

**KUSAM-MECO**

# 3 PHASE POWER CLAMP-ON METER (TRMS) WITH KWHR & HARMONICS MEASUREMENT & PC INTERFACE

**MODEL - 2709**

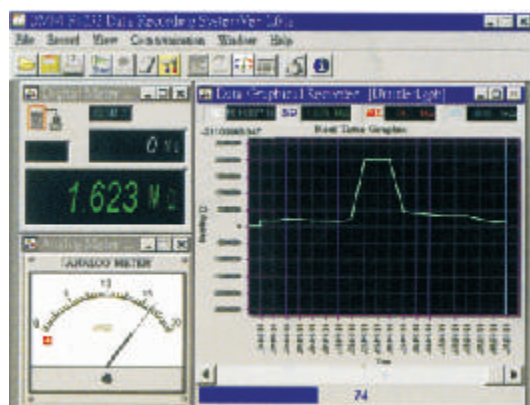
Preliminary Data

**FEATURES :**

- **Display :**  
Voltage Function : 6000 counts LCD display  
Power, Ohm & Hz functions : 9999 counts LCD display  
ACA clamp-on function : 4000 counts LCD display
- **Update Rate :**  
Power function : 2 per second nominal  
Voltage, ACA clamp-on & Ohm functions : 2 per second nominal  
Hz function : 1 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 to 60°C, < 80% R.H.  
(With battery removed)
- **Temperature Coefficient :** nominal 0.15x (specified accuracy) / °C @ (0°C -18°C or 28°C - 40°C), or otherwise specified
- **Sensing :** True RMS sensing
- **Power supply :** Standard 1.5V AAA Battery x 2.
- **Power Consumption :** Voltage, ACA, Hz &  
Power functions : 11mA typical  
Ohm function : 5.5mA typical
- **APO Timing :** Idle for 30 minutes
- **APO Consumption :** 4µA typical
- **Dimension :** 224(L) x 78(W) x 40(H) mm
- **Weight :** approx. 224 gms
- **Jaw opening & Conductor diameter :** 45mm max
- **Special features :** Backlight display, AutoVA™ (Auto Selection on ACV, DCV or ACA functions); selectable Power parameters of KW, KVAR & KVA with Total Power Factor in dual-display; Total harmonic distortion THD%-F in dual-display; kWhr Recording; Display Hold; PEAK-rms HOLD; PC-Comm computer interface capabilities
- **Accessories :** Test leads (pair), batteries installed, user's manual & soft carrying case
- **Optional Accessories :** PC interface kit

**SAFETY :**

- Meets IEC61010-2-032(2002), EN61010-2-032(2002), UL61010B-2-032(2003)
- **Measurement Category :** CATIII 600Volts AC & DC
- **Transient Protection :** 6.5kV (1.2/50µs surge)
- **Pollution degree :** 2
- **E. M. C. :** Meets EN61326(1997, 1998/A1), EN61000-4-2 (1995,2000/A2), and EN61000-4-3(2002)  
In an RF field of 3V/m :  
Total Accuracy = specified Accuracy + 50 digits  
Performance above 3V/m is not specified
- **Overload Protections :**  
ACA Clamp-on jaws : AC 1000A rms continuous  
+ & COM terminals : 600VDC/VAC rms



## ELECTRICAL SPECIFICATIONS

Accuracy is  $\pm$  (% reading digits + number of digits) or otherwise specified at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  & less than 75% R.H.

True RMS ACV & ACA clamp-on accuracies are specified from 0% 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 and 60Hz.

### ACA CURRENT (Clamp-on)

Range	Resolution	Accuracy <sup>(1)(2)</sup>
<b>50Hz / 60Hz</b>		
40.00A	0.01A	1.0% + 5d
400.0A	0.1A	
1000A	1A	
<b>45Hz ~ 500Hz</b>		
40.00A	0.01A	2.0% + 5d
400.0A	0.1A	
1000A	1A	
<b>500Hz ~ 3.1kHz</b>		
40.00A	0.01A	2.5% + 5d
400.0A	0.1A	
1000A	1A	

### ACV AutoVA™ Threshold :

1A AC (40Hz ~ 500Hz only) nominal

**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.

<sup>1)</sup> Induced error from adjacent current carrying conductor : <0.06A/A

<sup>2)</sup> 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 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 marking lines (toward jaws Opening)

### SINGLE-PHASE & 3-PHASE BALANCED-LOAD POWER

Range	Accuracy <sup>(1)(2)(3)</sup>			
<b>0 ~ 600.0kVA</b>	<b>F ~ 10<sup>th</sup></b>	<b>11<sup>th</sup> ~ 45<sup>th</sup></b>	<b>46<sup>th</sup> ~ 51<sup>st</sup></b>	
@ PF = 0.99 ~ 0.1	2.0%+6d	3.5%+6d	5.5%+6d	
Range	Accuracy <sup>(1)(2)(4)</sup>			
<b>0 ~ 600.0kW / kVAR</b>	<b>F ~ 10<sup>th</sup></b>	<b>11<sup>th</sup> ~ 25<sup>th</sup></b>	<b>26<sup>th</sup> ~ 45<sup>th</sup></b>	<b>46<sup>th</sup> ~ 51<sup>st</sup></b>
@ PF = 0.98 ~ 0.70	2.0%+6d	3.5%+6d	4.5%+6d	10%+6d
@ PF = 0.70~0.50	3.0%+6d	4.5%+6d		
@ PF = 0.50-0.30	4.5%+6d			
@ PF = 0.30-0.20	10%+6d			15%+6d

<sup>1)</sup> Specified accuracy is for ACA clamp measurement at the center of jaws.

When the conductor is not positioned at the jaw center, position errors introduced are :

Add 1% to specified accuracy for ACA measurements made WITHIN jaw marking lines (away from jaw opening)  
Accuracy is not specified for ACA measurement made BEYOND jaw Marking lines (toward jaws opening)

<sup>2)</sup> Add 4d to specified accuracy for 3-Phase Balanced-load Power measurements.

<sup>3)</sup> Add 1% to specified accuracy @ ACA fundamental <6A or ACV fundamental <90V. Accuracy is not specified @ ACA fundamental < 1A or ACV Fundamental <30V

<sup>4)</sup> Add 1% to specified accuracy @ ACA fundamental <6A or ACV fundamental < 90V.  
Accuracy is not specified @ ACA fundamental < 2A or ACV fundamental <50V

### OHM

Range	Accuracy
999.9Ω	1.0% + 6d

**Open Circuit Voltage :**  
0.4VDC typical

### FREQUENCY

Range	Accuracy
5Hz ~ 500Hz	0.5% + 4d

Sensitivity (Sine RMS)

40A range : > 4A  
400A range : > 40A  
1000A range: >400A  
600V range : >30V

### TOTAL POWER FACTOR (PF)

Range	Accuracy <sup>1)</sup>	
	F ~ 21 <sup>st</sup>	22 <sup>nd</sup> ~51 <sup>st</sup>
0.10 ~ 0.99	3d	5d

Specified accuracy @ ACA fundamental > 2A;  
ACV fundamental > 50V

### A-lags-V Indication :

LCD annunciator "A-lags-V" turns on to indicate an inductive circuit, or Current A lags .Voltage V (i.e., Phase-shift angle  $\theta$  is "+").

A-lags-V Indication is specified at 50/60Hz fundamental without the presence of harmonics, and at ACV > 90V, ACA>9A and PF < 0.95

### Audible Continuity Tester

Audible threshold :  
between 10Ω and 300Ω  
Response time : 250μs

### PEAK-rms HOLD (ACA & ACV only)

Response : 65 ms to >90%

### KWhr (kilo-Watt-Hour Energy)

Time base accuracy : <30ppm  
Non-volatile memory :  
Separately stores one  
3-Phase -Balanced-load and one  
Single-Phase result.

### THD%-F

Range	Harmonic order	Accuracy <sup>1)</sup>
0.0% ~ 50.0%	Fundamental	1.5% + 6d
	2nd ~ 3rd	7% + 6d
	4th ~ 21st	2.5% + 6d <sup>2)(3)</sup>
	22nd ~ 51st	10% + 10d <sup>4)</sup>
50.0% ~ 100%	2nd ~ 3rd	Unspecified
	4th ~ 21st	2.5% + 6d <sup>5)(6)</sup>
	22nd ~ 51st	10% + 10d <sup>4)</sup>
100% ~ 450% <sup>7)</sup>	2nd ~ 3rd	Unspecified
	4th ~ 21st	7% + 6d <sup>2)(4)</sup>
	22nd ~ 51st	Unspecified

**THD%-F is defined as :** (Total Harmonic RMS / Fundamental RMS) x 100%

<sup>1)</sup> Accuracy specified @ fundamental  $\geq$  70V & Total RMS  $\leq$  600V for ACV THD%-F, fundamental  $\geq$  6A & Total RMS  $\leq$  1000A for ACA THD%-F, and Crest Factors @ :

<2.5 for 600V Range

<2.5 for 400A Range

< 3.0 for 400A Range

< 1.6 for 1000A Range

<sup>2)</sup> Add 4d to specified accuracy @ 40A Range

<sup>3)</sup> Add 4.5% to specified accuracy @ 1000A range

<sup>4)</sup> Unspecified @ 1000A range

<sup>5)</sup> Add 1% + 4d to specified accuracy @40A Range

<sup>6)</sup> Add 4.5% to specified accuracy @ 400A ~ 750A;

Unspecified @ > 750A

<sup>7)</sup> ~150% for 600V Range.

### AC VOLTAGE

Range	Resolution	Accuracy
<b>50Hz / 60Hz</b>		
600.0V	0.1V	0.5% + 5d
<b>45Hz ~ 500Hz</b>		
600.0V	0.1V	1.5% + 5d
<b>500Hz ~ 3.1kHz</b>		
600.0V	0.1V	2.5% + 5d

**CMRR** : > 60dB @ DC to 60Hz, Rs=1kΩ

**Input Impedance** : 2MΩ, 30pF nominal

**Crest Factor** : < 2.3 : 1 at full scale & < 4.6 : 1 at half scale

**ACV AutoVA™ Threshold** : 30VAC  
(40Hz ~ 500Hz only) nominal

### DC VOLTAGE

Range	Resolution	Accuracy
600.0V	0.1V	$\pm$ 0.5% + 5d

**NMR** : >50dB @ 50 / 60Hz

**CMRR** : >120dB @ DC, 50/60Hz, Rs=1kΩ

**Input Impedance**: 2MΩ, 30pF nominal

**DCV AutoVA™ Threshold** : 2.4VDC nominal

### 3-Phase Unbalanced-Load Power

This 3-Phase Unbalanced-Load Power measurement is achieved thru the calculation of discrete single - phase measurements that are taken one at a time manually. Since it is not real-time on all 3 phases simultaneously, it is intended only for stable power conditions without significant power fluctuations over the time of measurements. Result accuracy is hence the accumulated accuracy of the discrete single-phase measurements plus the associated fluctuations.

All specifications are subject to change without prior notice.



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