KUSAM-MECO®

An ISO 9001:2008 Company

1000A DC/AC DIGITAL CLAMP METER

Model 2781 / 2781-T(True RMS)

9 FUNCTIONS 32 RANGES

FEATURES :

- Overload protection on all ranges.
- Maximum Voltage between any terminal and earth ground 600V rms
- Dual slope integration
- Data-hold facility
- DCA zero button for accurate reading
- Low battery indication
- Auto power off

GENERAL SPECIFICATIONS :

- **Sensing :** Average sensing **(Model 2781)** True RMS sensing **(Model 2781-T)**
- **Jaw opening size :** cables 40mm
- **Display :** 3 ¾ digit 3999 counts liquid crystal LCD display.
- **Over range indication :** Display of "OL" on LCD at the highest position means range selection too low for the input. (Except for ranges of 1000A AC, & 600V AC / DC)
- **Polarity :** Symbol "-" automatic displayed for negative input.
- **Sampling rate :** 3 times per second (Digital display)
- **Auto power off :** The meter is automatically powered off after idling for 15 minutes. To awake the meter, turn the rotary function switch or push any button.
- **Operating Temperature & Humidity :** 0°C to 40°C; < 80% R.H. Non-condensing
- **Low battery :** The symbol "⊟" is displayed when the batteries are weak and below the operating Voltage. Replace batteries immidiately.
- **Battery life :** Approx. 60 hrs continuously use with alkaline batteries.
- **Power supply :** 1.5V AAA x 2
- **Dimension :** 228(L) x 76(W) x 39(H) mm
- **Weight :** approx. 465gms. (Including batteries)

ACCESSORIES :

Test leads (pair), Battery installed, User's manual, K-Type Thermocouople(model 2781-T) & Carrying case.

ELECTRICAL SPECIFICATIONS : 2781 / 2781-T

Accuracy are : ±(% of reading + number of digits) at 18°C to 28°C with relative humidity below 80%R.H.

CAPACITANCE

Range	Resolution	Accuracy
40 nF	0.01nF	±(2.5%rdg+10dgts)
400 nF	0.1 nF	±(2.0%rdg+4dgts)
4 F	1 nF	
40 F	10 nF	
100 F	10 nF	Unspecified

Overload Protection : 250V rms

FREQUENCY

Range	Resolution	Accuracy
10Hz (2781only)	0.001Hz	Unspecified
100Hz	0.01 Hz	±(0.5%rdg+3dgts)
1KHz	0.1 Hz	
10KHz	1 Hz	
100KHz	10 Hz	
1MHz	100 Hz	
10MHz	1 KHz	Unspecified

Over load protection : 250Vrms
Sensitivity : 1V

DIODE & CONTINUITY TEST

Range	Description
⊣◁	Display read approx. Forward voltage of diode. Accuracy ± (3.0%rdg+3)
•))	If the resistance is less than 50 , the beeper sounds continuously

Overload Protection : 250V RMS

DC CURRENT

Range	Resolution	Accuracy
40 A (2781-T)	10 mA	± (2%rdg + 5dgts)
400 A	0.1 A	
1000 A	1 A	

Overload Protection : 1200A

DC VOLTAGE

Range	Resolution	Accuracy
400 mV (2781-T)	0.1 mV	±(1.0%rdg+5dgts)
4 V	0.001 V	±(0.8%rdg+2dgts)
40 V	0.01 V	
400 V	0.1 V	
1000 V	1 V	±(1.0%rdg+2dgts)

Overload protection : 1200Vrms
Input Impedance : 10M

RESISTANCE

Range	Resolution	Accuracy
400	0.1	±(1.2%rdg+8dgts)
4 K	1	±(1.0%rdg+2dgts)
40 K	10	
400 K	100	
4 M	1 K	
40 M	10 K	± (2%rdg+5dgts)

Overload Protection : 250V rms

AC CURRENT

Range	Resolution	Accuracy
40 A (2781-T)	10 mA	± (2%rdg + 5dgts)
400 A	0.1 A	
1000 A	1 A	

Overload Protection : 1200A

AC VOLTAGE

Range	Resolution	Accuracy
400 mV (2781-T)	0.1 mV	±(1.8%rdg+5dgts)
4 V	0.001 V	±(1.0%rdg+5dgts)
40 V	0.01 V	
400 V	0.1 V	
750 V	1 V	±(1.5%rdg+5dgts)

Overload protection : 660Vrms
Input Impedance : 10M
Frequency Response : 40Hz ~ 450Hz for 400V & below, 40Hz ~ 100Hz for 750V

TEMPERATURE (2781-T)

Range	Resolution	Accuracy
-40°C~1000°C	1°C	±(2.5%+3°C)
-40°F~1820°F	1°F	±(2.5%+5°F)

Type-K thermocouple range & accuracy not specified
Supplied K-type thermocouple suitable for 250°C.

DUTY CYCLE

Range	Resolution	Accuracy
0.1% ~ 99.9%		

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.