KUSAM-MECO®

An ISO 9001:2008 Company

2000 A AC TRUE RMS DIGITAL CLAMP METER WITH NON-CONTACT EF-DETECTION

20 FUNCTIONS 21 RANGES

Model - 2772

SPECIAL FEATURES :

- 2000A AC Clamp-on + Full Multimeter ranges
- AC True RMS Voltage & Current functions
- Autocheck feature (Automatic DCV, ACV & Ohms selection)
- Fully Autoranging on all functions
- Back lighted display & Data Hold function
- Non-Contact & Probe Contact EF-Detection
- Lo-Z Voltage to drain Ghost Voltages (Auto-V position)
- High Voltage frequency with auto-ranging trigger levels
- Overload-Alert ON > 600V AC/DC (Beeps & OL indication)
- Fast Audible Continuity & Diode Test

GENERAL SPECIFICATIONS :

- ✷ **Sensing :** True RMS sensing
- ✷ **Jaws opening size :** 45mm max.
- ✷ **Display :** 3-5/6 digits 6000 counts
- ✷ **Update Rate :** 5 per second nominal
- ✷ **Polarity :** Automatic
- ✷ **Operating Temperature :** 0°C ~ 40°C
- ✷ **Relative Humidity :** Max. R.H. 80% for temperature upto 31°C decreasing linearly to 50% R.H. 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.
- ✷ **Low Battery Indication :** Below approx. 2.4 V
- ✷ **Power Supply :** Standard 1.5V AAA battery X 2
- ✷ **Power Consumption :** 2.8mA typical
- ✷ **APO Consumption :** 230 A typical on Voltage & Current function
- ✷ **APO Timing :** Idle for 3 minutes
- ✷ **Dimension :** 224(L) x 78(W) x 40(H)mm
- ✷ **Weight :** approx. 220gm

SAFETY :

- **Safety :** Meets IEC 61010-2-032(1994), EN61010-2-031(1995), UL3111-2-032 (1999)
- **Measurement Category :** CAT III 600VAC & VDC.
- **Pollution degree** : 2
- **Overload Protection :**
  ACA Clamp-on jaws : AC 2000A rms continuous
  + & COM terminals (all functions) : 600VDC & VAC rms
- **E.M.C. :** Meets EN61326 (1997,1998/A1), EN61000 -4-2 (1995) & EN61000-4-3 (1996)
  In an RF Field of 3V/m :
  Capacitance function is not specified.
  Other function ranges :
  Total accuracy = Specified accuracy+ 45 digits
  Performance above 3V/m is not specified
- **Battery Cover with probe holders**
- **Rugged fire retarded casing**

ACCESSORIES :

Test leads (pair), Batteries installed, Users Manual, Carrying Case

ELECTRICAL SPECIFICATIONS : 2772

Accuracy : ± (% reading + number of digits)

ACA CLAMP-ON CURRENT

Range	Resolution	Accuracy [1) 2) 3)]
50Hz / 60Hz		
400.0 A	100 mA	±(1.5%rdg + 5dgts)
2000 A	1 A	

Crest Factor : < 2 at full scale & < 4 at half scale

[1)] Add 8d to specified accuracy while reading is below 10% of range.

[2)] Induced error from adjacent current-carrying conductor : < 0.06A/A.

[3)] Specified accuracy is for measurement made at the jaw center. When the conductor is not positioned at the jaw center, position errors introduced are:
Add 1% to specified accuracy for measurementts made WITHIN jaws marking lines (away from jaws opening).
Add 4% to specified accuracy for measurements made BEYOND jaws marking lines (toward jaws opening).

RESISTANCE

Range	Resolution	Accuracy [1)]
6.000 k [2)]	1	±(1.2%rdg + 6dgts)[3)]
60.00 k	10	±(1.0%rdg + 4dgts)
600.0 k	100	
6.000 M	1 k	±(2.0%rdg + 4dgts)

Open Circuit Voltage : 0.4VDC typical

[1)] Cool down interval 2 minutes after over 50V measurements in Auto-V position.

[2)] Beeper ON while reading < 0.025 k

[3)] Add 40d to specified accuracy while reading is below 20% of range.

NON-CONTACT EF-DETECTION

Typical Voltage	Bar Graph Indication
15V to 85V	-
40V to 130V	- -
60V to 210V	- - -
90V to 300V	- - - -
above 120V	- - - - -

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-Dection : For more precise indication of live wires, use the Red(+) probe for direct contact measurement

AC VOLTAGE

Range	Resolution	Accuracy
50Hz / 60Hz		
6.000 V	1 mV	±(1.5%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	±(2.0%rdg + 5dgts)
50Hz ~ 500Hz		
6.000 V	1 mV	±(2.0%rdg + 5dgts)
60.00 V	10 mV	
600.0 V	100 mV	±(2.5%rdg + 5dgts)

CMRR : > 60dB @ DC to 60 Hz; Rs =1k
Hi-Z ACV Input Impedance : 5 M , 90pF nominal
AutoCheck Lo-Z DCV Input Impedance :
Initially 1.6k , 90pF nominal ;
Impedance increases significantly as display voltage increases from 50V (typical). Typical impedances vs display voltages for reference are:

15k	@ 100V
100k	@ 300V
210k	@ 600V

AutoCheck ACV Threshold : > 2V AC (50 / 60Hz) nominal
Crest Factor : < 1.6:1 at full scale & < 3.3:1 at half scale

CAPACITANCE

Range	Resolution	Accuracy [1)]
100.0 nF [2)]	100 pF	±(3.5%rdg + 5dgts)[3)]
1000 nF	1 nF	
10.00 F	10 nF	
100.0 F	100 nF	
2000 F	1 F	

1) Accuracies with film capacitor or better.
2) Accuracy below 50 nF is not specified
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

DC VOLTAGE

Range	Resolution	Accuracy
6.000 V	1 mV	±(0.5%rdg + 3dgts)
60.00 V	10 mV	±(1.0%rdg + 5dgts)
600.0 V	100 mV	±(2.0%rdg + 5dgts)

NMRR : > 30 dB @ 50 Hz / 60 Hz
CMRR : > 100 dB @ DC, 50 Hz / 60 Hz; Rs =1k
Hi-Z DCV Input Impedance : 5 M , 90pF nominal
AutoCheck DCV Threshold :
> + 1.5VDC or < -1.0VDC nominal
AutoCheck Lo-Z DCV Input Impedance :
Initially 1.6 k , 90pF nominal ;
Impedance increases significantly as display voltage increases from 50V (typical). Typical impedances vs display voltages for reference are:

15 k	@ 100 V
100 k	@ 300 V
210 k	@ 600 V

FREQUENCY

Voltage Range	Sensitivity (Sine RMS)	Range
6.000 V	4 V	10Hz ~ 30KHz
60.00 V	30 V	10Hz ~ 1KHz
600.0 V	60 V	10Hz ~ 1KHz

Accuracy : ±(0.5%rdg + 4dgts)
Max display : 9999 counts

600 with CONTINUITY BEEPER

Range	Accuracy
600.0 k	±(2.0%rdg + 8dgts)[1)]

Continuity Beeper Response : <100 S
Open Circuit Voltage : 0.4VDC typical
Audible Threshold : between 10 and 300

[1)] Add 40d to specified accuracy while reading is below 20% of range

DIODE TESTER

Open Circuit Voltage	<1.6V DC
Test Current	0.4mA typical

Audible Threshold : between 0.015V and 0.080V

All Specifications are subject to change without prior notice

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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.