

⚠ Read First

⚠ Safety Information

Understand and follow operating instructions carefully. Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.

⚠ WARNING

Identifies hazardous conditions and actions that could cause **BODILY HARM** or **DEATH**

⚠ CAUTION

Identifies conditions and actions that could **DAMAGE** the meter or equipment under test

⚠ WARNING

- When using test leads or probes, keep your fingers behind the finger guards.
- Remove test lead from Meter before opening the battery door or Meter case.
- Use the Meter only as specified in this manual or the protection by the Meter might be impaired.
- Always use proper terminals, switch position, and range for measurements.
- Verify the Meter's operation by measuring a known voltage. If in doubt, have the Meter serviced.
- Do not apply more than the rated voltage, as marked on Meter, between terminals or between any terminal and earth ground.
- Only replace the blown fuse with the proper rating as specified in this manual.
- Use caution with voltages above 30 Vac rms, 42 Vac peak, or 60 Vdc. These voltages pose a shock hazard.
- To avoid false readings that can lead to electric shock and injury, replace battery as soon as low battery indicator.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Do not use Meter around explosive gas or vapor.
- To reduce the risk of fire or electric shock do not expose this product to rain or moisture.

⚠ CAUTION

- Disconnect the test leads from the test points before changing the position of the function rotary switch.
- Never connect a source of voltage with the function rotary switch in Ω , \pm , $^{\circ}\text{C}$, mA, A position.
- Do not expose Meter to extremes in temperature or high humidity.
- Never set the meter in Ω , \pm , $^{\circ}\text{C}$, mA, A function to measure the voltage of a power supply circuit in equipment that could result in damage the meter and the equipment under test.

Symbols as marked on the Meter and Instruction manual

	Risk of electric shock
	See instruction manual
	DC measurement
	Equipment protected by double or reinforced insulation
	Battery
	Fuse
	Earth
	AC measurement
	Conforms to EU directives
	Do not discard this product or throw away.

Unsafe Voltage

To alert you to the presence of a potentially hazardous voltage, when the Tester detects a voltage $\geq 30\text{ V}$ or a voltage overload (OL) in V, mV. The "⚠" symbol is displayed and High voltage indicator is turned on.

Maintenance

Do not attempt to repair this Meter. It contains no userserviceable parts. Repair or servicing should only be performed by qualified personnel.

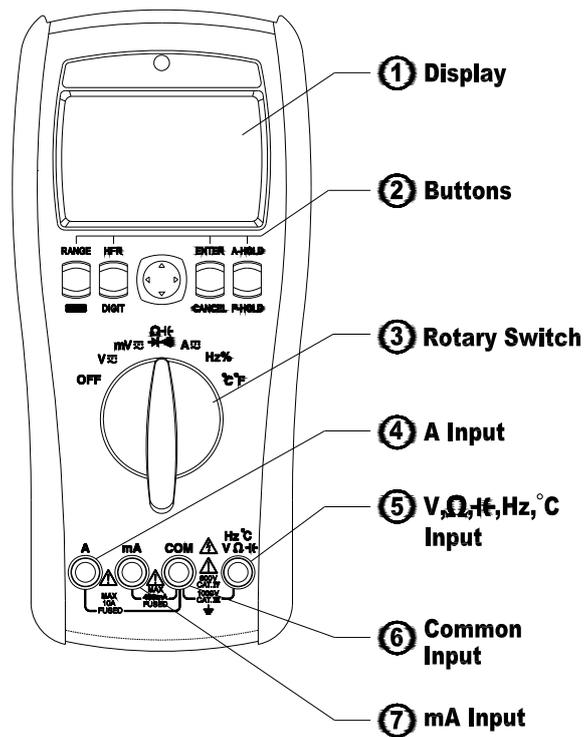
Cleaning

Periodically wipe the case with a dry cloth and detergent. Do not use abrasives or solvents.

The Meter Description

Front Panel Illustration

1. LCD display : 4000/40000 counts for APPA 503.
10000/100000 counts for APPA 505.
2. Push-buttons.
3. Rotary switch for turn the Power On / Off and select the function.
4. Input Terminal for A.
5. Input Terminal for V, Ω , μF , Hz, $^{\circ}\text{C}$ functions.
6. Common (Ground reference) Input Terminal.
7. Input Terminal for mA.



Making Basic Measurements

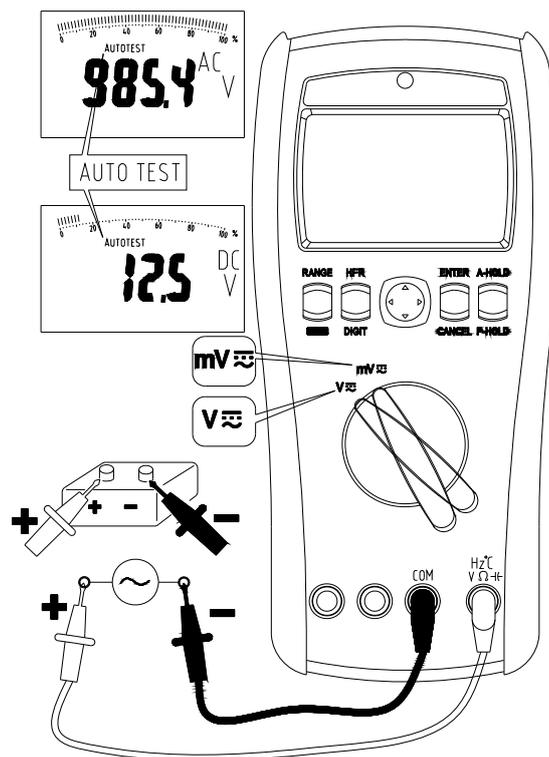
Preparation and Caution Before Measurement

⚠ : Observe the rules of **⚠** Warnings and **⚠** Cautions

When connecting the test leads to the DUT (Device Under Test) connect the common (mA) test lead before connecting the live lead ; when removing the test leads, remove the test live lead before removing the common test lead.

The figures on the following pages show how to make basic measurements.

Measuring AC / DC Voltage

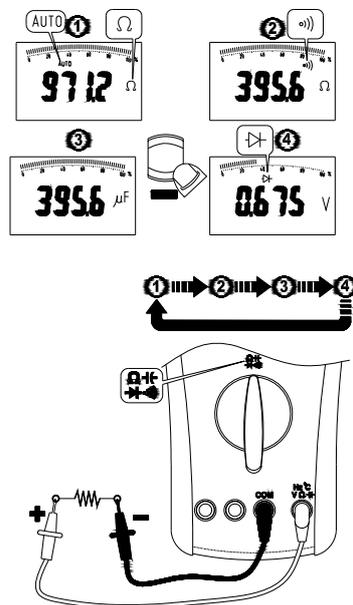


Press the function button to select the measuring function (AC/DC/AC+DC)

High Frequency Reject mode

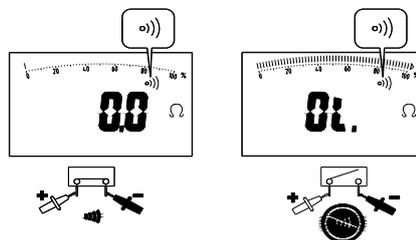
The HFR mode makes the voltage through a low pass filter to reject the high frequency. The -3dB point of the low pass filter is 800 Hz . When the rotary switch in V, mV position, the HFR mode can be used. To use HFR mode, press the HFR button.

Measuring Resistance / Continuity / Diode / Capacitance

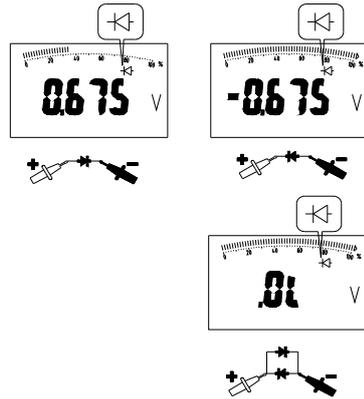


Press the function button to select the measuring function.
(Ω / \rightarrow / \rightarrow / \rightarrow)

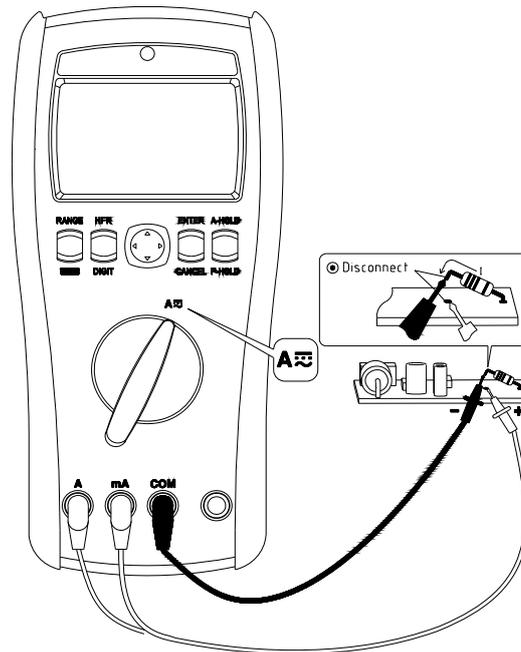
Testing Continuity



Testing Diode

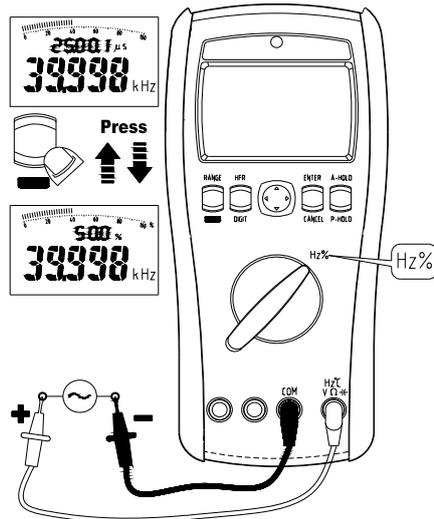


Measuring AC/DC Current



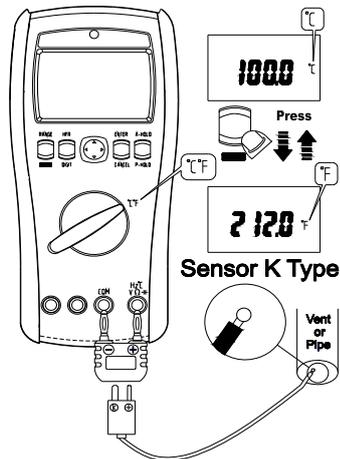
Press the function button to select the measuring function (AC/DC/AC+DC)

Measuring Frequency



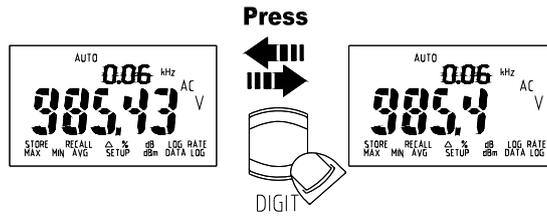
Press the function button to select the measuring function.
(Period/Duty)

Measuring Temperature °C / °F



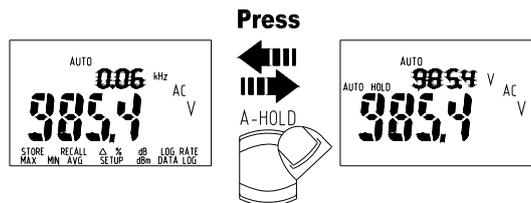
Press the function button to select the measuring function.
(°C / °F)

DIGIT :



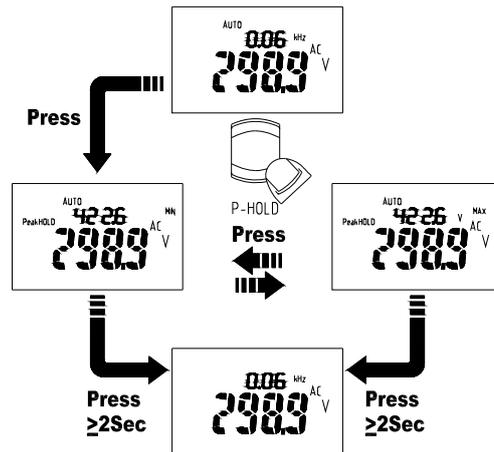
Press the DIGIT button to select the display digit.

AUTO HOLD



In the Auto Hold function, the meter holds the reading, and the current reading appears on the upper display. When the difference of the hold value and the current value above 20 counts, the meter beeps and holds the new value. To use the Auto Hold mode, press the A-Hold button.

Peak HOLD (ACV / ACA Only)



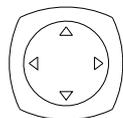
In the Peak Hold function, the meter records the peak maximum value and the peak minimum value when the inputs go below the recorded peak minimum value or above the recorded peak maximum value, the meter records the new value. To use the Peak HOLD mode, press the P-HOLD button.

Sub-Functions navigation option

Sub-Functions item

STORE	RECALL	△	%	dB	LOG RATE
MAX	MIN	AVG	SETUP	dBm	DATA LOG

Buttons



Navigation : Select the Sub-function item.

ENTER

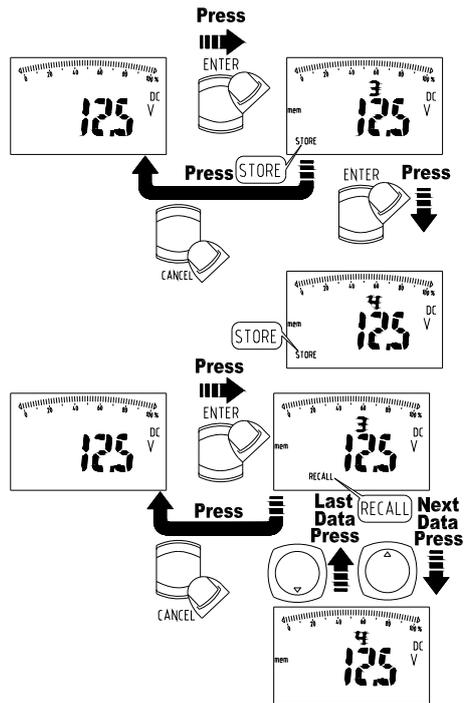


ENTER : Enter the Sub-function.

CANCEL

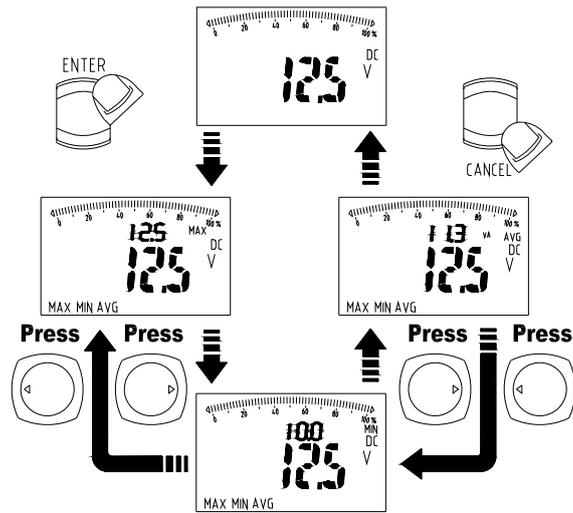
CANCEL : Exit the function.

1. Store and Recall



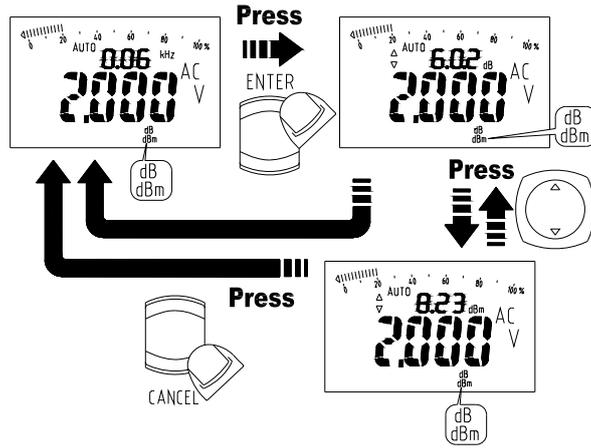
The store function records the input values to memory and recalls them from memory after. The maximum recorded amounts of memory are 1000.

2. MAX / MIN / AVG



The MAX/MIN/AVG mode records the minimum and maximum input values. When the inputs go below the record minimum value or above the record maximum value, the meter records the new value. The MAX/MIN/AVG mode can also calculate the average of the maximum value and the minimum value.

3. dB and dBm (ACV / ACmV only)

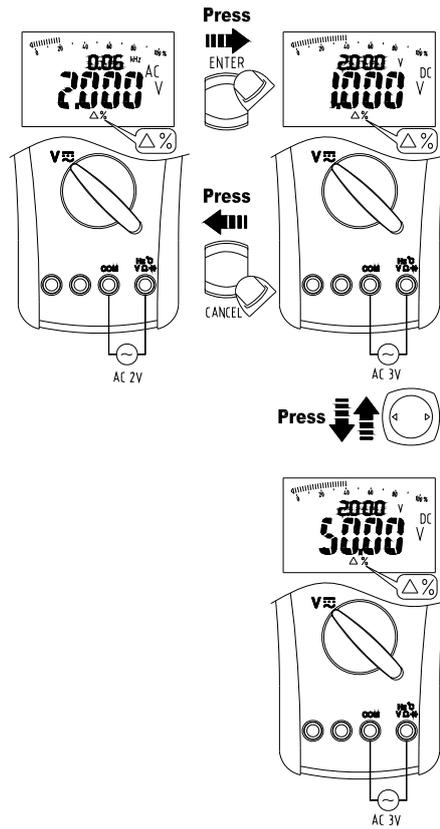


The decibel (dB) is a logarithmic unit of measurement that expresses the magnitude of a physical quantity relative to a specified or implied reference level. The dB and dBm are defined below.

$$dB = 20 \log \frac{V_{AC}}{1}$$

$$dBm = 20 \log \frac{V_{AC}}{0.7746}$$

4. Relative mode

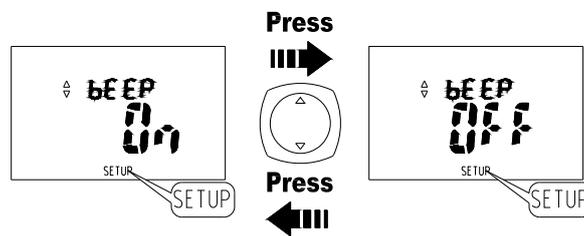


In the relative mode, the meter records the current input value as reference and appears on the upper display. The after input values will calculate the difference (Δ) of the reference value and the input value or the difference percent (%) of the reference value and the input value.

5. SETUP Option

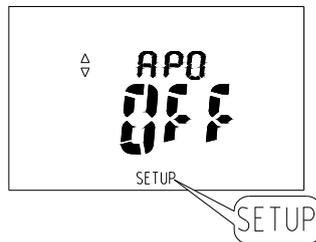
Press ▲ or ▼ changing the meter setting.
Press ENTER to store the setting in memory.
Press ◀ or ▶ select the meter setting item.
Press CANCEL to exit this function.

5.1 Beeper



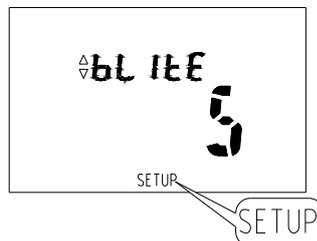
Setup the beeper is ON or OFF.

5.2 Auto Power Off



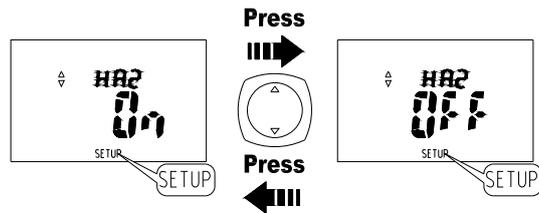
Setup the APO time from 1 to 60 minutes or OFF.

5.3 Back Light Auto OFF



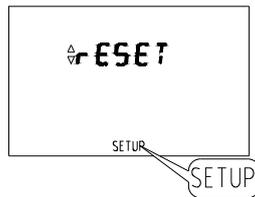
Setup the back light Auto OFF time from 1 to 60 minutes.

5.4 HAZARD



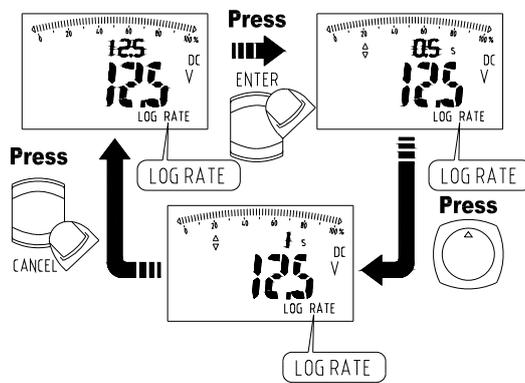
Setup the beep of the danger voltage ($\geq 60V_{DC}$ or $\geq 30V_{AC}$) sense is ON or OFF.

5.5 RESET



Reset all setup value to default.

5.6 LOG RATE

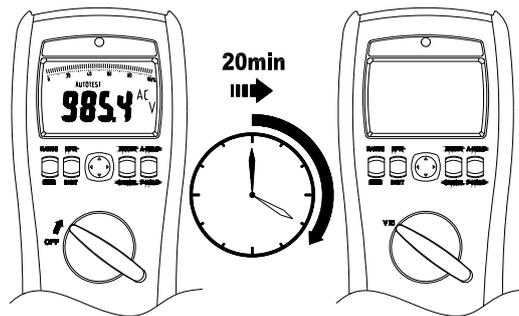


Setup the log rate from 0.5 to 600 seconds.

5.7 DATALOG

The datalog mode records the successive input values to memory and recalls them from memory after. The maximum recorded amounts of memory are 20000.

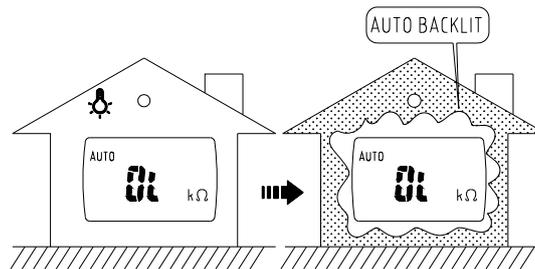
Auto Power Off



Wake-up the meter by switching rotor or pressing any button.

Auto Backlight

The backlight is automatically turned on at dark environment.



BUZZER

The meter beeps once for every valid key-press, and beeps twice for every invalid key-press.

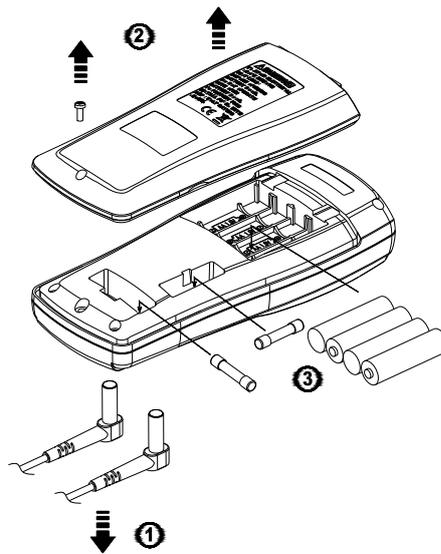
Power Up Options

Press the button while turning the meter on from OFF position.

- Cancel button** : Clear all stored data
- Range button** : Display LCD test frame
- Function button** : Default °C / °F reading
- HFR button** : Display firmware version
- A-HOLD button** : Disable AUTO BACKLIT

Battery and Fuse Replacement

Refer to the following figure to replace fuse and the batteries :



⚠ Caution

- Use only a fuse with the amperage, interrupt, voltage, and speed rating specified.
- Fuse rating : 440mA,1000V IR 10KA Fuse (size 35 x 10mm)
11A, 1000V IR 20KA Fuse (size 38 x 10mm)
- Replace the batteries as soon as the low batteries indicator  appears, to avoid false reading.
- 1.5V x 4 alkaline batteries.

Specifications

General Specifications

Maximum voltage applied to any terminal :
1000 V ac rms or dc.

Display : 4000/40000 counts for APPA 503.
10000/100000 counts for APPA 505.

Polarity Indication :

Automatic, positive implied, negative indicated.

Overrange Indication : OL

Batteries Life : 100hours

Low Batteries Indication : "  " is displayed when the batteries voltage drops below operating voltage.

Low battery voltage : Approx. 4.5V

Auto Power Off : Default 30 minutes.

Operating Ambient : Non-condensing $\leq 10^{\circ}\text{C}$,

11 $^{\circ}\text{C}$ ~ 30 $^{\circ}\text{C}$ ($\leq 80\%$ RH),

30 $^{\circ}\text{C}$ ~ 40 $^{\circ}\text{C}$ ($\leq 75\%$ RH),

40 $^{\circ}\text{C}$ ~ 50 $^{\circ}\text{C}$ ($\leq 45\%$ RH)

Storage Temperature :

-20 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$, 0 to 80% R.H. (batteries not fitted)

Temperature Coefficient :

0.15 x (Spec.Accy) / $^{\circ}\text{C}$, < 18 $^{\circ}\text{C}$ or > 28 $^{\circ}\text{C}$.

Measure : Samples 3 times per second normal.

Altitude : 6561.7 ft (2000m)

Safety : Complies with EN61010-1, UL61010-1, IEC 61010-1,
CAT.IV. 600V, CAT.III. 1000V

CAT Application field

I	The circuits not connected to mains.
II	The circuits directly connected to Low-voltage installation.
III	The building installation.
IV	The source of the Low-voltage installation.

Compliance to EN 61557 : IEC61557-1, IEC61557-2,
IEC61557-4, IEC61557-10

Weight : (630g) including battery.

Dimensions (W x H x D) : 95mm x 207mm x 52mm with holster.

Accessories : Battery (installed), Test leads and user manual.
(The probe assembly provided with the product are for use with meter)

Power Requirements : 1.5V x 4 IEC LR6 or AA size.

Pollution degree : 2

EMC : EN 61326-1

Shock vibration : Sinusoidal vibration per MIL-T- 28800E
(5 ~ 55 Hz, 3g maximum).

Drop Protection : 4 feet drop to hardwood on concrete floor.

Indoor Use.

Electrical Specifications

Accuracy is \pm (% reading + number of digits) at 23°C \pm 5°C < 80%RH.

(1) Voltage

APPA 503		
Range	Frequency	Accuracy
40.000mV _{DC}	-	\pm (0.040% + 40d)
400.00mV _{DC}		\pm (0.035% + 20d)
4.0000V _{DC} 40.000V _{DC} 400.00V _{DC} 1000.0V _{DC}		\pm (0.03% + 20d)
40.000mV _{AC} 400.00mV _{AC}	40Hz ~ 65Hz	\pm (1.00% + 50d) ^[1]
	66Hz ~ 1KHz	\pm (3.00% + 50d) ^[1]
	1.01KHz ~ 3KHz	\pm (5.00% + 50d) ^[2]
4.0000V _{AC} 40.000V _{AC} 400.00V _{AC} 1000.0V _{AC}	40Hz ~ 45Hz	\pm (1.50% + 50d) ^[1]
	46Hz ~ 65Hz	\pm (0.70% + 50d) ^[1]
	66Hz ~ 1KHz	\pm (1.50% + 50d) ^{[1][4]}
4.0000V _{AC} 40.000V _{AC}	1.01KHz ~ 10KHz	\pm (3.00% + 50d) ^[2]
	10.01KHz ~ 50KHz	\pm (5.00% + 50d) ^[3]
	50.01KHz ~ 100KHz	\pm (10.0% + 50d) ^{[3][5]}

[1] Below 5% of range, add 70 counts. Below 45Hz, < 50dgt rolling.
 [2] Below 5% of range, add 150 counts.
 [3] Below 5% of range, add 350 counts.
 [4] At 1000.0V_{AC}, the accuracy is \pm (10.0% + 50d).
 [5] At 40.000V_{AC}, the accuracy is \pm (15.0% + 50d).

APPA 505		
Range	Frequency	Accuracy
100.000mV _{DC}	-	± (0.025% + 40d)
1000.00mV _{DC}		± (0.020% + 20d)
10.0000V _{DC}		± (0.015% + 20d)
100.000V _{DC}		
1000.00V _{DC}		
100.000mV _{AC} 1000.00mV _{AC}	40Hz ~ 65Hz	± (0.70% + 50d) ^[1]
	66Hz ~ 1KHz	± (1.50% + 50d) ^[1]
	1.01KHz ~ 3KHz	± (3.00% + 50d) ^[2]
10.0000V _{AC} 100.000V _{AC} 1000.00V _{AC}	40Hz ~ 45Hz	± (1.00% + 50d) ^[1]
	46Hz ~ 65Hz	± (0.40% + 50d) ^[1]
	66Hz ~ 1KHz	± (1.00% + 50d) ^[1]
10.0000V _{AC} 100.000V _{AC}	1.01KHz ~ 10KHz	± (2.00% + 50d) ^[1]
	10.01KHz ~ 20KHz	± (3.00% + 50d) ^[2]
	20.01KHz ~ 50KHz	± (5.00% + 50d) ^[3]
	50.01KHz ~ 100KHz	± (10.0% + 50d) ^{[3][4]}

[1] Below 5% of range, add 70 counts. Below 45Hz, < 50dgt rolling.
[2] Below 5% of range, add 150 counts.[4] At 1000.0V_{AC}, the accuracy is ± (10.0% + 50d).
[3] Below 5% of range, add 350 counts.
[4] At 100.000V_{AC}, the accuracy is ± (15.0% + 50d).

Input Protection : 1000V_{DC} or 1000V_{AC} rms the accuracy is ± (5.0% + 15d)

Bandwidth : 40Hz ~ 100KHz

Minimum Resolution :

1µV in the 100mV range and the 40mV range.

Input Impedance : 10MΩ, <100pF

**CMRR / NMRR : (Common Mode Rejection Ratio)
(Normal Mode Rejection Ratio)**

V_{AC} : CMRR > 60dB at DC, 50Hz / 60Hz

V_{DC} : CMRR > 100dB at DC, 50Hz / 60Hz

NMRR > 50dB at DC, 50Hz / 60Hz

AC Conversion Type : AC conversions are ac-coupled, true rms responding, calibrated to the sine wave input.

For non-sine wave add the following Crest Factor corrections :

For Crest Factor of 1.4 to 2.0, add 1.0% to accuracy.

For Crest Factor of 2.0 to 2.5, add 2.5% to accuracy.

For Crest Factor of 2.5 to 3.0, add 4.0% to accuracy.

AC+DC Accuracy : Add 1.0% to accuracy.

HFR Accuracy : Add 1.0% to accuracy at 40Hz ~ 400Hz.

The cut-off frequency of the High Frequency Reject :

800Hz (-3dB)

dB/dBm : ± 60dBm

Note : For best measurements, with REL Δ function to compensate for offsets.

(2) Current

APPA 503		
Range	Frequency	Accuracy
40.000mA _{DC} 400.00mA _{DC}	-	± (0.2% + 40d)
4.0000A _{DC} 10.000A _{DC}		± (0.2% + 80d)
40.000mA _{AC} 400.00mA _{AC} 4.0000A _{DC} 10.000A _{AC}	40Hz ~ 65Hz	± (0.8% + 80d) ^[1]
	66Hz ~ 1KHz	± (3.0% + 80d) ^[1]
APPA 505		
Range	Frequency	Accuracy
10.0000mA _{DC} 100.000mA _{DC}	-	± (0.1% + 40d)
10.0000A _{DC}		± (0.1% + 80d)
10.0000mA _{AC} 100.000mA _{AC} 10.0000A _{AC}	40Hz ~ 65Hz	± (0.7% + 80d) ^[1]
	66Hz ~ 1KHz	± (2.0% + 80d) ^[1]

[1] Below 5% of range, add 70 counts. Below 45Hz, < 50dgt rolling.

Input Protection : Equipped with High Energy Fuse.

440mA, 1000V IR 10KA fuse for mA input.

11A, 1000V IR 20KA fuse for A input.

Bandwidth : 40Hz ~ 1KHz

Minimum Resolution :

1μA in the 40mA range for APPA 503,

0.1μA in the 10mA range for APPA 505.

Maximum Measuring Time :

3 minutes at A input, 10 minutes at mA input.

Rest time 20 minutes minimum.

AC Conversion Type : Conversion type and additional specification are same as voltage.

(3) Peak Hold

Specified accuracy ± (3.0% + 100d) up to 50000 count (full range) range.

(4) Resistance

APPA 503		
Range	Resolution	Accuracy
400.00Ω	0.01Ω	± (0.2% + 30d)
4.0000KΩ	0.1Ω	
40.000KΩ	1Ω	
400.00KΩ	10Ω	± (0.3% + 30d)
4.0000MΩ	100Ω	± (1.0% + 30d) ^[1]
40.00MΩ	10KΩ	± (1.5% + 30d) ^[1]
APPA 505		
Range	Resolution	Accuracy
1000.00Ω	0.01Ω	± (0.05% + 30d)
10.0000KΩ	0.1Ω	± (0.025% + 30d)
100.000KΩ	1Ω	
1000.00KΩ	10Ω	± (0.3% + 30d)
10.0000MΩ	100Ω	± (1.0% + 30d) ^[1]
40.00MΩ	10KΩ	± (1.5% + 30d) ^[1]

[1] < 100dgt rolling.

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Maximum Open Circuit Voltage : Approximate 2.5V

Maximum Test Current : Approximate 0.1mA

Note : For best measurements, with REL Δ function to compensate for offsets.

(5) Continuity Check

APPA 503		
Range	Resolution	Accuracy
400.0Ω	0.1Ω	± (0.2% + 3d)
APPA 505		
Range	Resolution	Accuracy
1000.0Ω	0.1Ω	± (0.05% + 3d)

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Maximum Open Circuit Voltage : Approximate 2.5V

Maximum Test Current : Approximate 0.1mA

Continuity Threshold : Approximate 50Ω

Continuity Indicator : 2KHz Tone Buzzer

(6) Diode Test

APPA 503		
Range	Resolution	Accuracy
2.000V	1mV	$\pm (1.5\% + 2d)$
APPA 505		
Range	Resolution	Accuracy
0.400V ~ 0.800V	1mV	$\pm (1.5\% + 2d)$

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Maximum Open Circuit Voltage : Approximate $\pm 2.5V$

Maximum Test Current : Approximate $\pm 0.5mA$

(7) Capacitance

APPA 503			
Range	Resolution	Accuracy	Measuring Time
4.000nF	1pF	Unspecified	0.7sce
40.00nF	10pF	$\pm (1.2\% + 20d)$	
400.0nF	100pF	$\pm (0.9\% + 2d)$	
4.000 μ F	1nF		
40.00 μ F	10nF		
400.0 μ F	100nF		
4.000mF	1 μ F	$\pm (1.2\% + 20d)$	3.75sec
40.00mF	10 μ F	$\pm (1.2\% + 40d)^{[1]}$	7.5sec
APPA 505			
Range	Resolution	Accuracy	Measuring Time
4.000nF	1pF	Unspecified	0.7sce
40.00nF	10pF	$\pm (1.2\% + 20d)$	
400.0nF	100pF	$\pm (0.8\% + 2d)$	
4.000 μ F	1nF		
40.00 μ F	10nF		
400.0 μ F	100nF		
4.000mF	1 μ F	$\pm (1.2\% + 20d)$	3.75sec
40.00mF	10 μ F	$\pm (1.2\% + 40d)^{[1]}$	7.5sec

[1] < 50dgt rolling.

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Note : For best measurements, with REL Δ function to compensate for offsets.

(8) Frequency Counter

APPA 503/505			
Range	Resolution	Accuracy	Sensitivity
40.000Hz	0.001Hz	$\pm (0.002\% + 50d)$	1V _{P-P}
400.00Hz	0.01Hz	$\pm (0.002\% + 10d)$	
4.0000KHz	0.1Hz		
40.000KHz	1Hz		
400.00KHz	10Hz		
4.0000MHz	100Hz		5V _{P-P}

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Min Frequency : 5Hz

(9) Duty Factor

APPA 503/505			
Range	Resolution	Accuracy	Sensitivity
20.0% ~ 80.0%	0.1%	$\pm (0.1\% + 10d)$	5V _{P-P}

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Sense Wave : Square Wave (5Hz ~ 10KHz)

(10) Temperature

APPA 503/505		
Range	Resolution	Accuracy
-200.0°C ~ 10.0°C	0.1°C	$\pm (1.0\% + 2^\circ\text{C})$
10.1°C ~ 1200.0°C		$\pm (1.0\% + 1^\circ\text{C})$
-328.0°F ~ 50.0°F	0.1°F	$\pm (1.0\% + 4^\circ\text{F})$
50.1°F ~ 2192.0°F		$\pm (1.0\% + 2^\circ\text{F})$

Input Protection : 1000V_{DC} or 1000V_{AC} rms

Limited Warranty

This meter is warranted to the original purchaser against defects in material and workmanship for 2 years from the date of purchase. During this warranty period, Manufacturer will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction.

This warranty does not cover Carlos fuses, disposable batteries, or damage from abuse, neglect, accident, unauthorized repair, alteration, contamination, or abnormal conditions of operation or handling.

Any implied warranties arising out of the sale of this product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above.

The manufacturer shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expense or economic loss. Some states or countries laws vary, so the above limitations or exclusions may not apply to you.



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