



Digital Clamp Multimeter

User Manual



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1. GENERAL INSTRUCTIONS

This instrument complies with IEC 61010-1, CAT.II 1000V and CAT.III 600V overvoltage standards.

To get the best service from this instrument, read carefully this user's manual and respect the detailed safety precautions.

International symbols used on the Meter and in this manual are explained in chapter 1.2.

1.1 Precautions safety measures

1.1.1 Preliminary

* As the possibilities of high transient overvoltages occurred in today's power systems increase, more stringent safety standards are set for the electrical test equipment. Transients on electrical systems(power grid, feeder or branch circuits) will trigger a series of incidents that may result in serious personal injury. To protect you against transients, safety must be built into the test equipment.

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Overvoltage category	In brief	Examples
CAT I	Electronic	<ul style="list-style-type: none"> • Protected electronic equipment. • Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriately low level. • Any high-voltage, low-energy source derived from a highwinding resistance transformer, such as the high-voltage section of a copier.
CAT II	Single-phase receptacle connected loads	<ul style="list-style-type: none"> • Appliance, portable tools, and other household and similar loads. • Outlet and long branch circuits. • Outlets at more than 10 meters (30 feet) from CAT III source. • Outlets at more that 20 meters (60 feet) from CAT IV source.
CAT III	Three-phase distribution, including single-phase commercial lighting	<ul style="list-style-type: none"> • Equipment in fixed installations, such as switchgear and polyphase motors. • Bus and feeder in industrial plants. • Feeders and short branch circuits, distribution panel devices. • Lighting systems in larger buildings. • Appliance outlets with short connections to service entrance.
CAT IV	Three-phase at utility connection, any outdoor conductors	<ul style="list-style-type: none"> • Refers to the "origin of installation"; i.e., where low-voltage connection is made to utility power. • Electricity meters, primary overcurrent protection equipment. • Outside and service entrance, service drop from pole to building, run between meter and panel. • Overhead line to detached building, underground line to well pump.

* When using this Multimeter, the user must observe all normal safety rules concerning:

- protection against the dangers of electric current.
- protection of the Multimeter against misuse.


* For your own safety, only use the test probes supplied with the instrument. Before use, check that they are in good condition.

1.1.2 During use

- * If the meter is used near noise generating equipment, be aware that display may become unstable or indicate large errors.
- * Do not use the meter or test leads if they look damaged.
- * Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- * Use extreme caution when working around bare conductors or bus bars.
- * Do not operate the meter around explosive gas, vapor, or dust.
- * Verify a Meter's operation by measuring a known voltage. Do not use the Meter if it operates abnormally. Protection may be impaired. When in doubt, have the Meter serviced.
- * Uses the proper terminals, function, and range for your measurements.
- * When the range of the value to be measured is unknown, check that the range initially set on the multimeter is the highest possible or, wherever possible, choose the autoranging mode.
- * To avoid damages to the instrument, do not exceed the maximum limits of the input values shown in the technical specification tables.
- * When the multimeter is linked to measurement circuits, do not touch unused terminals.
- * Caution when working with voltages above 60Vdc or 30Vac rms. Such voltages pose a shock hazard.
- * When using the probes, keep your fingers behind the finger guards.
- * When making connections, connect the common test lead before connecting the live test lead; when disconnecting, disconnect the live test lead before disconnecting the common test lead.
- * Before changing functions, disconnect the test leads from the circuit under test.
- * For all dc functions, including manual or auto-ranging, to avoid the risk of shock due to possible improper reading, verify the presence of any ac voltages by first using the ac function. Then select a dc voltage range equal to or greater than the ac range.
- * Disconnect circuits power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- * Never perform resistance or continuity measurements on live circuits.
- * Before measuring current, check the meter's fuse and turn off power to the circuit before connecting the meter to the circuit.
- * In TV repair work, or when carrying out measurements on power switching circuits, remember that high amplitude









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- voltage pulses at the test points can damage the multimeter. Use of a TV filter will attenuate any such pulses.
- * Use just 3pcs **AAA** batteries, properly installed in the Meter's battery case, to power the Meter.
 - * Replace the battery as soon as the battery indicator () appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.
 - * Do not measure voltages above 1000V in Category III, or 600V in Category IV installations.
 - * When in REL mode, the "REL" symbol is displayed. Caution must be used because hazardous voltage may be present.
 - * Do not operate the Meter with the case (or part of the case) removed.

1.2 Symbols:

Symbols used in this manual and on the instrument:

-  **Caution:** refer to the instruction manual. Incorrect use may result in damage to the device or its components.
-  AC (Alternating Current)
-  DC (Direct Current)
-  AC or DC
-  Earth ground
-  Double insulated
-  Fuse
-  Conforms to European Union directives

1.3 Instructions

- * Remove test leads from the Meter before opening the Meter case or battery cover.
- * When servicing the Meter, use only specified replacement parts.
- * Before opening up the instrument, always disconnect from all sources of electric current and make sure you are not charged with static electricity, which may destroy internal components.
- * Any adjustment, maintenance or repair work carried out on the meter while it is live should be carried out only by

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- appropriately qualified personnel, after having taken into account the instructions in this present manual.
- * A "qualified person" is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He is trained and authorized to energize and de-energize circuits and equipment in accordance with established practices.
 - * When the instrument is opened up, remember that some internal capacitors can retain a dangerous potential even after the instrument is switched off.
 - * If any faults or abnormalities are observed, take the instrument out of service and ensure that it cannot be used until it has been checked out.
 - * If the meter is not going to be used for a long time, take out the battery and do not store the meter in high temperature or high humidity environment.

2. DESCRIPTION

2.1 Instrument Familiarization

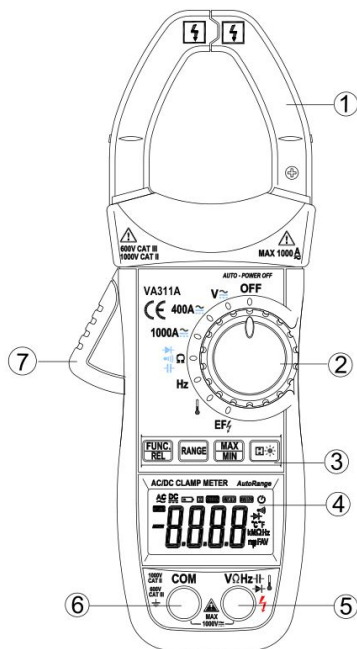


Figure 2-1

**The front panel is shown as in Figure 2-1,
explanation being as follows:**

- ① Clamp
Used for letting the wire across it.(Notice the direction of electricity.)
- ② Rotary switch
Used for selecting measurement functions.
- ③ Keypad
Measurement function keys.
- ④ LCD display
Used for displaying the measuring results and various symbols.
- ⑤ $V \Omega$
 Hz
Terminal receiving the red test lead for voltage, resistance, capacitance, frequency, Temperature, diode and continuity measurements.
- ⑥ COM
Terminal receiving the black test lead as a common reference.
- ⑦ Used for open the clamp

2.2 LCD Display

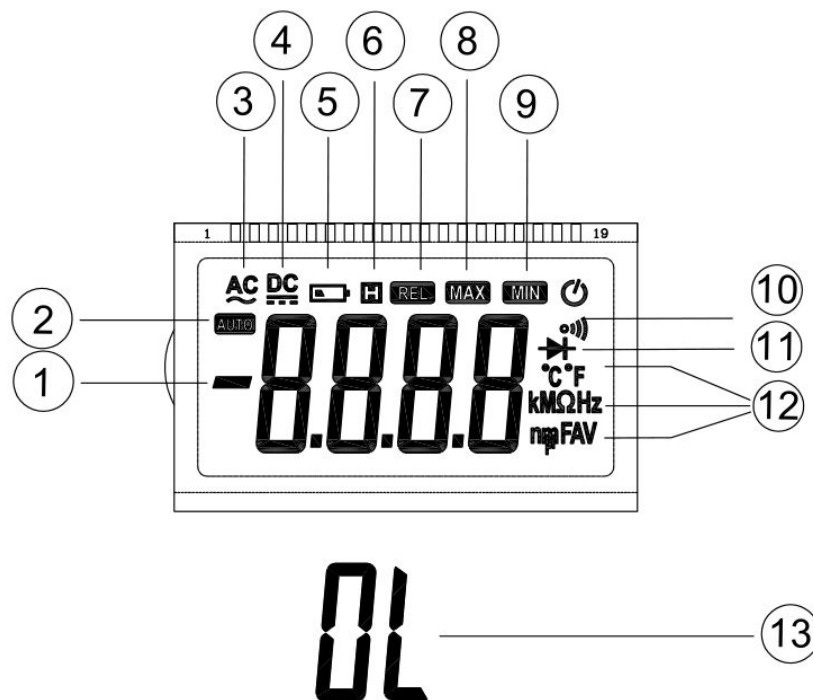










Figure 2-2

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LCD screen is shown as in Figure 2-2, with its every symbol's meaning shown as in the Table 1:

No.	Symbol	Meaning
1		Indicates negative readings
2	AUTO	The meter is in the Autorange mode in which the meter automatically selects the range with the best resolution.
3		Indicator for AC voltage or current
4		Indicator for DC voltage or current
5		Low battery indication
6	H	The meter is in Data Hold mode.
7	REL	The meter is in Relative Measurement mode.
8	MAX	Display maximum data
9	MIN	Display minimum data
10		The meter is in Continuity Check mode.
11		The meter is in Diode Test mode.
12	%°C°F KMΩHz nμmFAV	Measurement units
13		This symbol means that the input is too large for the selected range.
		Auto power off function indication

2.3 Keypad

2.3.1 FUNC.

Press it to switch the second function in the same rotary position.

2.3.2 RANGE

At V~, V $\overline{\sim}$, Ω , A, mA and μ A.

1. Press **RANGE** to enter the manual ranging mode.
2. Press **RANGE** to step through the ranges available for the selected function.
3. Press and hold **RANGE** for 2 seconds to return to autoranging.

2.3.3 MAX/MIN

This key is for measuring maximum value and minimum value.

1. Press it to enter Max/Min mode.
2. Press it again; the LCD will display the Maximum Value.
3. Press it again; the LCD will display the Minimum Value.
4. Press and hold it for two seconds, the meter will return to normal measurement state.

(Except Hz/Duty and Capacitance)




2.3.4

Press it to enter and exit the Data Hold mode. Press it and hold 2 seconds, backlight on; if press it and hold for 2 seconds again, backlight off.


3. FUNCTION DESCRIPTION

3.1 General Functions

3.1.1 DATA HOLD mode

Data Hold mode makes the meter stop updating the display. Enabling Data Hold function in autorange mode makes the meter switch to Manual ranging mode, but the full-scale range remains the same. Data Hold function can be cancelled by changing the measurement mode, pressing **RANGE** key, or push  key again.

To enter and exit the Data Hold mode:

1. Press  key (short press). Fixes the display on the current value, **H** is displayed.
2. A second short press returns the meter to normal mode.

3.1.2 Manual ranging and Autorange mode

The Meter has both manual ranging and autorange options.

* In the autorange mode, the Meter selects the best range for the input detected. This allows you to switch test points without having to reset the range.

* In the manual ranging mode, you select the range. This allows you to override autorange and lock the meter in a specific range.

* The Meter defaults to the autorange mode in measurement functions that have more than one range. When the Meter is in the autorange mode, **AUTO** is displayed.

To enter and exit the manual range mode:

1. Press **RANGE** key. The Meter enters the manual ranging mode. **AUTO** turns off. Each presses of **RANGE** key increments the range. When the highest range is reached, the Meter wraps to the lowest range.

NOTE: If you manually change the measurement range after entering the Data Hold modes, the Meter exits this mode.

2. To exit the manual ranging mode, press and hold down **RANGE** key for two seconds. The Meter returns to the autorange mode and **AUTO** is displayed.

3.1.3 Auto power off mode

The Meter at the "auto power off mode" and  display if the Meter is on but not used for 15 minutes.

Press the FUNC. key or rotate the rotary switch to wake the meter up.

To disable the "auto power off mode", hold down the **FUNC.** key while turning the meter on.

3.1.4 Relative measurement mode

The Meter will display relative measurement in all functions except frequency.

To enter and exit the relative measurement mode:

1. With the Meter in the desired function, touch the test leads to the circuit on which you want future measurement to be based.

3.1.5 RMS measurement

All the AC measurement values is the RMS (root-mean-square) values.

Frequency range is up to 1KHz sine.

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3.2 Measurement Functions

3.2.1 AC and DC Voltage measurement

⚠ To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 1000Vdc or 1000Vac rms.

The Meter's voltage ranges are 400.0mV, 4.000V, 40.00V, 400.0V and 1000V.

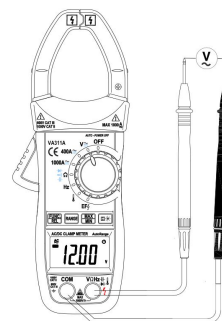
To measure ac or dc voltage (set up and connect the Meter as shown in Figure 3-1):

1. Set rotary switch to the AC/DC V range.
2. Press the **FUNC.** key can change the mode of voltage test.
3. Connect the black and red test leads to the COM and V terminals respectively.
4. Connect the test leads to the circuit being measured
5. Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.

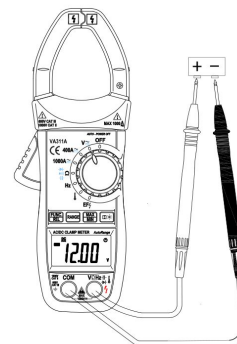
NOTE:

- Unstable display may occur especially at 400mV range, even though you do not put test leads into input terminals

For better accuracy when measuring the dc offset of an ac voltage, measure the ac voltage first. Note the ac voltage range, then manually select a dc voltage range equal to or higher than the ac range. This improves the accuracy of the dc measurement by ensuring that the input protection circuits are not activated.



AC Voltage



DC Voltage

Figure3-1 Measuring AC And DC Voltage

3.2.2 Current clamp measurement



To avoid damage to the meter and injured, Do not apply overload current when measurement.

The meter's current ranges are 400.0A and 1000A.

To measure current (set up the Meter as shown in Figure 3-2):

1. Set the rotary switch to the DC/AC 400A or 1000A range.
2. Press the **FUNC.** key to select DCA or ACA measuring mode.
3. Let the wire across the binding clip which you want to measure.(Notice the direction of current, and do not across the loop wires---Live and Neutral both)
- 4.Read the displayed value.

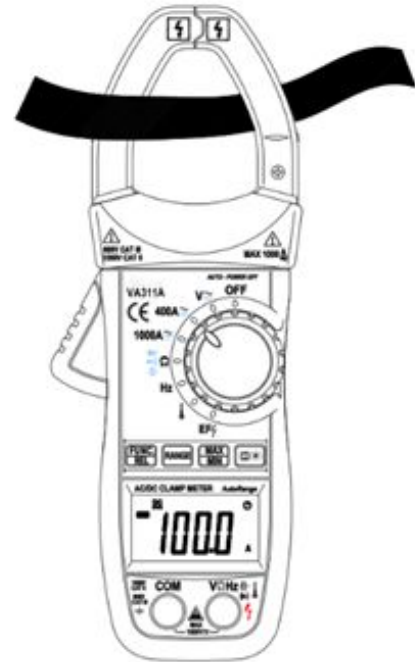


Figure 3-2 Measuring AC And DC Current

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3.2.3 Resistance measurement

⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.

The Meter's resistance ranges are 400.0 Ω , 4.000k Ω , 40.00k Ω , 400.0k Ω , 4.000M Ω and 40.00M Ω .

To measure resistance (set up the Meter as shown in figure 3-4):

1. Set the rotary switch to ΩH range.
2. Connect the black and red test leads to the COM and V Ω terminals respectively.
3. Connect the test leads to the circuit being measured and read the displayed value.

Some tips for measuring resistance:

- The measured value of a resistor in a circuit is often different from the resistor's rated value. This is because the Meter's test current flows through all possible paths between the probe tips.
- In order to ensure the best accuracy in measurement of low resistance, short the test leads before measurement and memory the test probe resistance in mind. This necessary to subtract for the resistance of the test leads.
- The resistance function can produce enough voltage to forward-bias silicon diode or transistor junctions, causing them to conduct. To avoid this, do not use the 40M Ω range for in-circuit resistance measurements.
- On 40M Ω range, the meter may take a few seconds to stabilize reading. This is normal for high resistance measuring.
- When the input is not connected, i.e. at open circuit, the figure "OL" will be displayed for the overrange condition.

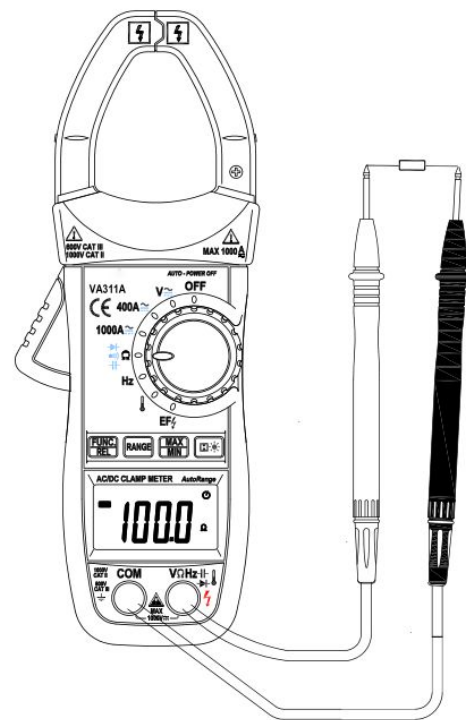


Figure 3-4 Measuring Resistance

3.2.4 Capacitance measurement

⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the dc voltage function to confirm that the capacitor is discharged.

The Meter's capacitance ranges are 4.000nF, 40.00nF, 400.0nF, 4.000 μ F, 40.00 μ F, 400.0 μ F and 4.000mF.

To measure capacitance (set up the Meter as shown in Figure 3-5):

1. Set the rotary switch to $\Omega \cdot \text{H}$ range.
2. Press the **FUNC.** key to select capacitance Test.
3. Connect the black and red test leads to the COM and H terminals respectively (or you can use capacitor test lead).
4. Connect the test leads to the capacitor being measured and read the displayed value.

Some tips for measuring capacitance:

- The meter may take a few seconds(>20 seconds on 400.0uF range) to stabilize reading. This is normal for high capacitance measuring.
- To improve the accuracy of measurements less than 4nF, subtract the residual capacitance of the Meter and leads.
- Below 100pF, the accuracy of measurements is unspecified.

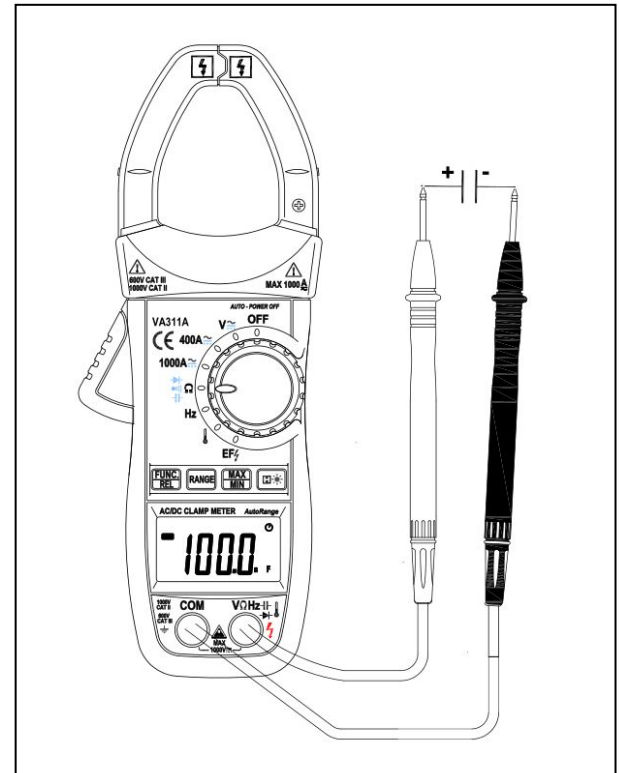


Figure 3-5 Measuring Capacitance

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3.2.5 Continuity Check

⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.

To test for continuity (set up the Meter as shown in Figure 3-6):

1. Set the rotary switch to $\blacktriangleleft \blacktriangleright$ range.
2. Connect the black and red test leads to the COM and Ω terminals respectively.
3. Connect the test leads to the resistance in the circuit being measured.
4. When the test lead to the circuit is below 50Ω , a continuous beeping will indicate it.

NOTE:

- Continuity test is available to check open/short of the circuit.

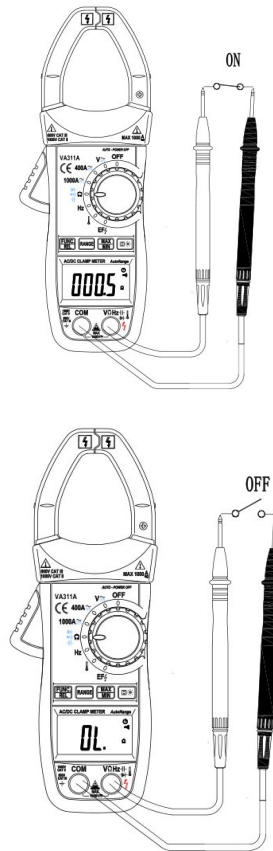


Figure 3-6 Checking the Continuity

3.2.6 Diode Test

⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.

To test a diode out of a circuit (set up the Meter as shown in Figure 3-7):

1. Set the rotary switch to $\rightarrow \nabla \rightarrow$ range.
2. Press the **FUNC.** key to select Diode Test.
3. Connect the black and red test leads to the COM and Ω terminals respectively.
4. For forward-bias readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.
5. The meter will show the approx. forward voltage of the diode.

In a circuit, a good diode (Si) should still produce a forward bias reading of 0.5V to 0.8V; however, the reverse-bias reading can vary depending on the resistance of other pathways between the probe tips.

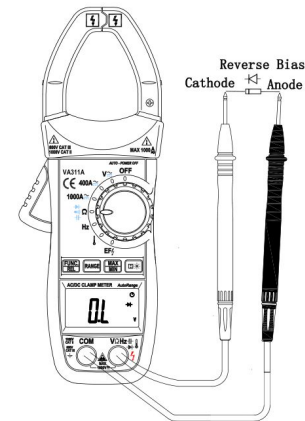


Figure 3-7 Measuring Capacitance

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3.2.7 Frequency measurement

⚠ Use for TTL/CMOS level. Do not measure Frequency on high voltage (>24V) to avoid electrical shock hazard and/or damage to the instrument.

The Meter can measure Frequency.

To measure frequency:

1. Set the rotary switch to the Hz range.
2. Insert the black and red test leads into the COM and Hz input terminals.
3. Connect the test leads tip in parallel with the circuit to be measured. And don't touch any electrical conductors.
4. Read the result directly from the display.

NOTE:

In noisy environment, it is preferable to use shield cable for measuring small signal

⚠ To avoid electrical shock and/or damage to the instrument, do not apply any voltage source between the °C terminal and the COM terminal.

To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 60v dc or 24v rms. Ac. To avoid damage or burns. Do not make temperature measurement in microwave ovens.

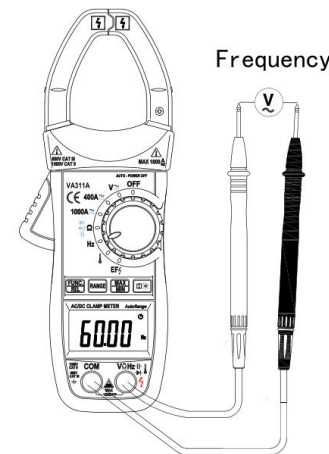


Figure 3-8 Measuring Frequency

To measure temperature:

1. Set the rotary switch to °C range and the LCD will show the current environment temperature.
2. Insert 'K' type thermocouples into the COM terminal and °C terminal (or you can insert it by using Multi Function Socket). Takings care to observe the correct polarity.
3. Touch the object with the thermocouple probe for measurement.
4. Read the stable reading from LCD.

3.2.9 NCV (Non-Contact Voltage detect)

Set rotary switch to the **EF-⚡** range, Put the EF-DETECT AREA close to the AC power cable or the power socket, if AC electrical voltage is present, the Buzzer warning will sound,

and the symbol bar “-” will be displayed on the LCD.

The lowest detect voltage is around 50V 50/60Hz.

The LCD display EF, when detect the AC voltage signal, the LCD display ‘ - ’/ ‘ -- ’/ ‘ --- ’/ ‘ ---- ’ from weak to strong.

This function is depending model.

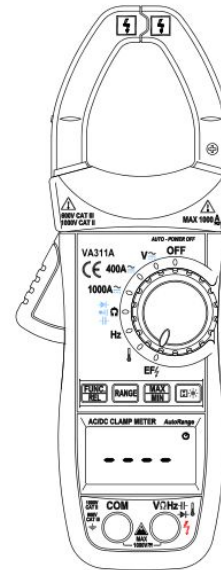


Figure 3-10 NCV

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4. TECHNICAL SPECIFICATIONS

4.1 General specifications

Environment conditions:

1000V CAT. II and 600V CAT. III

Pollution degree: 2

Altitude < 2000m

Operating temperature: 0~40°C, 32°F~122°F (<80% RH, <10°C/ 50°F non-condensing)

Storage temperature: -10~60 °C, 14°F~140°F (<70% RH, battery removed)

Temperature Coefficient: $0.1 \times (\text{specified accuracy}) / ^\circ\text{C}$ (<18°C or >28°C) (<64.4°F or >82.4°F)

MAX. Voltage between terminals and earth ground: 1000V AC rms or 1000V DC.

Sample Rate: 3 times/sec for digital data.

Display: 3 3/4 digits LCD display. Automatic indication of functions and symbols.

Range selection: automatic and manual.

Over Range indication: LCD will display "OL".

Low battery indication: The "" is displayed when the battery is under the proper operation range.

Polarity indication: "-" displayed automatically.

Power source: 4.5V 

Battery type: AAA * 3pcs.

Dimension (L x W x H) and Weight: 190×90×40 mm.(7.48 x 3.54 x 1.57 inch)

500g. Approx. (battery included).(17.63 Ounces)

4.2 Measurement specifications

Accuracy is specified for one year after calibration, at operating temperatures of 18°C to 28°C(64.4°F to 82.4°F), with relative humidity at less than 80%.

Accuracy specifications take the form of: \pm (% of Reading + Number of Least Significant Digits)

4.2.1 Voltage

DCV:

Range	Resolution	Accuracy
400.0mV	0.1mV	$\pm(0.5\% \text{ of rdg} + 5 \text{ digits})$
4.000V	1mV	$\pm(0.8\% \text{ of rdg} + 5 \text{ digits})$
40.00V	10mV	
400.0V	100mV	
1000V	1V	$\pm(1.0\% \text{ of rdg} + 2 \text{ digits})$

ACV:

Range	Resolution	Accuracy
4.000V	1mV	$\pm(1.0\% \text{ of rdg} + 5 \text{ digits})$
40.00V	10mV	
400.0V	100mV	
1000V	1V	$\pm(1.5\% \text{ of rdg} + 5 \text{ digits})$

Above accuracies can be guaranteed within 5%~100% of the full range.

The true RMS meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement.

1. Frequency Range for ACV: 40Hz~1000Hz.
2. Response for ACV: RMS measure, calibrated in rms of sine wave.
3. Overload Protection: 1000V dc or 1000V ac rms.
4. Input Impedance (Nominal): DC voltage: $>10M\Omega$; AC voltage: $>10M\Omega$

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4.2.2 Frequency

Logic frequency (1Hz-1MHz)

Range	Resolution	Accuracy
4.000 Hz	0.001Hz	$\pm(0.1\% \text{ of rdg}+5\text{digits})$
40.00Hz	0.01 Hz	
400.0Hz	0.1 Hz	
4.000kHz	0.001kHz	
40.00kHz	0.01kHz	
400.0kHz	0.1kHz	
4.000MHz	1kHz	

Voltage input <10Vpp

4.2.3 Resistance

Range	Resolution	Accuracy
400.0 Ω	0.1 Ω	$\pm(0.5\% \text{ of rdg}+3 \text{ digits})$
4.000k Ω	1 Ω	$\pm(0.5\% \text{ of rdg}+2 \text{ digits})$
40.00k Ω	10 Ω	
400.0k Ω	100 Ω	
4.000M Ω	1k Ω	
40.00M Ω	10k Ω	$\pm(1.5\% \text{ of rdg}+5 \text{ digits})$

4.2.4 Diode Test

Range	Resolution	Test Condition
2.000 V	0.001V	Forward DC current approximately 1mA. Reversed DC voltage approximately 1.5V.

4.2.5 Continuity Check

Range	Resolution	Test Condition
200.0Ω	0.1Ω	Open circuit voltage: approx. 0.5V

Description: Continuity beeper ≤ 50Ω

4.2.6 Capacitance

Range	Resolution	Accuracy
4.000nF	1pF	± (5.0% of rdg + 20 digits)
40.00nF	10pF	± (3.0% of rdg + 15 digits)
400.0nF	100pF	± (5.0% of rdg + 10 digits)
4.000μF	1nF	
40.00μF	10nF	
400.0μF	100nF	
4.000mF	1μF	

4.2.7 Temperature

Range	Resolution	Accuracy
-200~0°C (-328°F ~ 32°F)	1°C / 1°F	± (5.0% of rdg + 4°C / 39.2°F)
0~400°C (32°F ~ 752°F)		± (2.0% of rdg + 3°C / 37.4°F)
400~1200°C (752°F ~ 2192°F)		± 2.0% of rdg

Note: The specifications of temperature don't include thermocouple errors.

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4.2.8 Current

DCA:

Range	Resolution	Accuracy
400.0A	0.1A	$\pm(3.0\% \text{ of rdg} + 6 \text{ digits})$
1000A	1A	

ACA:

Range	Resolution	Accuracy
400.0A	0.1A	$\pm(3.0\% \text{ of rdg} + 8 \text{ digits})$
1000A	1A	

Above accuracies can be guaranteed within 5%~100% of the full range.

The true RMS meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement.

1. Frequency Range for ACA: 40Hz-400Hz. RMS
2. Maximum input current: 1000A dc or ac rms.
3. Use ZERO function to clean the initial reading before measurement.(ZERO function will disable AUTOOrange.)

5. MAINTENANCE

This section provides basic maintenance information, including fuse and battery replacement instructions. Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

5.1 General Maintenance



To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case

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

Dirt or moisture in the terminals can affect readings.

To clean the terminals:


Turn the meter off and remove all test leads.

Shake out any dirt that may be in the terminals.

Soak a new swab with a cleaning and oiling agent (such as WD-40).

Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.

5.2 Battery replacement

⚠ To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator () appears. Before replacing the battery, disconnect test leads and/or any connectors from any circuit under test, turn the meter off and remove test leads from the input terminals.

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the two screws on the battery cover.
4. Take out the battery cover from the meter.
5. Remove the used battery.
6. Replace with three new 1.5V battery (AAA).
7. Rejoin the battery cover and tighten the screws.

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6. ACCESSORIES

Delivered with the multimeter:

User's manual	One piece
Test leads	One piece
"K" type Thermocouple	One piece

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