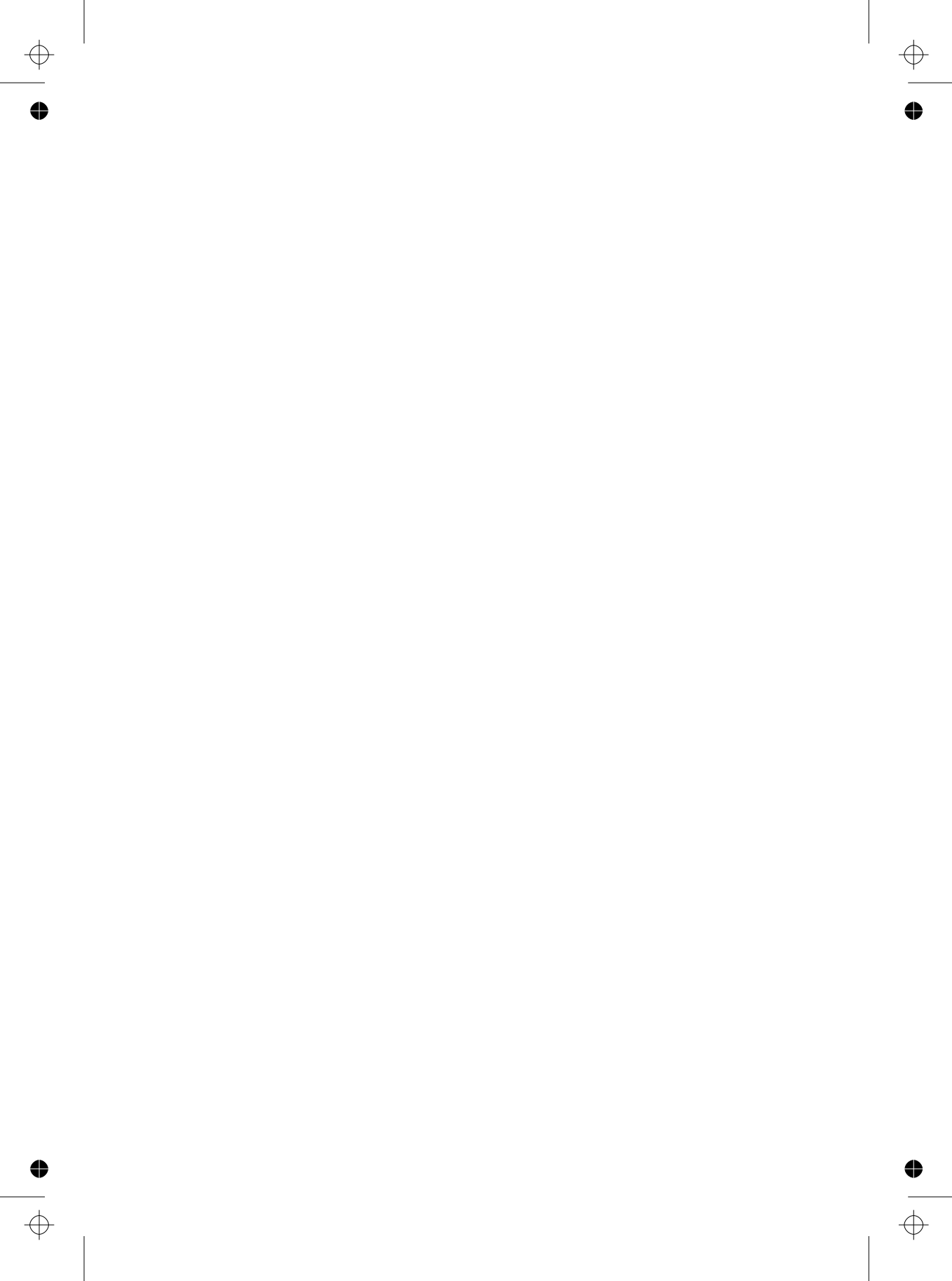


True RMS Thermal MultiMeter User Manual



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



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1. Introduction

Professional True RMS Industrial Digital Multimeter 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.

Key features

- 6000 count 2.8" 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
- DC current
- AC, AC+DC TRMS current
- Resistance and Continuity test
- Diode test
- Capacity
- Frequency
- Duty Cycle
- Temperature with K-type probe
- flexible coils current

2. Safety

2.1.safety information



This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.



This **WARNING** symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



This **CAUTION** symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.



This symbol advises the user that the terminal(s) so marked must not connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 1000 VAC or VDC.



This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.



This symbol indicates that a device is protected throughout by double insulation or reinforced insulation.

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.

2.2. 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.

- **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
mA AC/DC	800mA 1000V fast acting fuse
A AC/DC	10A 1000V fast acting fuse
Frequency, Resistance, Capacitance Duty Cycle, Diode Test, Continuity	1000VDC/AC rms
Temperature	1000VDC/AC rms
Surge Protection: 8kV peak per IEC 61010	

- **USE EXTREME CAUTION** when working with high voltages.
- **DO NOT** measure voltage if the voltage on the "COM" input jack exceeds 1000V above earth ground.
- **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.
- **ALWAYS** discharge filter capacitors in power supplies and disconnect the power when making resistance or diode tests.
- **ALWAYS** turn off the power and disconnect the test leads before opening the covers to replace the fuse or batteries.
- **NEVER** operate the meter unless the back cover and the battery and fuse covers are in place and fastened securely. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

3. Discription and reference guide

3.1. Front and back descriptions

- 1-NCV detector area
- 2-LCD Display
- 3-Navigation/Menu buttons
- 4-MODE button
- 5-RANGE button
- 6-Rotary function switch
- 7-Positive(+) Probe input jack for A (Current).
- 8-Positive(+) Probe input jack for mA (Current).
- 9-COM(-) Probe input jack
- 10-Positive(+) Probe input jack for all Inputs except A and mA
- 11-Thermal mode/Light button
- 12-Hold/Capture button



Fig 3.1 Front view

- 1-No-slip slope
- 2-Thermal imager Len
- 3-Len cover
- 4-Work light
- 5-Laser
- 6-Support plate
- 7-Battery cover lock

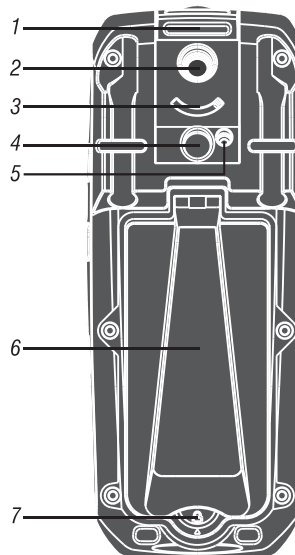


Fig 3.2 Back view

3.2. Understanding the Push Buttons

The 9 push buttons on the front of the Meter activate features that augment the function selected using the rotary switch, navigate menus or control power to Meter circuits.



• Cursor buttons:

MAX < **REL >** **PEAK >**

select an item in a menu, adjust display contrast, scroll through information, and perform data entry.

- REL >** Use Navigation UP buttons select PEAK function
- MAX <** Use Navigation Left buttons to select REL function
- PEAK >** Use Navigation Right buttons select MAX function

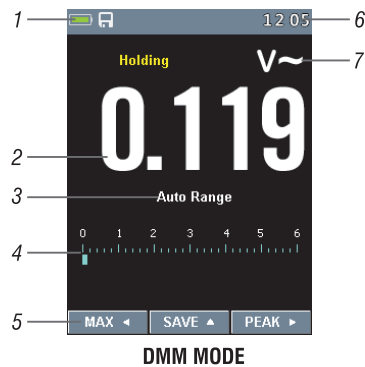
• Physical buttons:

- HOLD ESC** Freezes the present reading in the display and allows the display to be saved. Also wake up for APO.
- MODE** Press the MODE key to switch the functions;
- RANGE** Press the RANGE key to manual range.
- Menu Select** Enter function of the menu selects.
- IR** Press the IR key to switch DMM MODE and IR + DMM MODE.
- Navigation buttons** Navigation buttons.

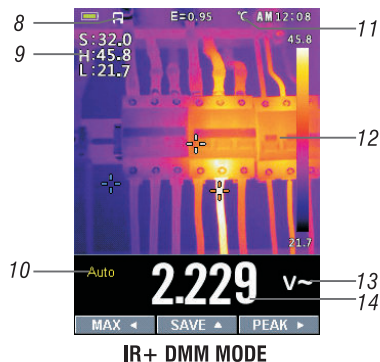
3.3. Understanding the Display

- Measurement on LCD Display

1. Indication of battery charge level
2. Indication of measuring result
3. Indication of Automatic/Manual mode
4. Analogue bargraph
5. Indications associated with function keys
6. Indication of the system's time
7. Indication of measuring unit



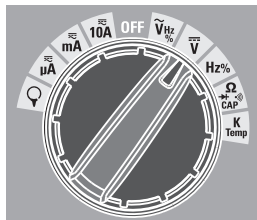
- 8.SD card
- 9.Temperature measuring result
- 10.Indication of Automatic/Manual mode
- 11.Temperature unit
- 12.IR camera
- 13.Indication of measuring unit
- 14.Indication of measuring result



Icons on LCD Display

- Voltage is over 30V (AC or DC)
- 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

3.4.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.

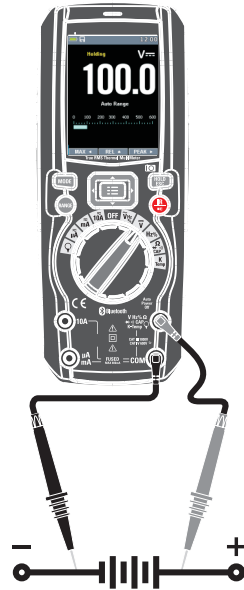
V~	AC voltage measurements
V~	DC and AC + DC voltage measurements
HZ %	Frequency and Duty measurements
Ω CAP → + →	Resistance, Diode test, capacitance and CONTINUITY measurements
K Temp	Temperature measurements
A	AC, DC and AC+DC amps measurements
mA	AC, DC and AC+DC milliamps measurements
μA	AC, DC and AC+DC microampere measurements up to 6,000 μA
	flexible coils current

4.DMM Measurement and Setup

4.1.DC Voltage Measurements

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

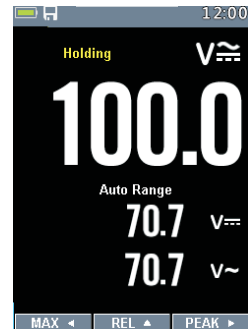
- Set the function switch to the VDC position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
- Read the voltage in the display.



4.2.AC + DC Voltage Measurements

CAUTION: Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

- Set the function switch to the VDC position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
- Press the MODE key to switch the \approx V AC + DC Voltage functions.
- Read the AC + DC voltage in the display.

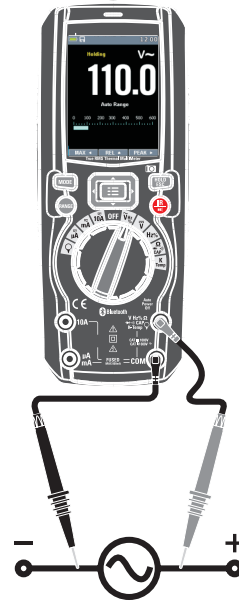


4.3.AC Voltage Measurements

WARNING: Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

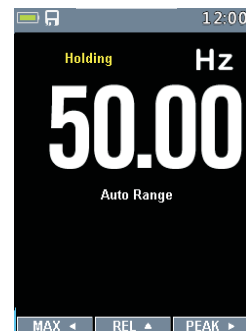
CAUTION: Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

- Set the function switch to the VAC position.
- Insert the black test lead banana plug into the negative COM jack. Insert red test lead banana plug into the positive V jack.
- Read the voltage in the main display.



4.4.Frequency Measurements

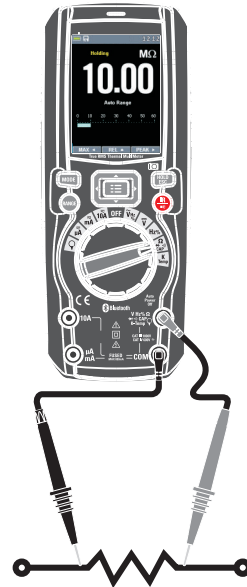
- Set the function switch to the Hz% position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
- Read the Frequency in the display.
- Press the MODE key to switch the Duty functions.
- Read the Duty in the display.



4.5. Resistance Measurements

To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

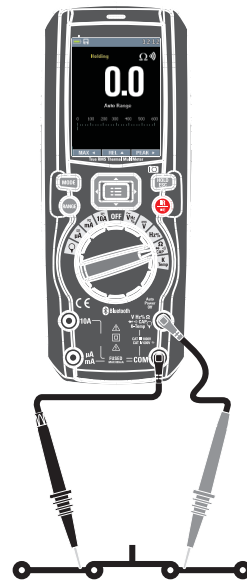
- Set the function switch to the Ω CAP \rightarrow \rightarrow position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive Ω Jack.
- Read the resistance in the display.



4.6. Continuity Check

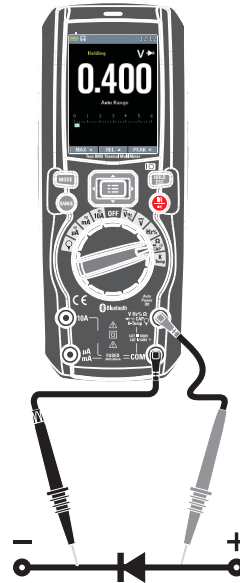
WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

- Set the function switch to the Ω CAP \rightarrow \rightarrow position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive jack.
- Press the MODE key to switch the continuity functions.
- If the resistance is less than approximately 50Ω, the audible signal will sound. If the circuit is open, the display will indicate "OL".



4.7. Diode Test

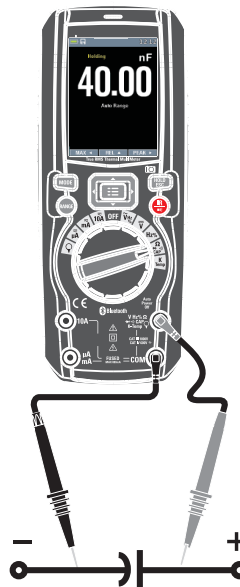
- Set the function switch to the Ω CAP \rightarrow \rightarrow position.
- Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
- Press the MODE key to switch the Diode functions.
- Forward voltage will typically indicate 0.400 to 3.000V. Reverse voltage will indicate "OL". Shorted devices will indicate near 0V and an open device will indicate "OL" in both polarities.



4.8. Capacitance Measurements

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

- Set the rotary function switch to the Ω CAP \rightarrow \rightarrow position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
- Press the MODE key to switch the Capacitance functions.
- Read the capacitance value in the Display



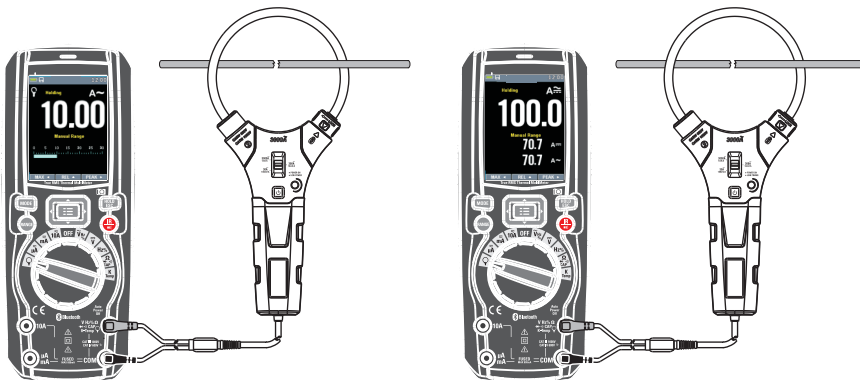
4.9. Temperature Measurements

- Set the function switch to the TEMP(°C or °F) position.
- Insert the Temperature Probe into the input jacks, making sure to observe the correct polarity.
- Read the temperature in the display.
- Press the MODE key to switch the Unit (°C or °F).



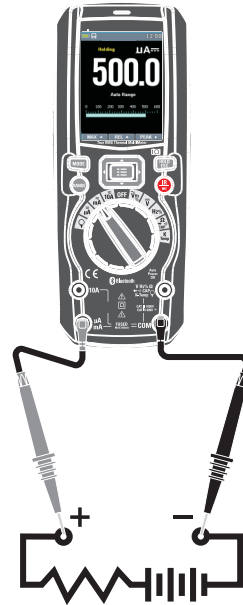
4.10. Flexible Coil Current Measurements

- Set the function switch to the Flexible coil position.
- Insert the black test lead banana plug into the negative COM jack. Insert the red test lead banana plug into the positive V jack.
- Read the current in the display.
- Press the MODE key to switch the AC, DC and AC+DC Current.
- Press the RANGE key to switch range. 1000mA, 10A, 30A, 40A, 100A, 300A, 400A, 1000A, 3000A.



4.11.DC Current Measurements

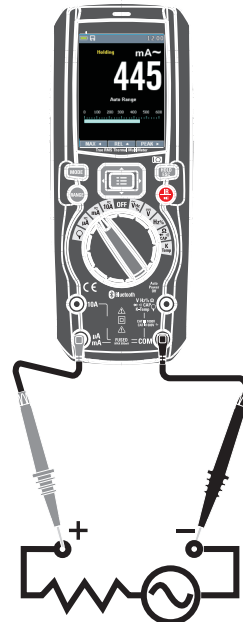
- Insert the black test lead banana plug into the negative COM jack.
- For current measurements up to $6000\mu\text{A}$ DC, set the function switch to the μA position and insert the red test lead banana plug into the $\mu\text{A}/\text{mA}$ jack.
- For current measurements up to 600mA DC, set the function switch to the mA position and insert the red test lead banana plug into the $\mu\text{A}/\text{mA}$ jack.
- For current measurements up to 10A DC, set the function switch to the 10A position and insert the red test lead banana plug into the 10A jack.
- Press the MODE button to indicate “ --- ” on the display.
- Read the current in the display.



4.12.AC Current Measurements

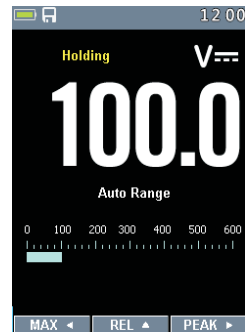
CAUTION: Do not make 10A current measurements for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

- Insert the black test lead banana plug into the negative COM jack.
- For current measurements up to $6000\mu\text{A}$ AC, set the function switch to the yellow μA position and insert the red test lead banana plug into the $\mu\text{A}/\text{mA}$ jack.
- For current measurements up to 600mA AC, set the function switch to the yellow mA position and insert the red test lead banana plug into the $\mu\text{A}/\text{mA}$ jack.
- For current measurements up to 10A AC, set the function switch to the yellow 10A position and insert the red test lead banana plug into the 10A jack.
- Press the MODE button to indicate “ \sim ” on the display.
- Read the current in the display



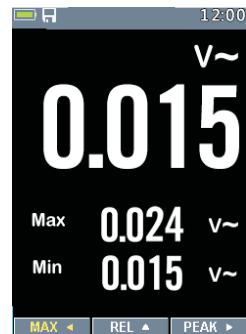
4.15. Hold and AutoHold Mode

To freeze the display for any function, press key HOLD.
And again press key HOLD to release freeze.



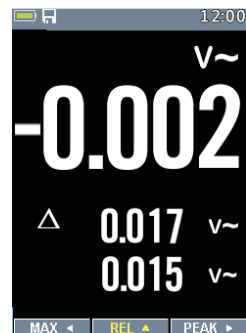
4.16. Capturing Minimum and Maximum Values

The MAX MIN Record mode captures minimum, and maximum input values. When the input goes below the recorded minimum value or above the recorded maximum value, the Meter beeps and records the new value. This mode is for capturing intermittent readings, recording minimum and maximum readings unattended, or recording readings while equipment operation precludes watching the Meter. To activate the MAX MIN mode, press soft key labeled \blacktriangleleft . If the Meter is already in MAX MIN function, press \blacktriangleleft causes the Meter to turn off MAX MIN function.



4.17. Relative Values

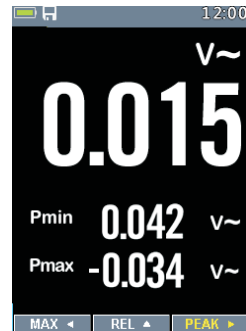
To activate the relative mode, press the soft key labeled \blacktriangle .
If the Meter is already in the relative function, press \blacktriangle causes the Meter to turn off relative.



4.18. Capturing Peak Values

To activate the peak mode, press the soft key labeled ►.

If the Meter is already in the peak function, press ► causes the Meter to turn off peak.



4.19. Non-Contact AC Voltage Detector (100 to 1000V AC)

WARNING: Risk of Electrocution. Before use, always test the Voltage Detector on a known live circuit to verify proper operation.

WARNING: Insulation type and thickness, distance from the source, and other factors may effect operation. Always verify live voltage using other methods before working on electrical circuits.

- The non-contact voltage detector operates when the meter is set to any measuring function. The detector does not operate when Auto Power Off turns the meter off or when the rotary function switch is set to the off position.
- Slowly move the detector probe closer to the conductor being tested.
- If AC voltage within the specified range is present, the indicator light will illuminate.



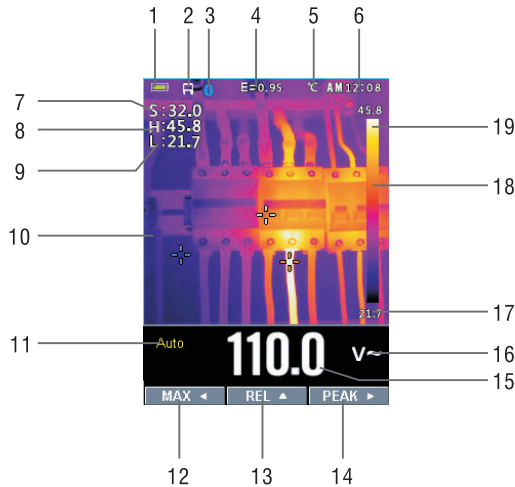
NOTES: The detector is designed with high sensitivity. Static electricity and other sources of electrical energy may randomly activate the detector. This is normal operation. The detector only activates the indicator light when AC voltage is present. It does not indicate the voltage level on the LCD display.

5. Thermal imager and DMM operation

5.1. Thermal imager basics

In the Thermal imaging and DMM 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 red "IR" button to open the Thermal Imager. In Fig5-1 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.



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 of the Thermal image frame
11. Range icon of the meter
12. Max soft button
13. REL soft button
14. PEAK soft button
15. DMM measurement is shown below the thermal image.
16. Unit of the meter
17. Lowest reading measured in the current frame
18. 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.
19. Highest reading measured in the current frame.

5.2.Using the thermal imager

For basic operation follow these steps:

- 1.Set the function switch to any position.
- 2.Press the "IR" button to switch the thermal imager ON. Target the object by the thermal imager len.
- 3.The display will show the temperature measurement in the upper left hand corner for the targeted area along with the currently selected emissivity value.
- 4.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.
- 5.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.
- 6.In the Thermal imaging mode, the meter continues to operate normally as a Multimeter allowing any of the electrical functions to be used.
- 7.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.
- 8.The thermal imager's FOV (Field of view) is 21 by 21 degrees.
- 9.FOV is the largest area that your imager can see at a set distance.
- 10.This table lists the horizontalFOV, vertical FOV and IFOV for lens.

Focal Length	Horizontal FOV	Vertical	FOVIFOV
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:

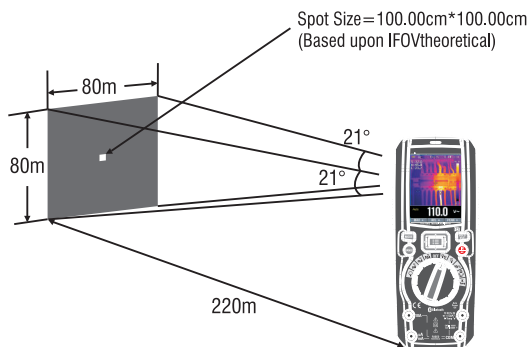
IFOV = (Pixel Size) / (Lens focal length);

$D:S_{\text{theoretical}} (= 1 / \text{IFOV}_{\text{theoretical}})$ 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 34 μ m.

Horizontal FOV is 21°, Vertical FOV is 21°, the IFOV is 34 μ m/7.5mm = 4.53mrad;

$D:S_{\text{theoretical}} (= 1 / \text{IFOV}_{\text{theoretical}}) = 220:1$



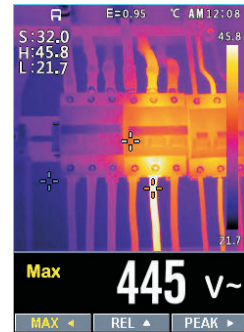
$D:S_{\text{measure}} (= 1 / \text{IFOV}_{\text{measure}})$ is the spot size needed to provide an accurate temperature measure. Typically, $D:S_{\text{measure}}$ is 2 to 3 times smaller than $D:S_{\text{theoretical}}$, which means the temperature measurement area of the target need to be 2 to 3 times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

5.3.Using the Multimeter with the thermal imager

on IR + DMM mode, MODE key, RANGE key, HOLD key and REL Function is same DMM mode.

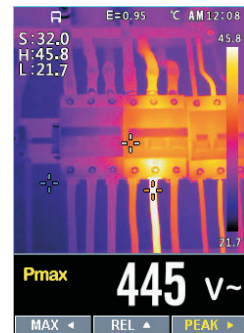
• Capturing MAXMIN Values on IR + DMM mode

- 1.To activate the maxmin mode, press the softkey labeled ◀, and display max value.
- 2.If the Meter is already in the maxmin function, then Press the ◀ key to display min value, then Press the ▶ key to display current measurement value. next press again display max value.
- 3.The Press and hold the ◀ key for more than 1 second to causes the Meter to turn off maxmin.



• Capturing Peak Values on IR + DMM mode

- 1.To activate the peak mode, press the softkey labeled ▶, and display Peak max value.
- 2.If the Meter is already in the peak function, then Press the ▶ key to display Peak min value, then Press the ▶ key to display current measurement value. next press again display Peak max value.
- 3.The Press and hold the ▶ key for more than 1 second to causes the Meter to turn off peak.



6.Settings Menus

6.1.Using Settings Menus

- Press MENU button to open the Settings Menus, as show below.



- Press UP/DOWN button to select menu item or change the value of current focus item.
- Press RIGHT/MENU button to enter the submenu or set focus on the current selected item.
Press LEFT button to return to the previous menu.
- If want to exit settings menus, can press MODE/RANGE/HOLD/IR button or press LEFT button in root menu.

6.2.Settings details

- Palette mode

Thermal imager has five kinds of palette, such as:

Press RIGHT/MENU button to select one of the display color palettes.



6.3.Temp Unit

Press RIGHT/MENU button to set focus on this option and the color of option value will change to black . Infocus state, use the RIGHT/MENU button to toggle °C, °F and K, use LEFT/RIGHT/MENU button to exit focus state and the color of option value will change white .

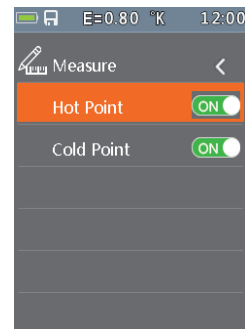


6.4.Measure

Press RIGHT/MENU button to enter measure menu.

Two selections are available: HOT POINT and COLD POINT. Press RIGHT/MENU button to set cur select item on or off.

- Hot point: This option enables thermal imager automatically detect the highest temperature point.
- Cold point: This option enables thermal imager automatically detect the lowest temperature point.



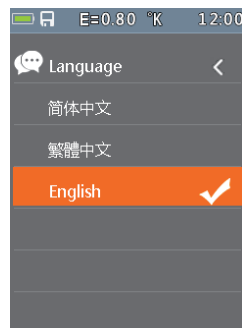
6.5.Emissivity

- Press RIGHT/MENU button to set focus on this option. In focus state, use UP /DOWN button to increase or decrease emissivity's value, use LEFT/RIGHT/MENU button to exit focus state. The available range is 0.01 to 0.99 in 0.01 steps.



6.6.Language

- Press RIGHT/MENU button to enter language menu. Three options are available: Simplified Chinese, Traditional Chinese and English. Use UP/DOWN button to select language and use RIGHT/MENU button to set selected language to be valid.

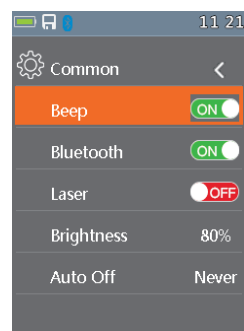


6.7.Common

Press RIGHT/MENU button to enter common menu.

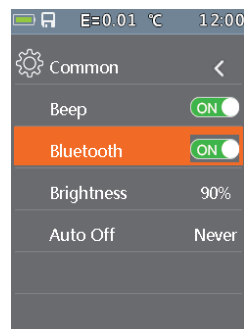
Five options are available: Beep, Bluetooth, Laser, Brightness and Auto Off.

- Beep: Use RIGHT/MENU button to set beep on or off.
- Bluetooth: Use RIGHT/MENU button to set bluetooth power on or off.
- Laser: Use RIGHT/MENU button to set laser pointer on or off.
- Brightness: Press RIGHT/MENU button to set focus on this option. In focus state, use UP/DOWN button to change LCD's brightness, use LEFT/RIGHT/MENU button to exit focus state. The available brightness's range is 100% to 10% in 10% steps.
- Auto Off: Press RIGHT/MENU button to set focus on this option. In focus state, use UP/DOWN button to choose the time period after which the meter enters the sleep mode.

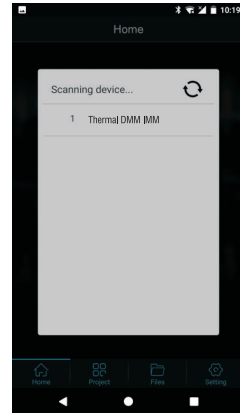
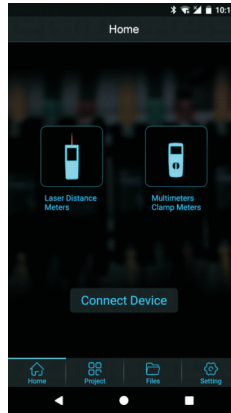


6.8.Bluetooth Connect

- Turn on the Bluetooth function on the instrument.



2. Turn on the bluetooth of smartphone, press the icon Thermview+ and enter into the home interface, Then press Connect Device icon on the Home interface, bluetooth device name will appear.



3. Touch the device "Thermal DMM IMM" listed in bluetooth sheet, it will be transmitted to laser distance meter measuring interface after connection.

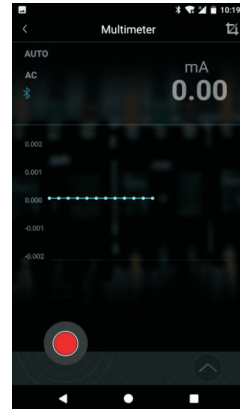
The detail information about Thermview+ , please refer to Thermview+ APP help file.

Thermview+ for Android :

Download link:

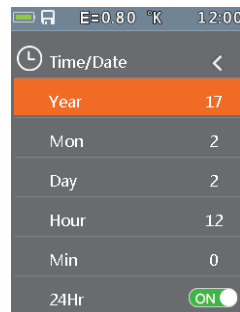
Thermview+ for iOS:

Please search in Apple store with keyword "Thermview+ ",download and run.



6.9. Time/Date

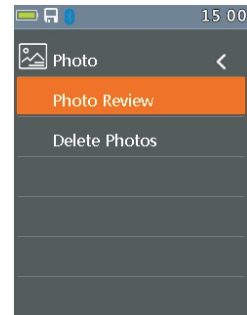
Press RIGHT/MENU button to enter time menu. In this menu, yeas, month, day, hour, minute and time formate can be set. The changes take effect after exitting settings menus.



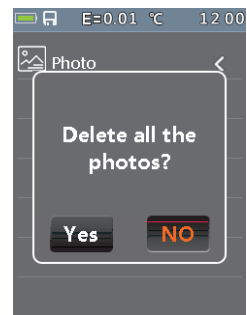
6.10.Photo

Press RIGHT/MENU button to enter photo menu.

Two options are available: Photo Review and Delete Photo.

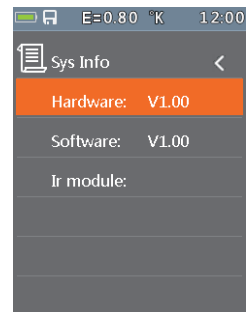


- Photo Review: Press RIGHT/MENU button to enter image browser function, and exit settings menus immediately.
- Delete Photo: After Press RIGHT/MENU button, dialog box will be displayed as shown below. Warning: Select 'YES', will delete all the photos in the memory card which captured by user.



6.11.Sys Info

Press RIGHT/MENU button to enter system information menu. This menu contains software's version, hardware's version and thermal imager's version.



6.12.Factory Set

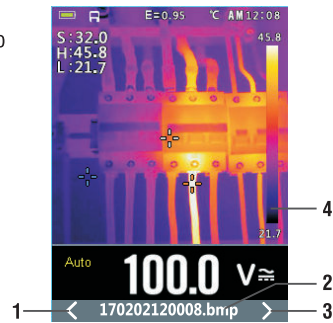
When select Factory Set option, after press RIGHT/MENU button, the dialog box will be displayed as show below. Select 'YES' button, system parameter will be reset.



7.Image Browser

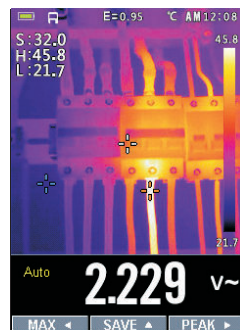
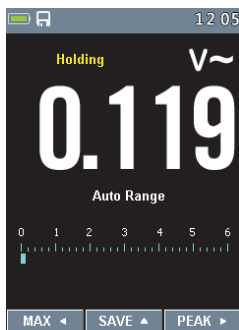
- In Image Browser mode. User can browse the pictures in the memory card. Press LEFT/RIGHT button to select prev or next picture. Press any other keys to exit Image Browser mode.

- LEFT key instruction..
- Current displayed picture's filename.
- RIGHT key instruction.
- Picture display area.



• How to capture screen

When in DMM mod or Thermal imaging + DMM mode, use HOLD button to enter hold mode, as show below. Then press UP button to capture screen. After saving to TF card completely, multimeter will exit hold mode.



8. Technical specifications

8.1. Technical characteristics

• Thermal imager

Field of view (FOV) / Minimum focus distance	21° x 21° / 0.5m
Spatial resolution (IFOV)	4.53mrad
IR resolution	80 × 80 pixels
Thermal sensitivity/NETD	< 0.1°C @ +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 / 8–14 μm
Object temperature range	–20°C to +260°C (–4°F to +500°F)
Accuracy	±3°C (±5.4°F) or ±3% of reading (Environment temperature 10°C–35°C, object temperature >0°C.)

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

• DC Voltage

Range	Resolution	Accuracy	Input impedance	Protection against overcharge
600.0mV	0.1mV	±(0.09%reading + 5digits)	>10MΩ	1000VDC/ACrms
6.000V	0.001V			
60.00V	0.01V			
600.0V	0.1V	±(0.2%reading + 5digits)		
1000V	1V			

• AC TRMS Voltage

Range	Resolution	Accuracy(*)		Protection against overcharge
		(50Hz÷60Hz)	(61Hz÷1kHz)	
6.000V	0.001V	±(0.8%reading + 5digits)	±(2.4%reading + 5dgt)	1000VDC/ACrms
60.00V	0.01V			
600.0V	0.1V			
1000V	1V			

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

Input impedance: >9MΩ;

Accuracy PEAK function: ±10%rdg, PEAK response time: 1ms

• AC+ DC TRMS Voltage

Range	Resolution	Accuracy (50Hz÷1kHz)	Input impedance	Protection against overcharge
6.000V	0.001V	±(2.4%reading + 20dgt)	>10MΩ	1000VDC/ACrms
60.00V	0.01V			
600.0V	0.1V			
1000V	1V			

• **DC Current**

Range	Resolution	Accuracy	Protection against overcharge
600.0uA	0.1uA	$\pm (0.9\% \text{reading} + 5 \text{digits})$	Quick fuse 800mA/1000V
6000uA	1uA		
60.00mA	0.01mA		
600.0mA	0.1mA	$\pm (0.9\% \text{reading} + 8 \text{digits})$	Quick fuse 10A/1000V
10.00A	0.01A	$\pm (1.5\% \text{reading} + 8 \text{digits})$	

• **AC TRMS Current**

Range	Resolution	Accuracy(*) (50Hz÷1kHz)	Protection against overcharge
600.0uA	0.1uA	$\pm (1.2\% \text{reading} + 5 \text{digits})$	Quick fuse 800mA/1000V
6000uA	1uA		
60.00mA	0.01mA		
600.0mA	0.1mA	$\pm (1.5\% \text{reading} + 5 \text{digits})$	Quick fuse 10A/1000V
10.00A	0.01A		


(*) Accuracy specified from 5% to 100% of the measuring range, sine wave.

Accuracy PEAK function: $\pm 10\% \text{rdg}$, AC+DC TRMS Current: accuracy (50Hz÷1kHz): $\pm (3.0\% \text{reading} + 20 \text{dgt})$

• **Flexible coil Current**

Range	Resolution	(50Hz÷60Hz)	(61Hz÷1kHz)	Protection against overcharge
30.00A	0.01A	$\pm (0.8\% \text{reading} + 5 \text{digits})$	$\pm (2.4\% \text{reading} + 5 \text{dgt})$	1000VDC/ACrms
300.0A	0.1A			
3000A	1A			

• **Diode test**

Function	Test current	Max voltage with open circuit
	<1.5mA	3.3VDC

• **Resistance and Continuity test**

Range	Resolution	Accuracy	Buzzer	Protection against overcharge
600.0Ω	0.1Ω	± (0.5%reading + 10dgt)	>50Ω	1000VDC/ACrms
6.000kΩ	0.001kΩ	± (0.5%reading + 5digits)		
60.00kΩ	0.01kΩ			
600.0kΩ	0.1kΩ			
6.000MΩ	0.001MΩ	± (2.5%reading + 10dgt)		
60.00MΩ	0.01MΩ			

• **Frequency (electronic circuits)**

Range	Resolution	Accuracy	Protection against overcharge
40.00Hz÷10kHz	0.01Hz÷0.001kHz	± (0.5%reading)	1000VDC/ACrms

Sensitivity: 2Vrms

• **Frequency (electronic circuits)**

Range	Resolution	Accuracy	Protection against overcharge
60.00Hz	0.01Hz	± (0.09%rdg + 5digits)	1000VDC/ACrms
600.0Hz	0.1Hz		
6.000kHz	0.001kHz		
60.00kHz	0.01kHz		
600.0kHz	0.1kHz		
6.000MHz	0.001MHz		
10.00MHz	0.01MHz		

Sensitivity: >2Vrms (@ 20% 80% duty cycle) and f<100kHz;
>5Vrms (@ 20% 80% duty cycle) and f>100kHz

• **Duty Cycle**

Range	Resolution	Accuracy
5.0%÷95.0%	0.1%	± (1.2%reading + 2digits)

Pulse frequency range: 40Hz÷10kHz, Pulse amplitude: ±5V (100us÷100ms)

• **Capacity**

Range	Resolution	Accuracy	Protection against overcharge
60.00nF	0.01nF	± (1.5%reading + 20dgt)	1000VDC/ACrms
600.0nF	0.1nF	± (1.2%reading + 8digits)	
6.000uF	0.001uF	± (1.5%reading + 8digits)	
60.00uF	0.01uF	± (1.2%reading + 8digits)	
600.0uF	0.1uF	± (1.5%reading + 8digits)	
6000uF	1uF	± (2.5%reading + 20dgt)	

• **Temperature with K-type probe**

Range	Resolution	Accuracy (*)	Protection against overcharge
-40.0°C ÷ 600.0°C	0.1°C	±(1.5%reading + 3°C)	1000VDC/ACrms
600°C ÷ 1000°C	1°C		
-40.0°F ÷ 600.0°F	0.1°F	±(1.5%rdg+ 5.4°F)	
600°F ÷ 1800°F	1°F		

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

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

- **Reference standards**


Safety:	IEC/EN61010-1
EMC:	IEC/EN 61326-1
Insulation:	double insulation
Pollution level:	2
Overvoltage category:	CAT IV 600V, CAT III 1000V
Max operating altitude:	2000m (6562ft)

- **General characteristics**

- Mechanical characteristics**

Size (L x W x H):	175 x 85 x 55mm (7 x 3 x 2in)
Weight (batteries included):	540g

- **Power supply**

Battery type:	1x7.4V rechargeable Li-ION battery, 2300mAh
Battery charger power supply:	100/240VAC, 50/60Hz, 10VDC, 1A
Low battery indication:	symbol "  " on the display
Auto Power Off:	after 15÷60min minutes' idling (may be disabled)
Fuses:	F10A/1000V, 10 x 38mm (input 10A) F800mA/1000V, 6 x 32mm (input mA uA)

- **Display**

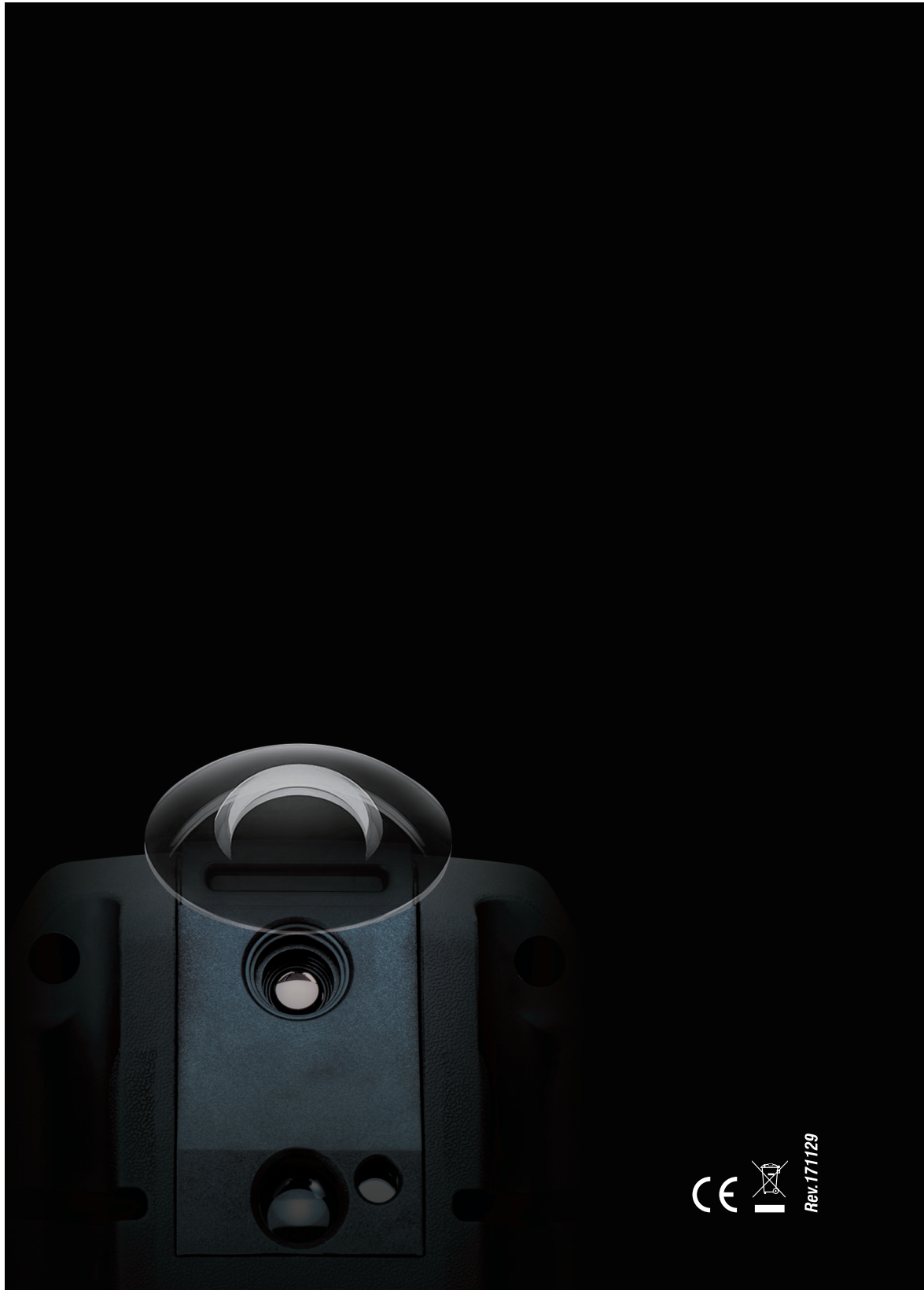
Conversion:	TRMS
Characteristics:	colour TFT, 6000 dots with bargraph
Sampling frequency:	3 times/s

8.2.Environment

Environmental conditions for use

Reference temperature:	18°C ÷ 28°C (64°F ÷ 82°F)
Operating temperature:	5°C ÷ 40°C (41°F ÷ 104°F)
Allowable relative humidity:	<80%HR
Storage temperature:	-20° ÷ 60°C (-4°F ÷ 140°F)
Storage humidity:	<80%HR





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