BLACK CANYON

CLAMP METER

T9-102

Read this manual thoroughly before use

WARRANTY

This instrument is warranted to be free from defects in material and workmanship for a period of one year. Any instrument found defective within one year from the delivery date and returned to the factory with transportation charges prepaid, will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expandable items such as battery. If the defect has been caused by a misuse or abnormal operating condition, the repair will be billed at a nominal cost.

INTRODUCTION

This instrument is a 3 5/6 digits true-RMS autorange digital clamp meter designed to measure DC and AC voltage, DC and AC current, resistance, continuity, diode, capacitance, frequency, duty cycle, and temperature.

It features inrush current measurement, VFD voltage measurement, VFD current measurement, non-contact AC voltage detection, relative measurement, MIN MAX mode, data hold, bar graph, backlight, low battery indication, automatic power-off, illumination, full-range overload

protection, and etc. It is easy to operate and is a useful test tool.

SAFETY INFORMATION

This meter has been designed according to IEC 61010 concerning electronic measuring instruments with a measurement category (CAT III 1000V) and Pollution Degree 2.

⚠ Warning

To avoid possible electric shock or personal injury, follow these guidelines:

- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Pay particular attention to the insulation surrounding the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.
- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.

- Do not operate the meter where explosive gas, vapor or dust is present.
- Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- Before use, verify the meter's operation by measuring a known voltage.
- When servicing the meter, use only specified replacement parts.
- Use caution when working with voltage above 30V AC RMS, 42V AC peak, or 60V DC. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guard on the probes.
- When making connections, connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Remove the test leads from the meter and the clamp from any conductor under test before you open the battery cover or the case.
- Do not operate the meter with the battery cover or portions of the case removed or loosened.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator () appears.

- When in Relative mode or Data Hold mode or after zeroing the display in DC current function, caution must be used because hazardous voltage may be present.
- Use the meter only as specified in this manual; otherwise the protection provided by the meter may be impaired.
- Adhere to local and national safety codes. Individual protective equipment must be used to prevent shock and arc blast injury where hazardous live conductors are exposed.
- To avoid electric shock and personal injury, do not touch any naked conductor with hand or skin; and do not ground yourself while using this meter.
- Do not use the meter if the meter, a test lead or your hand is wet.
- Remaining endangerment:
  When an input terminal is connected to dangerous live potential, it is to be noted that this potential can occur at all other terminals!
- Do not use the VFD voltage measurement function or VFD current measurement function to verify the presence of hazardous voltages or currents. Voltages or currents greater than what is indicated may be present.

- **CAT III** - Measurement Category III is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.
  Do not use the meter for measurements within Measurement Category IV.

Caution

To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

- Disconnect circuit power and discharge all capacitors thoroughly before testing resistance, continuity, diode, capacitor, or temperature of an object.
- Use the proper terminals, function and range for your measurements.
- Before turning the rotary switch to change function, disconnect the test leads and the clamp from any object under test.

Symbols

~ Alternating Current

⎓ Direct Current

⎓~ DC or AC

⚠ Caution, risk of danger, refer to the operating manual before use.

⚠ Caution, risk of electric shock.

⏚ Earth (ground) Terminal

CE Conforms to European Union directives

⧈ The equipment is protected throughout by double insulation or reinforced insulation.

⚡ Application around and removal from hazardous live conductors is permitted.

FRONT PANEL

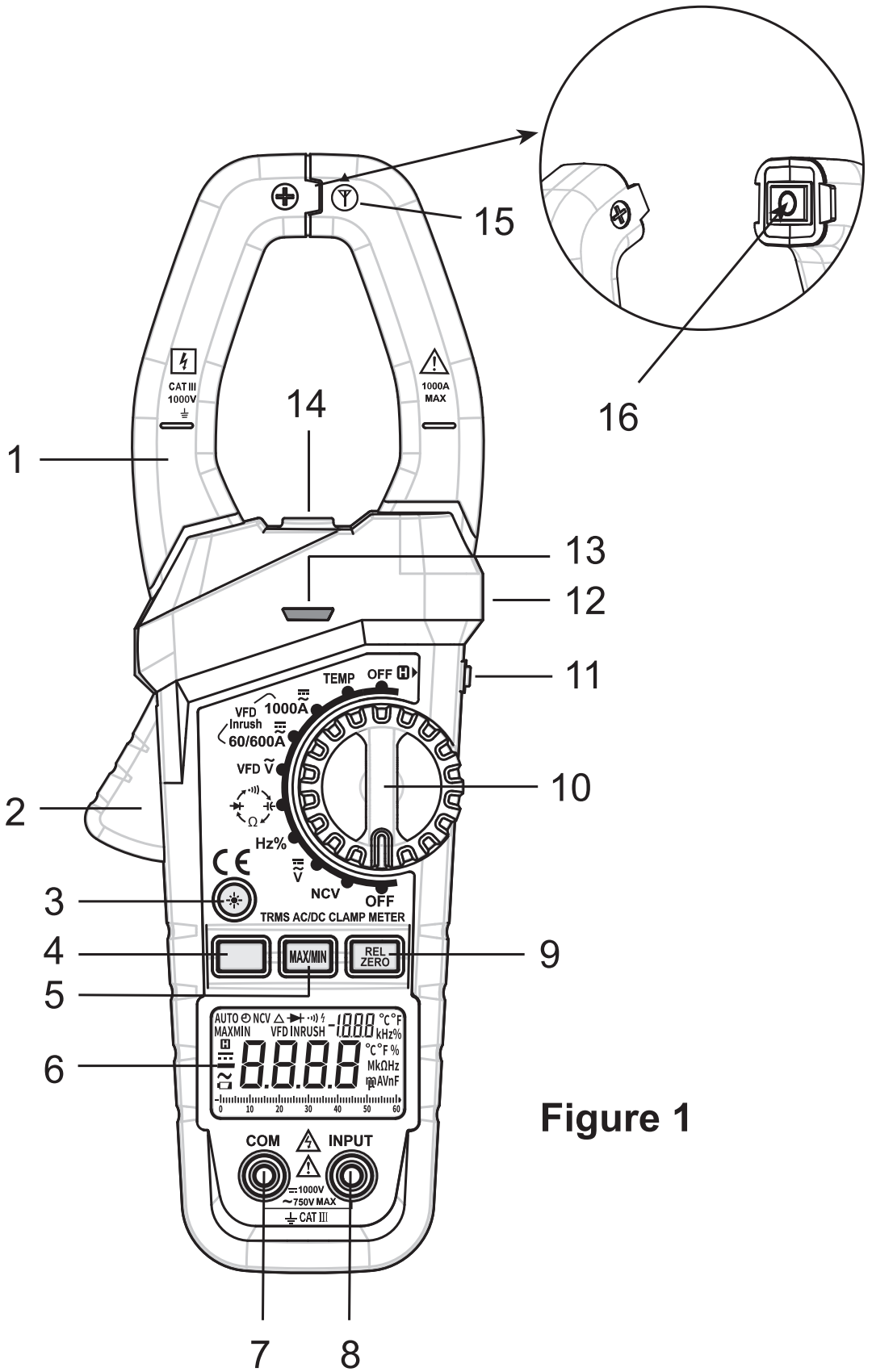


Figure 1

1. **Jaws**

   Used for clamping the conductor for current measurements. The conductor should be positioned at the center of the jaws during measurement.

2. **Trigger**

   Used to open and close the jaws.

3. **" ☼ " Button**

   With the meter on, press this " ☼ " button to turn on or off the backlight. The backlight will turn off automatically after about 30 secs.

4. **Function Selector Button**

   Used to switch between:
   - DC current, AC current, VFD current and inrush current measurement functions.
   - DC voltage and AC voltage measurement functions.
   - Resistance, diode, continuity and capacitance test functions.

5. **" MAX/MIN " Button**

   Used to enter or exit the MIN MAX mode.

6. **Display**

   3 5/6 digits LCD.

7. **" COM " Terminal**

   Plug-in connector for the black test lead.

8. " INPUT " Terminal

Plug-in connector for the red test lead.

9. " REL ZERO " Button

In dc current measurement function, press this " REL ZERO " button to zero the display before measurement. Press again to undo the zeroing.

In other measurement functions, this button is used to enter/exit Relative mode.

10. Rotary Switch

Used to select a desired function or range as well as to turn on or off the meter.

To save battery charge, set this rotary switch to " **OFF** " position to turn off the meter when the meter is not in use.

11. " H " Button

Briefly press this " H " button to enter or exit Data Hold mode.

Press and hold down this button for about 2 secs to turn on or off the illumination LED

12. Tactile Barrier

Used to prevent finger from touching the conductor

under test.

Do not hold the meter anywhere beyond the tactile barrier.

13. RED LED

An indicator used in non-contact ac voltage detection and continuity test.

14. Illumination LED

15. NCV Sensor

This NCV sensor is located at the mark " ▲ " near the top of the clamp. It is used in non-contact ac voltage detection.

16. Jaw Wear Indicator

Warning:
To avoid injury, do not use the meter if the jaw wear indicator in the jaw opening is invisible.

UNDERSTANDING THE DISPLAY

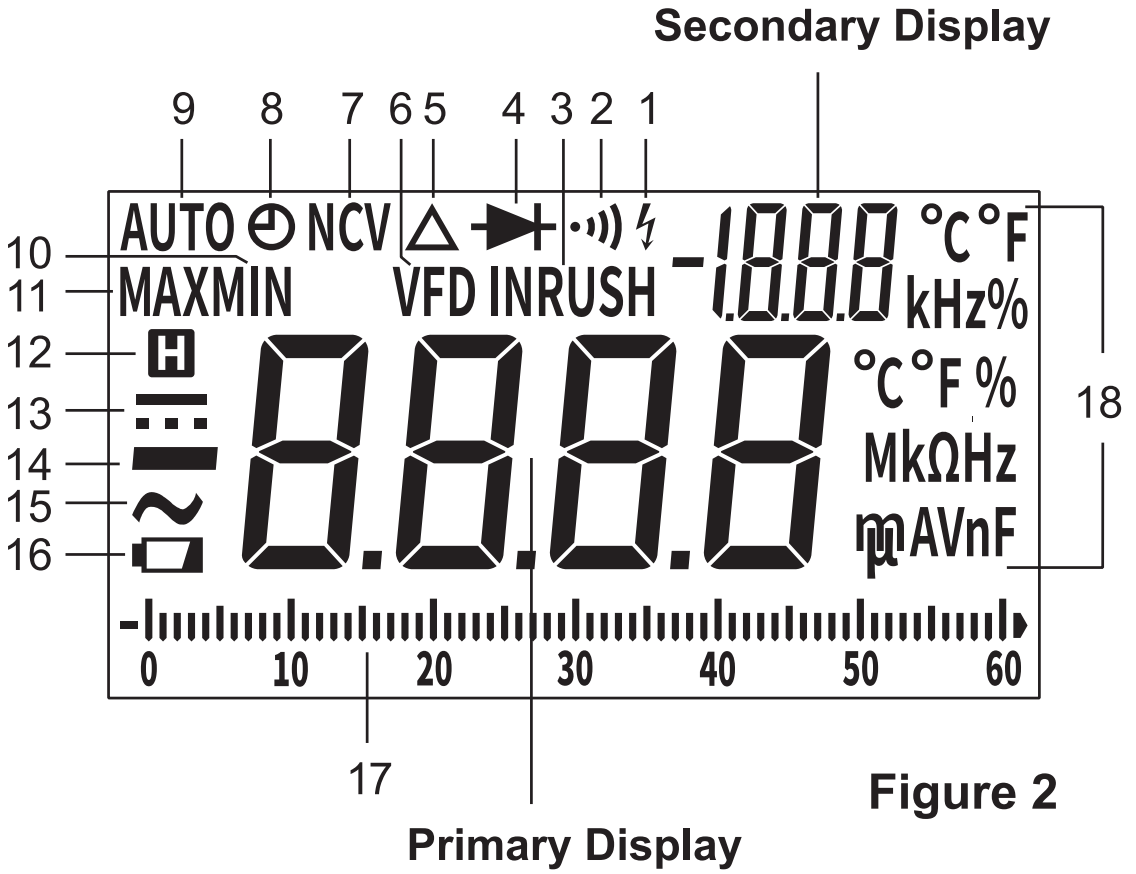


Figure 2

Symbol Meanings:

1. ..... The meter detects an input voltage > 30V. This icon is intended to remind you that hazardous voltage is present and that you must use caution to avoid electric shock.

2. ..... Continuity test function is selected.

3. INRUSH ..... Inrush current measurement function is selected.

4.  ..... Diode test function is selected.

5.  ..... Relative mode is active.

6. VFD ..... Variable frequency drive signal test is enabled.

7. NCV ..... Non-contact ac voltage detection function is selected.

8.  ..... The automatic power-off feature is enabled.

9. AUTO ..... Autorange mode is active.

10. MIN ..... Minimum reading is being displayed.

11. MAX ..... Maximum reading is being displayed.

12.  ..... The meter is in Data Hold mode.

13.  ..... DC

14.  ..... Negative sign

15.  ..... AC

16.  ..... The batteries are not high enough and must be replaced immediately.

17. Bar Graph

The bar graph on the bottom of the LCD is like the needle on an analog meter. It has an overload indicator (◗) on its right and a negative polarity indicator (▬) on its left. The number of lit segments indicates the measured value and is relative to the full-scale value of the selected range. In the 600V range, for example, the major divisions on the scale represent 0, 100, 200, 300, 400, 500 and 600V. An input of –100V lights the negative sign and the segments up to the " 10 " on the scale.

Note:

In frequency, duty cycle, temperature and capacitance measurement functions and non-contact ac voltage detection function, the bar graph is turned off.

18. Units:

V	Unit of voltage V: Volt
A	Unit of current A: Ampere
Ω, kΩ, MΩ	Unit of resistance Ω: Ohm; kΩ: Kilohm; MΩ: Megohm $1M\Omega = 10^3 k\Omega = 10^6 \Omega$
nF, μF, mF	Unit of capacitance nF: Nanofarad; μF: Microfarad; mF: Millifarad $1mF = 10^3 \mu F = 10^6 nF$
Hz, kHz, MHz	Unit of frequency Hz: Hertz; kHz: Kilohertz; MHz: Megahertz $1MHz = 10^3 1kHz = 10^6 Hz$
°C, °F	Unit of temperature °C: Degree Celsius; °F: Degree Fahrenheit f (°F) = 32 + 1.8 x c (°C)
%	Unit of duty cycle %: Percent

GENERAL SPECIFICATION

Display: 3 5/6 digits LCD

Negative Polarity Indication: Negative sign "—" shown on the display automatically

Sampling Rate: About 3 times/sec

Jaw Opening Capability: About 50mm

Max. Measurable Conductor for Current Measurements: About Ø38mm

Low Battery Indication: "  " shown on the display

Battery: 1.5V battery, AAA or equivalent, 3 pieces

Operating Environment: Temperature: 0°C ~ 40°C
Relative Humidity: < 75%

Temperature Coefficient:
0.2 x (specified accuracy)/°C (< 18°C or > 28°C)

Storage Environment: Temperature: -30°C ~ 60°C
Relative Humidity: < 85%

IP Degree: IP20

Operating Altitude: 0 to 2000 meters

Size: 243mm X 87mm X 44mm

Weight: About 382g (including battery)

SPECIFICATION

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C, with relative humidity < 75%.

Except the ranges specified specially, accuracy is specified from 5% of range to 100% of range.

Accuracy specifications take the form of:
±([% of Reading]+[number of Least Significant Digits])

DC Voltage

Range	Resolution	Accuracy	Overrange Indication
6V	0.001V	± (0.8% + 5)	" OL " shown on the display
60V	0.01V		
600V	0.1V		
1000V	1V	± (1.0% + 5)	——— [1]

Input Impedance: 10MΩ
Max. Allowable Input Voltage: 1000V dc
Note:
1. 1000V range is specified from 20% of range to 100% of range.

2. When the input terminals are open, the display may show a reading other than zero. This is normal and will not affect measurements.

[1] If the voltage being measured is ≥ 1000V, the built-in buzzer will sound. If the voltage is > 1010V, the display will show " OL ".

AC Voltage

Range	Resolution	Accuracy	Overrange Indication
6V	0.001V	± (0.8% + 5)	" OL " shown on the display
60V	0.01V	± (1.2% + 5)	
600V	0.1V		
750V	1V		_____[1]
VFD 750V	1V	± (2.5% + 15)	

Input Impedance: 10MΩ

Frequency Range:

40Hz - 400Hz (only for 6V range)

40Hz - 1kHz (only for 60V, 600V and 750V ranges)

Note: Except for sine wave signal and triangular wave signal measurements, accuracy specifications in the above table do not apply to measurements of signals whose frequencies are > 200Hz.

Reading: True rms

Max. Allowable Input Voltage: 750V ac

Note:

1. 750V range is specified from 20% of range to 100% of range.
2. When the input terminals are open, the display may show a reading other than zero. This is normal and will not affect measurements.

[1] If the voltage being measured is ≥ 750V, the built-in buzzer will sound. If the voltage is > 760V, the display will show " OL ".

DC Current

Range	Resolution	Accuracy	Overrange Indication
60A	0.01A	± (3% + 10)	" OL " shown on the display
600A	0.1A	± (3% + 6)	
1000A	1A		

Note:

1. 60A and 600A ranges are specified from 10% of range to 100% of range.
   1000A range is specified from 20% of range to 100% of range.
2. In 1000A range, if the current being measured is ≥ 1000A, the built-in buzzer will sound, and if the current is > 1010A, the display will show " OL ".

AC Current

Range	Resolution	Accuracy
60A	0.01A	± (2.5% + 6) VFD current: ± (5.0% + 15) Inrush current: not specified
600A	0.1A	
1000A	1A	

Frequency Range: 50Hz ~ 60Hz
Reading: True rms
Overrange Indication: " OL " shown on the display
Integration Time: 100ms (only for inrush current measurements)

Note:

1. 60A and 600A ranges are specified from 10% of range to 100% of range.
   1000A range is specified from 20% of range to 100% of range.
2. In 1000A range, if the current being measured is ⩾ 1000A, the built-in buzzer will sound, and if the current is > 1010A, the display will show " OL ".

Resistance

Range	Resolution	Accuracy	Overrange Indication
600.0Ω	0.1Ω	± (1.0% + 5)	" OL " shown on the display
6.000kΩ	0.001kΩ		
60.00kΩ	0.01kΩ		
600.0kΩ	0.1kΩ		
6.000MΩ	0.001MΩ	± (1.5% + 5)	
60.00MΩ	0.01MΩ	± (3.0% + 10)	

Frequency

Range	Resolution	Accuracy	Remark
9.999Hz	0.001Hz	± (1.0% + 5)	Autorange
99.99Hz	0.01Hz		
999.9Hz	0.1Hz		
9.999kHz	0.001kHz		
99.99kHz	0.01kHz		
999.9kHz	0.1kHz		
9.999MHz	0.001MHz	not specified	

Note:
For frequency measurements with the rotary switch in the " **H%**" position, the amplitude of the input signal is required to be in the range of 2V rms to 20V rms.

When the meter is measuring ac voltage and frequency at the same time with the rotary switch in the " $\tilde{V}^{\equiv}$ " position, the frequency measurement range is 10Hz to 1kHz and the input voltage for frequency measurements is required to be > 2V (the higher the frequency of input signal, the higher the required input voltage).

For frequency measurements with the rotary switch in the " **VFD** $\tilde{V}$ " position, the measuring range is 10Hz to 1kHz, and the input voltage is required to be > 1/3 of the present voltage range (the higher the frequency of input signal, the higher the required input voltage).

When the meter is measuring VFD current and the frequency of the current at the same time, the frequency measurement range is 10Hz to 1kHz, and the amplitude of the current for frequency measurement is required to be > 1/3 of the present current range (the higher the frequency of input signal, the higher the required current to be tested).

Duty Cycle

Range	Resolution	Accuracy
5% ~ 95%	0.1%	± (2% + 7)

Input Voltage: 2V rms – 20V rms

Frequency Range: 4Hz ~ 1kHz

Capacitance

Range	Resolution	Accuracy	Remark
6.000nF	0.001nF	± (5.0% + 5)	Autorange
60.00nF	0.01nF		
600.0nF	0.1nF		
6.000µF	0.001µF		
60.00µF	0.01µF		
600.0µF	0.1µF		
6.000mF	0.001mF	± (5.0% + 20)	
60.00mF	0.01mF	not specified	

Note:

1. If the capacitance being measured is > 60mF, the display may show a reading, but the measurement result may be wrong or inaccurate.
2. Use the Relative mode to subtract the residual capacitance of the meter and leads.

Temperature

Range	Reso-lution	Accuracy	Overrange Indication
-20°C ~ 0°C	1°C	± (6.0% + 5°C)	_____[1]
0°C ~ 400°C		± (1.5% + 4°C)	
400°C ~ 1000°C		± (1.8% + 5°C)	
-4°F ~ 32°F	1°F	± (6.0% + 9°F)	
32°F ~ 752°F		± (1.5% + 7°F)	
752°F ~ 1832°F		± (1.8% + 9°F)	

Temperature Sensor: K Type thermocouple

Note:

1. Accuracy does not include error of the thermocouple probe.
2. Accuracy specification assumes ambient temperature is stable to ±1°C. For ambient temperature changes of ±5°C, rated accuracy applies after 1 hour.
3. The meter's operating temperature must be between 18°C and 28°C; otherwise measurement accuracy is not guaranteed.

[1] The display will show " OL " if the temperature being measured is higher than 1010°C (1850°F) or lower than -30°C (-22°F).

Continuity Test

Range	Description
•)))	The built-in buzzer will sound if the resistance is less than about 50Ω The buzzer will not sound if the resistance is more than 100Ω. The buzzer may or may not sound if the resistance is between 50Ω and 100Ω.

Diode Test

Range	Description	Remark
	The approximate forward voltage drop of the diode under test is displayed.	Open Circuit Voltage: about 4V

Data Hold Mode

Briefly press the " H " button to enter the Data Hold mode. The present reading is held on the display, and the symbol " H " appears on the display as an indicator.

To exit the Data Hold mode, briefly press this button again. The symbol " H " disappears.

Note:

In non-contact ac voltage detection function, the " H " button is disabled.

Using Relative Mode

Relative mode is available in some functions. Selecting Relative mode causes the meter to store the present reading as a reference for subsequent measurements.

1. Set the meter in desired function or range.
2. Connect the meter to a desired circuit (or object) properly to get a reading, which is to be used as a

reference for subsequent measurements.

3. Press the " REL ZERO " button once. The meter enters the Relative mode and stores the present reading as a reference for subsequent measurements. The symbol " Δ " appears on the display as an indicator and the display reads zero.
4. In subsequent measurements, the display shows the difference between the reference and the new measurement.
5. To exit the Relative mode, just press this " REL ZERO " button again. The symbol " Δ " disappears.

Note:

1. When you use Relative mode, the actual value of the object under test must not exceed the full-scale value of the present range.
2. To avoid wrong measurement result, never enter Relative mode when Data Hold mode is active.
3. When the display shows " OL ", it means overrange.
4. Except for capacitance function, the meter enters manual ranging in the present range when you enter the Relative mode.
5. For frequency, duty cycle, diode, continuity and inrush current measurement functions and non-contact ac voltage detection function, Relative mode is not available.

6. In dc current measurement function, the " REL ZERO " button is used to zero the display.

MIN MAX Mode

The MIN MAX mode stores minimum and maximum input values. When the input goes below the stored minimum value or above the stored maximum value, the meter stores the new value.

To use the MIN MAX mode:

1. Make sure that the meter is in desired function or range.
2. Press the " MAX/MIN " button to enter MIN MAX mode. The display shows the maximum reading of all readings taken since entering this mode, and " MAX " is shown on the display as an indicator.
   Press this " MAX/MIN " button to toggle between the minimum reading (" MIN " appears) and the maximum reading (" MAX " appears).
3. To pause MIN MAX recording, briefly press the " H " button. The symbol " H " is displayed.
   To resume MIN MAX recording, briefly press the " H " button again. The symbol " H " disappears.

4. To exit the MIN MAX mode and erase all the stored readings, press and hold down this " MAX/MIN " button for about 2 secs; the meter will return to normal operation.

Note:

1. In autorange mode, the meter enters manual ranging in the present range when you enter the MIN MAX mode.
2. When the display shows " OL ", it means overrange.
3. For frequency, duty cycle, capacitance, diode, continuity and inrush current measurement functions and non-contact ac voltage detection function, MIN MAX mode is not available. When the rotary switch is in the " **TEMP** " position, MIN MAX mode is not available.

Measuring AC or DC Voltage

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the V position.
3. If you want to measure DC voltage, press the Function Selector Button until the symbol " ⎓ " is displayed.
   If you want to measure AC voltage, press the Function Selector Button until the symbol " ~ " is displayed.

4. Connect the test leads across the source or circuit to be tested.
5. Read the voltage reading on the primary display.
   For DC voltage measurements, the polarity of the red test lead connection will be indicated as well, and the secondary display will show the ambient temperature.
   For AC voltage measurements, the secondary display will show the frequency of the ac voltage being measured.

Note:

To avoid electric shock to you or damage to the meter, do not apply a voltage higher than 1000V dc or 750V ac between the terminals.

Measuring VFD Voltage

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the " **VFD $\tilde{V}$** " position.
3. Connect the test leads across the source or circuit to be tested.
4. Read the voltage reading on the primary display. The secondary display shows the frequency of the voltage.

Note:

1. To avoid electric shock to you or damage to the meter, do not apply a voltage higher than 750V ac between the terminals.
2. In the VFD voltage measurement function, the low pass filter in the internal circuit of the meter is turned on, and all high frequency noises received from the circuit under test will be eliminated. To avoid possible electric shock or personal injury, never use the VFD voltage measurement function to verify the presence of hazardous voltages. Voltages greater than what is indicated may be present.

Measuring DC Current

1. Make sure that all the test leads have been removed from the meter. Then set the rotary switch to desired current range position (" **1000A** " or " **60/600A** " position).
2. Press the Function Selector Button until the symbol " ⎓ " appears on the display.
3. If the primary display shows a reading other than zero, press the "REL ZERO" button once to zero the primary display.

4. Press the trigger and clamp the jaws around one conductor to be tested. Make sure that the jaws are perfectly closed.

   Note:

   - Only one conductor should be clamped. Measuring two or more conductors at the same time will produce wrong reading.
   - The conductor should be positioned at the center of the jaws; otherwise there will be an additional measurement error, which is typically not more than about 2% of reading.

5. Read the DC current reading on the primary display. The secondary display shows the ambient temperature.

Note:

1. After you turn on the meter, wait about 5 to 10 minutes to allow the meter to warm up before you start current measurement. This is necessary for accurate measurements.
2. The reading on the display also indicates the current's direction: A positive reading indicates that the current direction is from the meter's front to its back.

   Tip: Current direction is the opposite of electron flow direction.

3. Don't use the meter to measure a circuit's current if the circuit contains a voltage > 1000V.

Measuring AC Current

1. Make sure that all the test leads have been removed from the meter. Then set the rotary switch to desired current range position (" **1000A** " or " **60/600A** " position).
2. Press the Function Selector Button until the symbol " ~ " is displayed and the symbol " **VFD** " is absent from the display.
3. Press the trigger and clamp the jaws around one conductor to be tested. Make sure that the jaws are perfectly closed.

   Note:

   - Only one conductor should be clamped. Measuring two or more conductors at the same time will produce wrong reading.
   - The conductor should be positioned at the center of the jaws; otherwise there will be an additional measurement error, which is typically not more than about 2% of reading.

4. Read the ac current reading on the primary display. The secondary display shows the frequency of the ac current being measured.

Note:

1. After you turn on the meter, wait about 5 to 10 minutes to allow the meter to warm up before you start current measurement. This is necessary for accurate measurements.
2. Don't use the meter to measure a circuit's current if the circuit contains a voltage > 1000V.

Measuring VFD Current

1. Make sure that all the test leads have been removed from the meter. Then set the rotary switch to desired current range position (" **1000A** " or " **60/600A** " position).
2. Press the Function Selector Button until both the symbols " ~ " and " **VFD** " are present on the meter screen.

3. Press the trigger and clamp the jaws around one conductor to be tested. Make sure that the jaws are perfectly closed.

   Note:

   - Only one conductor should be clamped. Measuring two or more conductors at the same time will produce wrong reading.
   - The conductor should be positioned at the center of the jaws; otherwise there will be an additional measurement error, which is typically not more than about 2% of reading.

4. Read the current reading on the primary display. The secondary display shows the frequency of the current being measured.

Note:

1. In the VFD current measurement function, the low pass filter in the internal circuit of the meter is turned on, and all high frequency noises received from the circuit under test will be eliminated. To avoid possible electric shock or personal injury, never use the VFD current measurement function to verify the presence of hazardous currents. Currents greater than what is indicated may be present.

2. After you turn on the meter, wait about 5 to 10 minutes to allow the meter to warm up before you start current measurement. This is necessary for accurate measurements.
3. Before measurement, press the " REL ZERO " button to zero the display if the display does not read zero.
4. Don't use the meter to measure a circuit's current if the circuit contains a voltage > 1000V.

Measuring Inrush Current

Inrush current is surge current that occur when an electrical device is first powered on. Once the device has reached its normal working condition, the current stabilizes.

To capture the inrush current reading:

1. Make sure that the system to be tested has been turned off.
2. Make sure that all the test leads have been removed from the meter. Then set the rotary switch to desired current range position (" **1000A** " or " **60/600A** " position).

3. Press the Function Selector Button until the symbol " INRUSH " appears on the screen. Now the meter is in the inrush current measurement function.
4. With the system under test powered down, place the source wire into the Meter jaws. Make sure that the jaws are perfectly closed.

   Note:

   - Only one wire should be clamped. Measuring two or more wires at the same time will produce wrong reading.
   - The wire to be tested should be positioned at the center of the jaws.
5. Power up the system under test. The value of inrush current is shown and held on the display.

Measuring Resistance

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the  position.
3. Press the Function Selector Button until the screen shows a resistance measurement unit and the symbol

"  " is absent from the display.

4. Connect the test leads across the resistor to be tested.
5. Wait until the reading on the primary display is stable, then read the resistance reading on the primary display. The secondary display shows the ambient temperature.

Note:

1. For measurements > 1MΩ, the meter may take a few seconds to stabilize reading. This is normal for high resistance measurements.
2. When the input terminals are open, the display will show " OL ".
3. Before measurement, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

Diode Test

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
   Note: The polarity of the red test lead is positive.
2. Set the rotary switch to the  position.
3. Press the Function Selector Button until the symbol

"  " appears on the screen.

4. Connect the red test lead to the anode of the diode to be tested, and the black test lead to the cathode of the diode.
5. The primary display shows the approximate forward voltage drop of the diode.

Continuity Test

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the  position.
3. Press the Function Selector Button until the symbol "  " appears on the screen.
4. Connect the test leads across the circuit to be tested.
5. The primary display shows the resistance value of the circuit under test. If the resistance is less than about 50Ω, the built-in buzzer will sound and the red LED will light.

Note:

Before test, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

Measuring Capacitance

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the  position.
3. Press the Function Selector Button until the display shows a capacitance measurement unit (nF).
4. If the primary display shows a reading other than zero, press the " REL ZERO " button to zero the primary display; the symbol "△" will appear on the meter screen to indicate that the meter is in Relative mode.

   Note: Do not short the test leads together.
5. Connect the test leads across the capacitor to be tested.
6. Wait until the reading on the primary display is stable, then read the capacitance reading on the primary display. The secondary display shows the ambient temperature.

Note:

1. Before measurement, make sure that the capacitor to be tested has been discharged thoroughly.
2. For measurements > 10μF, it may take about 30 secs for the meter to complete measurement and stabilize reading.

Measuring Frequency and Duty Cycle

1. Connect the black test lead to the " **COM** " terminal, and the red test lead to the " **INPUT** " terminal.
2. Set the rotary switch to the " **Hz%** " position.
3. Connect the test leads to the source or circuit to be tested.
4. The primary display shows the frequency reading, and the secondary display shows the duty cycle of the square wave signal being measured.

Note:

1. For frequency measurements, range change is automatic, and measurement range is: 0 ~ 10MHz.
2. The voltage of input signal is required to be in the range of 2V rms to 20V rms. The higher the frequency of input signal, the higher the required input voltage.

Measuring Temperature

Note

To avoid possible damage to the meter or other equipment, remember that while the meter is rated for -20°C to +1000°C and -4°F to 1832°F, the K Type Thermocouple provided with the meter is rated to 250°C. For temperature out of that range, use a higher rated thermocouple.

The K Type Thermocouple provided with the meter is a present, it is not professional and can only be used for non-critical measurements. For accurate measurements, use a professional thermocouple.

1. Set the rotary switch to the **TEMP** position. The secondary display shows the environment temperature.
2. Connect the negative " – " plug of the K Type thermocouple to the " **COM** " terminal, and the positive " + " plug of the K Type thermocouple to the " **INPUT** " terminal.
3. Connect the sensing end of the thermocouple to the object to be tested.
4. Wait a while until thermal equilibrium between the

thermocouple probe and the object is reached, then read the readings on the screen. The primary display shows the celsius measured temperature of the object under test, and the secondary display shows the fahrenheit measured temperature of the object under test.

Non-Contact AC Voltage Detection

1. Set the rotary switch to the **NCV** position. The symbol " **NCV** " appears on the upper area of the screen. The primary display shows " EF ", the secondary display shows the environment temperature. (See Figure 3.)
2. Move the NCV sensor at the " ▲ Ⓨ " mark on the meter clamp close to the object to be tested. When the meter detects electric field generated by ac voltage, the red LED on the meter will flash and the meter will indicate the intensity of the electric field being detected. The intensity of the electric field being detected is indicated by the number of the bar-graph segments shown at the vertical center of the display (see Figure 4), the flashing rate of the red LED, and the beeping rate of the built-in buzzer. The higher the intensity of the

electric field being detected, the larger the number of the bar-graph segments shown on the display, the faster the flashing rate of the red LED and beeping rate of the buzzer.

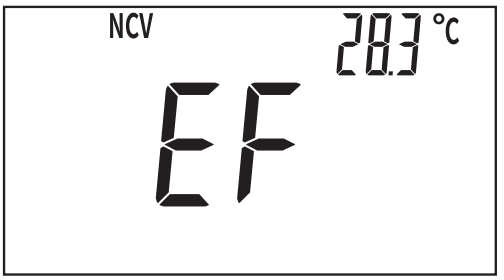


Figure 3

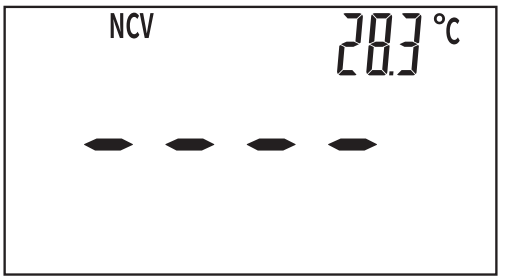


Figure 4

Note:

1. Detection Range: 90V - 1000V
   Required Voltage Frequency: 50Hz/60Hz
2. The optimal detecting position of the meter is at the "Ⓨ" mark on the meter clamp.
3. If an ac voltage is not within the meter's detecting capacity/distance, the meter can not detect this voltage.
4. The meter's electric field intensity indication is affected by the magnitude of the ac voltage of the conductor under test, the distance between the meter and the conductor, the insulation of the conductor, and etc.
5. Because of the meter's detection limit, a line (or conductor) under test may be electrically live even if the buzzer does not sound, the red LED does not flash

and the display does not indicate the presence of electric field.

6. Before and after each use, verify the meter's operation by detecting a known AC voltage. Do not use the meter if it operates abnormally or malfunctions.
7. To avoid electric shock, do not touch any conductor with hand or skin.
8. To avoid interference, don't perform non-contact ac voltage detection in an environment with strong electromagnetic field; otherwise the detection result may be wrong.

Automatic Power-Off

The meter will turn off automatically and go into Sleep mode if you have not operated the meter for about 15 minutes. To arouse the meter from Sleep, just press a button.

To disable the automatic power-off feature, turn the rotary switch from " **OFF** " position to other switch setting while holding down the Function Selector Button; the symbol "◴" will be absent from the display.

MAINTENANCE

Warning

Except replacing batteries, never attempt to repair or service the meter.

Store the meter in a dry place when not in use. Don't store it in an environment with intense electromagnetic field.

General Maintenance

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

Dirt or moisture in the terminals can affect readings. Clean the terminals as follows:

1. Set the rotary switch to **OFF** position and remove all the test leads from the meter.
2. Shake out any dirt which may exist in the terminals.
3. Soak a new swab with alcohol.
4. Work the swab around in each terminal.

If the meter fails, check and replace (as needed) the batteries and/or review this manual to verify proper use of

the meter.

Replacing the Batteries

Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator ( ) appears.

Turn off the meter, remove the test leads from the meter and the meter clamp from any conductor under test before opening the case or the battery cover.

When the low battery indicator " " appears on the display, the batteries are not high enough and must be replaced immediately.

To replace the batteries, remove the screw on the battery cover and remove the battery cover. Replace the exhausted batteries with new ones of the same type, make sure that the polarity connections are correct. Reinstall the

battery cover and the screw.

ACCESSORIES

Manual: 1 piece

Test Lead: 1 pair

PRESENT

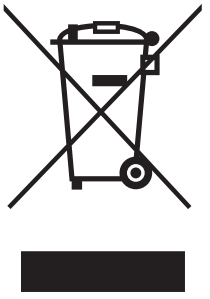
K Type Thermocouple: 1 piece

NOTE

1. This manual is subject to change without notice.
2. Our company will not take the other responsibilities for any loss.
3. The contents of this manual can not be used as the reason to use the meter for any special application.

DISPOSAL OF THIS ARTICLE

Dear Customer,
If you at some point intend to dispose of this article, then please keep in mind that many of its components consist of valuable materials, which can be recycled.



Please do not discharge it in the garbage bin, but check with your local council for recycling facilities in your area.