



- 5-1/2 digits, full-scale 409999
- Max. sample rate 100 times/sec. (at 4-1/2 digits mode)
- High resolution  
DCV: 1  $\mu$ V, ACV: 1  $\mu$ V,  $\Omega$ : 0.1 m $\Omega$ ,  
DCA/ACA : 10 nA,  $^{\circ}$ C: 0.1 $^{\circ}$ C
- TRUE RMS ACV/ACA
- Temperature measurement from -200 $^{\circ}$ C to 1600 $^{\circ}$ C
- 4-wire ohms measurement
- Storage of 3,000 data
- A variety of optional units enhance measuring efficiency.

## Specifications

### 1. DC VOLTS

#### Accuracy

Sample rate : SLOW/MID :  $\pm$  (% of reading + digits)

Range	23 $\pm$ 1 $^{\circ}$ C, s 24hr	23 $\pm$ 5 $^{\circ}$ C, 90days	23 $\pm$ 5 $^{\circ}$ C, one year	Resolution		Input resistance
				Slow,Mid 5-1/2	Fast 4-1/2	
40 mV	0.008 + 10	0.015 + 10	0.025 + 10	0.1 $\mu$ V	—	$\geq$ 100 M $\Omega$
400 mV	0.0035 + 5	0.008 + 5	0.012 + 5	1 $\mu$ V	10 $\mu$ V	$\geq$ 1000 M $\Omega$
4 V	0.0035 + 2	0.008 + 2	0.012 + 2	10 $\mu$ V	100 $\mu$ V	$\approx$ 10 M $\Omega$
40 V	0.004 + 5	0.012 + 5	0.016 + 5	100 $\mu$ V	1 mV	
400 V	0.004 + 2	0.012 + 2	0.016 + 2	1 mV	10 mV	
1000 V				10 mV	100 mV	

\* The accuracy at 23 $\pm$ 1 $^{\circ}$ C, and 24 hrs. is relative to the calibration standards.

\* The accuracy at 400 mV range is specified after zero compensation through the REL operation.

\* Add 0.003% of reading when used with SC-306 battery unit.

\* In FAST sample mode, add 5 digits to the accuracy in SLOW and MID sample modes.

**Temperature coefficient** (0 $^{\circ}$ C to 18 $^{\circ}$ C, 28 $^{\circ}$ C to 50 $^{\circ}$ C)  
(1/10 of the accuracy for each range)/ $^{\circ}$ C

**Maximum input voltage** 40 mV to 4 V range :  $\pm$ 1100 V DC (5sec.)  
 $\pm$ 500 V DC (continuous)  
40 V to 1000 V range :  $\pm$ 1100 V DC (continuous)

#### Sample rate and noise rejection

Sample rate mode	Reading rate	NMR	CMR
SLOW	$\approx$ 4 times/sec	$>$ 55 dB	$\geq$ 110 dB
MID	$\approx$ 20 times/sec		$\geq$ 55 dB
FAST	$\approx$ 100 times/sec	0 dB	

\* Reading rates are specified with math function OFF.

\* NMR : 50/60 Hz :  $\pm$ 0.1%

\* CMR : 1 k $\Omega$  unbalance, DC, 50/60 Hz :  $\pm$ 0.1%

### 2. AC VOLTS

**Accuracy (For sine wave only)** :  $\pm$ (% of reading + digits)

400 mV to 400 V range : Accuracy is specified for 20,000 counts or more.

750 V range : Accuracy is specified for 10,000 counts or more.

Range	Resolution	Frequency	23 $\pm$ 5 $^{\circ}$ C, 90days	23 $\pm$ 5 $^{\circ}$ C, one year	Input resistance
400 mV	1 $\mu$ V	15 Hz-45 Hz	0.5 + 100	0.5 + 150	$\approx$ 2 M $\Omega$ / 100 pF or below
4 V	10 $\mu$ V	45 Hz-100 Hz	0.25 + 100	0.25 + 150	
40 V	100 $\mu$ V	100 Hz-50 kHz	0.2 + 100	0.2 + 150	
400 V	1 mV	50 kHz-100 kHz	0.5 + 300	0.5 + 300	
750 V	10 mV				

\* In the 750 V range, accuracy is specified at 20 kHz or lower.

\* In SLOW sample mode, accuracy is specified at 15 Hz or higher.

\* In FAST sample mode, accuracy is specified at 200 Hz or higher.

**Temperature coefficient** (0 $^{\circ}$ C to 18 $^{\circ}$ C, 28 $^{\circ}$ C to 50 $^{\circ}$ C)  
(1/10 of the accuracy for each range)/ $^{\circ}$ C

**Maximum input voltage** All range : 780 Vrms (continuous), 1100 V peak  
AC converter True RMS.

Signals other than sine wave : add the following values to the accuracy of the sine wave.

Frequency	Crest factor		
	1-1.5	1.5-2	2-3
15 Hz-20 kHz	0.05%	0.15%	0.3%
20 kHz-300 kHz	0.2%	—	—

#### Sample rate

Sample rate mode	Reading rate	Frequency	Response time
SLOW	$\approx$ 4 times/sec	15 Hz-100 kHz	$\leq$ 2 sec
FAST	$\approx$ 20 times/sec	200 Hz-100 kHz	$\leq$ 1 sec

\* Response time is the time for meter reading to reach within 100 counts of final value in the same range.

### 3. RESISTANCE $\Omega$ (2W $\Omega$ /4W $\Omega$ )

**Accuracy** Sample rate : SLOW/MID :  $\pm$  (% of reading + digits)

Range	23 $\pm$ 1 $^{\circ}$ C, 24hrs	23 $\pm$ 5 $^{\circ}$ C, 90days	23 $\pm$ 5 $^{\circ}$ C, one year	Resolution		Test current
				Slow,Mid 5-1/2	Fast 4-1/2	
40 $\Omega$	0.01 + 10	0.02 + 10	0.025 + 10	0.1 m $\Omega$	1 m $\Omega$	$\approx$ 10 mA
400 $\Omega$	0.005 + 3	0.01 + 3	0.014 + 3	1 m $\Omega$	10 m $\Omega$	$\approx$ 10 mA
4 k $\Omega$				10 m $\Omega$	100 m $\Omega$	$\approx$ 1 mA
40 k $\Omega$				100 m $\Omega$	1 $\Omega$	$\approx$ 100 $\mu$ A
400 k $\Omega$	0.006 + 3	0.011 + 3	0.015 + 3	1 $\Omega$	10 $\Omega$	$\approx$ 10 $\mu$ A
4000 k $\Omega$	0.012 + 10	0.03 + 10	0.033 + 10	10 $\Omega$	100 $\Omega$	$\approx$ 1 $\mu$ A
40 M $\Omega$	0.05 + 20	0.2 + 20	0.25 + 20	100 $\Omega$	1 k $\Omega$	$\approx$ 100 nA
400 M $\Omega$	0.5 + 50	1.5 + 50	1.5 + 50	1 k $\Omega$	10 k $\Omega$	$\approx$ 10 nA

\* The accuracy at 23 $\pm$ 1 $^{\circ}$ C, and 24 hrs. is relative to the calibration standards.

\* The accuracy at 40  $\Omega$  to 4 k $\Omega$  ranges are specified after zero compensation through the REL operation.

\* Add 0.003% of reading when used with SC-306 battery unit.

\* In FAST sample mode, add the following values to the accuracy in SLOW and MID sample modes.

40  $\Omega$  to 4 k $\Omega$  ranges ..... 5 digits  
40 k $\Omega$  to 4000 k $\Omega$  ranges ..... 30 digits  
40 M $\Omega$  to 400 M $\Omega$  ranges ..... 10 digits

**Temperature coefficient** (0 $^{\circ}$ C to 18 $^{\circ}$ C, 28 $^{\circ}$ C to 50 $^{\circ}$ C)  
(1/10 of the accuracy for each range)/ $^{\circ}$ C

**Maximum input voltage**  $\pm$ 500 V DC  
Between V/ $\Omega$  and COM terminals, and between 4 W $\Omega$  SENSE H and L terminals

**Open circuit test voltage** 6.8 V or less

**Sample rate** Sample rate and noise rejection

Sample rate mode		Reading rate
SLOW		$\approx$ 4 times/sec
MID		$\approx$ 20 times/sec
FAST	40 $\Omega$ to 4000 k $\Omega$	$\approx$ 100 times/sec
	40 M $\Omega$ , 400 M $\Omega$	$\approx$ 20 times/sec

#### Response time

Range	Response time	Notes
40 $\Omega$ to 400 k $\Omega$	50 ms	Zero to full scale within the same range
4000 k $\Omega$	0.1s	
40 M $\Omega$	0.5s	
400 M $\Omega$	5s	

### 4. DC CURRENT

**Accuracy** Sample rate : SLOW/MID :  $\pm$  (% of reading + digits)

Range		23 $\pm$ 5 $^{\circ}$ C, 90days	23 $\pm$ 5 $^{\circ}$ C, one year	Resolution		Voltage drop across input terminal
				Slow,Mid 5-1/2	Fast 4-1/2	
4 mA	0.05 + 5	0.08 + 7		10 nA	100 nA	$\leq$ 600 mV
40 mA				100 nA	1 $\mu$ A	
400 mA				1 $\mu$ A	10 $\mu$ A	
4000 mA	$\leq$ 2 A	0.05 + 5	0.08 + 7	10 $\mu$ A	100 $\mu$ A	$\leq$ 1 V
	$>$ 2 A	0.1 + 5	0.13 + 7			

\* In FAST sample mode, add 10 digits to the accuracy in SLOW and MID sample modes.

**Temperature coefficient** (0 $^{\circ}$ C to 18 $^{\circ}$ C, 28 $^{\circ}$ C to 50 $^{\circ}$ C)  
(1/10 of the accuracy for each range)/ $^{\circ}$ C

**Maximum current** Protected by a 4 A fuse.  
4 mA to 400 mA range : 4 A DC or rms (5 sec.)  
1.5 A DC or rms (continuous)  
4000 mA range : 4 A DC or rms (continuous)

#### Sample rate

Sample rate mode		Reading rate
SLOW		$\approx$ 4 times/sec
MID		$\approx$ 20 times/sec
FAST		$\approx$ 100 times/sec

## 5. AC CURRENT

**Accuracy** 23±5°C, one year  
Accuracy is specified for 20,000 counts or more: ± (% of reading + digits)

Range	Resolution	Frequency	Accuracy (Sine wave only)	Voltage drop across input terminal
4 mA	10 nA	15 Hz–45 Hz	1.0 + 200	≤ 600 mVrms
40 mA	100 nA			
400 mA	1 µA	45 Hz–1k Hz	0.4 + 200	≤ 1 Vrms
4000 mA	1 µA			

\* Accuracy is specified at 15 Hz or higher in SLOW and 200 Hz or higher in FAST sample mode.

\* DC component must be smaller than five times of the range.

**Temperature coefficient** (0°C to 18°C, 28°C to 50°C)  
(1/10 of the accuracy for each range)/°C

**AC converter** True RMS.  
**Maximum current** Protected by a 4 A fuse.  
4 mA to 400 mA range : 4 A DC or rms (5 sec.)  
1.5 A DC or rms (continuous)  
4000 mA range : 4 A DC or rms (continuous)

Signals other than sine wave : Add the following values to the accuracy of the sine wave

Frequency	Crest factor		
	1–1.5	1.5–2	2–3
15 Hz–1 kHz	0.05%	0.15%	0.3%

### Sample rate

Sample rate mode	Reading rate
SLOW	≈4 times/sec
FAST	≈20 times/sec

## 6. Temperature

**Accuracy** 23±5°C, one year : ±(% of reading + digits)

Thermocouple type	Temperature range	Resolution	Accuracy
R	0°C – +1600°C	0.1°C	0.2 + 30
K (CA)	–200°C – +1370°C		0.1 + 15
T (CC)	–200°C – +380°C		0.15 + 15
J (IC)	–200°C – +900°C		0.15 + 15
E (CRC)	–200°C – +1000°C		0.15 + 15

\* Not includes the accuracy of thermocouple.

**Temperature coefficient** (0°C to 18°C, 28°C to 50°C)  
±0.1°C/°C (for any thermocouples)

**Interpolation** Linear interpolation

### Sample rate

Sample rate mode	Reading rate
SLOW	≈4 times/sec
FAST	≈8.3 times/sec

## 7. MATH and MISCELLANEOUS FUNCTIONS

### 7-1. REL and % MATH

① REL math  
Y=X-A Y : Reading value  
X : Measurement value.  
A : Reference value.

② % math  
Y = X/A x 100 Y : Reading value.  
X : Measurement value.  
A : Reference value.

- \* The function shall be same for all values.
- \* Full scale is + 999999 under no over-range condition.
- \* Math ON/OFF and reference value are stored in each function.
- \* The % indicator lights at % math function.

### 7-2. MAX/MIN math

Maximum and minimum values are stored in the internal memory in the same function and the same range.

\* Data are read out in the RECALL mode.

### 7-3. AVG math

Moving average of 0 to 100 times (from the keys) or 0 to 255 times (via GP-IB) is available.

Setting the number of average to 0 disables AVG math function with AVG indicator off

\* When used in TRIG or remote mode, the AVG math is run once up to the specified number of average.

### 7-4. STORE function

The internal memory stores up to 3,000 data with the address from 0 to 2999.

\* Data are read out in the RECALL mode.

### 7-5. Continuity test

Continuity test is available by pushing the Ω key at the 2 WΩ function.

Threshold level : 17,000 counts ±10,000 counts

Accuracy : Two times of the resistance measurement accuracy.

Sample rate : Approx. 20 times/sec.

\* The resistance measurement is available in continuity test.

### 7-6. A/D converter

Converting method: Triple slope integration.

Integration time

SLOW/MID : 20 m sec (200 m sec) at 50 Hz power line frequency  
16.67 m sec (200 m sec) at 60 Hz Power line frequency  
The number in the parentheses is at DCV 40 mV range for VOAC 7512 and VOAC 7513.

FAST : 2msec at 50Hz and 60Hz power line frequencies. Same specification as SLOW/ MID mode at ACV/ ACA function and 40 MΩ or higher range in 2 WΩ/ 4 WΩ function.

\* Integration time is automatically adjusted depends on the power line frequency, when used with AC power source.

\* Manual set of integration time is available, when used with DC power source

### 7-7. Battery back-up

The last setup before the power off including STORE data is recalled at turning power on when SET UP function is ON..

## 8. GENERAL

**Display :** 7-segment LED of 11mm height.  
**Full scale :** 409999 (A/D converter full scale)  
999999 (REL math full scale)

**Over range display :** UUUUUU  
**Converting method :** Drift compensated triple slope integration.  
**Polarity indication :** “—” indication at negative polarity.  
**Range selection :** AUTO/MANUAL or remote control by using option unit.

**AUTO ranging :** Range up when more than 409999 counts.  
Range down when less than 036000 counts.

**Function selection :** MANUAL or remote control by using option unit.

**Withstand voltage :** ±500 V DC (between COM input and ground terminals)

**Power supply :** AC100V ±10% 50/60 Hz or battery operation by using SC-306 option unit.

**Option :** AC117V, 217V, or 234V

**Power consumption :** Less than 8W without option unit

**Operating temperature :** 0°C to 50°C

**Operating humidity :** Less than 80% RH (0°C to 40°C)

Less than 60% RH (40°C to 50°C)

**Warm up time :** 1hour after turning power on.

**Dimensions :** Approx. 191 (W) x 80 (H) x 260 (L) mm

**Weight :** Approx. 1.9 kg

**Accessories :** Power code (1), Test lead (1 set). Fuses (4), Alignment screw driver (1), Accessory bag (1), Instruction manual (1)