KUSAM-MECO®

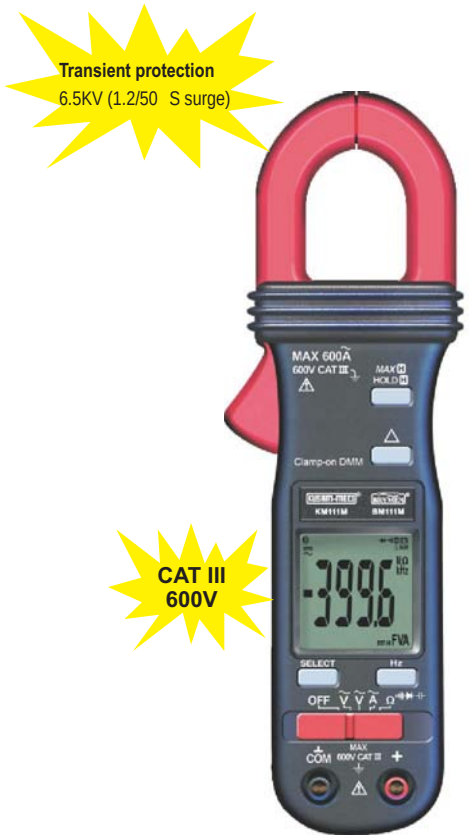
An ISO 9001:2008 Company

3¾ DIGITS DIGITAL CLAMPMETER + MULTIMETER
MODEL - KM 111M / KM 112M

Model KM 111M - Average Sensing - 18 FUNCTIONS 30 RANGES
KM 112M - True RMS Sensing - 19 FUNCTIONS 30 RANGES

SPECIAL FEATURES :

- 600A AC Clamp-on + Multimeter ranges
- Ultra-slim jaws to access tight places
- Light weight & compact body to fit your hand
- Fully Auto-ranging for fast measurements
- Input Protection on all ranges
- Fast 30ms MAX Hold to capture in-rush currents
- Relative Zero mode
- Measures non-invasive ACA Frequency via clamp jaws
- Line level frequency measurements
- Data Hold function

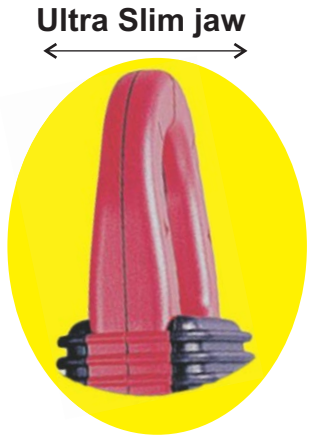


GENERAL SPECIFICATIONS :

- ✶ **Sensing :** Average sensing (KM 111M); True RMS Sensing (KM 112M)
- ✶ **Jaw Opening Size :** 26mm
- ✶ **Basic Accuracy :** 0.5%
- ✶ **Display :** 3¾ Digits 4000 counts LCD display
- ✶ **Update Rate :** 3 per second nominal
- ✶ **Polarity :** Automatic
- ✶ **Low Battery :** Below approx. 2.4V.
- ✶ **Operating Temperature:** 0°C to 40°C.
- ✶ **Relative Humidity:** Maximum relative humidity 80% for temperature upto 31°C decreasing linearly to 50% relative humidity at 40°C
- ✶ **Altitude :** Operating below 2000m
- ✶ **Storage Temperature :** -20°C ~ 60°C,< 80% R.H. (With Battery removed)
- ✶ **Temperature Coefficient :** Nominal 0.15 x (specified accuracy) / °C @ (0°C ~ 18°C or 28°C ~ 40°C), or otherwise specified.
- ✶ **Power Supply :** Single 3V coin Battery IEC CR-2032.
- ✶ **Power Consumption :** 2.8mA typical, except 3.3mA typical for current function.
- ✶ **APO Timing :** Idle for 30 minutes.
- ✶ **APO Consumption :** 5 A typical.
- ✶ **Dimension :** 190(L) x 63(W) x 32(H)mm
- ✶ **Weight :** Approx. 139gm

Safety :

- **Safety :** Meets IEC61010-2-032, EN61010-2-032, UL61010B-2-032, IEC61010-1 2nd Ed., EN61010-1 2nd Ed., UL61010-1 2nd Ed.
  Measurement Category : CAT III 600 Volts AC & DC.
- **Pollution degree :** 2
- **E.M.C. :** Meets EN61326 (1997, 1998/A1), EN61000-4-2 (1995, 2000/A2), and EN61000-4-3 (2002)
  In an RF field of 3 V/m :
  Capacitance function is not specified.
  Total Accuracy = specified Accuracy + 65 digits.
  Other function ranges :
  Total Accuracy = Specified Accuracy + 45 digits.
  Performance above 3V/m is not specified.
- **Overload Protections :**
  ACA Clamp-on jaws : AC 600A rms Continuous.
  + / A & COM terminals : 600VDC / VAC rms.
- **Transient protection :** 6.5KV (1.2/50 S surge)
- Rugged Fire-retarded casing



ACCESSORIES :

Test lead pair, Battery installed, User's Manual & Carrying case.

All Specifications are subject to change without prior notice

ELECTRICAL SPECIFICATIONS : KM 111M / KM 112M

Accuracy is ± (% reading digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 75% R.H. True RMS accuracy of ACV is specified from 5% to 100% of range, & ACA is specified from 10% to 100% of range, or otherwise specified. Maximum Crest Factor <1.75 : 1 at full scale & <3.5 : 1 at half scale, and with frequency spectrums, besides fundamentals, fall within the meter specified AC bandwidth for non-sinusoidal waveforms.

AC CURRENT (CLAMP-ON) (50HZ / 60HZ)

Range	Resolution	Accuracy [1)2)3)]
40.00 A	10 mA	±(1.5%rdg + 8dgts)
400.0 A	100 mA	
600 A	1 A	

[1)] **Induced error from adjacent current-carrying conductor :** 0.05/A

[2)] **Specified accuracy is from 1% to 100% of range and for measurements made at the jaw center. When the conductor is not positioned at the jaw center, position errors introduced are:**
Add 2% to specified accuracy for measurements made BEYOND jaw marking lines (toward jaw opening)

[3)] Add 8d to specified accuracy @ reading < 10% of range.

AC VOLTAGE (50HZ ~ 500HZ)

Range	Resolution	Accuracy
4.000 V	1 mV	±(1.5%rdg + 5dgts)
40.00 V	10 mV	
400.0 V	100 mV	
600 V	1 V	±(2.0%rdg + 5dgts)

CMRR : > 60dB @ DC to 60Hz, Rs=1k
Input Impedance : 10 M , 30pF Nominal.

DC VOLTAGE

Range	Resolution	Accuracy
400.0 mV	100 V	±(0.3%rdg + 4dgts)
4.000 V	1 mV	±(0.5%rdg + 3dgts)
40.00 V	10 mV	
400.0 V	100 mV	
600 V	1 V	±(1.0%rdg + 4dgts)

NMRR : > 50dB @ 50/60Hz
CMRR : > 120dB @ DC,50/60Hz; Rs=1K
Input impedance : 10M , 30pF nominal
(1000M for 400.0mV range)

DIODE TESTER

Open Circuit Voltage	Test Current (typical)
< 1.6 VDC	0.25mA

MAX HOLD (WHERE APPLICABLE)

Specified accuracy ± 50 digits for changes > 25ms in duration.

HZ FREQUENCY

Function	Sensitivity (sine Rms)	Range
400.0 mV	350 mV	10Hz ~ 2KHz
4.000 V	1 V	5Hz ~ 5KHz
40.00 V	32 V	5Hz ~ 100KHz
400.0 V	90 V	5Hz ~ 10KHz
600 V	500 V	5Hz ~ 5KHz
400.0 A	60 A	40Hz ~ 400Hz

Display counts : 5000
Best Resolution : 0.001Hz
Accuracy : ±(0.5%rdg + 4dgts)

RESISTANCE

Range	Resolution	Accuracy
400.0	0.1	±(0.8%rdg + 6dgts)
4.000 K	1	±(0.6%rdg + 4dgts)
40.00 K	10	
400.0 K	100	
4.000 M	1 k	±(1.0%rdg + 4dgts)
40.00 M	10 k	±(2.0%rdg + 4dgts)

Open Circuit Voltage : 0.4VDC typical

CAPACITANCE

Range[1)]	Resolution	Accuracy [2) 3)]
500.0 nF	100 pF	±(3.5%rdg + 6dgts)
5.000 F	1 nF	
50.00 F	10 nF	
500.0 F	100 nF	
3000 F	1 F	

[1)] Additional 50.00nF range accuracy is not specified.
[2)] Accuracies with film capacitor or better
[3)] Specified with battery voltage above 2.8V (approx. half full battery). Accuracy decreases gradually to 12% at low battery warning voltage of approx. 2.4V.

AUDIBLE CONTINUITY TESTER

Audible threshold	between 20 and 120 .

All specifications are subject to change without prior notice.

KUSAM-MECO®
An ISO 9001:2008 Company

G-17, Bharat Industrial Estate, T. J. Road, Sewree (W), Mumbai - 400 015. INDIA.
Sales Direct.: 022 -24156638, **Tel. :** 022-241224540, 24181649, **Fax :** 022 - 24149659
Email : kusam_meco@vsnl.net, **Website :** www.kusamelectrical.com

KUSAM-MECO®

An ISO 9001:2008 Company

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.