

# Operating Instruction for True RMS Thermal Multimeter & Insulation / Low OHM Tester



Please read this manual before switching the unit on.  
Important safety information inside.



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## 1. Precautions and Safety Measures

- The instrument has been designed in compliance with directive IEC/EN61010-1 relevant to electronic measuring instruments.
- For your safety and in order to prevent damaging the instrument, please carefully follow the procedures described in this manual and read all notes preceded by symbol with the utmost attention.
- The Meter wirelessly transmits data to the mobile app via Bluetooth allowing you to view, save, organize and share datalogs and take measurements from a safe distance.

### 1-1. Before and after carrying out measurements, carefully observe the following instructions:

- Do not carry out any measurement in humid environments.
- Do not carry out any measurements in case gas, explosive materials or flammables are present, or in dusty environments.
- Avoid any contact with the circuit being measured if no measurements are being carried out.
- Avoid any contact with exposed metal parts, with unused measuring probes, circuits, etc.
- Do not carry out any measurement in case you find anomalies in the instrument such as deformation, breaks, substance leaks, absence of display on the screen, etc.
- Pay special attention when measuring voltages higher than 20V, since a risk of electrical shock exists.

### 1-2. In this manual, and on the instrument, the following symbols are used:

- ⚠ **WARNING:** Observe the instructions given in this manual; improper use could damage the instrument or its components.
- ☐ Double Insulated Meter
- ~ AC Voltage or Current
- ≡ DC Voltage or Current
- ⚡ Connection to Earth

### 1-3. Safety

#### Per IEC1010 Overvoltage Installation Category

- **Overvoltage Category I:** Equipment of Overvoltage Category I is equipment for connection to circuits in which measures are taken to limit the transient overvoltages to an appropriate low level.

**Note:** Examples include protected electronic circuits.

- **Overvoltage Category II:** Equipment of Overvoltage Category II is energy-consuming equipment to be supplied from the fixed installation.

**Note:** Examples include household, office, and laboratory appliances.

- **Overvoltage Category III:** Equipment of Overvoltage Category III is equipment in fixed installations.

**Note:** Examples include switches in the fixed installation and some equipment for industrial use with permanent connection to the fixed installation.

- **Overvoltage Category IV:** Equipment of Overvoltage Category IV is for use at the origin of the installation.

**Note:** Examples include electricity meters and primary over-current protection equipment.

### 1-4. Safety Instructions

- This meter has been designed for safe use, but must be operated with caution.
  - The rules listed below must be carefully followed for safe operation.
1. Never apply voltage or current to the meter that exceeds the specified maximum:

#### Input Protection Limits

Function	Maximum Input
V DC or V AC	1000VDC/AC RMS
Frequency, Resistance, Capacitance, Duty Cycle, Diode Test, Continuity	1000VDC/AC RMS
Temperature	1000VDC/AC RMS

Surge Protection: 8kV peak per IEC 61010

2. Use extreme CAUTION when working with high voltages.
  3. Do not measure voltage if the voltage on the "COM" input jack exceeds 1000V above earth ground.
  4. Never connect the meter leads across a voltage source while the function switch is in the current, resistance or diode mode, doing so can damage the meter.
  5. Always discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
  6. Always turn off the power and disconnect the test leads before opening the covers to replace the fuse or batteries.
  7. Never operate the meter unless the back cover and the battery and fuse covers are in place and fastened securely.
  8. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Electromagnetic Environment: IEC EN 61326-1. This equipment meets requirements for use in basic and controlled electromagnetic environments like residential properties, business premises, and light-industrial locations.

## 2.Introduction

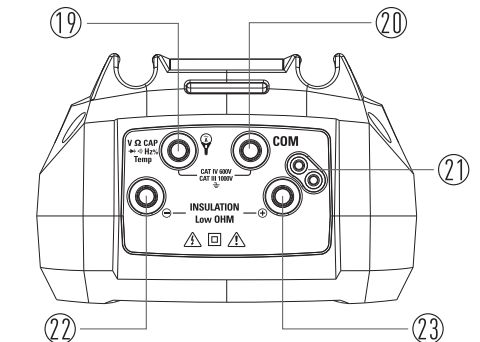
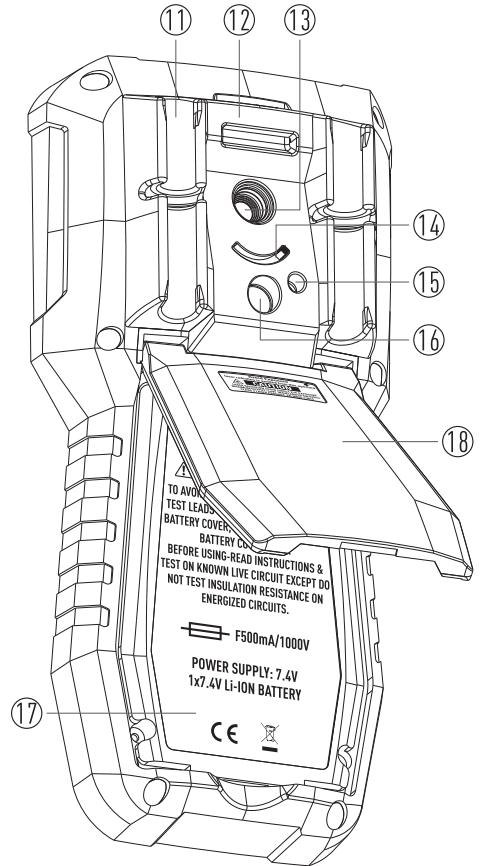
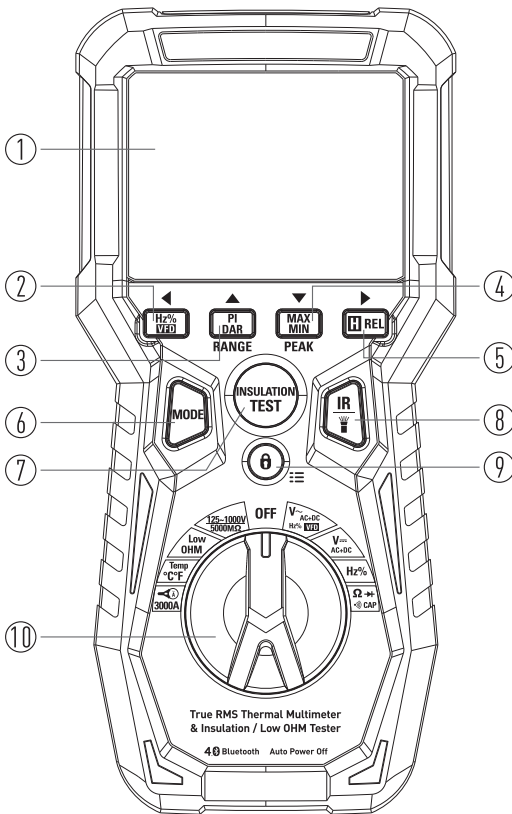
Professional True RMS Multimeter and insulation tester with built-in Thermal Imager, and TFT color LCD display, providing fast A/D converting sampling time, high accuracy. It is easy to find and solve the problems of the production equipments, providing Bluetooth technology. It is much more safe measurements with double molded plastic housing design and IP65 waterproof function.

- 6000 Count 3.5" TFT Color LCD Display
- Built-in Thermal Imager with Max, Min and Center Crosshair Targeting
- 50Hz Fast Thermal Image Frame Rate
- DC Voltage
- AC, AC+DC TRMS Voltage
- VFD, Variable Frequency Drive
- Low OHM
- Flexible Coils Current
- Resistance and Continuity Test
- Diode Test
- Capacity
- Frequency
- Duty Cycle
- Temperature with K-Type Probe
- Insulation Tester
- PI/DAR Test
- Data Logger Function and Recall

### 3. Description

#### 3-1. Meter Description

- |                           |                        |                           |
|---------------------------|------------------------|---------------------------|
| 1-RGB Display             | 11-Test Lead Holders   | 21-INSULATION Input Jack  |
| 2-Hz/%/VFD Key            | 12-Lanyard Hole        | 22-INSULATION- Input Jack |
| 3-PI/DAR/RANGE Key        | 13-Thermal Imager Len  | 23-INSULATION+ Input Jack |
| 4-MAX/MIN/PEAK Key        | 14-Len Cover           |                           |
| 5-HOLD/REL Key            | 15-Laser               |                           |
| 6-MODE Key                | 16-Work Light          |                           |
| 7-INSULATION TEST Key     | 17-Battery Cover       |                           |
| 8-IR/Work Light Key       | 18-Tilt Stand          |                           |
| 9-LOCK Key                | 19-Positive Input Jack |                           |
| 10-Rotary Selector Switch | 20-COM Input Jack      |                           |





## 3-2. Description of Function Keys

### 3-2-1. IR Key

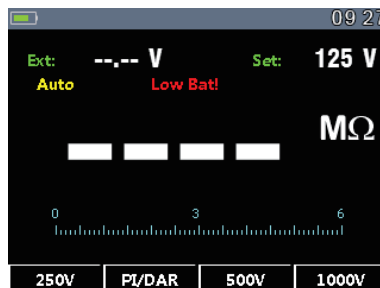
Press the **IR** Key to switch **DMM** mode and **IR** mode.

### 3-2-2. MODE Key

Press the **MODE** Button to select AC or DC, Frequency or Duty Cycle, Resistance, Continuity or Diode Test and °C or °F.

### 3-2-3. INSULATION TEST Key

- With the test leads connected to the equipment under test, press and hold the **TEST** Button to begin an insulation resistance test.
- The lower-right display will show test voltage, and the main display will show the resistance.
- This key used to start the insulation measurement, it must kept pressed until the insulation measurement is stabilized.
- The symbol is displayed on the screen during the measurement.
- After each measurement, the **HOLD** symbol is displayed and the HOLD function automatically activated.
- If the object being measured is charged, the meter will automatically reject the test without generating a high voltage.
- The LCD display the lightning bolt symbol and the unit beeps.
- If the battery is low, Insulation measurement does not start, see picture.



### 3-2-4. LOCK Key

- For hands-free insulation resistance testing, use the **LOCK** Button feature.
- With the test leads connected to the equipment under test, press the **LOCK** Button, and then press the **TEST** Button to begin the test.
- The lock icon will appear on the display and the meter will beep to indicate it is in lock mode.
- Press the **TEST** Button to end the test.

### 3-2-5. HOLD/REL Key

- Pressing the **HOLD/REL** Key freezes the value of the measured quantity on the display.
- After pressing this key, the message “Hold” appears on the display.
- Press the **HOLD/REL** Key again to exit the function.
- To save the vale on the display.

- Press and hold the **HOLD/REL** Key for a long time in order to Relative measurement.
- Press and hold the key to exit Relative and return to normal operation.

### 3-2-6. MAX/MIN/PEAK Key

- Use **MAX/MIN/PEAK** Key select MAX function.
- Press and hold the **MAX/MIN/PEAK** Key for a long time in order to Peak function.

### 3-2-7. PI/DAR/RANGE Key

Press the **PI/DAR/RANGE** Key to switch PI/DAR function at insulate measurement and manage range at other measurement.

### 3-2-8. Hz/%/VFD Key

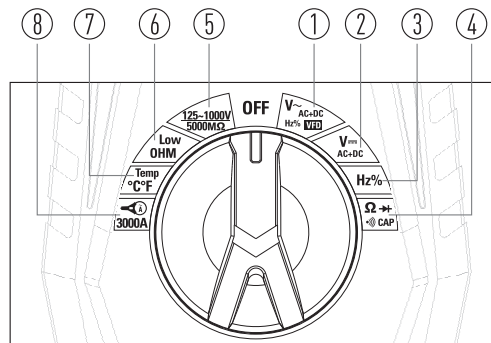
- Press the **Hz/%/VFD** Key to switch Hz/% function at AC Voltage measurement.
- Press and hold the **Hz/%/VFD** Key for a long time to switch VFD function at AC Voltage measurement.

### 3-3. Understanding the Rotary Switch

- Select a primary measurement function by positioning the rotary switch to one of the icons around its perimeter.
- For each function, the meter presents a standard display for that function (Range, Measurement Units and Modifiers).

• Button choices made in one function do not carry over into another function.

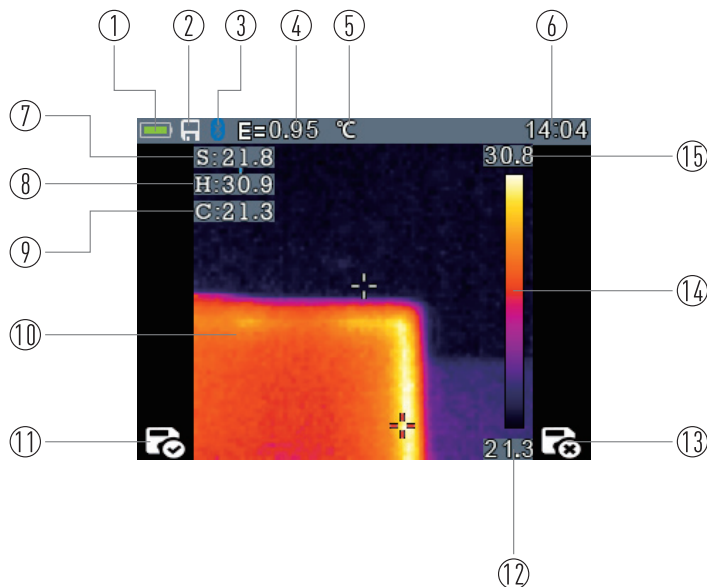
- 1-AC Voltage Measurements and Hz, VFD
- 2-DC and AC+DC Voltage Measurements
- 3-Frequency and Duty Measurements
- 4-Resistance, Diode test, Capacitance and Continuity Measurements
- 5-Insulation Tester
- 6-Low Resistance Tester
- 7-Temperature Measurements
- 8-Flexible Coils Current



### 3-4. Description of the Display

#### 3-4-1. IR Mode

- 1-The battery capacity indicator
- 2-SD card icon, if this icon is displayed, there is a SD card inserted.
- 3-Bluetooth icon, if this icon is displayed, the Bluetooth is opened.
- 4-The currently selected emissivity value, use the thermal settings menu to change the emissivity value.
- 5-The temperature unit icon, use the thermal settings menu to select °C, °F, K.
- 6-Current time display
- 7-Center cross of the thermal imager temperature measurement, represents the center spot temperature of the scene.
- 8-Highest temperature spot of the thermal imager temperature measurement, represents the highest spot temperature of the scene.
- 9-Minimum temperature spot of the thermal imager temperature measurement, represents the minimum spot temperature of the scene.
- 10-Current scene at the thermal image frame
- 11-Image Save Button
- 12-Lowest reading measured in the current frame
- 13-Image Cancel Button
- 14-The Thermal scale shows the range color for thermal images, the lighter the color, the warmer the temperature; the darker the color, the cooler the temperature.
- 15-Highest reading measured in the current frame.



### 3-4-2.DMM Mode

- 1-Indication of battery level and activation/deactivation of key tone (not associated with continuity test)
- 2-Indication of the system's time
- 3-Indication of measuring unit
- 4-Analogue bargraph
- 5-Indication of measuring result
- 6-Indication of Automatic/Manual mode



### 3-5. Icons on LCD Display

	Warning
	Flexible Coils
	Traditional Clamps
	Relative
	High Edge Time
	AC Voltage or Current
	DC Voltage or Current
	AC+DC Voltage or Current
	Continuity Function
	Diode Function
	Ohms

## 4. Meter & Tester Measurement and Function

### 4-1. HOLD Function and Saving

1. Press the **HOLD/REL** Key to freeze the result, the message "Hold" appears on the display.
2. Press the **SAVE (Hz/%/VFD)** Key to save the data in the instrument's memory.



### 4-2. Relative Measurement

1. Press and hold the **HOLD/REL** Key to enter relative measurement, the message "REL" and symbol "Δ" appear on the display.
2. Again press and hold the **HOLD/REL** Key to return normal measurement.
3. Press the **HOLD** and **SAVE** Key to save the result.



### 4-3. Saving MAX/MIN and PEAK Values

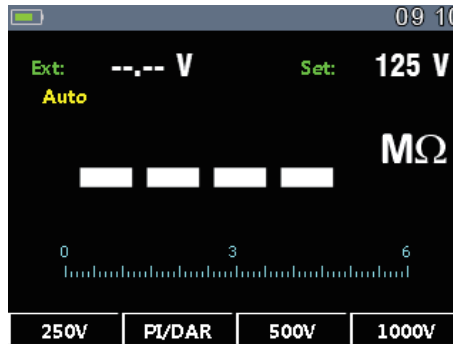
1. Press the **MAX/MIN/PEAK** Key to enter the measuring mode of MAX, MIN values of the quantity to be measured, the message "MAX/MIN" appears on the display.
2. The values are automatically updated by the instrument, which emits a short beep whenever the actually displayed values are exceeded (Higher for MAX value, Lower for MIN value).
3. Press the **MAX/MIN/PEAK** Key again to end MAX/MIN.
4. Press the **HOLD** and **SAVE** Key to save the measured result.

5. Press and hold the **MAX/MIN/PEAK** Key to enter the measuring mode of peak values, the message "**PEAK**" appears on the display and the values is updated in the same way as for the MAX/MIN function.
6. Press and hold the **MAX/MIN/PEAK** Key again to end PMAX/PMIN.
7. Press the **HOLD** and **SAVE** Key to save the measured result.



#### 4-4. Insulation Measurement

1. The default voltage for the insulation test range is 125V.
2. Press **250V** Key to enter test rang **250V**, Press **500V** Key to enter test rang **500V**, Press **1000V** Key to enter test rang **1000V**, **EXT**: voltage values.
3. Press **PI/DAR** Key to enter **PI.DAR** measuring mode: Polarization (**PI**) or Medium absorption ratio (**DAR**).
4. The polarization index (**PI**) is the ratio of the 10-minute insulation resistor to the 1-minute insulation resistor; The media absorption ratio (**DAR**) is the ratio of 1-minute insulation resistance to 30-second insulation resistance.



**Note:** Insulation tests can only be performed on the power-off circuit, measure the polarization index or medium absorption ratio.

**Note:** Test time is not completed and interrupted, the interface shows test fail.



DAR TEST



TEST FAIL

5. Pressing the **LOCK** Key is the test lock, and pressing this key and then pressing the **TEST** Key will keep the test locked.



## 5. Operating Instructions

### 5-1. DC, AC+DC Voltage Measurement

**CAUTION:** The maximum input DC voltage is 1000V. Do not measure voltages exceeding the limits given in this manual. Exceeding voltage limits could result in electrical shocks to the user and damage to the instrument.

1. Set the function switch to the **V<sub>DC</sub>** / **AC+DC** Position
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Position the red lead and the black lead respectively in the spots with positive and negative potential of the circuit to be measured.
4. The display shows the value of voltage.
5. If the display shows the message “**0.L**”, select a higher range.
6. To use the HOLD, RANGE and REL function, see the key operation instructions.
7. For AC+DC measurement, press the **MODE** Button to indicate “**AC+DC**” on the display.





### 5-2.AC Voltage Measurement

**CAUTION:** The maximum input AC voltage is 1000V. Do not measure voltages exceeding the limits given in this manual. Exceeding voltage limits could result in electrical shocks to the user and damage to the instrument.

1. Set the function switch to the **V~Hz%/VFD** Position
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Position the red lead and the black lead respectively in the spots with positive and negative potential of the circuit to be measured.
1. Read the AC voltage in the display.
2. If the display shows the message “**O.L**”, select a higher range.
3. Press the **Hz/%/VFD** Key to select measurements “**Hz**” or “**%**” in order to display the values of frequency and duty cycle of input voltage.
4. Press and hold the the **Hz/%/VFD** Key to VFD (Variable Frequency Drive) test.



### 5-3. Frequency Measurement

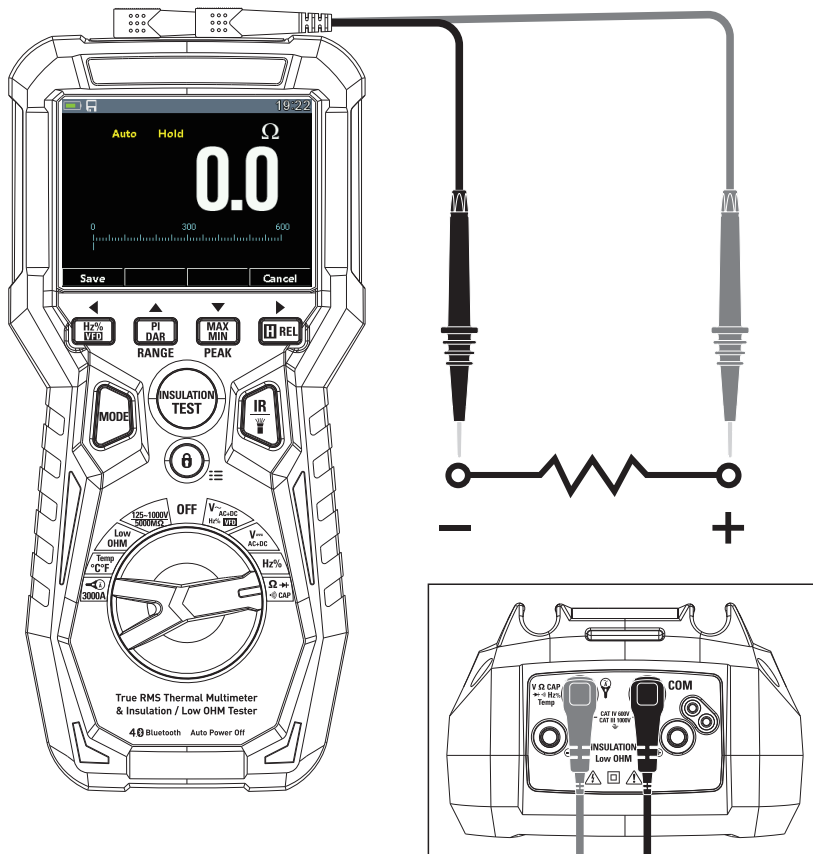
1. Set the function switch to the **Hz%** Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Position the black test probe tip and red test probe tip respectively in the spots of the circuit to be measured.
4. Read the Frequency in the display.
5. Press the **MODE** Key to switch the Duty functions.
6. Read the Duty in the display.



### 5-4. Resistance Measurement and Continuity Test

**CAUTION:** Before attempting any resistance measurement, cut off power supply from the circuit to be measured and make sure that all capacitors are discharged, if present.

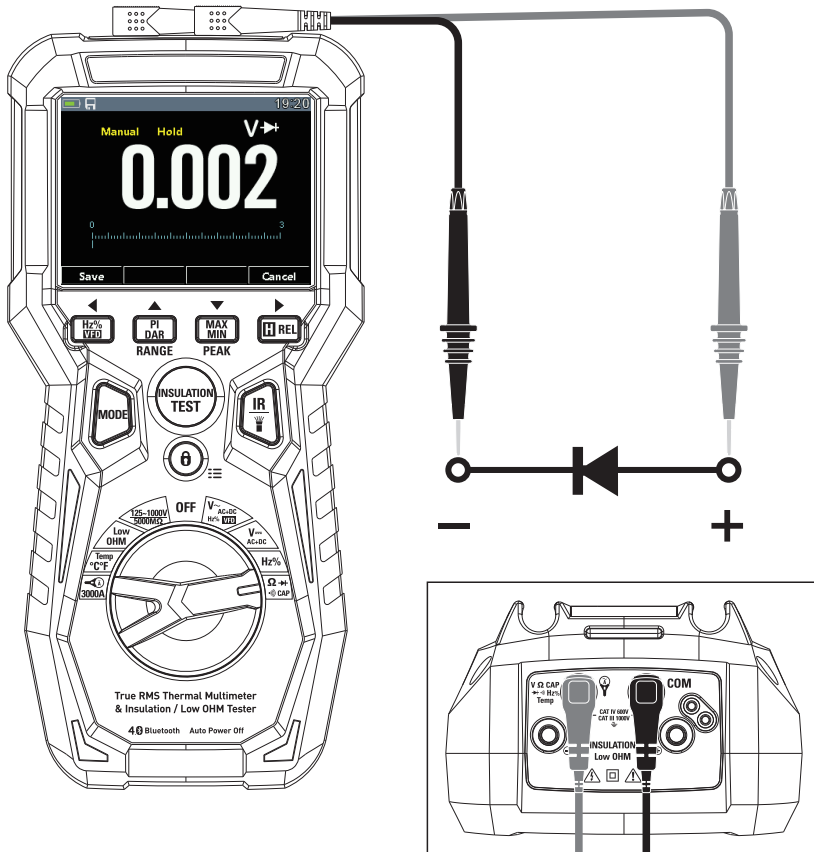
1. Set the function switch to the  $\Omega$   $\rightarrow$  CAP Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Position the test leads in the desired spots of the circuit to be measured.
4. The display shows the value of resistance.
5. If the display shows the message "O.L", select a higher range.
6. Press the **MODE** Key to select measurement " $\rightarrow$ " relevant to the continuity test, and position the test leads in the desired spots of the circuit to be measured.
7. The value of resistance (which is only indicative) is displayed in  $\Omega$  and the instrument sounds if the value of resistance is  $<50 \Omega$ .
8. To use the HOLD, RANGE and MAX function, see the key operation instructions.



### 5-5. Diode Test

**CAUTION:** Before attempting any resistance measurement, cut off power supply from the circuit to be measured and make sure that all capacitors are discharged, if present.

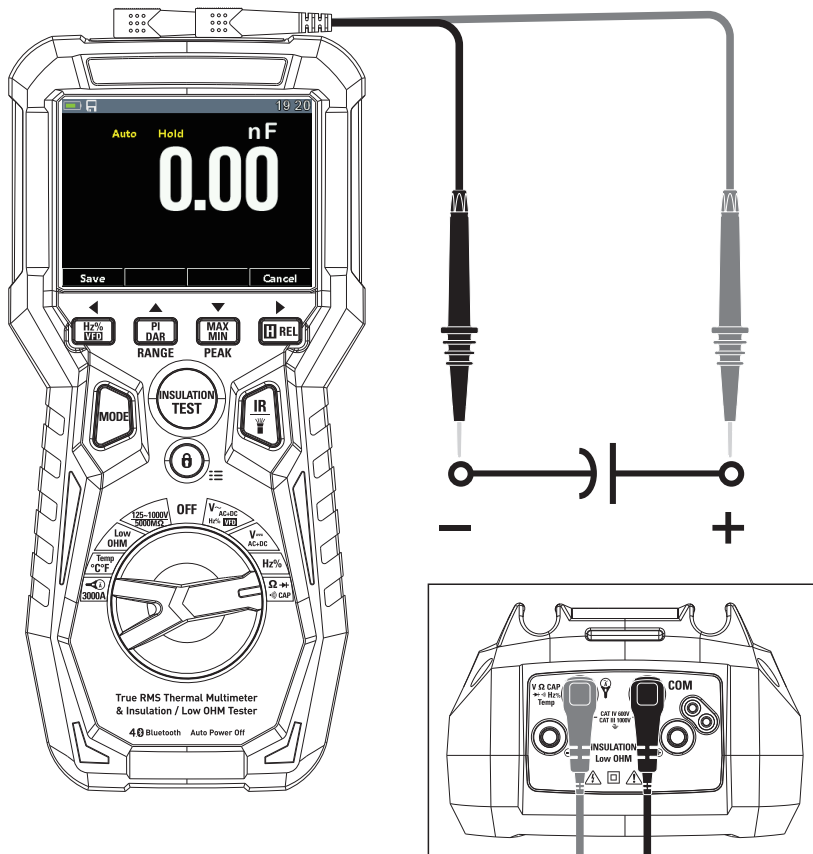
1. Set the function switch to the  $\Omega$   $\rightarrow$  CAP Position.
2. Press the **MODE** Key to select " $\rightarrow$ " measurement.
3. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
4. Position the leads at the ends of the diode to be tested, respecting the indicated polarity.
5. The value of directly polarized threshold voltage is shown on the display.
6. If threshold value is equal to 0mV, the P-N junction of the diode is short-circuited.
7. If the display shows the message "**0.L**", the terminals of the diode are reversed with respect to the indication given in picture or the P-N junction of the diode is damaged.



### 5-6. Capacitance Measurement

**CAUTION:** Before carrying out capacitance measurements on circuits or capacitors, cut off power supply from the circuit being tested and let all capacitance in it be discharged. When connecting the multimeter and the capacitance to be measured, respect the correct polarity (when required).

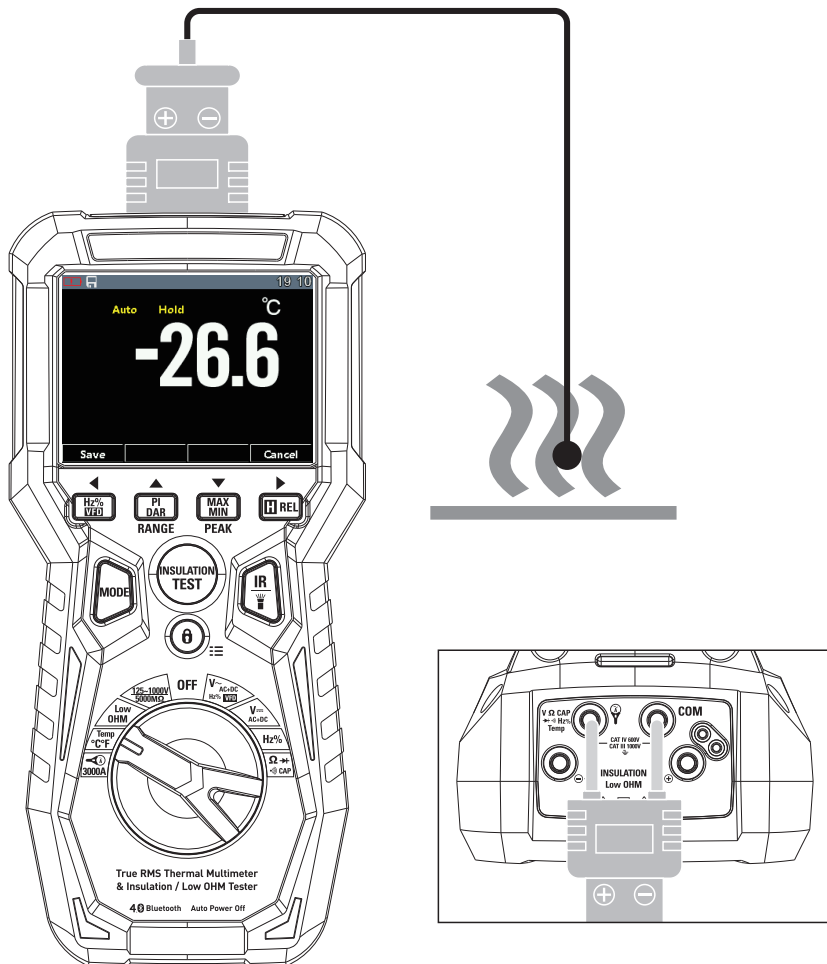
1. Set the function switch to the  $\Omega$   $\rightarrow$  CAP Position.
2. Press the **MODE** Key until the symbol "nF" is displayed.
3. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
4. Press the **F2 (REL)** Key before carrying out measurements.
5. Position the leads at the ends of the capacitor to be tested, respecting, if necessary, the Positive (Red cable) and Negative (Black cable) polarity.
6. The display shows the value of capacitance, the bargraph is not active in this function.
7. The message "O.L." indicates that the value of capacitance exceeds the maximum measurable value.



### 5-7. Temperature measurement with K-Type Probe

**CAUTION:** Before attempting any temperature measurement, cut off power supply from the circuit to be measured and make sure that all capacitors are discharged, if present.

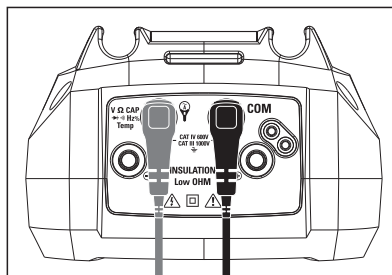
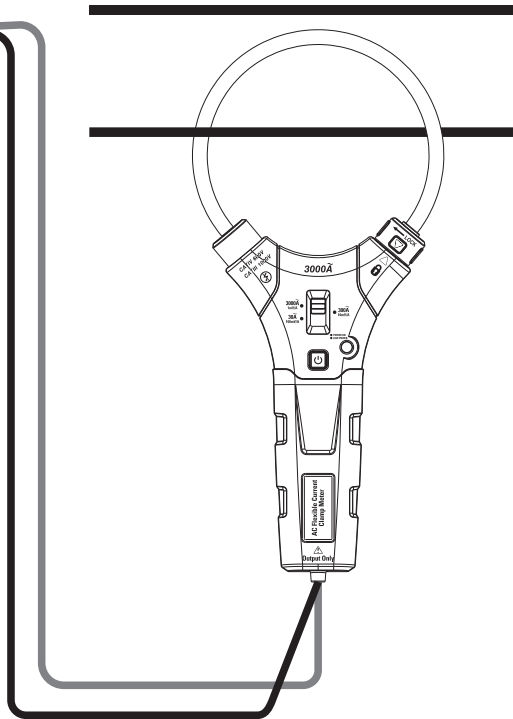
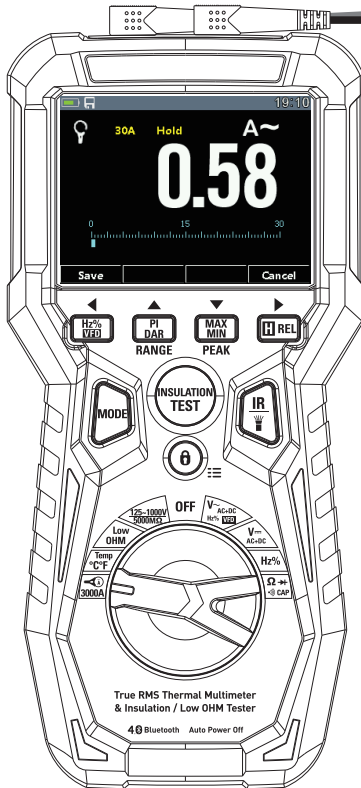
1. Set the function switch to the **Temp °C/°F** Position.
2. Press the **MODE** Key until the symbol “°C” or “°F” is displayed.
3. Insert the provided adapter into input terminals **Positive +** and **COM-**.
4. Connect the provided K-type wire probe or the optional K-type thermocouple to the instrument by means of the adapter, respecting the positive and negative polarity on it.
5. The display shows the value of temperature, the bargraph is not active in this function.
6. The message “**O.L.**” indicates that the value of temperature exceeds the maximum measurable value.



### 5-8. Flexible Coil Current Measurement

**CAUTION:** Maximum input AC current is 3000A (Input VHz%CAPTemp Ω → → ). Do not measure currents exceeding the limits given in this manual.

1. Set the function switch to the **3000A** Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Select current Transducer Rang, press the **RANGE** Key to select “30A, 300A, 3000A”.
4. Read the current value in the display.



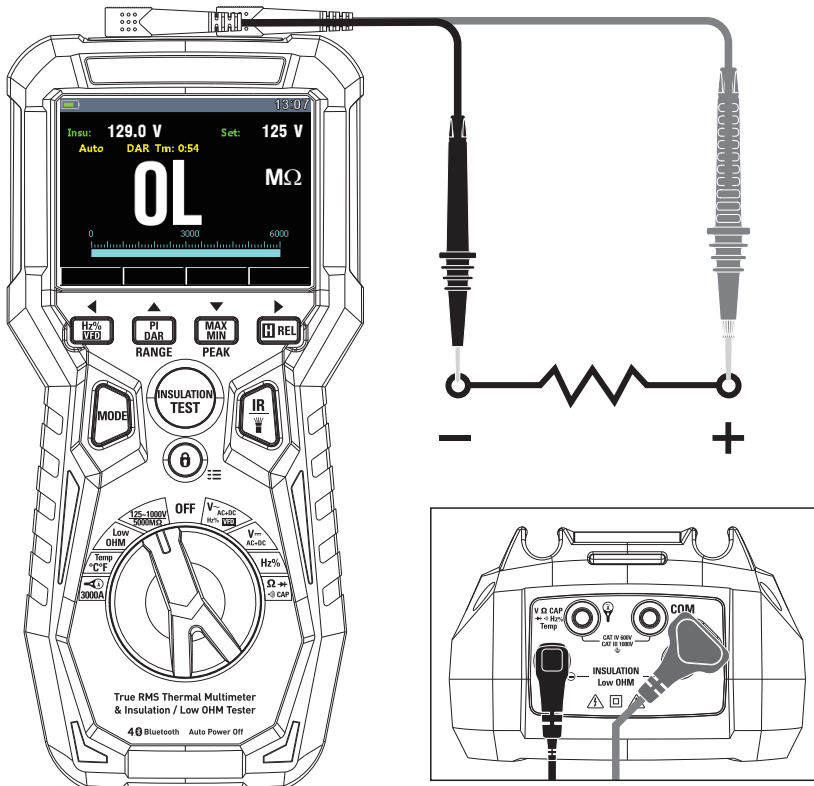
### 5-9. Insulation Resistance Measurement

**CAUTION:** Disconnect the circuit under test and isolate it from any stray resistance. Insulation test should only be performed on de-energized circuits.

1. Insert red test lead into **INSULATION+** Input Jack and black test lead into **INSULATION-** Input Jack, and rotate the function selector to the desired test voltage.
2. Choose from 125V, 250V, 500V or 1000V based on the compatibility with the device tested.

**Note:** Disconnect the circuit under test and isolate it from any stray resistance. Insulation test should only be performed on de-energized circuits.

3. Connect the red and black leads to the circuit under test, if there is a voltage in the circuit, a constant beep will sound and the test voltage symbol will be displayed.
4. Press and hold the **TEST** Button to begin test, the lower right display shows test voltage, and the main display shows the resistance.
5. The measured insulation resistance is displayed on the main display in  $M\Omega$ , allow the reading to stabilize before recording the measurement, turning the function switch, at any time during the insulation test will end the testing process.
6. The circuit will discharge through the meter, keep the test leads connected until the circuit is completely discharged and the lower right display shows near zero volts.
7. Press the **F4 (PI/DAR)** Key to select "**PI TEST** or **DAR TEST**".

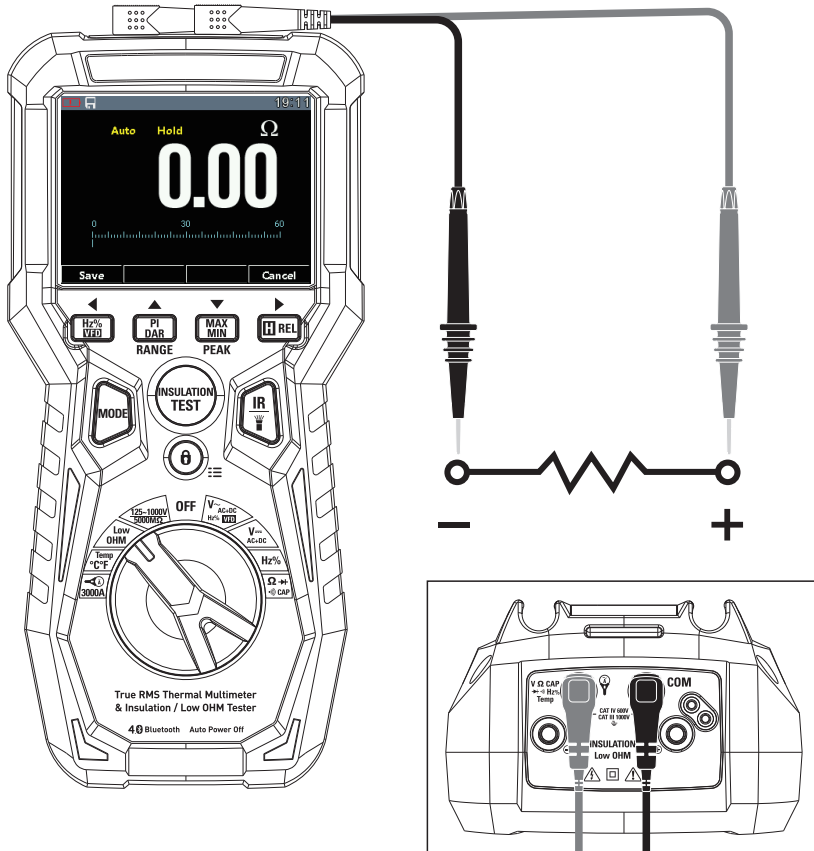




### 5-10. Low OHM Measurement

**CAUTION:** Before attempting any resistance measurement, cut off power supply from the circuit to be measured and make sure that all capacitors are discharged, if present.

1. Set the function switch to the **Low OHM** Position.
2. Insert the black test lead into the **COM** Input Jack and the red test lead into the **Positive** Input Jack.
3. Read the OHM in the display.



## 6. Thermal Imager

### 6-1. Thermal Imager Basics

- In the Thermal imaging mode, user can measure a targeted surface's temperature and user can use Multimeter at the same time, the measured result will display under the thermal image.
- Press the **IR** Button to open the Thermal Imager, the thermal image is set to color palette IRON, select other palettes in the Menu Settings.
- Open the protective lens cover on the back of the meter.

### 6-2. Using the Thermal Imager

For basic operation follow these steps:

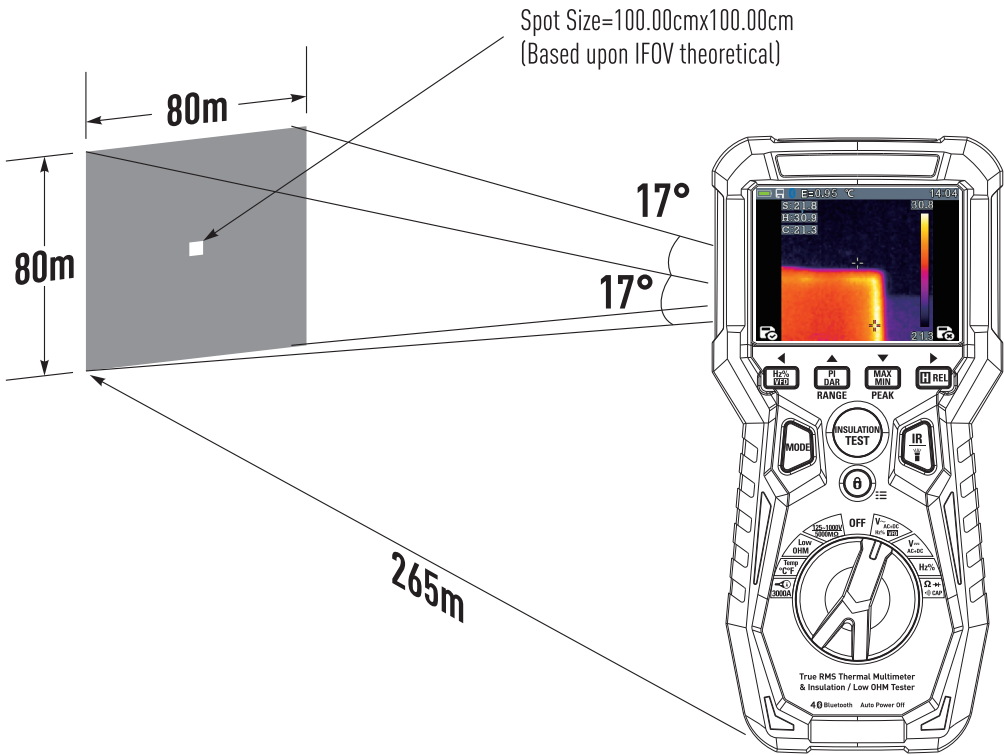
- Set the function switch to any Position
- Press the **IR** Button to switch the thermal imager ON, target the object by the thermal imager lens.
- The display will show the temperature measurement in the upper left hand corner for the targeted area along with the currently selected emissivity value.
- In the Thermal imaging mode, the laser pointer and display cross hairs can be used to assist in targeting, these tools can be switched ON or OFF in the Setting menu.
- In the Thermal imaging mode, the highest temperature will auto marked by a red cross, and the lowest temperature will auto marked by a blue cross, the two spots can be switched ON or OFF in the setting menu.
- In the Thermal imaging mode, the meter continues to operate normally as a multimeter allowing any of the electrical functions to be used.
- Press the **HOLD** Button to hold the thermal image frame, then long press the HOLD button, you will capture the screen and save a bitmap with measure data into SD card, the saved bitmap later can be analysed by the PC software or Smartphone APPs.
- The thermal imager's FOV (Field of view) is 21 by 21 degrees.
- FOV is the largest area that your imager can see at a set distance.
- This table lists the Horizontal FOV, Vertical FOV and IFOV for lens.

Focal Length	Horizontal FOV	Vertical FOV	IFOV
7.5mm	21°	21°	4.53mrad

- **IFOV** (Instantaneous Field of View) is the smallest detail within the FOV that can be detected or seen at a set distance, the unit is rad, The formula is this: **IFOV=(Pixel Size)/(Lens focal length)**.
- **D:S theoretical** (=1/IFOV theoretical) is the calculated spot size based on the pixel size of the Thermal Imager detector array and lens focal length.

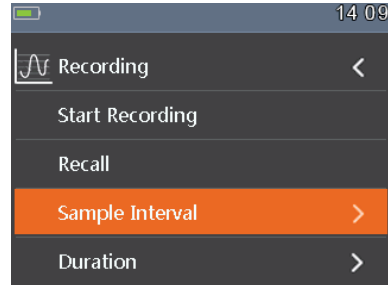
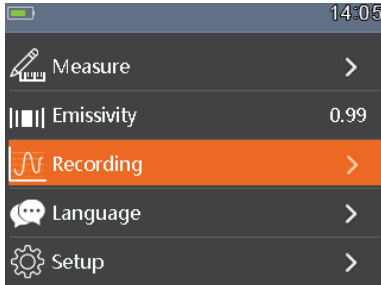
**Example:** If Thermal Imager uses 9mm lens, because the Pixel Size of detector is 34um, Horizontal FOV is 17°, Vertical FOV is 17°, the IFOV is 34um/9mm = 3.78mrad; D:S theoretical ( = 1/ IFOV theoretical) = 265:1.

- **D:S measure** ( = 1/ IFOV measure) is the spot size needed to provide an accurate temperature measure.
- Typically, D:S measure is 2 to 3 times smaller than D:S theoretical, which means the temperature measurement area of the target need to be 2 to 3 times larger than that determined by the calculated theoretical D:S.



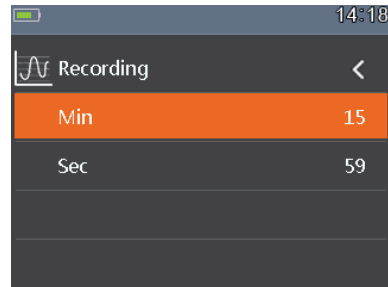
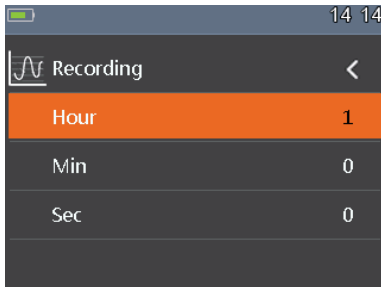
## 7.Menu Settings

1. Press **Menu** Key into menu function, use the ▲ or ▼ key to select symbol "Recording", and Enter ► Record Menu.



2. In Record Menu press the ▲ or ▼ key to select Sample Interval Item or Duration Item, press the Button ► Enter Record setting, then Press the ▲ or ▼ key to adjust time.

- Setting of sampling interval from **1second** to **59min:59s**.
- Setting of recording duration, from **1second** to **9h:59min**.



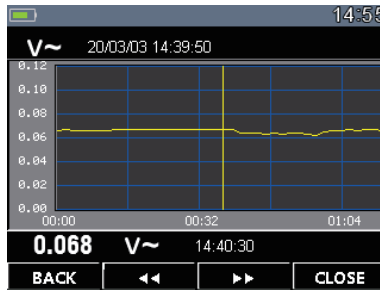
3. In Record Menu press the ▲ or ▼ key to select "Start record" Item, press the Button ► enter save record measurement; In Save Record measurement, press the Button ► to stop record and press the Button ◀ save.



4. In Record Menu, press the ▲ or ▼ key to select "Recall" Item, press the Button ► Enter View Record measurement.

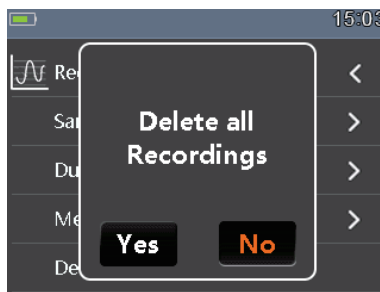


• Press the ◀ key to Trend record and press the ◀ or ▶ key to select previous record measurement or next record measurement and press the ▶ key to exit view record measurement.

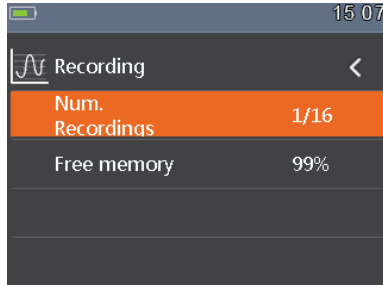


• In Record View Display and press the ◀ or ▶ key to move the cursor on the graph.

5. In Record Menu, press the ▲ or ▼ key to select "Delete all Recordings" Item, press the ► key enter delete box and select Yes or No.

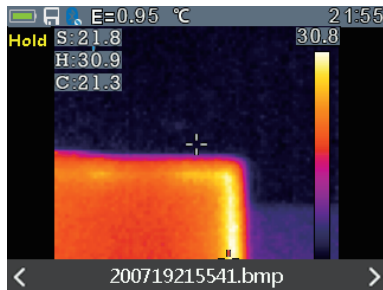


6. In Record Menu, press the ▲ or ▼ key to select "Memory" Item, press the the ► key/Enter to view Record memory space.



**Note:** No recording function in insulation and Low OHM test mode.

## 8. Image Browser



## 9. Maintenance

**CAUTION:** Only expert and trained technicians should perform maintenance operations, Before carrying out maintenance operations, disconnect all cables from the input terminals.

**CAUTION:** Do not use the instrument in environments with high humidity levels or high temperatures, Do not expose to direct sunlight.

**CAUTION:** Always switch off the instrument after use, In case the instrument is not to be used for a long time, remove the battery to avoid liquid leaks that could damage the instrument's internal circuits.

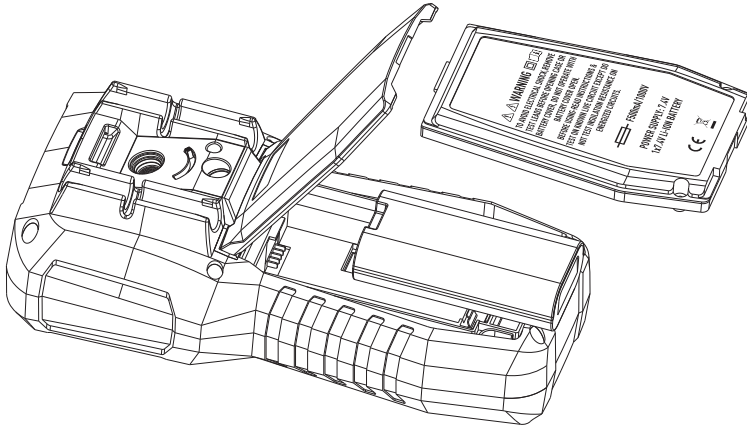
### 9-1.Recharging the Internal Battery

When the LCD displays symbol "☐", it is necessary to Replace the batteries.

**WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery cover.

**WARNING:** To avoid electric shock, do not operate the meter until the battery cover is in place and fastened securely.

1. Turn the Meter off and remove the test leads from the terminals.
2. Remove the battery door assembly by using a standard blade screwdriver to turn the battery door screw one-half turn counterclockwise.
3. Replace the batteries 7.4V Li-ION battery.
4. Reinstall the battery door assembly and secure it by turning the screw one-half turn clockwise.

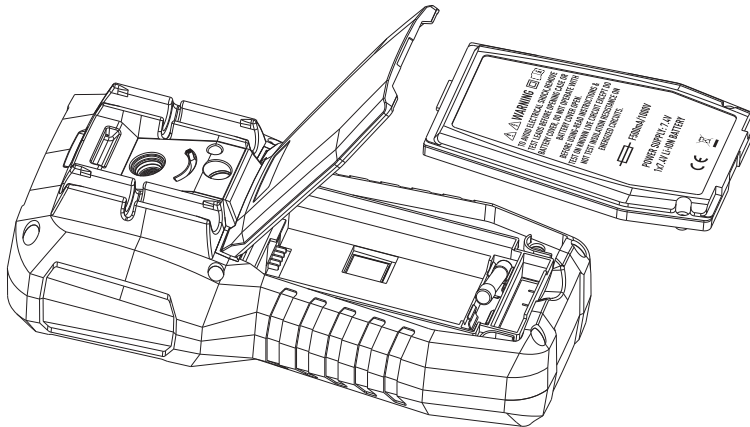


## 9-2.Replacement of Internal Fuses

**WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the meter cover.

**WARNING:** To avoid electric shock, do not operate your meter until the fuse cover is in place and fastened securely. Examine or replace the Meter's fuses as follows:

- 1.Turn the Meter off and remove the test leads from the terminals.
- 2.Remove the battery door assembly by using a standard blade screwdriver to turn the battery door screw one-half turn counterclockwise.
- 3.Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket.
- 4.Install only specified replacement fuses.
- 5.Reinstall the battery door assembly and secure it by turning the screw one-half turn clockwise.



## 9-3.Cleaning the Instrument

- Use a soft and dry cloth to clean the instrument.
- Never use wet cloths, solvents, water, etc.

## 9-4.End of Life



**WARNING:** the symbol on the instrument indicates that the appliance and its accessories must be collected separately and correctly disposed of.



## 10. Specifications

### 10-1. Technical Specifications

#### 10-1-1. Thermal Imager

Field of View (FOV) / Minimum Focus Distance	21°x 21° / 0.5m
Spatial Resolution (IFOV)	4.53mrad
IR Resolution	80 x 80 pixels
Thermal Sensitivity/NETD	< 0.1°C at 30°C (86°F) / 100 mK
Image Frequency	50Hz
Focus Mode	Focus free
Focal Length	7.5mm
Focal Plane Array (FPA) / Spectral Range	Uncooled microbolometer / 8-14µm
Object Temperature Range	-20 to 260°C (-4 to 302°F)
Accuracy	±3°C (±3.6°F) or ±3% of reading (Environment temperature 10 to 35°C, object temperature >0°C)

#### 10-1-2. Meter and Tester

- Accuracy calculated as [%reading + (num. digits\*resolution)] at 18 to 28°C; <75%HR.

Function	Range	Resolution	Accuracy	Input Impedance
DC Voltage	600.0mV	0.1mV	±(0.8% + 8 digits)	>10MΩ
	6.000V	0.001V	±(0.5% + 5 digits)	
	60.00V	0.01V		
	600.0V	0.1V	±(0.8% + 5 digits)	
	1000V	1V		

Protection against overcharge: 1000VDC/ACrms.

Function	Range	Resolution	Accuracy (50 to 60Hz)	Accuracy (61 to 1kHz)
AC TRMS Voltage	6.000V	0.001V	±(1.2% + 5 digits)	±(2.5% + 5 digits)
	60.00V	0.01V		
	600.0V	0.1V		
	1000V	1V		

Protection against overcharge 1000VDC/ACrms.

(\*)Accuracy specified from 10% to 100% of the measuring range, sine wave. Input impedance: > 9MΩ ;

Accuracy PEAK function: ±10%rdg+25dgt, PEAK response time: 1ms.

VFD AC Voltage reading for reference only.

Function	Range	Resolution	Accuracy	Input Impedance
AC+ DC TRMS	6.000V	0.001V	±(2.5% + 20 digits)	>10MΩ
Voltage	60.00V	0.01V		
(50 to 1kHz)	600.0V	0.1V		
	1000V	1V		

Protection against overcharge: 1000VDC/ACrms.

Function	Range	Resolution	Accuracy (*)
Flexible Coil	30.00A	0.01A	±(3.0%reading + 5digits)
Current	300.0A	0.1A	
(50 to 400Hz)	3000A	1A	

Protection against overcharge: 1000ADC/ACrms.

(\*) Accuracy specified from 10% to 100% of the measuring range, sine wave.

Function	Test Current	Max Voltage with Open Circuit
Diode Test	<2mA	3.2VDC

Function	Range	Resolution	Accuracy	Buzzer
Resistance and Continuity Test	600.0Ω	0.1Ω	±(1.0% + 10 digits)	<50Ω
	6.000kΩ	0.001kΩ	±(0.8% + 5 digits)	
	60.00kΩ	0.01kΩ		
	600.0kΩ	0.1kΩ		
	6.000MΩ	0.001MΩ	±(2.5% + 10 digits)	
	60.00MΩ	0.01MΩ		

Protection against overcharge: 1000VDC/ACrms.

Function	Range	Resolution	Accuracy
Frequency (Electronic Circuits)	60.00Hz	0.01Hz	±(0.2% + 5 digits)
	600.0Hz	0.1Hz	
	6.000kHz	0.001kHz	
	60.00kHz	0.01kHz	
	600.0kHz	0.1kHz	
	6.000MHz	0.001MHz	
	10.00MHz	0.01MHz	

Protection against overcharge: 1000VDC/ACrms

Sensitivity: >±2V (at 20 to 80% Duty Cycle) and f<100kHz; >5Vrms (at 20 to 80% Duty Cycle) and f>100kHz.

Function	Range	Resolution	Accuracy
Frequency (Electrical Circuits)	40.00 to 10kHz	0.01 to 0.001kHz	±(1.0% + 5 digits)

Protection against overcharge: 1000VDC/ACrms

Sensitivity: >±2V

Function	Range	Resolution	Accuracy
Duty Cycle	10.0 to 90.0%	0.1%	±(1.2% + 8 digits)

Pulse frequency range: 40 to 10kHz, Pulse amplitude: ±5V (100s to 100ms).

Function	Range	Resolution	Accuracy
Capacity	60.00nF	0.01nF	±(3.0% + 20 digits)
	600.0nF	0.1nF	
	6.000µF	0.001µF	
	60.00µF	0.01µF	±(3.0% + 8 digits)
	600.0µF	0.1µF	
	6000µF	1µF	±(3.5% + 20 digits)

Protection against overcharge: 1000VDC/ACrms.

Function	Range	Resolution	Accuracy
Temperature with K-Type Probe	-20.0 to 600.0°C	0.1°C	±(2.5% reading + 5°C)
	600 to 1000°C	1°C	
	-20.0 to 600.0°F	0.1°F	±(2.5% reading + 9.0°F)
	600 to 1800°F	1°F	
	253.0 to 600.0K	0.1K	±(2.5% reading + 5K)
600 to 1273K	1K		

Protection against overcharge: 1000VDC/ACrms.

(\*) Instrument accuracy without probe; Specified accuracy with stable environmental temperature at ±1°C.

For long-lasting measurements, reading increases by 2°C.

Function	Range	Resolution	Accuracy
Low OHMS	1.00 to 60.00Ω	0.01Ω	±(1.5% + 40 digits)
	60.00 to 600.0Ω	0.1Ω	±(1.5% + 20 digits)

The open circuit voltage is about 4V and the short circuit current is greater than 200mA.

Function	Terminal Voltage	Range	Resolution	Accuracy	Test Current
Meg OHMS	125V (0 to 20%)	125k $\Omega$ -6.000M $\Omega$	0.001M $\Omega$	$\pm(3.0\% + 20 \text{ digits})$	1mA at 125k $\Omega$
		6.000M $\Omega$ -60.00M $\Omega$	0.01M $\Omega$	$\pm(2.5\% + 8 \text{ digits})$	
		60.00M $\Omega$ -600.0M $\Omega$	0.1M $\Omega$	$\pm(3.0\% + 8 \text{ digits})$	
		600.0M $\Omega$ -5000M $\Omega$	1M $\Omega$	$\pm(5.0\% + 20 \text{ digits})$	
	250V (0 to 20%)	250k $\Omega$ -6.000M $\Omega$	0.001M $\Omega$	$\pm(2.5\% + 20 \text{ digits})$	1mA at 250k $\Omega$
		6.000M $\Omega$ -60.00M $\Omega$	0.01M $\Omega$	$\pm(2.0\% + 8 \text{ digits})$	
		60.00M $\Omega$ -600.0M $\Omega$	0.1M $\Omega$	$\pm(3.0\% + 8 \text{ digits})$	
		600.0M $\Omega$ -5000M $\Omega$	1M $\Omega$	$\pm(5.0\% + 20 \text{ digits})$	
	500V (0 to 20%)	500k $\Omega$ -6.000M $\Omega$	0.001M $\Omega$	$\pm(2.5\% + 20 \text{ digits})$	1mA at 500k $\Omega$
		6.000M $\Omega$ -60.00M $\Omega$	0.01M $\Omega$	$\pm(2.0\% + 8 \text{ digits})$	
		60.00M $\Omega$ -600.0M $\Omega$	0.1M $\Omega$	$\pm(3.0\% + 8 \text{ digits})$	
		600.0M $\Omega$ -5000M $\Omega$	1M $\Omega$	$\pm(5.0\% + 20 \text{ digits})$	
	1000V (0 to 20%)	1.000M $\Omega$ -6.000M $\Omega$	0.001M $\Omega$	$\pm(3.0\% + 20 \text{ digits})$	1mA at 1.0M $\Omega$
		6.000M $\Omega$ -60.00M $\Omega$	0.01M $\Omega$	$\pm(2.5\% + 8 \text{ digits})$	
		60.00M $\Omega$ -600.0M $\Omega$	0.1M $\Omega$	$\pm(4.0\% + 8 \text{ digits})$	
		600.0M $\Omega$ -5000M $\Omega$	1M $\Omega$	$\pm(5.0\% + 20 \text{ digits})$	

A Insulation Resistance.

See Electrical Specifications <30%.

\*Indicates maximum amount allowable by standard.

## 10-2.General Specifications

### Reference Standards

Safety	IEC/EN61010-1
EMC	IEC/EN 61326-1,61557-1-2-4
Insulation	Double Insulation
Pollution Level	2
Overvoltage Category	CAT IV 600V, CAT III 1000V
Max Operating Altitude	2000m (6562ft)

### Mechanical Characteristics

Size (L x W x H)	210 x 85 x 65mm
Weight (batteries included)	680g

### Power Supply

Battery Type	1x7.4V rechargeable Li-ION battery, 2600mAh
Battery Charger Power Supply	100/240VAC, 50/60Hz, 12VDC, 2A
Low Battery Indication	symbol "☐" on the display
Auto Power Off	After 5-60min minutes' idling (May be disabled)
Fuses	500mA/1000V

### Display

Conversion	TRMS
Characteristics	Color RGB, 6000 dots with bargraph
Sampling Frequency	3 times/s

### Environmental Conditions for Use

Reference Temperature	18 to 28°C (64 to 82°F)
Operating Temperature	5 to 40°C (41 to 104°F)
Allowable Relative Humidity	<80%HR
Storage Temperature	-20 to 60°C (-4 to 140°F)
Storage Humidity	<80%HR

## 11.Accessories Provided

- Pair of Test Leads
- K-Type Wire Probe
- 1x7.4V rechargeable Li-ION battery
- Carrying Bag
- User Manual





True RMS Thermal Multimeter & Insulation/Low OHM Tester



Rev.200326