

# Megger<sup>®</sup>



## TC3231

Thermal camera

## User Guide

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For Patent information about this instrument refer to the following web site:

[megger.com/patents](http://megger.com/patents)

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## **Declaration of Conformity**

Hereby, Megger Instruments Limited declares that radio equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directive 2014/53/EU. Other equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directives 2014/30/EU and 2014/35/EU where they apply.

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**[megger.com/company/about-us/eu-dofc](http://megger.com/company/about-us/eu-dofc)**

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## 1. Safety Information

To ensure safe operation and service of the camera, follow these instructions.

Failure to observe warnings may result in personal injury or damage to the camera.

- Do not use the camera if the instrument appears damaged
- Do not use the camera if the instrument is not operating correctly or if it is wet.
- Avoid pointing the camera directly at the eyes.
- Precautions should be exercised when measuring in close proximity to exposed rotating parts.
- Precautions should be exercised when measuring in close proximity to exposed live parts.

### 1.1 Symbols as marked on the instrument and instruction card

Icon	Description
	Caution: Refer to User Guide.
	Equipment complies with current EU directives.
	Equipment complies with current UKCA legislation.
	N13117 Equipment complies with current 'C tick' requirements.
	Do not dispose of to landfill, sewage systems or by fire.
	USB terminal
	Micro SD card

## Description

### 2. Description

The Megger TC3231 is a professional, easy to use, thermal imaging camera. Fast accurate readings are possible, covering a wide range of surface temperatures with on-screen spot as well as max/min temperature measurement and tracking. With the added convenience of image blending provided by combining a visual and full infrared image on screen, troubleshooting and pinpointing problems is made far simpler. Captured images can be stored on the included SD card for later viewing on MAC/PC. A range of thermal image display palettes, high/low user preset alarms and fully adjustable emissivity make the Megger TC3231 an extremely versatile instrument for multiple applications.

#### 2.1 Features



- 2.2 inch (55.88 mm) 320\*240 TFT LCD display
- IR temperature measurement with resolution 32 x 31 pixels
- Range -20° to 300°C / -4°F to 572°F
- Image capture frequency 9 Hz
- Thermal sensitivity (NETD)  $\leq 150$  mK
- Adjustable emissivity
- Hot spot and cold spot tracking
- High & Low Alarm (enable & disable)
- Selectable colour palette
- Image blending with selectable distance of 0.5 m, 1 m, 2 m or 3 m
- Visual camera & images capture (.BMP) (6000 images)
- Micro SD memory card with SD card adapter
- Date/time setup controls
- Li-Ion rechargeable battery
- USB interface for charging and downloading images from SD memory
- Auto power off (10 minutes of inactivity)
- Standard camera mount

## 3. Front Panel Buttons and Camera Details



**Note:** Micro SD card MUST be inserted to store any images. The SD card symbol will be visible at the top left of the LCD screen next to the battery symbol.

**Note:** The TC3231 has a rechargeable Li-Ion battery; before using the camera for the first time charge the battery. The charger has suitable adapters for use around the world. Connect the micro USB connector to the USB port on the camera. Connect the USB lead to the charger and connect to an AC outlet and the display will illuminate.

When the battery is charging  shows on the top left corner of the display.  indicates the battery is fully charged.

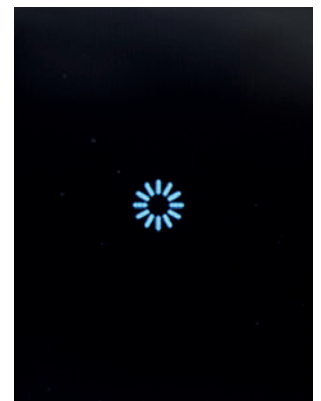
Typical charge time 0% to 100% = 3 to 4 hours.

**Note:** While charging switch the camera off.

### 3.1 Power On / Off

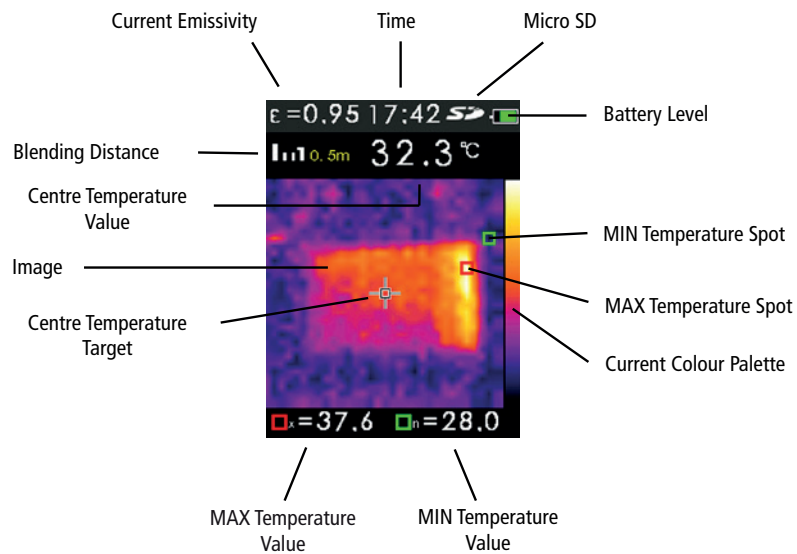
To switch on, briefly press the **MENU** button; after a few seconds the LCD illuminates with the Megger logo; the camera is now active.

To switch the camera off press and hold the **MENU** button for 5 seconds until the display shutdown symbol appears. The unit will power off in a few seconds.



## TC3231 LCD display details

### 4. TC3231 LCD display details



#### 4.1 Image Capture & Save (Measure Mode)

The TC3231 can save up to 6000 images on the supplied micro SD memory card.

To capture the image and save it to memory:



Unclip and retract the lens cover. Point the camera at the object or area of interest and pull the measurement trigger.

Press the **Enter** button to save the image.

Press the **Menu** button to cancel.

The image is now saved as a .BMP file on the Micro SD memory.

Note: Image numbers are automatically assigned by the camera.

To view the saved images use the setup menu **MEMORY** option.

(See section **13. Setup Menu MEMORY / Saved Images**)

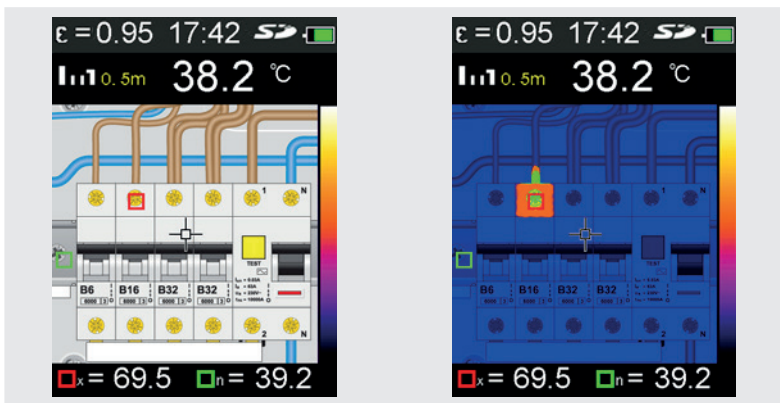


## 4.2 Image Blending

Image blending makes it easier to understand infrared heat maps through the use of an aligned visible image and full infrared heat map. The product captures a visible image with each infrared heat map to clearly show the target area.

It is possible to adjust the blending between visible images to a full infrared heat map in increments in the measure mode.

The **UP / DOWN** buttons select the blending in increments. Once the required blend is selected, pull the measurement trigger and then press the **Enter** button to store the image.



Note: Images for illustration only

## Setup Menu Options

### 5. Setup Menu Options

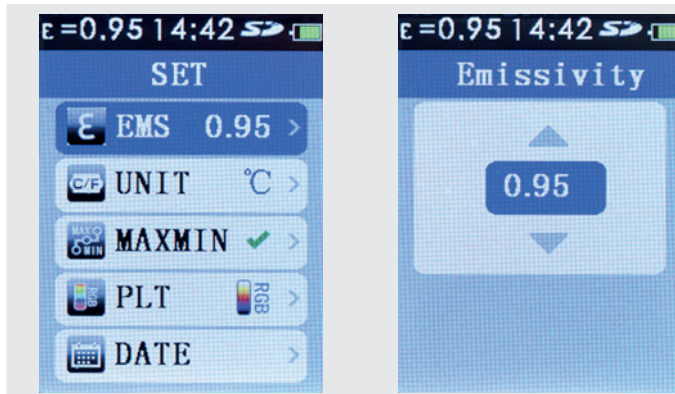
To enter the setup menu press the **MENU** button

The menu has options as listed below:

Setup menu items	Description
EMS	Adjust emissivity
UNIT	Select the temperature unit (°C / °F)
MAXMIN	Display max / min value (On/Off)
PLT	Select thermal colour palette
DATE	Set date and time
MEMORY	Display / Delete saved pictures
BGT	Adjust background temperature
ALARM	Enable / Disable / Adjust the high & low alarm levels
DISPLAY	Adjust LCD brightness
DIST	Select Image Blending distance
LANG	Languages
INFO	Camera information / SD card size



#### 5.1 Setup Menu Emissivity



Note: All menu settings are retained when the instrument is switched off

Press the **MENU** button to enter the setup menu. Use **UP / DOWN** navigation buttons to highlight EMS.

The current emissivity is displayed. Press the **Enter** button and press the **UP / DOWN** navigation buttons to adjust emissivity. Press the **MENU** button; the new value is now stored and displayed. Press the **MENU** button again to exit the setup menu.

## 5.2 Emissivity

Definition of emissivity is the ratio of the energy radiated from a material's or object's surface to that radiated from a perfect emitter, known as a blackbody.

It is a value between 0 (for a perfect reflector) and 1 (for a perfect emitter).

The emissivity of a surface depends on two variables; the material and the nature of the surface itself. A polished metal surface will have a low emissivity, while an oxidized metal surface will have a fairly high emissivity. The emissivity is also dependent on the temperature of the surface.

Typically, 90% of organic materials and painted or oxidized surfaces have an emissivity of 0.95. Inaccurate readings will result from measuring shiny or polished metal surfaces. To compensate, cover the surface to be measured with masking tape or matt / flat black paint and allow time for the tape/paint to reach the same temperature as the material underneath it. An accurate measurement can then be made of the taped/painted surface.

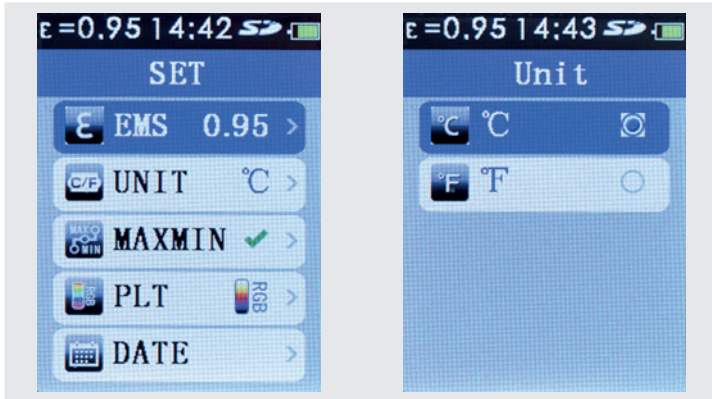
Typical Emissivity Values			
Substance	Emissivity	Substance	Emissivity
Asphalt	0.90 - 0.98	Aluminium Foil	0.04
Concrete	0.94	Aluminium (oxidized)	0.01 - 0.40
Cement	0.96	Brass (oxidized)	0.50 - 0.65
Sand	0.90	Chromium oxides	0.81
Earth	0.92 - 0.96	Copper oxides	0.78
Water	0.92 - 0.96	Copper (oxidized)	0.20 - 0.88
Ice	0.96 - 0.98	Steel (oxidized)	0.79 - 0.80
Snow	0.83	Zinc (oxidized)	0.10 - 0.11
Glass	0.90 - 0.95	Iron (oxidized)	0.50 - 0.90
Ceramic	0.90 - 0.94	Iron (rust)	0.65 - 0.96
Marble	0.94	Wood	0.80 - 0.90
Plaster	0.80 - 0.90	Graphite	0.70 - 0.80
Plasterboard	0.91	PVC	0.91 - 0.93
Mortar	0.89 - 0.91	Coal	0.80
Brick	0.93 - 0.96	Cardboard	0.81
Rubber (black)	0.94	Cloth (black)	0.98
Plastic	0.85 - 0.95	Human Skin	0.97 - 0.99
Textiles	0.90	Charcoal (powder)	0.96
Paper	0.70 - 0.94	Electrical Terminal Blocks	0.60

## Setup Menu Options

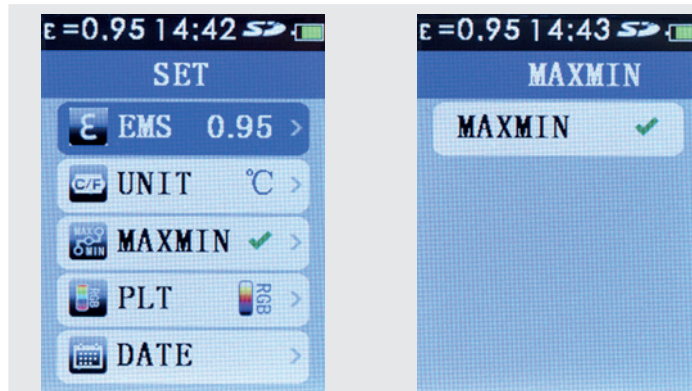
### 5.3 Setup Menu Temperature Unit (°C / °F)

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight **UNIT**.

The current temperature unit is displayed. Press the **Enter** button and press the **UP / DOWN** navigation buttons to select °C or °F. Press the **Enter** button; the selection is now stored and displayed. Press the **MENU** button again to exit the setup menu.




## 5.4 Setup Menu MAXMIN settings



The **MAXMIN** setting, when enabled, indicates the position of the highest and lowest temperatures as well as their values at the bottom of the LCD display.

Red square x = Highest temperature

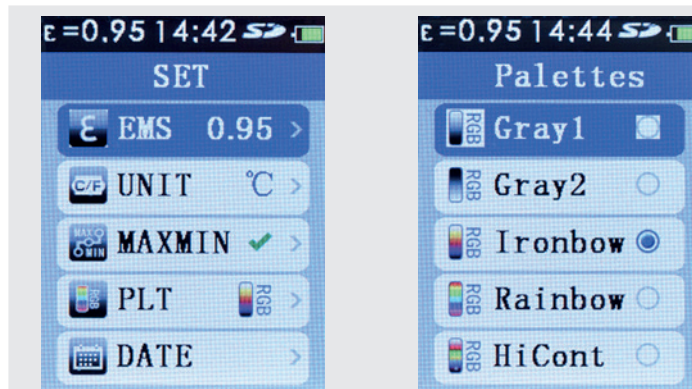
Green square n = Lowest temperature

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **MAXMIN** option. The **MAXMIN** option will either indicate  (On) or X (Off)

To enable or disable the MAXMIN option, press the **Enter** button. Use the **Enter** button again to enable or disable the MAXMIN. Press the **MENU** button twice to exit the setup menu.

MAXMIN readings will not be displayed with MAXMIN disabled.

## 5.5 Setup Menu PLT (Thermal Display Palette) settings

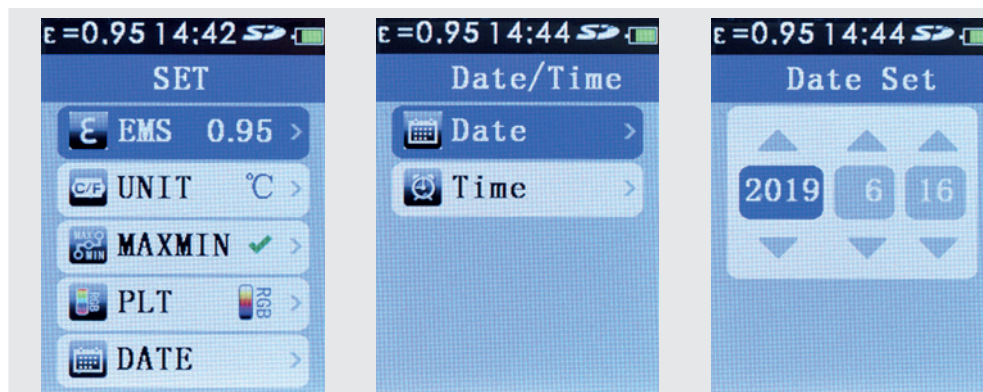


The **PLT** setting allows a user defined choice of the thermal display palette on the LCD displayed images.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **PLT** option. Press the **Enter** button.

Use the **UP / DOWN** navigation buttons to highlight the desired palette. Press the **Enter** button to store the selected palette. Press the **MENU** button to exit the setup menu. The selected palette is now displayed.

## 5.6 Setup Menu DATE settings



Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **DATE** option. Press the **Enter** button.

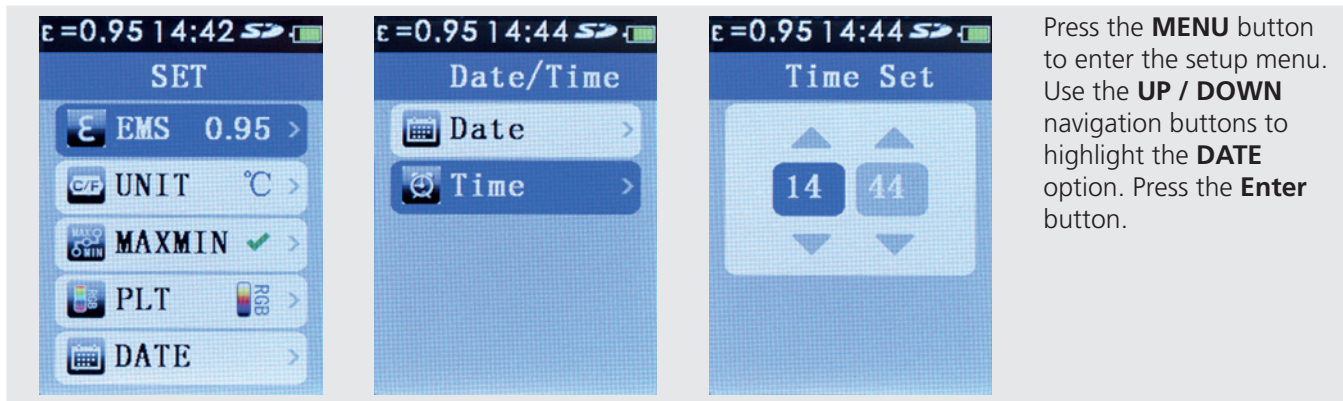
Use the **UP / DOWN** navigation buttons to highlight the Date settings. Press the **Enter** button to set the date. Press the **Enter** button repeatedly to select year / month / day.

The **UP / DOWN** navigation buttons change the year / month / day

Once the date is set press the **MENU** button 3 times to exit the setup menu.

## Setup Menu Options

### 5.7 Setup Menu TIME settings (24 hr)



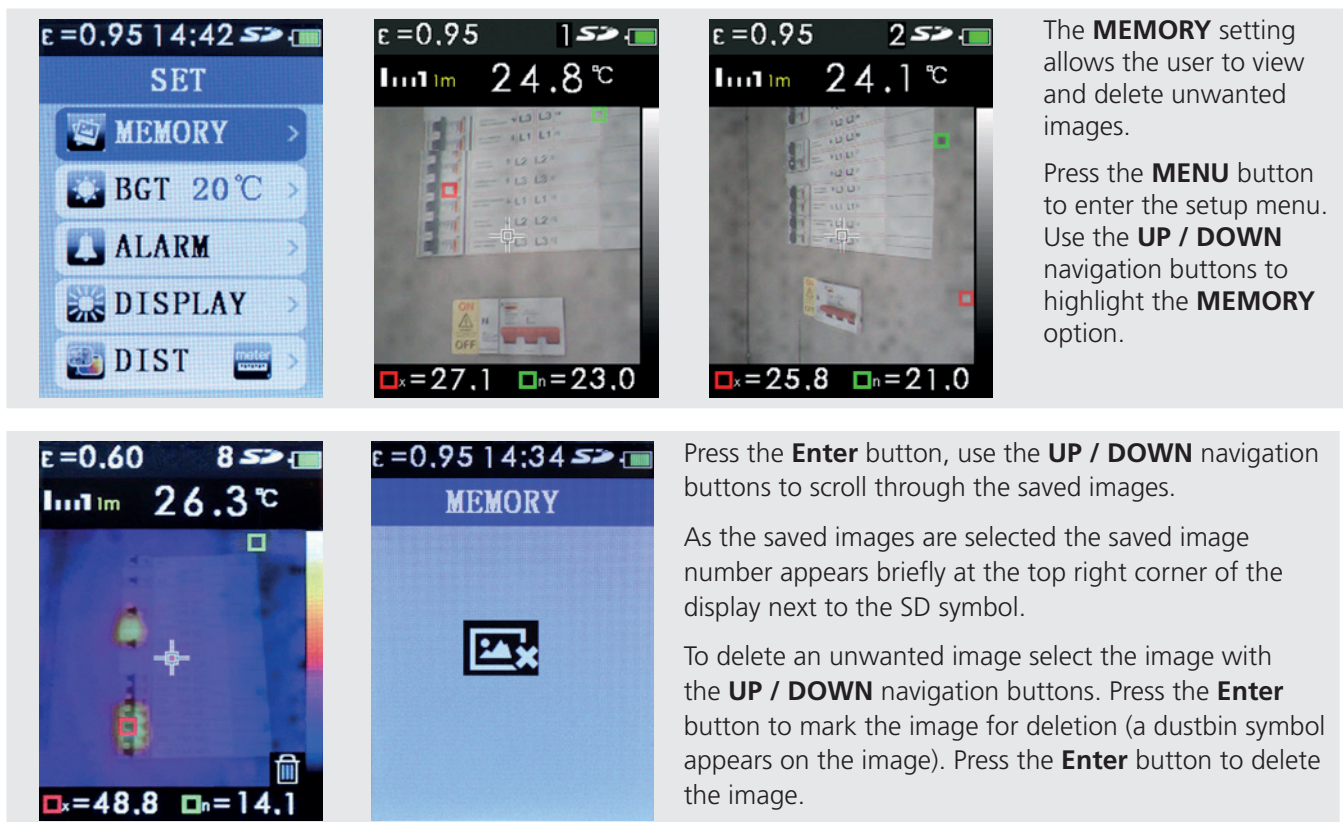
Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **DATE** option. Press the **Enter** button.

Use the **UP / DOWN** navigation buttons to highlight the **Time** settings. Press the **Enter** button to set the time. Press the **Enter** button repeatedly to select hour / minutes.

The **UP / DOWN** navigation buttons change the hour / minutes.

Once the time is set press the **MENU** button 3 times to exit the setup menu.

### 5.8 Setup Menu MEMORY / Saved Images



The **MEMORY** setting allows the user to view and delete unwanted images.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **MEMORY** option.

Press the **Enter** button, use the **UP / DOWN** navigation buttons to scroll through the saved images.

As the saved images are selected the saved image number appears briefly at the top right corner of the display next to the SD symbol.

To delete an unwanted image select the image with the **UP / DOWN** navigation buttons. Press the **Enter** button to mark the image for deletion (a dustbin symbol appears on the image). Press the **Enter** button to delete the image.

**Note:** When all the images are deleted the **MEMORY** empty screen is shown. Press the **MENU** button twice to exit the setup **MEMORY** option.

Saved images can be accessed on a PC by attaching the supplied USB cable to a PC USB port. The Micro SD card is recognised as a Removable Disk on the PC. The image files are located in a folder marked IMG. Alternatively, the Micro SD card can be removed from the camera and inserted into the supplied SD card adapter for connection to a standard PC SD card port.

## 5.9 Setup Menu BGT Background Temperature settings



The BGT setting allows the user to set the background temperature.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **BGT** option. The set background temperature is displayed.

Press the **Enter** button, use the **UP / DOWN** navigation buttons to set the background temperature. Press the **Enter** button to store the temperature.

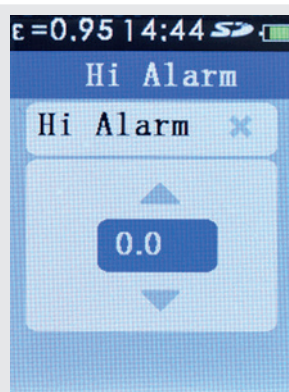
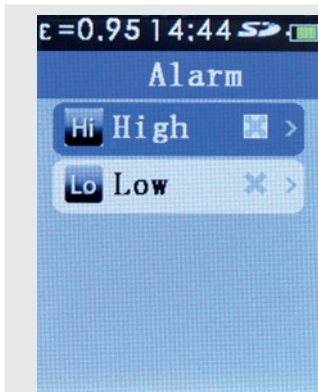
Press the **MENU** button to exit the setup menu.

## 5.10 Setup Menu High / Low Temperature Alarm settings



If required, the ALARM setting allows user to preset either or both a high and low threshold temperature alarm. A tone will sound when the high / low thresholds are viewed.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation button to highlight the **ALARM** option. Press the **Enter** button to enable / disable / adjust the alarm settings.

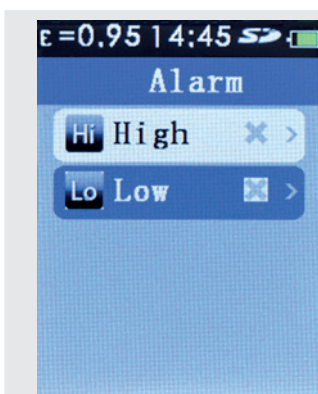


### High level alarm option

Use the **UP / DOWN** navigation buttons to highlight the High option. Press the **Enter** button.

Use the **UP / DOWN** navigation buttons to set the Hi Alarm level. Press **Enter** button to enable the Hi Alarm .

Press the **MENU** button 3 times to exit the ALARM and setup menu or once to enable / disable / set the Low alarm .



### Low level alarm option

Use the **UP / DOWN** navigation buttons to highlight the Low option.

Use the **UP / DOWN** navigation buttons to set the Lo Alarm level. Press **Enter** button to enable the Lo Alarm .

Press the **MENU** button 3 times to exit the ALARM and setup menu or once to enable / disable / set the High alarm (As above)

## Setup Menu Options

### 5.11 Setup Menu LCD Brightness



The DISPLAY setting allows the user to adjust the LCD brightness.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **DISPLAY** option.

Press the **Enter** button, use the **UP / DOWN** navigation buttons to adjust the level. Press the **MENU** button twice to exit the setup menu.

### 5.12 Setup Menu Image Blending (metric / imperial units)

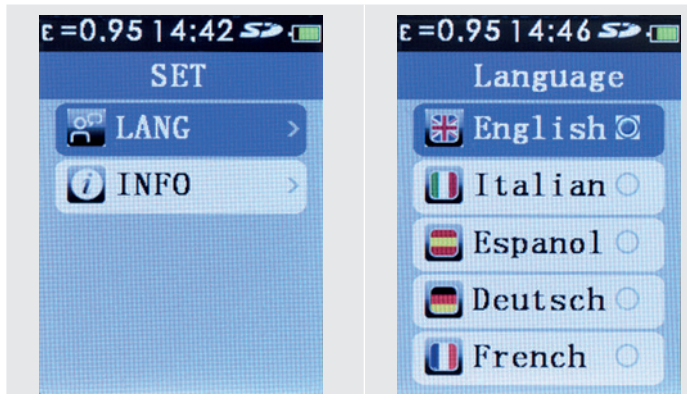


Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the DIST option. Press the **Enter** button.

Use the **UP / DOWN** navigation buttons to select Unit (metres or feet). Press the **Enter** button to store the selected Unit. Press the **MENU** button to exit the setup menu.

In the Measure Mode, you can use the **LEFT** and **RIGHT** navigation buttons to adjust image blending distance.

### 5.13 Setup Menu Language Selection



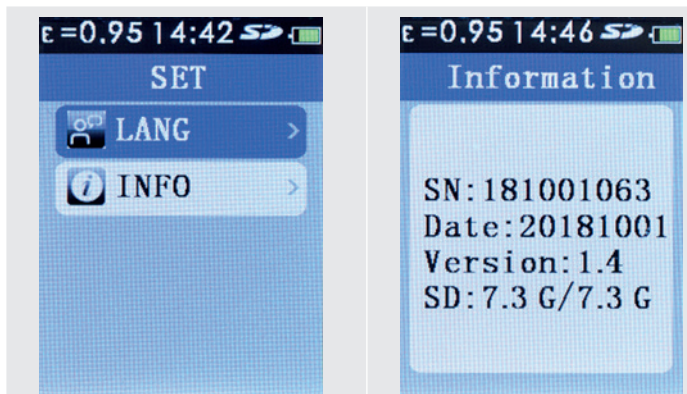
Languages available: English, Italian, Espanol, Deutsch and French.

Press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the LANG option. Press the **Enter** button.

Use the **UP / DOWN** navigation buttons to select the required language. Press the **Enter** button to store the selection.

Press the **MENU** button to exit the setup menu

### 5.14 Setup Menu Camera Information



The setup option **INFO** displays the camera serial number, date of manufacture, firmware version and size of the fitted micro SD card.

To view press the **MENU** button to enter the setup menu. Use the **UP / DOWN** navigation buttons to highlight the **INFO** option. Press the **Enter** button.

Press the **MENU** button twice to exit the setup menu



## 6. Specifications

<b>Temperature</b>	
Temperature Measurement Range	-20 to 300 °C / -4° to 572°F
Temperature Measurement Accuracy	+/-2% +/-2°C as tested (at 25 °C)
On-Screen Emissivity Correction	Yes
On-Screen Reflected Background Temperature Compensation	Yes
<b>Image Performance</b>	
Image Capture Frequency	9 Hz
Detector Type	Un-cooled pyroelectric ceramic
Thermal Sensitivity (NETD)	≤ 150 mK
Infrared Spectral Band	6.5 μm to 14 μm
Visual Camera	48608 pixels
Field of View	38 ° x 38 °
Focus Mechanism	Fixed Focus
<b>Image Presentation</b>	
Palettes	Hot Metal, Ironbow, Rainbow, Rainbow High Contrast, Grayscale (white hot) and Grayscale (black hot)
Level and Span	Auto
<b>Blending Information</b>	
Parallax Correction of Visual and IR blending	0.5 m, 1.0 m, 2.0 m, 3.0 m
View Options	Blending of the visual and the infrared from full infrared to full visual in 25 % steps
Hot Spot and Cold Spot Tracking	Yes
<b>Image capture and data storage</b>	
Image Capture	Image available for review before saving
Storage Medium	Micro SD memory card, stores up to 6000 images on the supplied micro SD card
File Format	.bmp
Memory Review	Scroll through all saved images and view on-screen images / delete unwanted images
Operating Temperature	0 °C to +50 °C
Storage Temperature	-20 °C to +60 °C
Relative Humidity	10 % to 90 % non-condensing
Display	2.2 inch (55.88 mm) diagonal 320 x 240 TFT LCD
Overload Display	----
Dimensions	208 mm (H) x 62 mm (W) x 150 mm (D)
Weight	406 g (including battery)
Battery (fitted)	18500 3.7 V 1400 mAh Li-Ion
Auto Power Off	10 minutes

## Maintenance

### 7. Maintenance

Do not attempt to repair this camera. It contains no user-serviceable parts.

Repair or servicing should only be performed by qualified personnel.

#### 7.1 Cleaning

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

#### 7.2 WEEE Directive

The crossed out wheeled bin symbol on the instrument and on the batteries is a reminder not to dispose of them with general waste at the end of their life. Megger is registered in the UK as a Producer of Electrical and Electronic equipment. The registration No is; WEE/DJ2235XR.

Users of Megger products in the UK may dispose of them at the end of their useful life by contacting B2B Compliance at [www.b2bcompliance.org.uk](http://www.b2bcompliance.org.uk) or by telephone on 01691 676124. Users of Megger products in other parts of the EU should contact their local Megger company or distributor.

##### **Battery Disposal**

The battery in this product is classified as Portable Batteries under the Batteries Directive. Please contact Megger Ltd for instructions on the safe disposal of this battery. For disposal of batteries in other parts of the EU contact your local distributor. Megger is registered in the UK as a producer of batteries. The registration number is BPRN01235.

For further information see [www.megger.com](http://www.megger.com)

### 8. Warranty (2 years)

This meter is warranted to the original purchaser against defects in material and workmanship for 2 year from the date of purchase. During this warranty period, the manufacturer will, at its option, replace or repair the defective unit, subject to verification of the defect or malfunction. This warranty does not cover fuses, disposable batteries, or damage from abuse, neglect, accident, unauthorised repair, alteration, contamination, or abnormal conditions of operation or handling.

Any implied warranties arising out of the sale of this product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. The manufacturer shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expense or economic loss. Some states or countries laws vary, so the above limitations or exclusions may not apply to you.

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**The company reserves the right to change the specification or design without prior notice.**

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