KUSAM-MECO®

An ISO 9001:2008 Company

TRMS DATA LOGGER CLAMP METER WITH PC INTERFACE

14 FUNCTION 09 RANGES

Model - KM 135

SPECIAL FEATURES :

- Stylish & Versatile
- AC Clamp-on + Multimeter ranges
- AC True RMS Voltage & Current functions
- Total Harmonic distortion THD%-R
- Data Hold & Auto Hold
- 5400 points Hi-Lo logging
- On screen Hi-Lo logging data review capability
- K-type Temperature measurement
- Fast Audible Continuity
- PC interface kit (Optional)

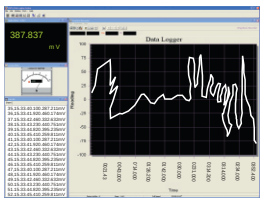
GENERAL SPECIFICATION :

✶ **Sensing :** True RMS sensing
✶ **Jaw opening size :** 45mm max
✶ **Display :** 3-5/6 Digits 6000Counts Backlight Display
Voltage functions : 6000 counts; **Ohms & Hz functions :** 9999 counts;
ACA clamp-on function : 4000 counts
✶ **Update Rate :** Voltage, ACA clamp-on, Ohms & Temperature function : 4 per second nominal
Hz function : 2 Per second nominal
✶ **Polarity :** Automatic
✶ **Operating Temperature :** 0°C to 40°C
✶ **Relative Humidity :** Max. R.H. 80% for temperature uptp 31°C decreasing linearly to 50% R.H. at 40°C
✶ **Altitude :** Operating below 2000m
✶ **Storage Temperature :** -20°C to 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 :** standard 1.5V AAA battery x 2
✶ **Power Consumption (typical) :** Voltage & ACA functions : 3.5mA typical
Ohm & Temperature functions : 4mA typical
✶ **Low Battery :** Below approx. 2.4V
✶ **APO Consumption :** 10 A typical
✶ **APO Timing :** Idle for 16 minutes
✶ **Dimension :** L224mm x W78mm x H40mm
✶ **Weight :** 224gm approx

SAFETY :

- **Safety :** Meets IEC61010-2-032(1994), EN61010-2(1995), UL3111-2-032(1999).
Measurement Category : CAT III 600 Volts AC & DC
- **Transient protection :** 6.5kV (1.2/50µs surge)
- **Pollution degree :** 2
- **E.M.C. :** Meets EN61326(1997,1998/A1),EN61000-4-2(1995), and EN61000-4-3(1996)
In an RF field of 3V/m :
Total Accuracy = Specified Accuracy + 45 digits;
Performance above 3V/m is not specified
- **Overload Protection :**
ACA Clamp-on jaws : AC 1000A rms Contuinuous
+ & COM terminals (all functions) : 600VDC / VAC rms

Software CD

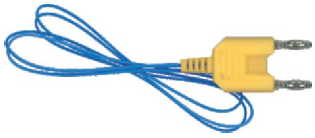


PC Software Screen

BA-1XX Cable | **BUA-2303 USB to Serial Adapter** | **BC-100R USB port Cable**

ACCESSORIES :

Test Leads pair, User's Manual, Batteries installed, BKP60 banana plug type K-thermocouple & Carrying case.



Thermocouple

OPTIONAL ACCESSORIES :

PC interface kit (including BA-1XX optical adaptor back, BC-100R cable, Software CD), BKB32 banana plug to type-K socket plug adaptor

All Specifications are subject to change without prior notice

ELECTRICAL SPECIFICATIONS : KM 135

Accuracy is ± (% of reading digits + number of digits) or otherwise specified, at 23°C ± 5°C and less than 75% R. H. ACV & ACA clamp-on accuracies are specified from 5% to 100% of range or otherwise specified. Maximum Crest Factor are as specified below, and with frequency spectrums, besides fundamentals, fall within the meter specified AC bandwidth for non-sinusoidal waveforms. Fundamentals are specified at 50Hz or 60Hz.

AC CURRENT (CLAMP-ON)

Range	Resolution	Accuracy[1) 2) 3)]
50Hz / 60Hz		
40.00 A	10 mA	±(1.0%rdg + 5dgts)
400.0 A	100 mA	
1000 A	1 A	
45Hz ~ 500Hz		
40.00 A	10 mA	±(2.0%rdg + 5dgts)
400.0 A	100 mA	
1000 A	1 A	±(2.5%rdg + 5dgts)
500Hz ~ 3.1kHz		
40.00 A	10 mA	±(2.0%rdg + 5dgts)
400.0 A	100 mA	
1000 A	1 A	±(2.5%rdg + 5dgts)

Crest Factor :
< 2.5 :1 at full scale & < 5.0 : 1 at half scale for 40.00A & 400.0A ranges
< 1.4 :1 at full scale & < 2.8 : 1 at half scale for 1000A range

1) Add 8d to specified accuracy while reading is below 10% of range
2) Induced error from adjacent current-carring conductor : < 0.06A/A
3) Specified accuracy is for measurements made at the jaw center.
When the conductor is not positioned at the jaw center, position errors introduce are :
Add 1% to specified accuracy for measurements made WITHIN jaw marking lines (away from jaw opening)
Add 4% to specified accuracy for measurements made BEYOND jaw making lines (toward jaws opening)

DC VOLTAGE

Range	Resolution	Accuracy
600.0V	100 mV	±(0.5%rdg + 5dgts)

NMRR : > 50dB @ 50/60Hz
CMRR : > 120dB @DC, 50/60Hz, RS = 1k
Input Impedance : 2M , 30pF nominal

FREQUENCY

Range	Accuracy
5.00Hz ~ 500.0Hz	±(0.5%rdg + 4dgts)

Sensitivity (Sine RMS)
40A range : > 4A
400A range : > 40A
1000A range : > 400A
600V range : > 30V

AUDIBLE CONTINUITY TESTER

Audible threshold	between 10 and 300
Response time	250µS typical

AC VOLTAGE

Range	Resolution	Accuracy
50Hz / 60Hz		
600.0 V	0.1 V	±(1.0%rdg + 5dgts)
40Hz ~ 500Hz		
600.0 V	0.1 V	±(1.5%rdg + 5dgts)
500Hz ~ 3.1kHz		
600.0 V	0.1 V	±(2.5%rdg + 5dgts)

CMRR : > 60dB @ DC to 60Hz, Rs = 1K
Input Impedance : 2M , 30pF nominal
Crest Factor : < 2.3 : 1 at full scale & < 4.6 : 1 at half scale

TEMPERATURE

Range	Accuracy [1) 2)]
-50°C ~ 300°C	±(2.0%rdg + 3°C)
-58°F ~ 572°F	±(2.0%rdg + 6°F)

1) Type-K thermocouple range & accuracy not included
2) Add 3°C (or 6°F) to specified accuracy @ -20°C~50°C (@ -4°F~58°F)

THD%-R[1)]

Range	Harmonic Order	Accuracy[2)]
0.0%~99.9%	Fundamental	1.5% of Reading + 6d
	2nd ~ 3rd	5.0% of Reading + 6d
	4th ~ 10th	2.5% of Reading + 6d
	11th ~ 51st	2.0% of Reading + 6d

1) THD% -R is defined as : (Total Harmonic RMS / Total RMS) x 100%
2) Specified accuracy @ ACA fundamental > 5A; ACV fundamental > 50V

RESISTANCE

Range	Resolution	Accuracy
999.9	0.1	±(1.0%rdg + 6dgts)

Open Circuit Voltage : 0.4VDC typical

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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

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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.