIAL NO. _____

DATE: _____

ISO 9001
REGISTERED

QC
KUSAM-MECO
PASS

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 & 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.