KUSAM-MECO®

An ISO 9001:2008 Company

TRUE RMS DIGITAL INSULATION MULTIMETER
MODEL KM 876

22 Functions 71 Ranges

SPECIAL FEATURES :

- VFD V & Hz readings.
- Paper-White Backlight LCD Display
- Record MAX / MIN readings.
- Display Hold Function.
- Dual Digital Display.
- PI & DAR Function.
- Autoranging.
- Pass /Fail Insulation Resistance Compare function; 12 selectable Preset Values.
- BeepJack™ audible & visible input warning.

Preliminary Data

GENERAL SPECIFICATIONS :

- ✶ **Sensing :** AC, True RMS
- ✶ **Display :** 3-5/6 digits 6000 Counts Backlight LCD Display.
- ✶ **Polarity :** Automatic
- ✶ **Update Rate :** 5 per second nominal
- ✶ **61 Segments Analog Bar Graph :** 60 per second max.
- ✶ **Power Supply:** Four Alkaline AA batteries
- ✶ **Power Consumption:** 4.5mA typical except : ACV $^{+Hz}$ & VFD ACV $^{+Hz}$: 7.0mA

  Insulation Resistance @ 1mA Test Current :

  50V output Voltage : 25mA, 100V output Voltage : 45mA
  250V output Voltage : 85mA, 500V output Voltage : 170mA
  1000V output Voltage : 440mA

  Tester can perform at least 950 Insulation Tests with new alkaline batteries at room temperature.
  These are standard tests of 1000V into 1MΩ with a duty cycle of 5 seconds on and 25 seconds off.
- ✶ **Operating Temperature :** -10ºC ~ 40ºC
- ✶ **Relative Humidity :** Maximum relative humidity 90% for temperature up to 28ºC decreasing linearly to 50% relative humidity at 40ºC.
- ✶ **Pollution degree :** 2
- ✶ **IP Rating :** IP40
- ✶ **Storage Temperature :** -20ºC ~ 60ºC, < 80% R.H. (with battery removed)
- ✶ **Altitude :** Operating below 2000m
- ✶ **Temperature Coefficient :** Nominal 0.15 x (specified accuracy)/ °C @(-10ºC~18ºC or 28ºC~40ºC), or otherwise specified.
- ✶ **Low Battery:** approx. 4.6V
- ✶ **APO Timing:** Idle for 20 minutes
- ✶ **APO Consumption:** 50μA typical
- ✶ **Auto or Manual-ranging mode.**
- ✶ **Auto Power Off.**
- ✶ **Dimension:** 208(L) X 103(W) X 64.5(H) mm with holster
- ✶ **Weight:** 635 gm with holster.

SAFETY :

- ✶ **Safety :** Double insulation per IEC/UL/EN61010-1 Ed. 3.0, IEC/EN61010-2-030 Ed. 1.0, IEC/EN61010-2-033 Ed. 1.0, IEC/UL/EN61010-031 Ed. 1.1 and CAN/CSA-C22.2 No. 61010-1-12 Ed. 3.0 to CAT III 1000 V AC & DC and CAT IV 600V AC & DC.
- ✶ **Compliance to IEC/EN61557; 2007 (per CE requirements, not certified by UL or ETL) :** IEC/EN61557-1, IEC/EN61557-2 & IEC/EN61557-4 where applicable.
- ✶ **E.M.C. :** Meets EN61326-1:2006 (EN55022, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11)
  In an RF field of 3V/m:
  Total Accuracy = Specified Accuracy + 25 digits.
  Performance above 3V/m is not specified.
- ✶ **Transient Protection :** 8KV(1.2/50μS Surge)
- ✶ **Overload Protections :**

  V : 1100Vrms
  mV, Ω & Others : 1000 Vrms

ACCESSORIES : Test probe pair, Alligator clip pair, Holster, User manual & Carrying Case.

OPTIONAL ACCESSORIES : BRP21S2-C Remote probe & Magnetic hanger.

All Specifications are subject to change without prior notice

ELECTRICAL SPECIFICATIONS : KM 876

Accuracy is ± (% of reading digits + number of digits) or otherwise specified, at 23°C ± 5°C & less than 80%relative humidity.
True RMS voltage & current accuracies are specified from 1 % to 100 % of range or otherwise specified.
Maximum Crest Factor < 1.70:1 at full scale & < 3.4:1 at half scale, and with frequency components fall within the specified frequency bandwidth for non-sinusoidal waveforms.

DC VOLTAGE

Range	Resolution	Accuracy
6.000 V	1 mV	±(0.2%rdg + 3dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	±(0.3%rdg + 3dgts)

Input Impedance : 10MΩ, 110pF nominal

VFD AC VOLTAGE

Range	Resolution	Accuracy[1)]
10Hz ~ 45Hz		
600.0 V	100 mV	±(4%rdg + 5dgts)
45Hz ~ 200Hz		
600.0 V	100 mV	±(2%rdg + 5dgts)
200Hz ~ 440Hz		
600.0 V	100 mV	±(7%rdg + 5dgts[2)])

[1)] Unspecified for fundamental frequency > 440Hz
[2)] Accuracy linearly decreases from 2% + 5d @ 200Hz to 7% + 5d @ 440Hz
Input impedance : 10MΩ, 110pF nominal.

INSULATION RESISTANCE

Test Voltage[1)]	Range	Test Current	Accuracy
50 V	3.000MΩ, 30.00MΩ, 55.0MΩ	1mA @50kΩ	±(1.5%rdg + 5dgts)
100 V	3.000MΩ, 30.00MΩ, 110.0MΩ	1mA @100kΩ	
250 V	3.000MΩ, 30.00MΩ, 275.0MΩ	1mA @250kΩ	
500 V	3.000MΩ, 30.00MΩ, 300.0MΩ, 550.0MΩ	1mA @500kΩ	
1000 V	3.000MΩ, 30.00MΩ, 300.0MΩ	1mA @1MΩ	±(1.5%rdg + 5dgts)
	3000MΩ		±(2.0%rdg + 5dgts)
	25.0GΩ		±(10%rdg + 5dgts)

[1)] **Actual output voltage :** 100% ~ 120% of Test Voltage
Live Circuit Detector : Inhibit test and display voltage reading instead if terminal voltage > 30V prior to initialization of test.
Display Voltage Accuracy : DCV : 1.5% + 5d ;
ACV : 3.0% + 5d @50Hz ~60Hz (unspecified @ >600Vac)
Specified measuring range is 0.020MΩ....25.0GΩ for percentage operating uncertainly B(%) ≤ ± 30% per IEC/EN61557-2 requirements.

~ Hz Line Level Frequency

Function Range	Sensitivity (Sine RMS)	Range
6 V	0.6 V	10Hz ~ 20kHz
60 V	6 V	
600 V	60 V	10Hz ~ 3kHz
1000 V	600 V	
VFD 600 V	60~240 V[1)]	10Hz ~ 440Hz

Accuracy : ±(0.02%rdg + 4dgts)
[1)] VFD sensitivity linearly decreases from 10% F.S. @200Hz to 40% F.S. @440Hz.

AC VOLTAGE

Range	Resolution	Accuracy
50Hz ~ 60Hz		
6.000 V	1 mV	±(1%rdg + 3dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
60Hz ~ 1kHz		
6.000 V	1 mV	±(2%rdg + 3dgts)
60.00 V	10 mV	
600.0 V	100 mV	
1000 V	1 V	
1kHz ~ 3kHz		
6.000 V	1 mV	±(2%rdg + 3dgts)
60.00 V	10 mV	
600.0 V	100 mV	Unspecified
1000 V	1 V	
3kHz ~ 5kHz		
6.000 V	1 mV	±(4%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	Unspecified
1000 V	1 V	

Input Impedance : 10MΩ, 110pF nominal

RESISTANCE

Range	Resolution	Accuracy
600.0Ω	100 mΩ	±(0.9%rdg + 5dgts)
6.000kΩ	1 Ω	±(0.9%rdg + 2dgts)
60.00kΩ	10 Ω	
600.0kΩ	100 Ω	
6.000MΩ	1 kΩ	±(1.2%rdg + 3dgts)
60.00MΩ	10 kΩ	±(3.0%rdg + 6dgts)

Open Circuit Voltage : < 1.5VDC typical

DIODE TESTER

Range	Resolution	Accuracy[1)]
2.000 V	1 mV	±(1.5%rdg + 4dgts)

Test Current : 0.5mA typically **Open Circuit Voltage :** < 2.8VDC typically

AUDIBLE CONTINUITY TESTER

Audible Threshold	Between 20Ω and 200Ω
Response Time	< 30ms approx.

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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.