METREL **MD 9910**
Thermal camera

MD 9910
User manual

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CE Mark on your equipment certifies that this equipment meets the requirements of the EC (European Community) regulations concerning safety and electromagnetic compatibility.

Table of contents

1. Introduction

The thermal camera is handheld imaging camera used for predictive maintenance, equipment troubleshooting, and verification. Thermal images are displayed on the LCD and can be saved to internal memories. With Bluetooth instant share function, thermal images can be transferred to smart phone for analyse, share and report quickly.

Key features:

- 80x80 pixel thermal imaging system.
- Real temperature measurements in 6400 points.
- Hot, Cold, Centre temperature tracking with crosshairs.
- Large, easy-to-read, bright graphical TFT display.
- 50Hz thermal image frame rate.
- Bluetooth image instant share and save with Android smart device.
- Scene temperature range lock function.
- With LED flashlight function.
- Up to 8 hours work with rechargeable battery.
- Smart, compact and rugged industrial design.

2. Safety

Terms in this manual

WARNING identifies conditions and actions that could result in serious injury or even death to the user.

CAUTION identifies conditions and actions that could cause damage or malfunction in the instrument.

⚠ 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.

CAUTION

- Improper use can damage the meter. Please read and understand all of the information provided in this User Guide and other included documentation before use.
- Refer to the CAUTION statement label (shown below) for critical safety information.

3. Quick Start Guide

First steps

The thermal camera is intuitive and easy to use. Here are the first steps (covered in more detail later in this Guide):

- Press and hold the Power button for >2 seconds to power ON. The startup screen with logo will appear, followed by the thermal camera display. If the battery requires recharging, refer to Section 3.2 below.
- Point the lens toward the area or object of interest to view the thermal image. Relative temperature is represented by colours: hot to cold (light to dark, respectively). The IR Temperature reading represents the temperature of the spot targeted by the crosshairs on screen. At the same time, the hot and cold temperature points will displayed.
- Short-press trigger to freeze/capture the image. Press “OK” to save image or press “SHARE” to share the image with smart devices. Trigger again to discard the image.
- Press “LOCK” to lock current scene’s temperature range. Press “LOCK” again to discard.

Powering and charging the thermal camera

Press and hold the power button for >2 seconds to switch the unit on.
A start-up screen (a thermal image with logo) will appear. The unit is now ready to use. To switch off, press and hold power button for > 2 seconds.
Note that the Auto Power Off function switches the unit off automatically after a programmed period of time.

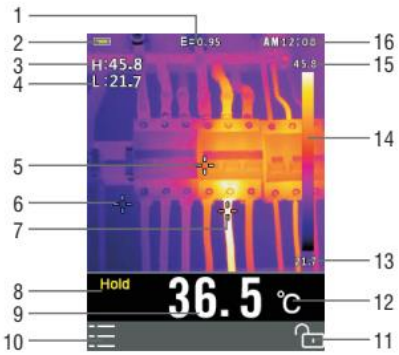
With the power on, the battery status icon is located at the top left of the display. When battery power is low, connect to an AC source or a computer USB port using the supplied USB cable. USB port is located at top of the unit. See Figure 1.

When powered off, the battery charging is indicated with red LED. If the red LED is off, it indicates the battery is full.
The unit can also be powered up and in use while charging in which case the battery symbol is animated in the upper left.

Figure 1: USB port

The IR thermal Imaging Display

1. Current Emissivity setting
2. Battery indicator
3. Hot temperature point reading
4. Cold temperature point reading
5. Centre crosshair
6. Lowest temperature crosshair
7. Highest temperature crosshair
8. Image freeze/hold icon
9. Centre temperature point reading
10. "OK" button
11. "LOCK" button
12. Current temperature unit
13. Scene Low Temperature
14. Palette scale
15. Scene High Temperature
16. Time clock



Control Buttons and Trigger

Became familiar with the operation of the control buttons and the trigger as described below.

- POWER / BACK / LOCK button

Press and hold >2 seconds to cycle the meter power ON or OFF. Short press to exit a menu screen. Also used to lock the current scene temperature range. Icon "" will appear on the display above the button when this option is available.

- OK / MENU button

Short press to access the Settings Menu, to confirm an edit, or to save an image when prompted. An "OK" icon appears on the display above the button when this option is available.

- UP and DOWN navigation arrow buttons

Scroll the Settings Menu or select a menu item setting.

- TRIGGER / LED flashlight

Short press will take a snapshot of the current image. Short press again to discard image and return to live image mode. Long press will turn the LED flashlight on, repeated long press will turn it off.

Measure, Save, Delete, and Review IR Images

- Point the thermal camera toward the object or area of interest.
- Pull the trigger to capture the image. Press OK / MENU button to save image. Press POWER / BACK / LOCK button to share the image. "Save" and "share" options are indicated on screen.
- To review an image see the chapter Settings Menu..
- To delete images from the internal memory, access the Settings Menu and delete the stored images as described in the chapter Settings Menu..

WARNING: All images are deleted when the internal memory is erased.

4. Product Description

Front descriptions:

1. TFT Colour Display
2. MENU-OK button
3. UP-Down arrow buttons
4. Lanyard slot
5. POWER / BACK button

Back descriptions:

1. LED flashlight
2. IR Imaging lens
3. Trigger

Top descriptions

1. Battery Charging LED indicator
2. USB Battery charging interface

Display Icon and Indicator Description

°F K °C	Temperature units		Centre crosshair
H	Max temperature reading		Hot crosshair
C	Minimum temperature reading		Cold crosshair
Hold	Freeze image icon		Unlock icon
AM	12h time format		Lock icon
	IRON Color palette		Bluetooth icon
Battery empty Battery Full Battery charging			

5. Operation

Switch on the thermal camera

Press and hold for > 2 seconds to switch the unit ON. If the unit is sufficiently charged, the meter will display the splash screen as shown below. The initial image be displayed until the shutter resets the image. After the start-up delay, the unit will show a real-time IR thermal image along with an IR temperature reading. If the meter does not switch on, please refer to chapter Powering and charging the thermal camera for information regarding battery charging. Lock/Unlock scene temperature span

In default setting operation, the unit automatically adjusts image based on the

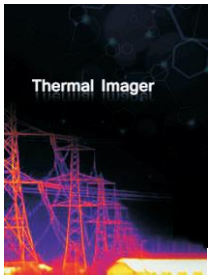


Figure 2: Splash screen

highest and the lowest temperature detected. This means the colour of an object with the same temperature can vary depending on the environment. It can be beneficial for image comparison to keep one temperature a single colour. The unit can lock the current scene temperature range to make this possible.
If a new measured temperature will be higher than the locked range, it will appear as white. If it will be lower, it will appear as black.

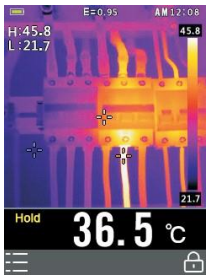


Figure 4: Lock mode

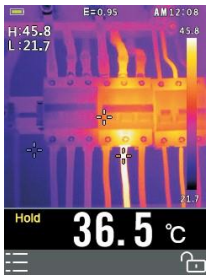


Figure 3: Unlock mode

1. Point the unit at an object or an area of interest.
2. Short press the soft button “” to lock the scene temperature range; the highlight colour of the temperature readings .will turn grey.
3. Short press the “” button again, it will unlock the scene temperature range.

Capture/Save images to the internal memory

The unit can store up to 20 images in the internal memory. The saved images can be transferred to iOS, Android or PC device through Bluetooth.

1. Point the unit at an object or an area of interest.
2. Short press the trigger to capture the image; the image will freeze. Ikon “Hold” will appear on screen.
3. If don’t want to save the current image, Short press the trigger again, the image will unfreeze.
4. Press “SAVE” soft button to save the image.

5. If the image is stored successfully in the internal memory, the image will unfreeze.
6. To erase/format internal memory please refer to chapter Settings details.

Share images using Bluetooth

- Instant share

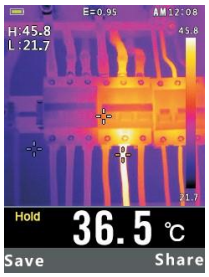


Figure 5: Hold image

The unit has Bluetooth instant share function for quick analysis and for reporting the thermal images. It works with corresponding Metrel Thermal Image Viewer software for Android.

1. Enable the Bluetooth on the thermal camera.
2. Run Metrel Thermal Image Viewer software and connect unit with smart device. Detailed reference can be found in chapter Bluetooth Connect.
3. Point the unit at an object or an area of interest.
4. Short press the trigger to capture the image; the image will freeze and the “Hold” icon will appear. Short press the trigger again to unfreeze without sharing.
5. Press SHARE soft button to transfer the image. If the image is transferred successfully to the smart device, the image will unfreeze.
6. Save, analyse, share or report the thermal images on smart devices.

Figure 6: Transferring image to Android or iOS device

Transfer the saved images

1. Enable the Bluetooth on the unit.
2. Run Metrel Thermal Image Viewer software and connect unit with smart device. Detailed reference can be found in chapter Bluetooth Connect.
3. To access the Image Review mode, open the Settings Menu (Chapter Settings Men). Images are available to review or delete.
4. Press Trigger to share the current picture.
5. Press “SHARE” soft button to transfer the image
6. Save, analyse, share or report the thermal images on smart devices.

Review/Delete Images

Use the Review Mode to view or delete stored images.

1. To access the Settings Men to review and delete images.
2. Press the ESC button to exit the image review mode
3. To delete all images, please access the Settings Menu as described in Section 6 and reformat the SD card.

Lens and camera field of view

This table lists the horizontal Filed of view (FOV), vertical FOV and IFOV for lens.

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

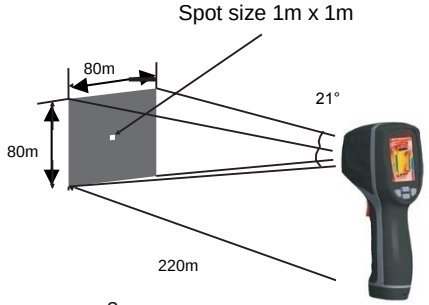
IFOV (Instantaneous Field of View) is the size of the object caught in the single pixel on the detector. It is given as spatial angle with unit mrad. It depends on the lens and detector size.
$DTS_{theoretical}$ is distance to spot. It is the distance at which the given size spot can be measured. At unity distance, the IFOV can be then directly translated to spot size. For accurate temperature measurement, the spot has to be about three times the size of $DTS_{theoretical}$.

$$IFOV = \frac{Pixel\ size}{Lens\ focal\ length}$$

$$DTS_{theoretical} = \frac{1}{IFOV}$$

$$DTS_{measured} = \frac{DTS}{3}$$

EXAMPLE:
The FOV of the camera is 21° x 21°, which is about 0.36x 0.36 rad. The detector resolution is 80x80 pixel. Each pixel then covers about 4.53 mrad, which is IFOV. This means that at 1m distance, each pixel is covering 4.53mm^2 actual space. Temperature can be accurately measured on about 13.6mm^2 at 1m distance. If turned the other way, DTS can be the calculated distance at which each pixel will



cover 1m^2 space, which is about 220m. Thermal camera uses 7,5mm lens, so knowing the IFOV gives the pixel size of the detector as 34um.

6. Settings Menu

Using Settings Menu

- Press OK button to open the Settings Menu, as show below.
- Press UP / DOWN button to select menu item or change the value of currently focused item.
- Press OK button to enter the submenu or set focus on the current selected item. Press ESC button to return to the previous menu.
- If want to exit settings menu press ESC button in root menu.

Figure 7: Settings menu

Settings details

- Palette mode

Thermal camera has five palettes, such as:

Press OK button to select one of the display colour palettes.

- Temp Unit

To change, press OK button with this option in focus. The colour of set value will change to black: °C . Use up and down arrows to change to °F and K, use either ESC or OK button to exit focus state. The colour of set value will change back to white: K.

- Measure

Figure 8: Measure menu

Press OK button to enter measure menu. Two selections are available: Temp.Max and Temp. Min. Press OK button to set currently selected item on or off.

- Temp.Max: This option enables thermal camera to automatically detect the highest temperature point.
- Temp.Min: This option enables thermal camera to automatically detect the lowest temperature point.

- Emissivity

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

- Language

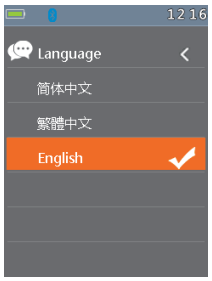


Figure 9: Language menu

Press OK button to enter language menu. Three options are available: Simplified Chinese, Traditional Chinese and English. Use UP /DOWN button to select language and use OK button to set.

- Setup

Figure 10: Setup menu

Press OK button to enter setup menu. Three options are available: Bluetooth, Brightness and Auto Off.

  - Bluetooth: Use OK button to set Bluetooth connectivity on or off.
  - Brightness: Press OK button to set focus on this option. In focus state, use UP/DOWN button to change LCD's brightness, use ESC orOK button to exit focus state. The available brightness's range is 100% to 10% in 10% steps.
  - Auto Off: Press OK 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.

- Time/Date

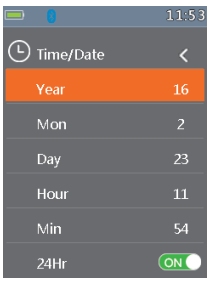


Figure 11: Time/date menu

Press OK button to enter time menu.
In this menu, year, month, day, hour, minute and time format can be set by focusing them and using UP/DOWN arrow keys. The changes take effect after exiting settings menus.

- Memory

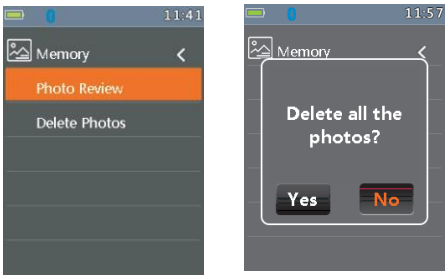


Figure 12: Memory menu

Press OK button to enter photo menu.
Two options are available:

- Photo Review: Press OK button to enter image browser and exit settings menu.
- Delete Photo: Select to erase all the images. A dialog box will be displayed as shown above.

WARNING: Selecting 'YES' will delete all the photos in 'RECORD' folder of the memory card.

- Information

Figure 13: Information menu

Press OK button to enter system information menu. This menu contains software version, hardware version and thermal camera version.

- Factory Set

Figure 14: Factory settings

When Factory Set option is selected, the dialog box will be displayed as shown above. Select 'YES' button to reset system parameters.

Bluetooth Connectivity

1. Turn on the Bluetooth function on the instrument.

Figure 15: Turn on Bluetooth

2. Turn on the Bluetooth in the smart device, start the “Metrel Thermal Image Viewer” application and enter into the home interface.
3. Press Connect Device icon on the Home interface. Bluetooth device list will appear.

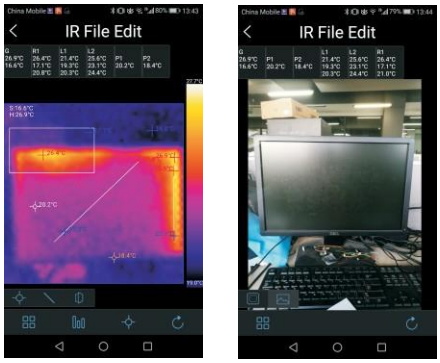


Figure 16: Edit the image

4. Touch the device name in the listed in Bluetooth devices list to connect the device.

For detailed information about Metrel Thermal Image Viewer, please refer to Metrel Thermal Image Viewer application help file. The application can be found on Google Play store.

7. Image Browser

- In Image Browser mode, user can browse the pictures in the 'RECORD' folder of the memory card. Press UP / DOWN button to select previous or next picture. Press any other key to exit Image Browser mode.

  1. Currently displayed picture's filename.
  2. Current picture's index and total number of pictures.
  3. Temperature of centre point.
  4. Picture display area.

- Screen capture

When in thermal imaging mode, use HOLD button to enter hold mode, as shown below. Then press OK button to capture screen. After saving to memory is

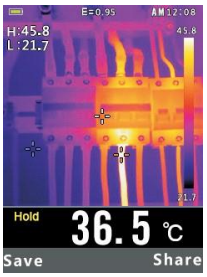


Figure 17: Captured screen

completed, screen will exit hold mode.

8. Technical specifications

Technical characteristics

Field of view (FOV)	21° x 21°
Minimum focus distance	0.5m
Spatial resolution (IFOV)	4.53mrad
Thermal sensitivity/NETD	< 0.1°C @ +30°C (+86°F) / 100 mK
Image frequency	50Hz
Focus	Fixed focus
Focal length	7.5mm
Focal Plane Array / FPA Spectral range	Uncooled microbolometer / 8–14 µm
Object temperature range	–20°C to +380°C
Accuracy	±2°C (±3.6°F) or ±2% of reading (valid at environment temperature 10°C–35°C, object temperature >0°C)
Display	2” color TFT LCD screen
Display resolution	240x320 pixels resolution
Battery	Rechargeable 3.7V 1300mA lithium ion battery (not user-replaceable)
Battery life	6 hours typical
Battery Charger	5V 1A USB charger (not included）
Drop test	2 m
Connectivity	Bluetooth BLE4.0, thermal image transfer and data logging
Save image format	Bitmap (.bmp) with 6400 points with temperature analysis and emissivity
Operating Temperature	-10 to 45°C
Storage Temperature	-30 to 55°C
Allowable relative humidity	< 80%HR
Storage temperature	-20° ÷ 60°C
Storage humidity	< 80%HR