

ENGLISH

User manual



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1 PRECAUTIONS AND SAFETY MEASURES

The instrument has been designed in compliance with the directives 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 the symbol  with the utmost attention. Before and after carrying out the measurements, carefully observe the following instructions:



CAUTION

- Do not carry out any measurements in case gas, explosive materials or flammables are present, or in humid or dusty environments.
- 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.
- Keep the instrument steady during any measuring operation.
- Do not carry out any measurements which exceed the working and storage temperature ranges specified in § 8.1.1.
- Only the accessories provided together with the instrument will guarantee safety standards. They must be used only if in good conditions and replaced with identical models, when necessary.
- Check that the battery is correctly inserted.
- Check that the LCD display gives indications consistent with the function selected.
- Do not direct the instrument at very high intensity radiation sources (e.g. the sun) in order to prevent damaging the IR sensor.
- Prevent hits or strong vibrations in order to keep the instrument from damage.
- When bringing the instrument from a cold to a hot environment, leave it on long enough for condensation water to evaporate.
- Only use the micro SD card provided with the instrument.

In this manual, and on the instrument, the following symbols are used:



Caution: observe the instructions given in this manual; improper use could damage the instrument or its components.



This symbol on the display means that the instrument is able to emit a laser pointer in Class 2. **Do not direct the radiation towards the eyes in order to prevent physical damage to people.**



Compliant with European Standards

1.1 DURING USE



CAUTION

- Failure to comply with the caution notes and/or instructions may damage the instrument and/or its components or be a source of danger for the operator.
- Use the instrument only in the temperature ranges indicated in this manual.

1.2 AFTER USE

When measurement is complete, switch off the instrument. If you expect not to use the instrument for a long period, remove the battery.

2 GENERAL DESCRIPTION

The instrument is a professional digital thermal camera capable of carrying out infrared temperature measurements of objects and providing high-resolution images in an extremely flexible way. It is also very easy to use and needs little maintenance.

The main characteristics of the instrument are:

- Infrared temperature measurement ranging from -20°C to 400°C
- Built-in photo camera for visible image
- Fusion PiP function
- 3 selectable measuring cursors
- TFT colour display with capacitive touch-screen
- Alarm conditions on temperature measurement
- Table with emissivity values of common material
- 8 standard colour palettes
- 10 custom colour palettes
- Electronic zoom x1-x20
- Advanced analyses (Spots, Lines, Areas, Isotherm)
- Automatic detection of hot/cold spots of the image
- Storage of JPG images on external micro SD card
- IR sensor resolution: 384x288pxl
- USB port for PC connection and image transfer
- Voice and text annotations
- IR MPEG4 video recording on micro SD card
- Video and microphone output
- Built-in laser pointer and illuminator
- Rechargeable Li-ION battery
- Analysis and printing of images with the dedicated software provided

The applications of the digital thermal camera are:

- Predictive and preventive maintenance of the electrical and mechanical appliances
- Monitoring of the temperature of working processes
- Maintenance and troubleshooting on forced ventilation ducts
- Domestic/industrial use in troubleshooting environmental insulation problems
- Applications in the construction field
- Safety problems

3 PREPARATION FOR USE

3.1 INITIAL CHECKS

Before shipping, the instrument has been checked from an electric as well as mechanical point of view. All possible precautions have been taken so that it is delivered undamaged.

However, we recommend generally checking the instrument in order to detect possible damage suffered during transport. In case anomalies are found, immediately contact the forwarding agent.

We also recommend checking that the packaging contains all components indicated in § 7.5. In case of discrepancy, please contact the Dealer. In case the instrument should be replaced, please carefully follow the instructions given in §. 9

3.2 INSTRUMENT POWER SUPPLY

The instrument is supplied by a 1x7.4V rechargeable Li-ION battery and AC mains power supply, which also provides for the recharge of the mentioned battery. Both of these systems are provided with the instrument. For battery recharge, please refer to § 7.2.

3.3 CALIBRATION

The instrument has the technical specifications described in this manual. The instruments performance is guaranteed for one year.

3.4 STORAGE

In order to guarantee precise measurement, after a long storage time under extreme environmental conditions, wait for the instrument to come back to normal condition (see § 8.1.1).

4 NOMENCLATURE

4.1 INSTRUMENT DESCRIPTION

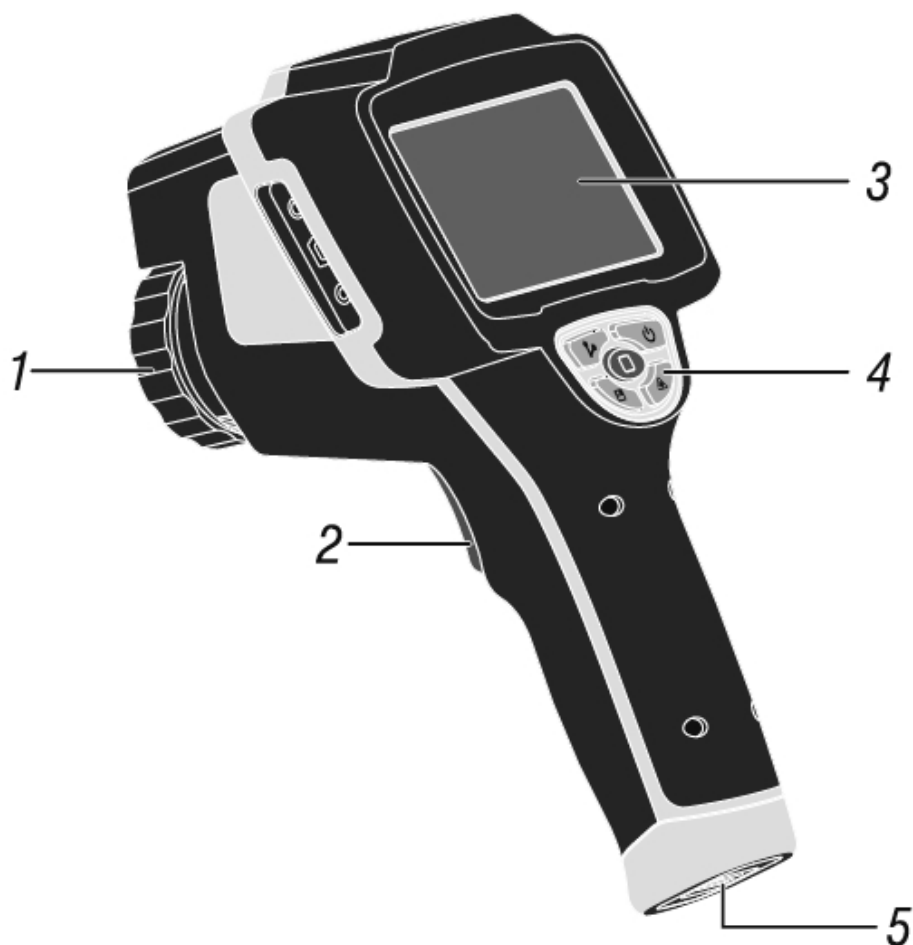


Fig. 1: Description of the instrument's backside

CAPTION:

1	Lens associated with the IR sensor
2	Trigger key (T)
3	LCD touch-screen display
4	Function keys  ,  ,  ,  , 
5	Battery compartment cover

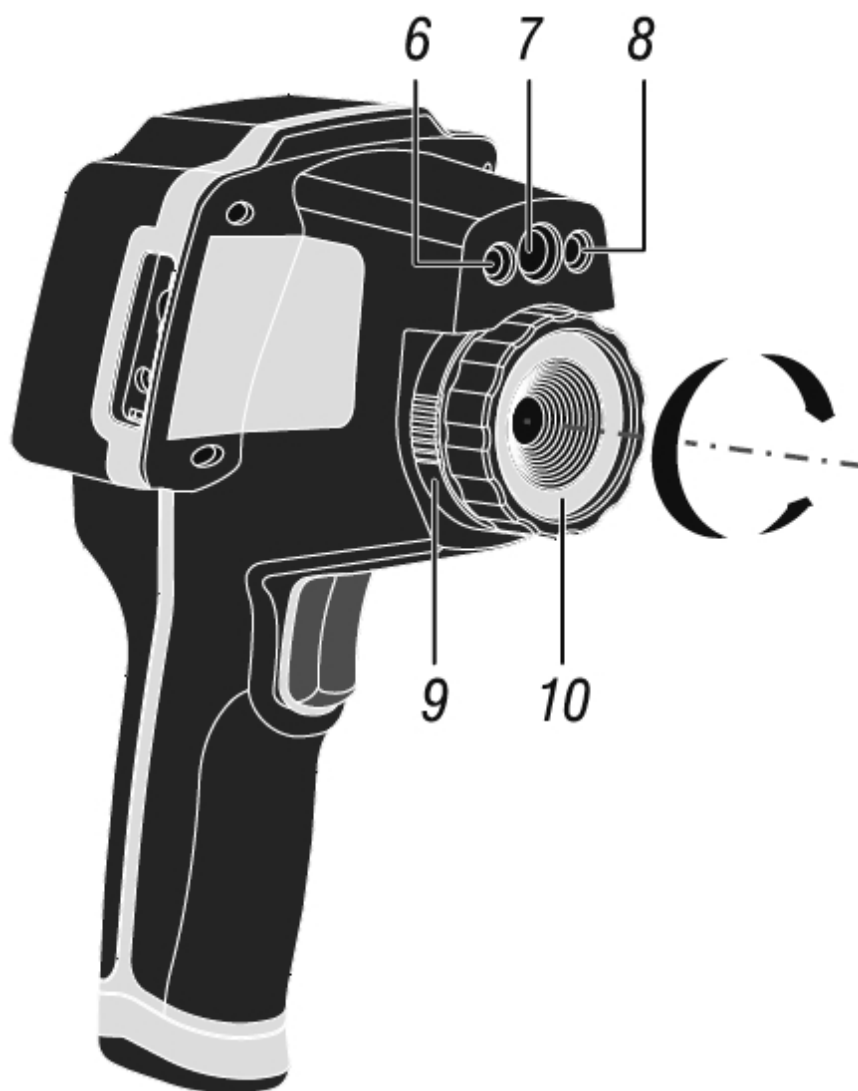


Fig. 2: Description of the instruments front side

CAPTION:

6	Built-in illuminator
7	Photo camera
8	Laser pointer
9	Lens locking/releasing mechanism
10	Lens associated with the IR sensor

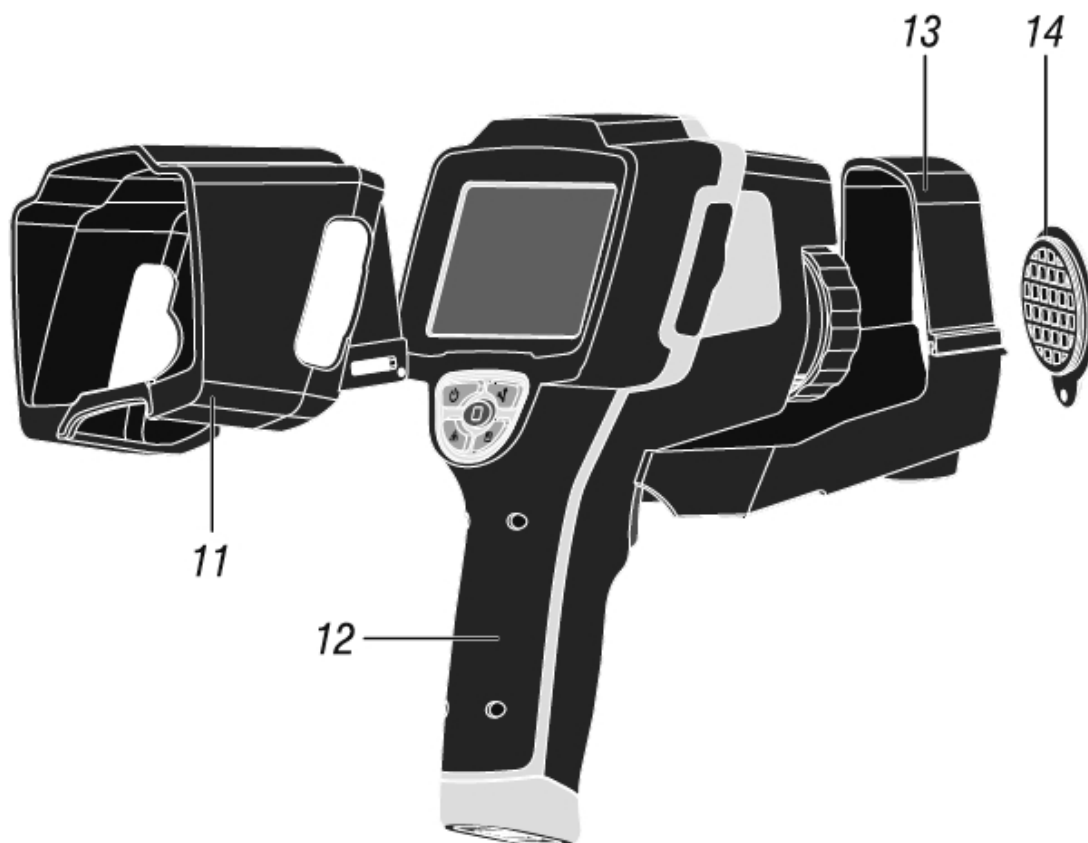


Fig. 3: General description of the instrument

CAPTION:

11	Sun shield
12	Instrument body
13	Universal adapter for tripods
14	Lens protection cap

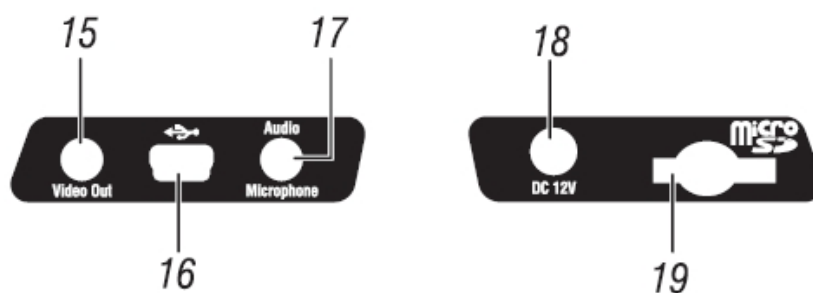


Fig. 4: Description of the instrument's side interfaces

CAPTION:

15	Video output
16	USB port
17	Audio input for connecting microphone/headphones
18	Input for connecting AC adapter/battery charger
19	Slot for micro SD card insertion

4.2 DESCRIPTION OF FUNCTION KEYS

The instrument has 5 function keys indicated as , , , ,  further in the manual and a trigger key "T" with multiple functions.

4.2.1 Switching on/off the instrument

Press and hold the  key for approx. 3 seconds to switch on the instrument. After approx. 20 seconds internal autotest, the instrument shows its normal measuring screen.

To switch off the instrument, proceed as follows:

1. Press and hold the  key for 3 seconds. The instrument shows the following screen:



Fig. 5: Instrument switch-off screen

2. Drag the icon  to the right until the end of the blue section. The instrument will automatically switch off after a few seconds. Touch the "X" key to cancel the operation.

CAUTION



- A simple pressing of the  key only causes the display to switch off and on again. The instrument also allows the display to automatically switch off after a selected time (see § 5.2.1.2).
- The instrument may take approx. 10s to switch off in case it is connected to the external power supply.

4.2.2 Key

Pressing the  key allows showing/hiding the icons of the instrument's main menu (operation possible also by touching the display), setting the value of the distance from the object in Fusion screens (see § 5.1.3) and quitting the internal function screens and going back to the main menu.

4.2.3 Key

The IR image on the display may be out of focus after a few minutes or if a new object is framed. In order to solve this problem it is necessary that the instrument performs its internal calibration. It is possible to manually calibrate the instrument at any time by pressing the  key, or to let the instrument calibrate itself automatically after a certain set time (see § 5.2.1.2).

4.2.4 Key

Press the  key to automatically save the IR image shown on the display in the instrument's memory (micro SD card) (see § 5.2.4.1).

4.2.5 Key

Press and hold the “” key to switch on the laser pointer which is always active on the instrument. A small red circle “” is found in the middle and on the top left-hand side of the display. Releasing the key automatically deactivates the laser pointer.

Simply press the “” key to activate/deactivate the built-in illuminator with white LED light. The symbol “” appears in the top left-hand part of the display.

4.2.6 T key (Trigger)

Pressing the **T** key found in the front part of the instrument allows freezing (Hold) the IR image on the display and automatically opens the section for saving the image (see §). The symbol “” is found in the top part of the display. Press the **T** key again to save the image and quit the Hold status.

4.2.7 Mounting of optional lens

For the mounting of focal optional lens proceed as follows:

1. Rotate the lens locking/releasing mechanism (see Fig. 2 – part 9) in counterclockwise from “” position to “” position
2. Pull outward to remove the mounted lens
3. Insert the new lens taking care to the position of internal terminals applying a slight pressure on it
4. Rotate the lens locking/releasing mechanism (see Fig. 2 – part 9) in clockwise from “” position to “” position

Check the correct recognition of the lens on the instrument (see § 5.2.2.4)

5 OPERATING INSTRUCTIONS

5.1 DESCRIPTION OF THE MAIN INTERFACE

The instrument shows the following main interface on the display:

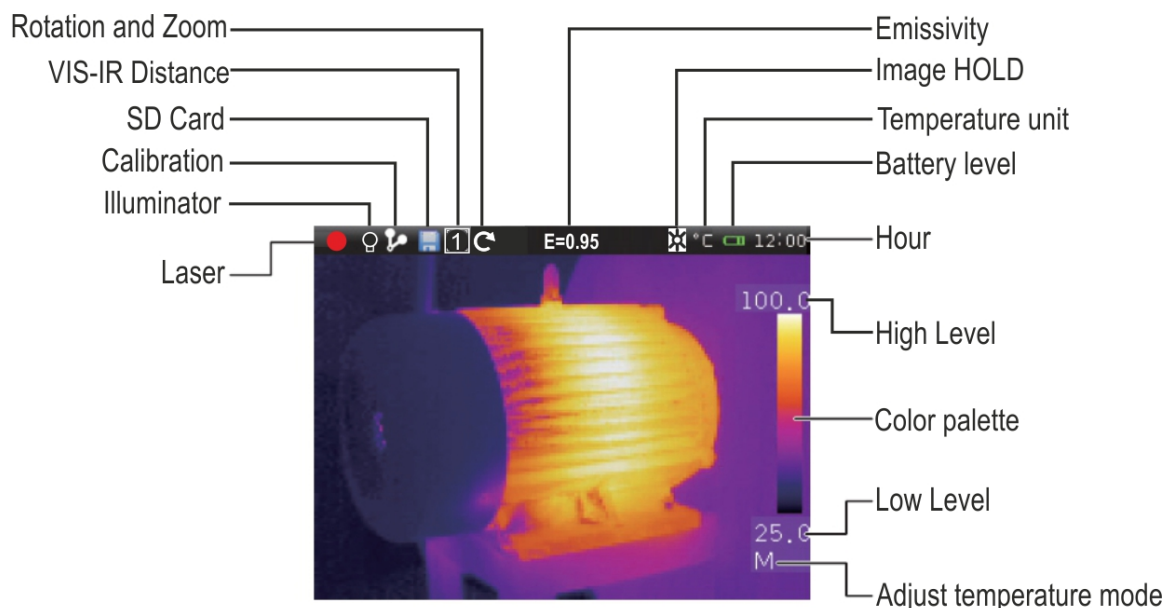


Fig. 6: Main instrument interface

The meaning of the symbols found on the display is described below.

Symbol	Description
	Active laser pointer (see § 4.2.5)
	Active built-in illuminator (see § 4.2.5)
	Manual or automatic calibration activated (see § 4.2.3)
	Micro SD card inside the instrument
	Setting of distance from object in VIS-IR screens (see § 5.1.3)
	Activation of rotation menu and image zoom (see § 5.1.2)
E=0.95	Set value of object emissivity
	Active HOLD function (see § 4.2.6)
°C	Temperature measuring unit selected on the instrument (see § 5.2.1.1)
	Battery charge level indication (see § 7.2)
12.00	Indication of the system's current time (see § 5.2.1.1)
Level	Indication of temperature levels of the IR image (see § 5.2.3.3)
Palette	Indication of colour palette (see § 5.2.3.2)
M,Auto,IG	Indication of image temperature adjustment mode (see § 5.2.3.3)

5.1.1 Image focusing

Focusing the IR image found on the instrument display must be performed manually by rotating the lens installed on the IR sensor (see Fig. 1 - Pos.1). Keep the instrument steady while performing this operation.



CAUTION

Always focus the image before saving it, in order to perform correct temperature measurements of the framed object.

5.1.2 Image rotation and zoom

The instrument allows performing complete rotations ($0 \div 360^\circ$) and has a digital electronic zoom function " $x1 \div x20$ " of the framed IR image. To use these functions, proceed as follows:

1. Touch the symbol "C" on the display. The instrument shows the following menu at the bottom of the display:

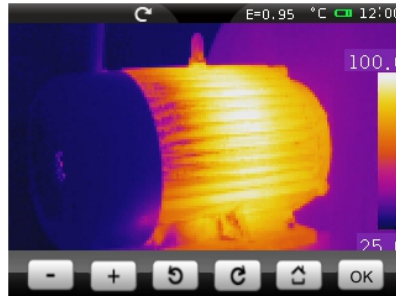


Fig. 7: Menu for setting image rotation and zoom

2. Press the "+" key to activate the zoom function. The indication " $0^\circ / 1.1$ " is shown on the display and the image is zoomed in 10% more with respect to the original image.
3. Touch the "+" or "-" keys to increase or decrease the image zoom with a resolution of 10%. Zoom range $1.1 \div 20.0$
4. Touch the "C" key to restore normal image view.
5. Touch the "C" key to activate rotation. The indication " $1^\circ / 1.0$ " appears on the display
6. Touch the "C" key to rotate the image clockwise of the "C" key to rotate the image counterclockwise with a resolution of 1° . Rotation range $0^\circ \div 360^\circ$
7. Touch the "C" key to restore normal image view.
8. Touch the "OK" key to quit the menu.

5.1.3 Adjusting the distance of the object in Fusion screens

In "IR_MIX_VIS" and "VIS_MIX_IR" display mode (see § 5.2.3.1), due to the different position of the lens and of the built-in photo camera, when the object is close to the lens, the visible image tends to become bigger, while the IR image tends to reduce. When the object is more than 5m far from the lens, this effect tends to disappear. The instrument allows setting the distance of the object in order to compensate the effect at distances shorter than 5m. Proceed as follows:

1. Select the "IR_MIX_VIS" or "VIS_MIX_IR" display on the instrument (see §). The instrument shows the following screens:

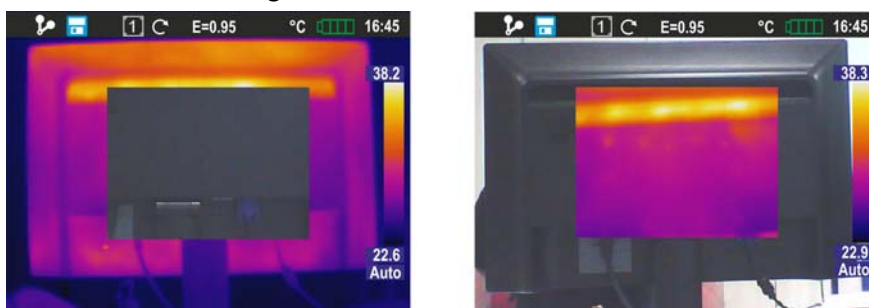


Fig. 8: Adjusting the distance of the object in Fusion screens

2. At the top of the display, the instrument automatically shows the symbol "1", where the value indicated inside the square represents the last value set for distance.
3. Press and hold for 2 seconds the □ key to set the value of distance of the lens from the object. The following values are available: **1/2m (0.5m), 1m, 2m and 5m**

5.2 MAIN MENU DESCRIPTION

Pressing the  key or simply touching the display, the instrument shows/hides the following main menu consisting in 6 icons which allow accessing all internal functions:



Fig. 9: Main instrument menu

Measure menu → defines the properties of the tools which can be used for measuring (cursors, lines, areas, object parameters, alarm conditions).

Image menu → defines the display mode of IR, Visible and Fusion images, the Automatic/Manual modes and the Isotherm line tool.

Camera menu → defines the saving modes of IR images and videos.

Gallery menu → includes the gallery of the IR images saved in the micro SD card.

Video menu → includes the list of the IR videos saved in the micro SD card.

Settings menu → allows setting system parameters.

5.2.1 Settings Menu

By touching the icon  the instrument enters the “Setting” menu, in which it is possible to define the values of system parameters.

5.2.1.1 “General” section

In this section (see Fig. 10) it is possible to define the system language, the type of video output, the accuracy in temperature measurement, the measuring unit of temperature and distance.

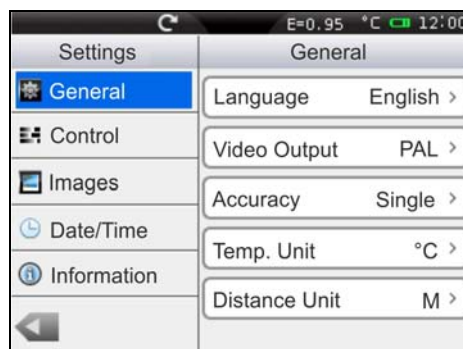


Fig. 10: “General” section, Setting menu

Language setting

1. Touch the box "Language". The following screen appears on the instrument's display:



Fig. 11: System language setting

2. Scroll the list of the available languages and touch the desired one. A tick "✓" is inserted into the corresponding line.
3. Touch "OK" to save your choice and exit the screen or "Cancel" to exit without saving.

Setting the Video output

Touch the box "Video output". The following options are available to define the type of video system to which to connect the instrument on the terminal with the same name (see Fig. 4 – Part 15): **PAL**, **NTSC**, **Off** (disabled output)

Setting the Accuracy

Touch the box "Accuracy" to define the instrument's accuracy when measuring temperature. Following options are available: **Single** (the value is displayed with one decimal figure). **Double** (the value is displayed with two decimal figures).

Setting the temperature measuring unit

Touch the box "Temp. Unit" to define the measuring unit used by the instrument when measuring temperature. Available options are: **°C**, **°F** ($^{\circ}\text{F} = 32 + 1.8 \times ^{\circ}\text{C}$), **°K** ($^{\circ}\text{K} = ^{\circ}\text{C} + 273.15$)

Setting the distance measuring unit

Touch the box "Distance Unit" to define the measuring unit used by the instrument when measuring the distance from the object. Available options are: **M (metres)**, **FT (feet)** ($\text{FT} = 0.3048 \times \text{M}$)

5.2.1.2 "Control" section

In this section (see Fig. 12) it is possible to define the activation of the built-in illuminator, set display brightness, the automatic calibration time, the display's switch-off time and the instrument's auto power-off time.



Fig. 12: "Control" section, Setting menu

Activation of the built-in illuminator

Touch the box “Lamp” to activate (ON) or deactivate (OFF) the built-in illuminator (operation possible also by pressing the  key)

Adjusting display brightness

1. Touch the box “Brightness”. The following screen appears on the instruments display:

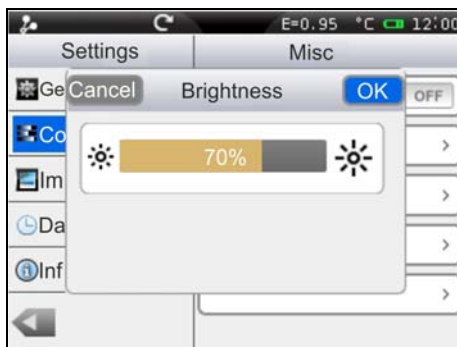


Fig. 13: Setting display brightness

2. Scroll the adjusting bar until reaching the desired brightness percentage visible in real time on the display. A very high level means an increased consumption of the internal battery.
3. Touch “OK” to save your choice and exit the screen or “Cancel” to exit without saving.

Adjusting the automatic calibration time (see § 4.2.3)

1. Touch the box “Auto Calib.”. The following screen appears on the instruments display:

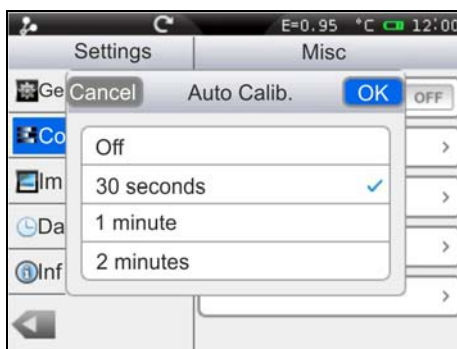


Fig. 14: Setting the automatic calibration time

2. Scroll the list of the available options: **30s**, **1min**, **2min** and **Off** (autocalibration deactivated) and touch the desired one. A tick “✓” is inserted into the corresponding line.
3. Touch “OK” to save your choice and exit the screen or “Cancel” to exit without saving.

Adjusting the display's switch-off time

1. Touch the box "LCD Off" to activate/deactivate and adjust the display's automatic switch-off time. The following screen appears on the instruments display:

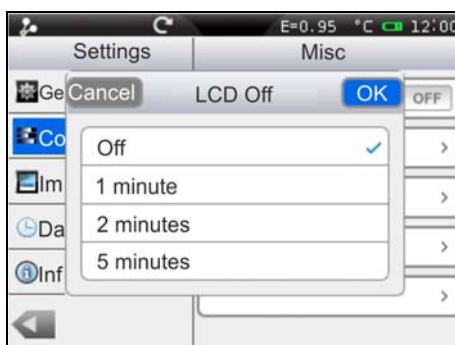


Fig. 15: Setting the display's switch-off time

2. Scroll the list of the available values: **1min**, **2min**, **5min** and **Off** (deactivated option) and touch the desired one. A tick "✓" is inserted into the corresponding line. With the display switched off it is sufficient to touch the screen or any other key to switch it on again.
3. Touch "OK" to save your choice and exit the screen or "Cancel" to exit without saving.

Adjusting the instrument's Auto Power-Off time

1. Touch the box "Auto Power Off" to activate/deactivate and adjust the auto power-off time of the instrument after a period of inactivity. The following screen appears on the instrument's display:



Fig. 16: Setting the instrument's auto power-off time

2. Scroll the list of the available values: **5min**, **10min**, **30min** and **Off** (deactivated option) and touch the desired one. A tick "✓" is inserted into the corresponding line.
3. Touch "OK" to save your choice and exit the screen or "Cancel" to exit without saving.

5.2.1.3 “Images” section

In this section it is possible to activate the automatic image saving option with programmable temporal scan.

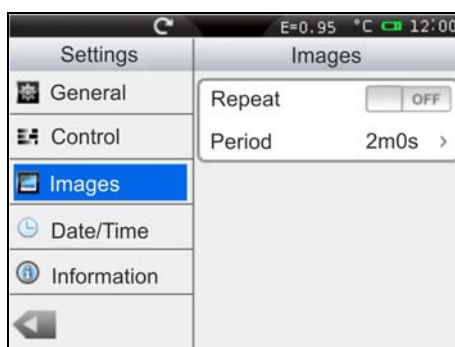


Fig. 17: “Images” section, Setting menu

1. In the box “Repeat”, select the option “ON” to activate the function and touch some internal point of the section. The following screen appears on the instrument's display:



Fig. 18: Setting the image saving time

2. Touch the keys “+” or “-” to define both the numerical value of time with a resolution of 1 unit and the choice of “Hours”, “Minutes” or “Seconds”. By touching the numerical value field, the instrument automatically opens a virtual keyboard (see Fig. 18 – Right side) in which it is possible to quickly enter any value. Confirm with “OK” on the keyboard the desired value.
3. Touch “OK” to save your choice and exit the screen or “Cancel” to exit without saving.

5.2.1.4 “Date/Time” section

In this section it is possible to set the system date/time of the instrument in various formats.

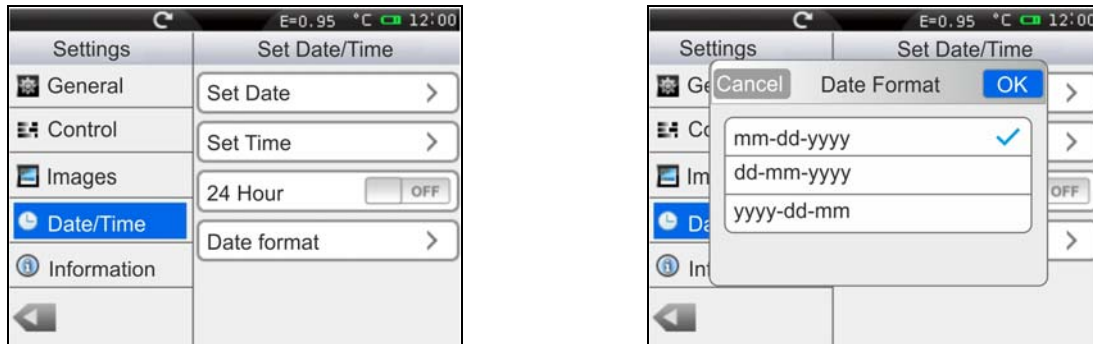


Fig. 19: “Date/Time” section, Setting menu

1. Touch the box “Date Format” and select the desired date format considering the options: **mm-dd-yyyy**, **dd-mm-yyyy** and **yyyy-dd-mm** (see Fig. 19).
2. Touch “OK” to save your choice and exit the screen or “Cancel” to exit without saving.
3. Touch the box “24 Hours (ON) / 12 Hours (OFF)”, choosing the desired time format.
4. Touch the box “set Time” and the keys “+” and “-” to set current time.
5. Touch “OK” to save your choice and exit the screen or “Cancel” to exit without saving.

5.2.1.5 “Information” section

This section contains the information relevant to the instrument such as model, serial number, production date, and internal Firmware version. In the lower part, the space already used on the micro SD card is indicated, as well as the space still available for saving data, expressed in MB, with reference to the card's dimension.



Fig. 20: “Information” section, Setting menu

In each screen, touch the key “◀” to go back to the main instrument's menu.

5.2.2 Measure Menu

By touching the icon  the “Measure” menu is entered, in which it is possible to activate/deactivate and define the characteristics of the measuring tools and temperature analysis. The thermal camera has:

- Max 3 dynamic measuring cursors
- Max 2 dynamic horizontal and vertical lines
- Max 3 dynamic measuring areas

5.2.2.1 Setting of measuring cursors

In the Measurement menu, by touching the icon “” it is possible to activate/deactivate up to 3 cursors at the same time, which can be freely positioned onto the image found on the display, to which the temperatures of the spots on the image are associated.

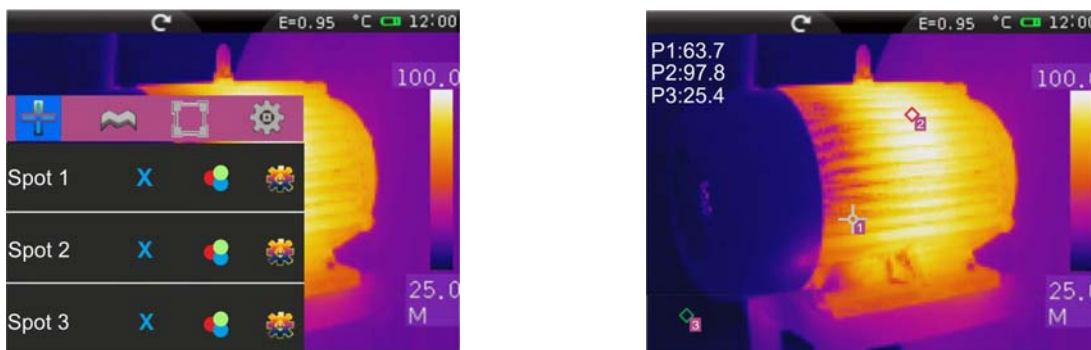


Fig. 21: Setting of measuring cursors

1. Touch the icon “” to activate the desired cursor. The icon “” and the activated cursor appear on the display.
2. Touch the icon “” to select the modes which can be associated to each cursor (see Fig. 22). Following options, which exclude one another, are available: **Manual** (cursor freely managed by the user), **Max** (cursor associated to the hottest spot of the image), **Min** (cursor associated to the coldest spot of the image). The selection is indicated by the icon “” on the display

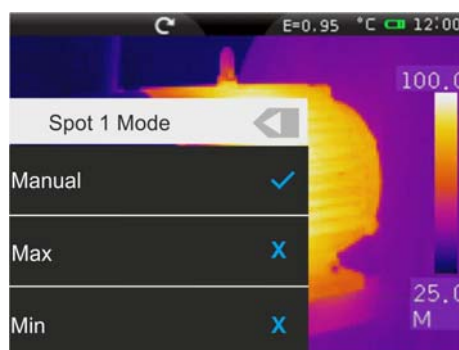


Fig. 22: Measuring modes associated to cursors

3. In manual mode the cursor takes the shape “” with identifier “1”, “2” or “3” and the label “P1”, “P2” or “P3” indicated next to the associated temperature value appears at the top left-hand side of the display. The cursor turns red when it is selected and can be moved on the image while it is white when it is fixed on the image (see Fig. 21).
4. In Max mode the cursor takes the shape “” when looking for the hottest spot.
5. In Min mode the cursor takes the shape “” when looking for the coldest spot.
6. Touch the icon “” to set the parameters associated to the single cursors (see § 5.2.2.5). The following screen appears on the instrument's display:

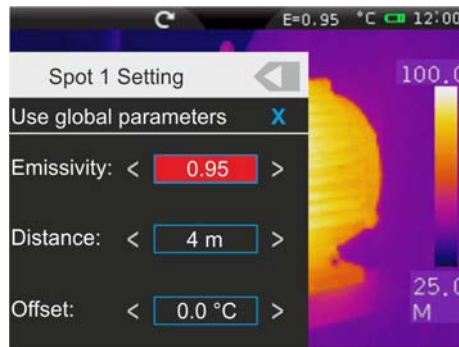


Fig. 23: Setting the parameters associated with the cursors

7. Touch the option **“Use global parameters”** to associate the values of the parameters globally defined on the instrument to the cursor (see §). The symbol “✓” is found on the display and the fields below it are deactivated.
8. With the previous option deactivated (see Fig. 23) it is possible to associate values of parameters “Emissivity”, “Distance” and “Offset” different from the global ones to the cursor. To this purpose, touch the field of the parameter highlighted in red and the symbols “<” and “>” to decrease or increase the value. Keep the keys pressed for a quick selection of the values, The measuring ranges are the following:
 - Emissivity → 0.01 ÷ 1.00
 - Distance → 0m ÷ 5000m
 - Offset → -10°C ÷ 10°C
9. For the parameter Emissivity it is possible to select the value according to an integrated table of the most common materials. Touch the field of the parameter. The following screen appears on the display:

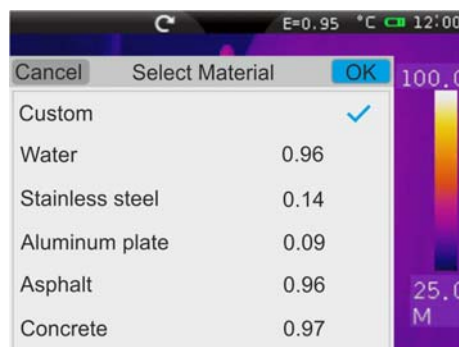


Fig. 24: Table with emissivity values of common materials

10. Scroll the screen, touching the desired material or select the item “Custom” and activate the symbol “✓”. Touch “OK” to confirm or “Cancel” to go back to the previous screen
11. Press the “◀” key to go back to the previous screen

5.2.2.2 Setting of Measuring lines

In the Measurement menu, by touching the icon “” it is possible to activate/deactivate 2 horizontal and vertical lines at the same time, which can be freely positioned onto the image for the description of the temperature profile

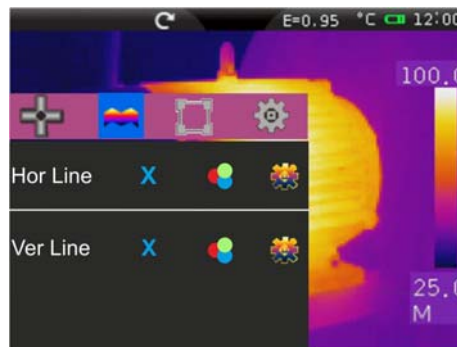


Fig. 25: Setting of Measuring lines

1. Touch the icon “” to activate the desired line. The icon “” and the selected line appear on the display (see Fig. 26). On each line, a mobile cursor “” is found, which identifies the point of the line in which the instrument carries out a temperature measurement. Each line and its relevant cursor can be dragged to any point of the image displayed. On the top left-hand part of the display there are the labels “L1” and “L2” of the lines and the value of temperature associated to the cursors. The line, the cursor and the label of the selected line are displayed in red, while they are white when they are fixed to the image.



Fig. 26: Display of Measuring lines

2. Touch the icon “” to set the precise value in pixel of the position of the cursor of the Line displayed (see Fig. 27).



Fig. 27: Setting the position of the cursor of the Line

3. Touch the keys “” and “” to set the pixels of line and column. Keep the keys pressed for a quick selection. Available ranges: **Row [21 ÷ 235], Column [5 ÷ 315]**
4. Press the “” key to go back to the previous screen

5. Touch the icon “” to set the parameters associated to the lines (see § 5.2.2.5). The following screen appears on the instrument's display:

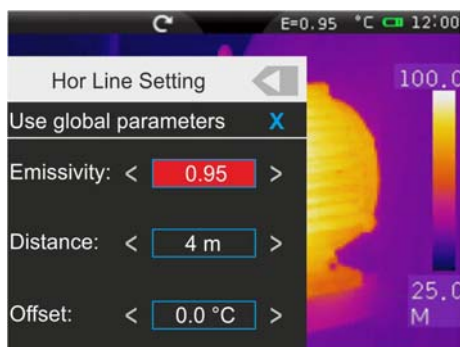


Fig. 28: Setting the parameters associated to the horizontal Line

6. Touch the option “**Use global parameters**” to associate the values of the parameters globally defined on the instrument to the line (see §). The symbol “” is found on the display and the fields below it are deactivated.
7. With the previous option deactivated (see Fig. 23) it is possible to associate values of parameters “Emissivity”, “Distance” and “Offset” different from the global ones to the line. To this purpose, touch the field of the parameter highlighted in red and the symbols “<” and “>” to decrease or increase the value. Keep the keys pressed for a quick selection of the values, The measuring ranges are the following:
 - Emissivity → 0.01 ÷ 1.00
 - Distance → 0m ÷ 5000m
 - Offset → -10°C ÷ 10°C
8. For the parameter Emissivity it is possible to select the value according to an integrated table of the most common materials. Touch the field of the parameter. The following screen appears on the display:

Material	Emissivity
Custom	
Water	0.96
Stainless steel	0.14
Aluminum plate	0.09
Asphalt	0.96
Concrete	0.97

Fig. 29: Table with emissivity values of common materials

9. Scroll the screen, touching the desired material or select the item “Custom” and activate the symbol “”. Touch “OK” to confirm or “Cancel” to go back to the previous screen
10. Touch the “” key to go back to previous screen and then to the main menu.

5.2.2.3 Setting of measuring areas

In the Measurement menu, by touching the icon “” it is possible to activate/deactivate at the same time max 3 areas which can be freely positioned onto the image. The Max, Min and Average values of the internal spots within each selected area may be associated.

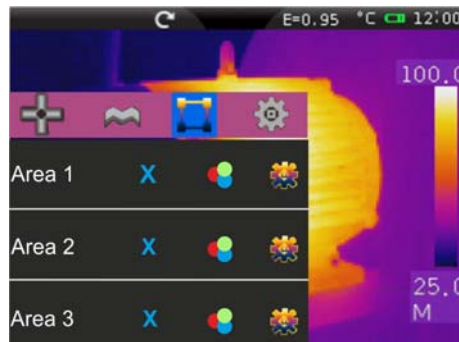


Fig. 30: Setting of measuring areas

1. Touch the icon “” to activate the desired area. The icon “” and the activated area appear on the display (see Fig. 31). Each area can be dragged to any point of the image displayed. In the top left-hand part of the display there are the labels “A1H”, “A1L” and “A1A”, which respectively indicate the Maximum, Minimum and Average temperature value of the internal spot within the area. The positions of the Max and Min spots are indicated with the icons “” and “” on the image. The area, the label (“1”, “2” and “3”) and the Min, Max, Average values of the selected area are displayed in red, while they appear in white when they are fixed to the image.



Fig. 31: Display of Measuring area

2. Touch the icon “” to select the following display options on the Measuring areas (see Fig. 32): **Max** (Maximum value of the internal spots within the area), **Min** (Minimum value of the internal spots within the area), **Average** (Average value of the internal spots within the area). The selection is indicated by the icon “” on the display.

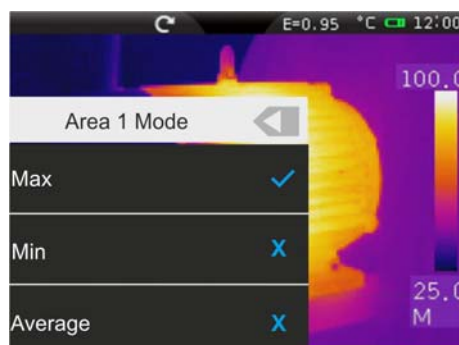


Fig. 32: Setting the parameters associated with the measuring area

3. Press the “” key to go back to the previous screen

4. Touch the icon “” to set the parameters associated to the areas (see § 5.2.2.5). The following screen appears on the instrument's display:

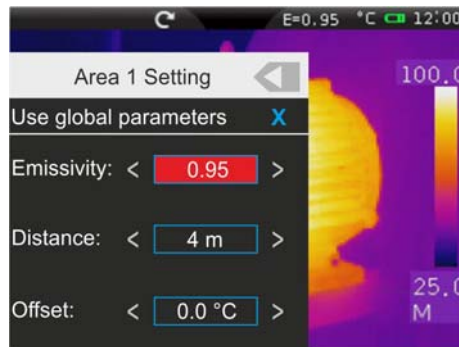


Fig. 33: Setting the parameters associated with the areas

5. Touch the option “**Use global parameters**” to associate the values of the parameters globally defined on the instrument to the area (see §). The symbol “” is found on the display and the fields below it are deactivated.
6. With the previous option deactivated (see Fig. 23) it is possible to associate values of parameters “Emissivity”, “Distance” and “Offset” different from the global ones to the area. To this purpose, touch the field of the parameter highlighted in red and the symbols “<” and “>” to decrease or increase the value. Keep the keys pressed for a quick selection of the values, The measuring ranges are the following:

- Emissivity → 0.01 ÷ 1.00
- Distance → 0m ÷ 5000m
- Offset → -10°C ÷ 10°C

7. For the parameter Emissivity it is possible to select the value according to an integrated table of the most common materials. Touch the field of the parameter. The following screen appears on the display:

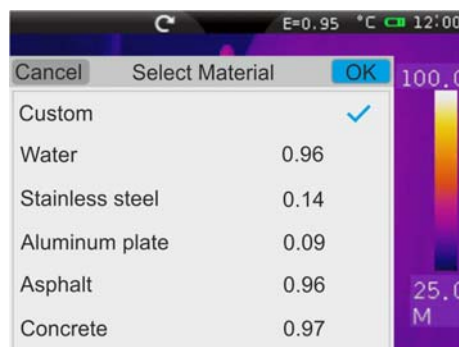


Fig. 34: Table with emissivity values of common materials

8. Scroll the screen, touching the desired material or select the item “Custom” and activate the symbol “”. Touch “OK” to confirm or “Cancel” to go back to the previous screen
9. Touch the “” key to go back to previous screen and then to the main menu.

5.2.2.4 Setting the Measure Menu

In the Measure menu, touch the icon “” to define:

- The global settings of the correction parameters of temperature measurement
- The general settings of the measuring parameters
- Configuring the alarm conditions on temperature measurement

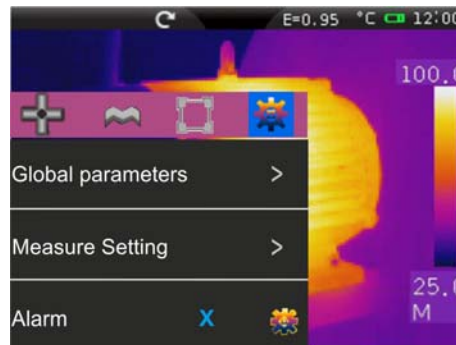


Fig. 35: Setting the Measurement Menu

Setting the global parameters

1. Touch the item “**Global parameters**”. The following screen appears on the instrument's display:

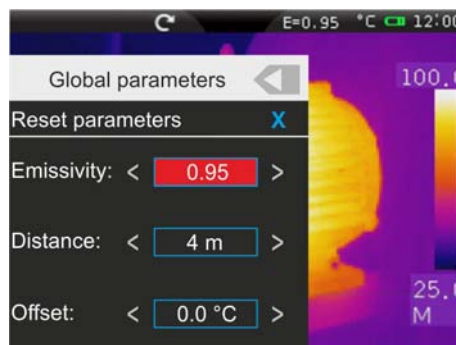
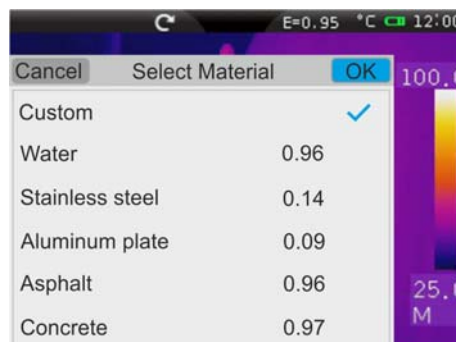


Fig. 36: Setting the global parameters

2. Set the values of global parameters “Emissivity”, “Distance” and “Offset” (see § 5.2.2.5) relevant to the measuring object by touching the relevant fields (see Fig. 36).
3. For the parameter Emissivity it is possible to select the value according to an integrated table of the most common materials. Touch the field of the parameter. The following screen appears on the display:



Material	Emissivity
Custom	✓
Water	0.96
Stainless steel	0.14
Aluminum plate	0.09
Asphalt	0.96
Concrete	0.97

Fig. 37: Table with emissivity values of common materials

4. Touch the field “**Reset parameters**” to restore the default conditions on the instrument. The following screen appears on the display:

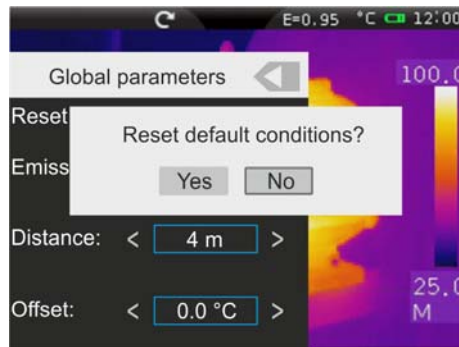


Fig. 38: Restoring default conditions on the instrument

5. Touch the “Yes” key to restore the default conditions (see Table 1) or the “No” key to cancel the operation.

Parameter	Default setting
Emissivity	0.95
Distance	5m
Environmental temperature	25°C
Relative humidity	60%RH
Reflected temperature	25°C
Offset	0.0°C

Table 1: Thermal camera default settings

Setting the general measuring parameters

1. Touch the item “**Measure Setting**”. The following screen appears on the instrument's display:



Fig. 39: Setting the general measuring parameters

2. The parameters whose field is included within the symbols “<” and “>” can be set by the user.

- **Lens** → Indication of the type of IR lens installed on the instrument. This parameter is automatically modified by the instrument by changing the lens (see § 4.2.7). Possible options: **22mm** (default), **11mm**, **38mm**
- **Range** → Indication of the temperature measuring range. Options: **-20°C ÷ 150°C** and **0 ÷ 400°C**
- **T. Env:** → Environmental temperature setting Measuring range: **-40°C ÷ 125°C**
- **Humidity** → Relative humidity setting. Measuring range: **1%RH ÷ 100%RH**
- **T. Ref** → Reflected temperature setting. Range: **-100°C ÷ 2000°C**

3. Press the “◀” key to go back to the previous screen

Setting the alarm on measurement

1. Touch the icon “” of item “**Alarm**”. The following screen appears on the instrument's display:

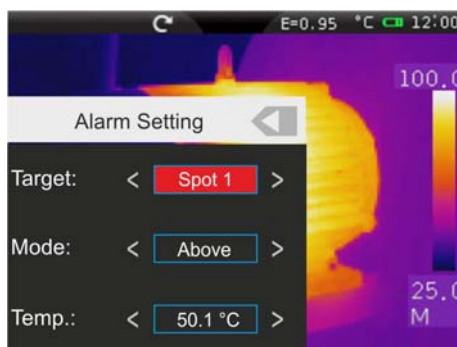


Fig. 40: Setting the alarm conditions on measurement

2. The parameters whose field is included within the symbols “<” and “>” can be set by the user.
 - **Target** → It allows selecting one of the 3 measuring cursors (see § 5.2.2.1) found on the instrument to which to associate the alarm condition on temperature measurement. Possible options: **Curs. 1**, **Curs. 2** or **Curs. 3**
 - **Mode** → It allows defining the type of alarm threshold according to temperature measurement. Possible options: **Lower**, **Higher**, **Same**
 - **Temp.** → It allows setting the value of the temperature threshold associated to the selected mode. Measuring range: **-20°C ÷ 400°C**

5.2.2.5 Control parameters of temperature measurement

The thermal camera allows correcting the measured value of temperature by means of the tools (Spots, Lines and Areas) in the following ways:

- Global mode → the values of the control parameters associated to all tools are defined globally.
- Custom mode → each tool may independently take different values of control parameters according to the selections made by the user.

Parameter Emissivity

In order to carry out accurate temperature measurements, it is important to define the correct emissivity value (ϵ), which represents the ability of a body to emit infrared radiation, according to the kind of material the measured object is made of Table 2 shows the emissivity values for the most common materials. Emissivity takes values between 0 (mirror or perfectly reflecting surface) and 1 (perfectly radiating blackbody). Most of the painted or oxydized surfaces have an emissivity value of approximately 0.95.

Material	ϵ	Material	ϵ
Black body	1.00	Steel (oxidized)	0.79
Smooth carbon surface	0.98	Very oxydized copper	0.78
Ice crystals	0.98	Cotton cloth	0.77
Human skin	0.98	Sand	0.76
Slate	0.97	Non-enameled silicone	0.75
Distilled water	0.96	Oxydized iron at 100°C	0.74
Smooth ice	0.96	C20A coating	0.73
Wet ground	0.95	Basalt	0.72
Carbon soot	0.95	Graphitized carbon at 500°C	0.71
Clean glass plate	0.94	Red rust	0.70
Paint, oil	0.94	Very rusty iron	0.69
Red brick	0.75	Water	0.67
White paper	0.93	Black soil	0.66
Cement	0.97	White cement	0.65
Dry ground	0.92	Oxydized wrought iron	0.64
Rough plaster coating	0.91	Oxydized lead at 1100°C	0.63
Oak wood	0.90	Zirconium on inconel	0.62
Enameled earthenware	0.90	Oxydized copper-zinc	0.61
Firn	0.89	Inconel sheets at 760°C	0.58
Enameled silicone	0.88	Dressed white marble	0.56
Copper oxyde at 38°C	0.87	Anodized chrome	0.55
Ground corundum	0.86	Clean wrought iron	0.21
Snow	0.85	Ground brass	0.20
Oxydized stainless steel at 800°C	0.85	18-8 stainless steel	0.16
Oxydized iron at 500°C	0.84	Coarse aluminium	0.09
Oxydized copper at 260°C	0.83	Clean steel	0.07
Fine snow	0.82	Clean aluminium	0.05
Non-oxydized brass	0.81	Clean copper	0.05
D convex glass	0.80	Bright brass	0.03

Table 2: Emissivity values of typical materials

Associated to each control tool (Spots, Lines, Areas) there is an internal table from which to select the emissivity value of common materials and define a custom value (see § 5.2.2.1, § 5.2.2.2 and § 5.2.2.3).

Parameters reflected temperature and environmental temperature

Objects with a low emissivity may reflect infrared energy coming from adjacent objects; this energy is added to the energy of the object itself, thus causing possible measurement mistakes. In several situations, there are sources of heat with a higher temperature than the temperature found near the object being measured. In this case, it is necessary to compensate this reflected energy by entering the presumed temperature value of the adjacent heat source into the thermal camera. In most of the applications, the reflected temperature is identical to the environmental temperature and has negligible effects on temperature measurement on objects with a high emissivity.

Environmental temperature → which can be set within the range: **-40°C ÷ 125.0°C**

Reflected temperature → which can be set within the range: **-100°C ÷ 2000.0°C**

Parameter Offset

This parameter can be set if, in automatic mode, you are sure of the values which the temperature levels associated with the colour palette must take (see § 5.2.3.3). In this case, the levels are increased or decreased by the quantity inserted in that field.

Offset → which can be set within the range: **-10°C ÷ 10.0°C**

Parameter Distance

This parameter identifies the distance between the thermal camera and the object to be measured. In most of the applications, the temperature levels associated to the colour palette (see § 5.2.3.3) are influenced negligibly by small variations of distance. Therefore, it is possible to leave this parameter set to the default value without having significant errors on measurement. For distances higher than 300m it is possible to have variations > 1°C in temperature level.

Distance → which can be set within the range: **0m ÷ 5000m**

Parameter Relative humidity

This parameter identifies the value of relative humidity of the environment where measurement is carried out. In most of the applications, the temperature levels associated to the colour palette (see § 5.2.3.3) are influenced negligibly by small variations of humidity. Therefore, it is possible to leave this parameter set to the default value without having significant errors on measurement.

Relative humidity %RH which can be set within the range: **1% ÷ 100%**

5.2.3 Image menu

By touching the icon  the “Image” menu is entered, in which it is possible:

- To set the display type of the IR and visible image on the display
- Define the colour palettes associated with the IR image
- Set the temperature level of the image and the image mode
- Define the characteristics of the Isotherm line tool

5.2.3.1 Setting the display type

In the Image menu, by touching the icon  it is possible to define the type of desired display by choosing between the following options:

- **IR** → display of IR image only (see Fig. 41)
- **Visible** → display of visible image only (see Fig. 42)
- **IR_FUSION_VIS** → Display of visible image within the IR image, with the possibility of choosing the position to the sides of the display (see Fig. 43).
- **VIS_FUSION_IR** → Display of IR image within the Visible image, with the possibility of choosing the position to the sides of the display (see Fig. 44).
- **IR_MIX_VIS** → Display of visible image in the middle of the screen/full screen of the IR image with the possibility of choosing the percentage value of the visible level (see Fig. 45).
- **VIS_MIX_IR** → Display of IR image in the middle of the screen/full screen of the visible image with the possibility of choosing the percentage value of the IR level (see Fig. 46).

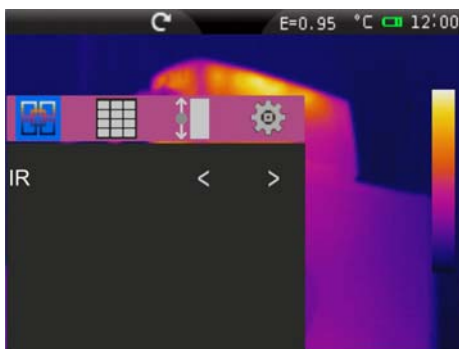


Fig. 41: Setting and displaying the IR image

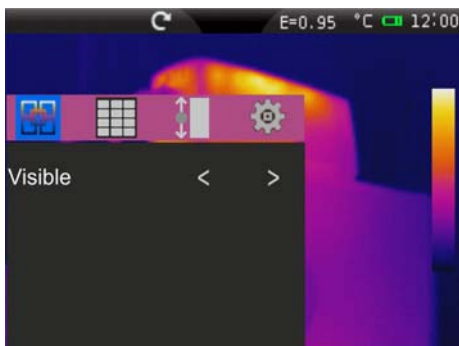


Fig. 42: Setting and displaying the visible image



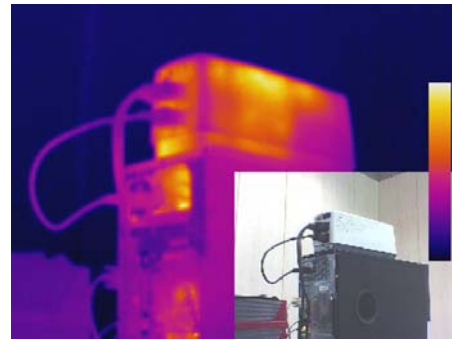
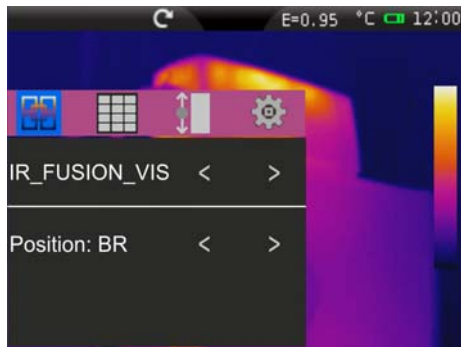


Fig. 43: Setting and displaying the IR_FUSION_VI image

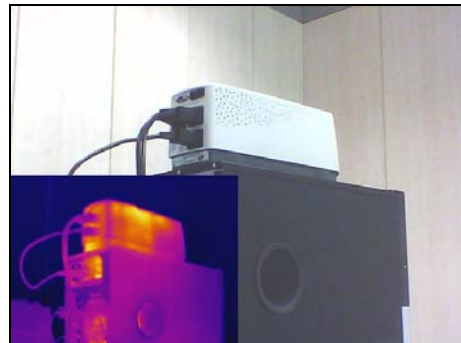
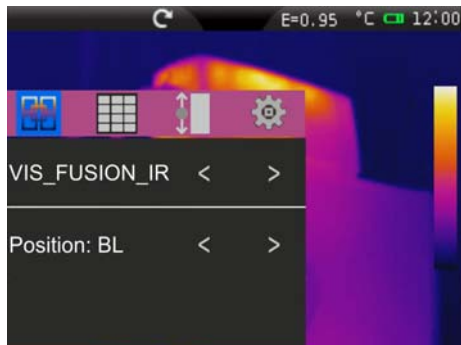


Fig. 44: Setting and displaying the VIS_FUSION_IR image

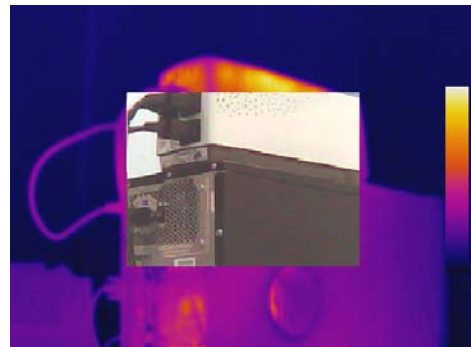


Fig. 45: Setting and displaying the IR_MIX_VIS image

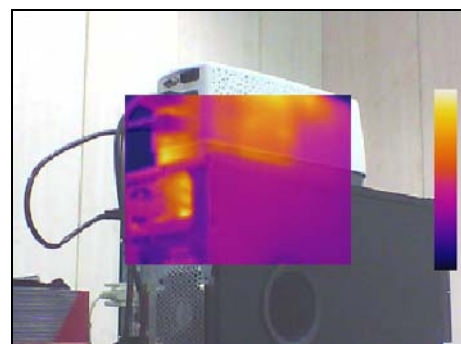
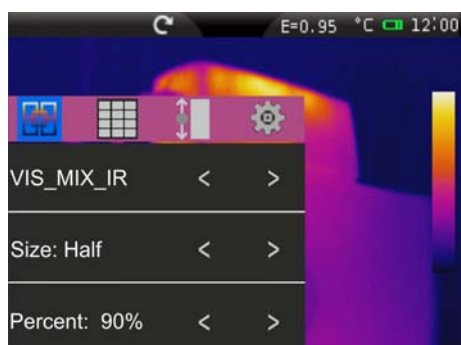


Fig. 46: Setting and displaying the VIS_MIX_IR image

1. Touch the symbols “<” and “>” to select the type of desired display.
2. In modes “**IR_FUSION_VIS**” and “**VIS_FUSION_IR**”, touch the symbols “<” and “>” to select the position between the options: “**BR**” (at the bottom on the right), “**BL**” (at the bottom, on the left), “**TR**” (at the top, on the right) and “**TL**” (at the top, on the left).
3. In modes “**IR_MIX_VIS**” and “**VIS_MIX_IR**” touch the symbols “<” and “>” to select the dimensions of the internal frame in item “Measurement” between the options “**Half**” and “**Whole**” and the percentage value of the IR or Visible level in item “Percent” with range: **0% ÷ 100%**

5.2.3.2 Setting the colour palette

In the Image menu, by touching the icon  it is possible to select the type of colour palette which can be associated to the IR image by choosing between the following options:

- **Standard palette** → allows choosing between 8 different standard palettes
- **User palette** → allows the user to define up to 10 custom palettes (2 fixed + 8 which can be fully customized) (this function can be used **in Manual mode only** – see § 5.2.3.3)

Standard palette

1. Touch the item “**Standard palette**”. The following screen appears on the instrument's display:

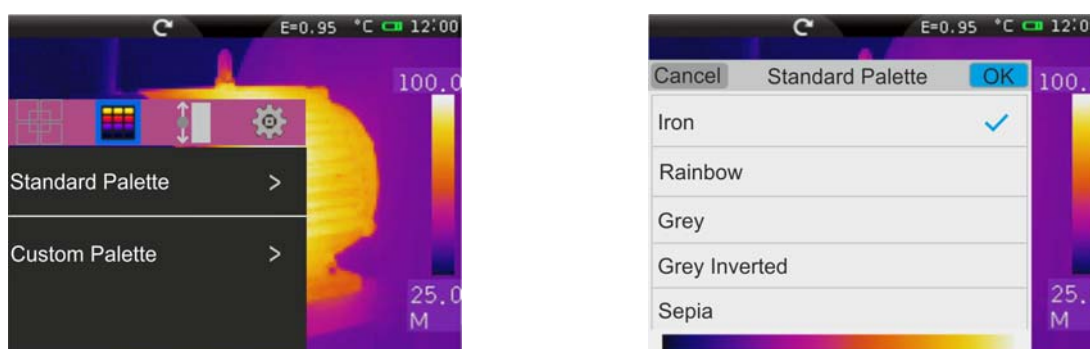


Fig. 47: Setting the standard palette

2. Scroll the entire length of the Table with your finger in order to find the desired option and activate the symbol “✓”. Touch “OK” to confirm or “Cancel” to go back to the previous screen. Notice the presence of the colours of the palette in the lower part of the display. The following standard palettes are available:

- Iron, Rainbow, Grey, Grey Inverted, Sepia, Blue_Red, Hot_Cold, Feather

User palette

1. **In manual mode**, touch the item “**Custom palette**”. The following screen appears on the instrument's display:

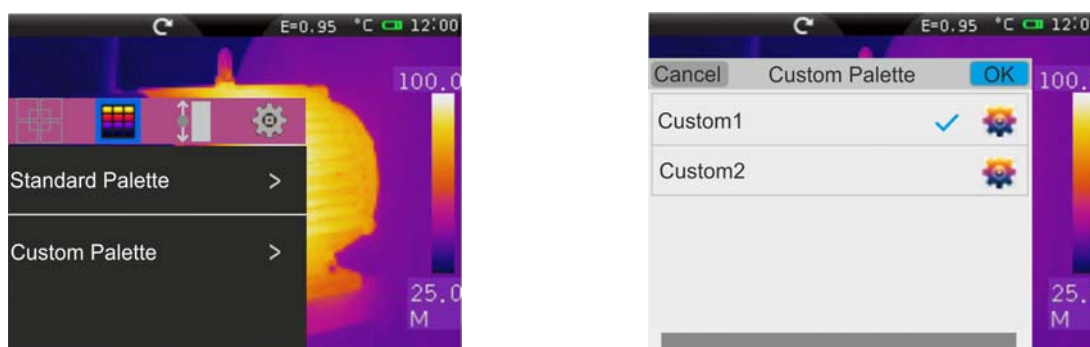


Fig. 48: Setting the user palette

2. The instrument makes two palettes named “**Custom1**” and “**Custom2**” which can be freely customized, but cannot be eliminated. These palettes have a default grey colour.
3. Touch one of the two palettes to select them by activating the symbol “✓”.
4. Touch **for approximately 2 seconds** the line corresponding to the selected palette. The following screen appears on the display:

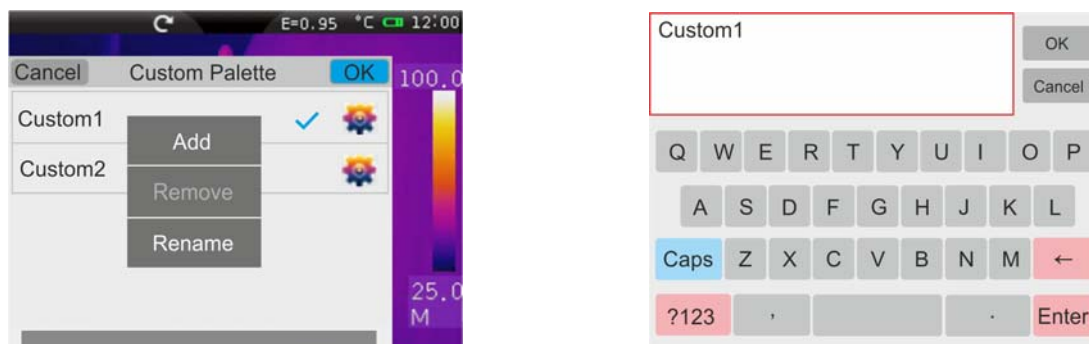


Fig. 49: Customizing the user palette name

5. Touch the item “**Rename**” to change the name of the palette (max 8 figures). An internal virtual keyboard is shown on the display (see Fig. 49). Confirm the operation with “OK”.
6. Touch the item “**Add**” to add further custom palettes (see Fig. 50). It is possible to add **max 8 palettes** further to the two available by default. By touching the item “**Remove**” it is possible to remove custom palettes, except for the two already available by default.

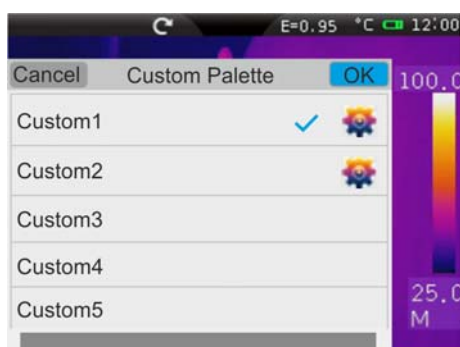


Fig. 50: Insertion of new user palettes

7. Touch the icon “” for a complete definition of customization. The following screen appears on the display:



Fig. 51: Customizing the user palette colours – Step 1

8. The screen shows the default palette in uniform grey with division markers in 4 parts in a default temperature range of **0.0°C/F (MIN) ÷ 50.0°C/F (MAX)** with values of: **12.5, 25.0** and **37.5**
9. **Touch the MIN 0.0 value and/or the MAX 50.0 value.** The following screens are shown on the display:



Fig. 52: Customizing the user palette colours – Step 2

10. Touch the symbols “<” and “>” to set:
 - **Min value:** → The minimum value of the manual temperature range in the instrument's measuring range: **-20°C ÷ 400°C**
 - **Max value:** → The maximum value of the manual temperature range in the instrument's measuring range: **-20°C ÷ 400°C**
 - The values of the colours associated to the **RGB model** (Red, Green, Blue) in a range between **0 ÷ 255**. Setting is possible both by inserting numerical values, and by touching the cursors “+” and “◀” on the colour spectrum and observing the resulting effect on the bar positioned at the top of the display (see Fig. 52 – right side).
11. Confirm the operation with “OK” or press “Cancel” to exit without saving and go back to the previous screen.
12. Drag the 4 division markers of the temperature range along the bar until the desired intermediate temperature values are obtained (see Fig. 53 – right side).



Fig. 53: Customizing the user palette colours – Step 3

13. Touch the division markers and set:
 - The values of the colours associated to the **RGB model** (Red, Green, Blue) in a range between **0 ÷ 255**. Setting is possible both by inserting numerical values, and by touching the cursors “+” and “◀” on the colour spectrum and observing the resulting effect on the bar positioned at the top of the display (see Fig. 53 – left side).
 - Activation of the marker with sign “✓” in the “**Activate**” range. The symbol “☐” is found on the bar of the palette (see Fig. 53 – right side).
14. Confirm the operation with “OK” or press “Cancel” to exit without saving and go back to the previous screen.

5.2.3.3 Adjusting the image temperature

In the Image menu, touch the icon  to set the adjusting mode of the temperature associated with the image framed on the display. The following options are available:

- **Automatic (Auto)** mode → the minimum and maximum temperature levels of the framed object on the display and associated with the colour palette are automatically defined by the instrument and dynamically vary when moving it. This (default) option, which can be used in most cases, allows for an optimum display of the IR image in a condition of temperatures equally distributed within it.
- **Histogram (HG)** mode → the minimum and maximum temperature levels of the object framed on the display are always defined automatically by the instrument, as in Auto mode, but in this case, the areas of the image in which temperature values are very different from the values of adjacent areas are highlighted.
- **Manual (M)** mode → the minimum and maximum temperature levels of the object framed on the display are manually set by the user, who can associate, if necessary, a custom colour palette. This mode, particularly useful to clearly identify only some areas of the image, is recommended in case of advanced thermographic operations.

1. Touch the symbols “<” and “>” to set the Automatic or Histogram modes. The following screens are shown on the display: The messages “**Auto**” and “**HG**” are found in the lower part of the colour palette.

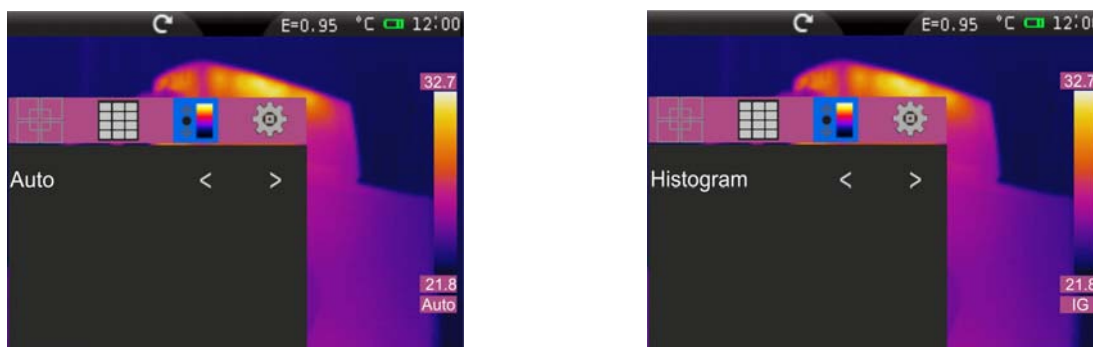


Fig. 54: Setting the Automatic and Histogram modes

2. Touch the symbols “<” and “>” to set the Manual mode. The following screen appears on the display:

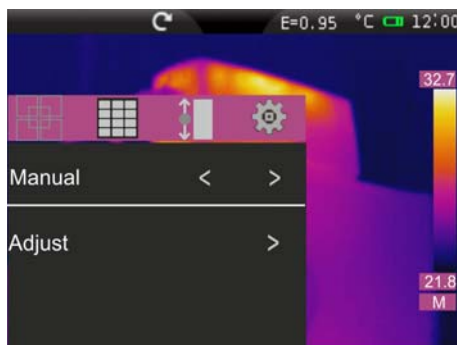


Fig. 55: Setting the Manual mode

3. Touch the item “**Adjust**”. The instrument shows the following screen:

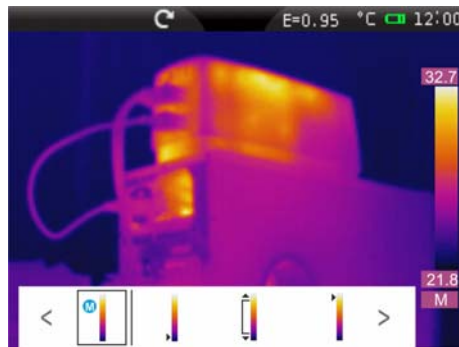


Fig. 56: Selection temperature mode



CAUTION

The screen of Fig. 56 is also shown, as a shortcut, touch the high and low level values located in the palette extremes in the right part of the display

4. Touch the icon “” for the setting of the adjustment mode. Touch the symbols “<” and “>” for the selection of Automatic (A), Manual (M) or Histogram (H) modes
5. Touch the icon “” or the icon “” for the single settings of adjustment respectively of high and low level of temperature. Touch the symbols “<” and “>” to carry out the adjustment of the temperature range associated with the colour palette until reaching the desired effect (see Fig. 57). Adjusting the levels is carried out with a fixed interval defined by the instrument and which cannot be modified, and the colour palette becomes white



Fig. 57: Single adjusting of high and low level of temperature

6. Touch the icon “” for the simultaneous adjustment of both high and low level of temperature. Touch the symbols “<” and “>” to carry out the adjustment of the temperature value associated with the palette up to reach the effect (see Fig. 58)

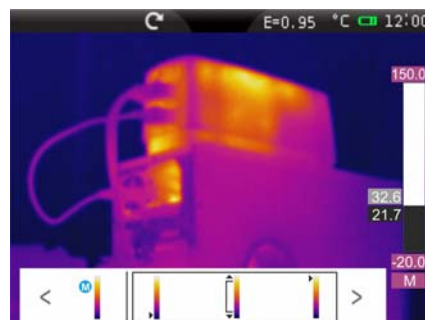


Fig. 58: Simultaneous adjusting of high and low level of temperature

7. At the end of the adjustment, the colour palette takes the original aspect again, with the values of the desired minimum and maximum levels Touch the display to exit the function

5.2.3.4 Setting the Isotherm function

In the Image menu, touch the icon “” to select the Isotherm function and to activate a screen clearing function. The following options are available (see Fig. 59)

- **Isotherm** → allows activating the Isotherm function and to define its characteristic.
- **Clear screen** → allows having the display cleared of all symbols.

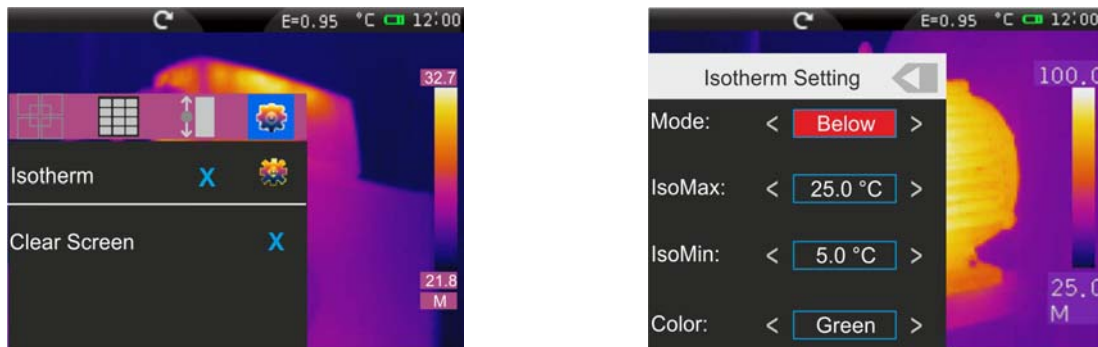


Fig. 59: Setting the Isotherm tool

1. Touch the item “**Isotherm**” or the symbol “” to activate the Isotherm function. The icon “” is shown on the display
2. Touch the icon “” to define the characteristics of the Isotherm line. The screen Fig. 59 is shown on the display. The meaning of the items is the following:
 - **Mode** → defines the type of Isotherm. Available options are:
 - **Between** → the instrument shows the spots of the image with temperature between $IsoMin \div IsoMax$ with colour defined by the user
 - **Higher** → the instrument shows the spots of the image with temperature higher than $IsoMax$ with colour defined by the user
 - **Lower** → the instrument shows the spots of the image with temperature lower than $IsoMin$ with colour defined by the user
 - **IsoMax** → defines the value of maximum threshold which the Isotherm line refers to. Measuring range: **-19.5°C ÷ 399.5°C**
 - **IsoMin** → defines the value of minimum threshold which the Isotherm line refers to. Measuring range: **-1.0°C ÷ 420.0°C**
 - **Colour** → defines the colour of the Isotherm line. Possible options: **Black, Green, White, Transp. (Transparent)**
3. Press the “” key to go back to the previous screen
4. Touch the item “**Clean screen**” to activate the complete clearing of the display from all other symbols (option recommended with use of the Isotherm line tool).
5. Touch the display to exit the Isotherm line function.

5.2.4 Camera menu

In this section it is possible to carry out the following operations:

- Fixing the images on the display
- Saving the images on the micro SD card
- Carrying out voice annotations when saving the image
- Carrying out text annotations when saving the image

5.2.4.1 Fixing the image on the display and saving

An IR image on the display may be saved on the micro SD card inserted in the instrument, after it has been frozen on the display. Proceed as follows:

1. Insert the micro SD card into the relevant slot of the instrument. The icon “” is shown in the top left-hand part of the display.
2. Press the **T** (Trigger) key to freeze an IR image on the display. The symbol “” appears in the upper part of the display, the icon “” appears in the lower part of the display and the icon “” becomes fully light blue “” (see Fig. 60 – right side). The same result is obtained by touching the icon “” in the general menu and by touching the icon “” (see Fig. 60 – left side). Touch the icon “” and then the **T** key to exit the Hold function.

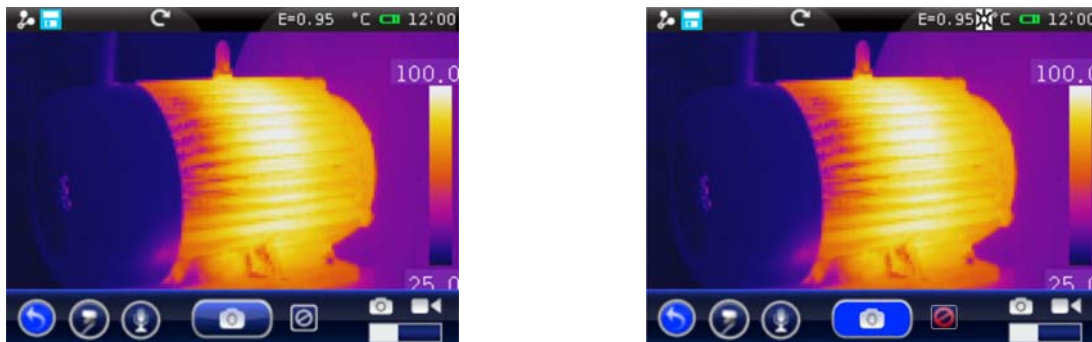


Fig. 60: Freezing the image on the display and saving

3. Touch the icon “” or press the **T** key again to save the image on the display. The image is saved with the name “YYMMDD_XXXXT” in which: “YY = Year”, “MM = Month”, “DD = Day” and “XXXX = progressive number of saving. This indication appears for a moment on the display.

5.2.4.2 Voice annotation

While saving the image, the instrument allows inserting a vocal comment recorded by the operator (max 60s for each image) as follows:

1. Save the image according to the procedure described in § 5.2.4.1. At the end of the operation, the instrument's situation is shown in Fig. 61 – Left side.

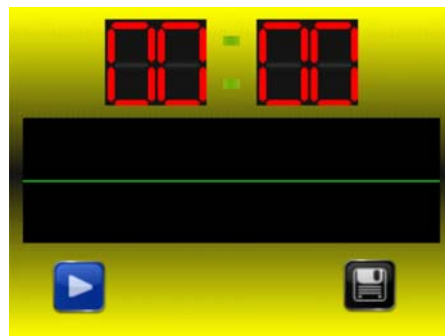
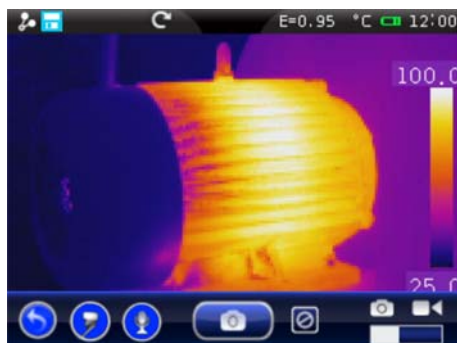


Fig. 61: Inserting a voice annotation

2. Touch the icon "🔊". The screen Fig. 61 – Right side is shown on the display
3. Insert the jack of the headphones provided into the instrument (see Fig. 4 – Part 17).
4. Touch the icon "▶" to start recording the voice annotation.
5. Speak into the microphone found on the headphones connected to the instrument for the desired time.
6. Touch the icon "◻" to stop recording. The following screen appears (see Fig. 62 – Left side):

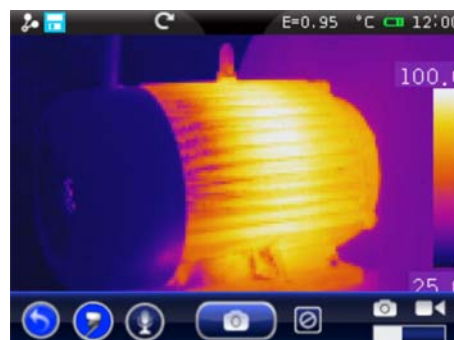
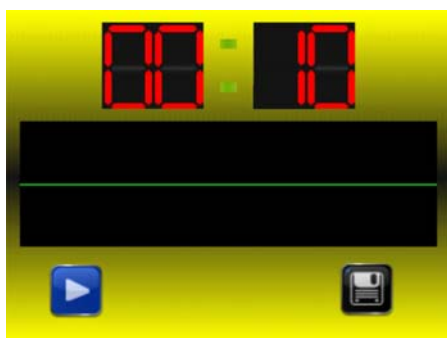


Fig. 62: Stopping a voice annotation

7. Touch the icon "💾" to save the voice annotation associated with the image previously saved or the key "◻" to exit without saving. The instrument shows the screen Fig. 62 – Right side and is ready to save the image again.
8. To listen to the voice annotation again, see § 5.2.5

5.2.4.3 Text annotation

While saving the image, the instrument allows inserting a text comment entered by the operator (possibly associated with the voice annotation) as follows:

1. Save the image according to the procedure described in § 5.2.4.1. At the end of the operation, the instrument's situation is shown in Fig. 63 – Left side.

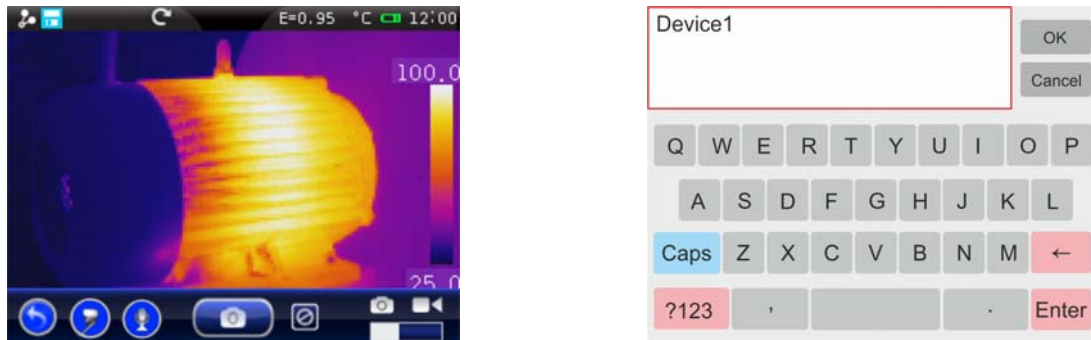


Fig. 63: Inserting a text annotation

2. Touch the icon “”. The screen Fig. 63 – Right side is shown on the display
3. Insert the desired text comment by using the virtual keyboard
4. Touch the “OK” key on the keyboard to confirm the text comment associated with the previously saved image or the “Cancel” key to exit without saving the comment.
5. To see the text annotation again, see § 5.2.5

5.2.4.4 Recording IR videos

The instrument allows recording and saving IR videos on the micro SD card as follows:

1. Touch the icon “” in the general menu and move the icon “” to the right. The following screen appears (see Fig. 64 – Left side):

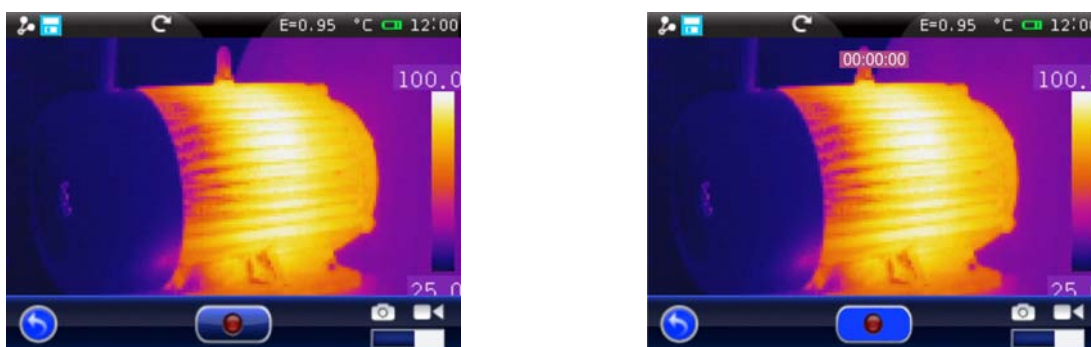


Fig. 64: IR video recording

2. Insert eventually the jack of the headphones provided into the instrument (see Fig. 4 – Part 17) to performed video with audio
3. Touch the icon “” to start recording the IR video. The icon becomes “” and the indication of the duration of the video indicated in “HH:MM:SS” appears in the upper part of the display (see Fig. 64 – Right side).
4. Touch the icon “” again to stop the video and save it automatically on the micro SD card.
5. Touch the icon “” to exit the function and go back to the main menu

5.2.5 Gallery menu

In this section it is possible to recall on the display and see the gallery of the IR images saved on the micro SD card inserted in the instrument. In the same section it is possible to see the text annotations and listen to the voice annotations made while saving the images.

1. Touch the icon “” in the main menu. The following screen appears (see Fig. 65 – Left side):

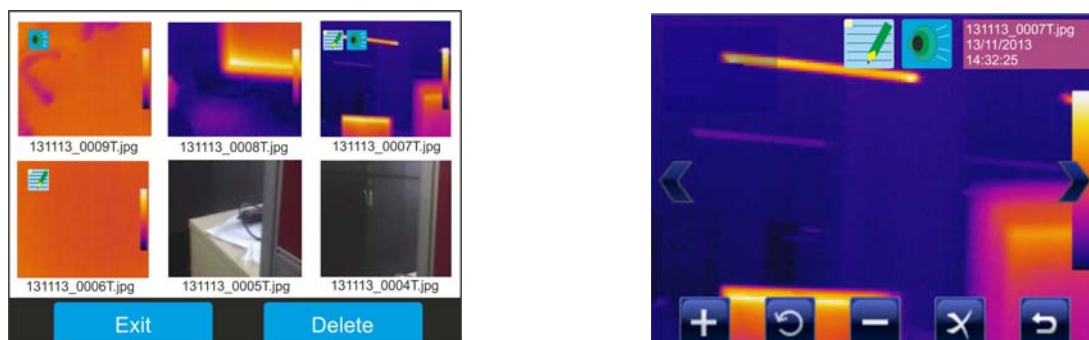


Fig. 65: Recalling on the display the images saved

2. The saved images are shown in reduced dimensions within the gallery in sequence according to the date in which they were saved. Scroll laterally with your finger on the display to change the screen in case the gallery contains many saved images.
3. The icons “” and “” possibly present on the images respectively indicate the presence of voice and text annotations saved with the image.
4. Touch an image in the gallery to see it again. The screen Fig. 65 – Right side is shown on the display. The meaning of the symbols is the following:

- “” and “” → allows switching from an image to the other.
- “” → allows zooming in the image. Press and hold the icon to continuously increase the zoom. Touch the icon “” to exit the screen and restore normal display.
- “” → allows zooming out the image. Press and hold the icon to continuously decrease the zoom. Touch the icon “” to exit the screen and restore normal display.
- “” → allows rotating the image in clockwise direction. Drag the image on the display to move it, if desired. Touch the icon “” to exit the screen and restore normal display.
- “” → allows exiting the section and going back to the previous screen.
- “” → allows deleting the selected image. A message is provided by the instrument to confirm the operation.

5. Touch the icon “”. The following screen appears on the display (see Fig. 66 – Left side).

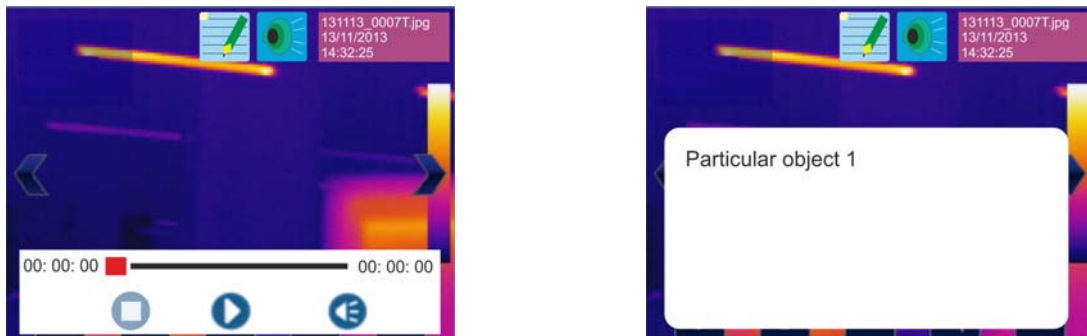


Fig. 66: Display of voice and text annotation

6. Insert the jack of the headphones provided into the instrument (see Fig. 4 – Part 17) and wear the headphones.
7. Touch the icon “

5.2.5.1 Deleting images

The instrument allows deleting images as follows:

- Touch the icon “- 1. Touch the icon “**Delete**” inside the image gallery. The following screen (see Fig. 67 – Right side) is shown on the display:

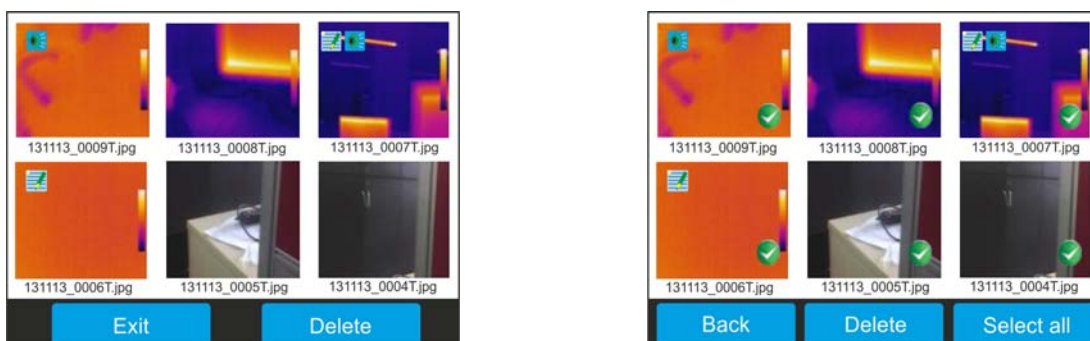


Fig. 67: Selecting and deleting images

2. Touch the single images or the icon “**Select all**” to select all images in the gallery. The icon “
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5.2.6 Video menu

In this section it is possible to recall on the display and see the gallery of the IR videos (MPEG4 format) saved on the micro SD card inserted in the instrument.

1. Touch the icon “” in the main menu. The following screen appears (see Fig. 68 – Left side):

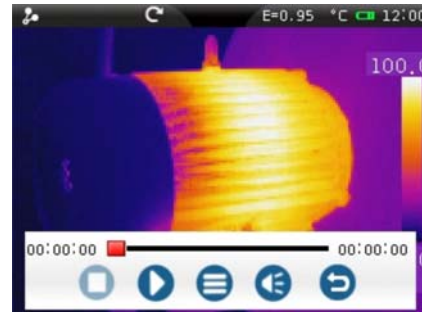


Fig. 68: Recalling saved IR videos on the display

2. The saved IR videos are shown in reduced dimensions within the gallery. Scroll laterally with your finger on the display to change the screen in case the gallery contains many saved videos. The first video on the left is the last saved.
3. Insert the jack of the headphones provided into the instrument (see Fig. 4 – Part 17) and wear the headphones.
4. Touch a video icon in the gallery to see it again. The selected video is marked by the symbol “▶”. The screen Fig. 68 – Right side is shown on the display. The meaning of the symbols is the following:

“▶” → Play IR video

“◻” → Stop IR video

“⏸” → Pause IR video

“🔊” → Adjust recording volume

“☰” → Back to IR video gallery

“⏮” → Back to main menu

5.2.6.1 Deleting IR videos

The instrument allows deleting IR videos as follows:

1. Touch the icon “Delete” inside the IR video gallery. The following screen (see Fig. 69 – Right side) is shown on the display:

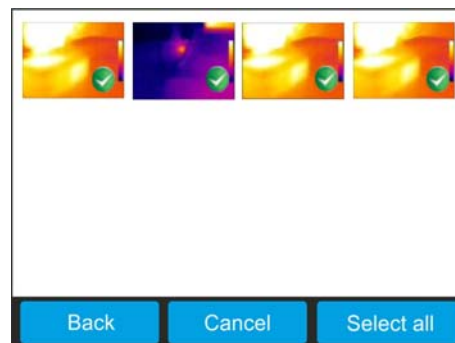


Fig. 69: Selection and deletion of IR videos

2. Touch the single videos or the icon “Select all” to select all videos in the gallery. The icon “✓” is shown on the selected videos.
3. Touch the single videos or the icon “Deselect all” to deselect all videos in the gallery. The icon “✓” disappears from the display.
4. Touch the icon “Delete” to definitively delete the selected videos (no message is provided by the instrument to confirm the operation).
5. Press the icon “Back” to go back to the previous screen.
6. Touch the icon “Exit” to exit and go back to the main menu.

5.3 USING THE INSTRUMENT

For a typical use of the instrument, please refer to the following procedure:

1. Switch on the instrument by pressing and holding the “” key for 3 seconds. After approx. 20 seconds of internal autotest, the instrument shows its normal measuring screen. The instrument shows an initial screen like the one shown in Fig. 70.



Fig. 70: Initial screen

2. It takes approx. 90 seconds for the instrument to become fully operating. During this time interval, the instrument carries out an automatic calibration and the internal commutations may produce some noise

CAUTION



The autocalibration sequence starts when the instrument is switched on and continues during the thermal cameras normal operation, during which the image freezes for a few seconds in order to eliminate offset errors. The noise produced by the commutation of internal parts is not to be considered as a problem of the instrument.

3. Before any measuring operation, correctly focus the thermal camera in order to prevent having grossly inaccurate measurements and a low quality of the saved image (see § 5.1.1).
4. For accurate temperature measurements, make sure the surface of the measured object is always bigger than the surface measurable by the instrument, which is given by the instruments field of view (FOV). The instrument has a field of view of $25^\circ \times 19^\circ$ and a detection vector of 384×288 (110592) pixels (see Fig. 71).

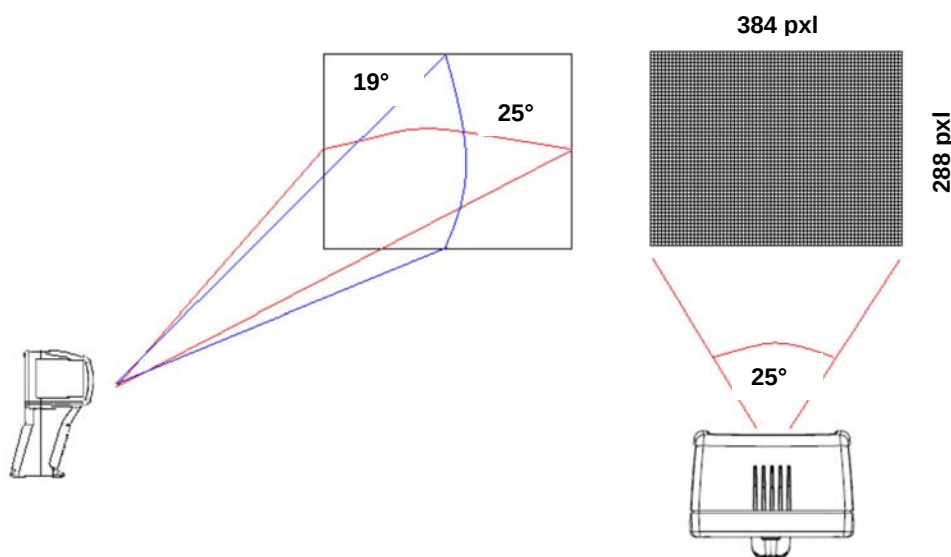


Fig. 71: Representation of the instruments field of view (FOV)

The representation of the ratio D (distance from the object) / S (surface of the object) for an instrument provided with 22mm lens is described below.

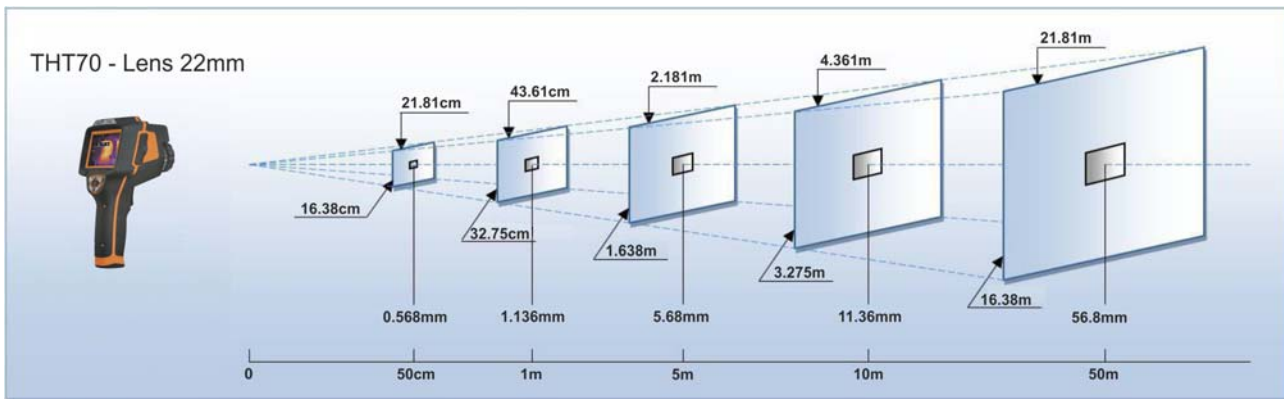


Fig. 72: Representation of the instruments D/S ratio

In the representation, it is possible to see how the IFOV (Instant Field Of View = geometrical resolution of the instrument = size of the single pxl of the IR sensor) is equal to 1.14mm at a distance of 1m of the instrument from the object being measured. This means that the instrument is capable of carrying out correct temperature measurements at a distance of 1m on objects with a size not lower than 1.14 mm.

5. The typical application of thermal cameras is the one in which it is necessary to detect a temperature difference between two adjacent objects, as this kind of analysis is often sufficient to identify anomalies in electrical and mechanical appliances, etc. In such situations, in which an accurate temperature measurement is not strictly necessary, emissivity value may be set to "1" (see § 5.2.2.5), it is not necessary to consider the objects surface, its distance and the field of view). However, if accurate measures are required (e.g. the temperature of an electric motor), it is necessary to correctly set the parameters previously described in this manual.
6. Correctly set the temperature range of the image (see § 5.2.1), defining the adequate values according to the MIN and MAX temperatures detected within the measured area.
7. Frame the objects to be measured by using the laser pointer, if necessary (see § 4.2.5). The instrument displays the temperature values associated with the measuring cursors.
8. Use the **T** key (see § 5.2.4.1) to freeze the image on the display and save it in the internal memory of the instrument or on the external micro SD card. The instrument saves the images in sequence with file name "YYMMDD_xxxxT". Enter possible voice (see § 5.2.4.2) or text (see § 5.2.4.3) annotations onto the saved image.
9. Touch the icon "" to see the saved images again (see § 5.2.5).

5.4 TRANSFERRING IR IMAGES/VIDEOS ONTO THE PC

The instrument allows saving the IR images/videos on an external micro SD card and to transfer them onto the PC by using the USB cable. Both the micro SD card and the cable are provided with the instrument. Proceed as follows:

1. Insert the micro SD card into the instrument on one side (see Fig. 4 – Part 19).
2. Connect the USB cable to the instrument (see Fig. 4 – Part 16) and to the PC or use the adapter for micro SD/SD card provided in case you have an SD card reader installed on the PC.
4. Inside **"My Computer"**, search for the removable disk associated to the micro SD card and copy the files "YMMDD_XXXXT.JPG" of the desired IR images or the files "YMMDD_XXXXV.MP4" of the desired IR videos contained in two separate folders on the micro SD card to a PC folder.

5.5 VIDEO OUTPUT

The video output available in the instrument (see Fig. 4 – Part 15) enables displaying the IR image acquired on an external monitor or video recording device capable of managing PAL or NTSC systems. To connect the instrument, proceed as follows:

1. Switch on the instrument
2. Touch the icon  and setting the PAL or NTSC system (see § 5.2.1.1)
3. Connect the instrument to the external monitor or recording device using the video cable provided.
4. Turn on the external monitor or device
5. Verify to see the IR image both on the display instrument and on the external monitor or device with simultaneous manage of the operation
6. Touch the icon  and set the type of system PAL or NTSC (see § 5.2.1.1).
7. Perform the saving/monitoring of the image on the external monitor or device
8. At the end of the operations select the option **"Off"** on the instrument (see § 5.2.1.1), switch off the monitor or the external device and disconnect the video cable from the instrument.

6 USING THE THTLINK SOFTWARE

The software “THTLink” can be used to analyse the images saved on the micro SD card inserted in the instrument.

6.1 MINIMUM SYSTEM REQUIREMENTS

Hardware:	Pentium IV
RAM memory:	512MB
Output interface:	USB ports or SD card reader
CD-ROM reader:	present
Screen resolution:	800x600
Operating system:	Windows XP o higher
Software applications:	Microsoft .Net Framework 2.0 or higher

6.2 INSTALLING THE THTLINK SOFTWARE

1. Insert the installation CD-ROM into the reader of the PC.
2. Launch the file “**THTLink.exe**” found inside the CD-ROM and follow the guided installation procedure

6.3 MAIN CHARACTERISTICS OF THE THTLINK SOFTWARE

With launched program, the PC shows the following initial screen:

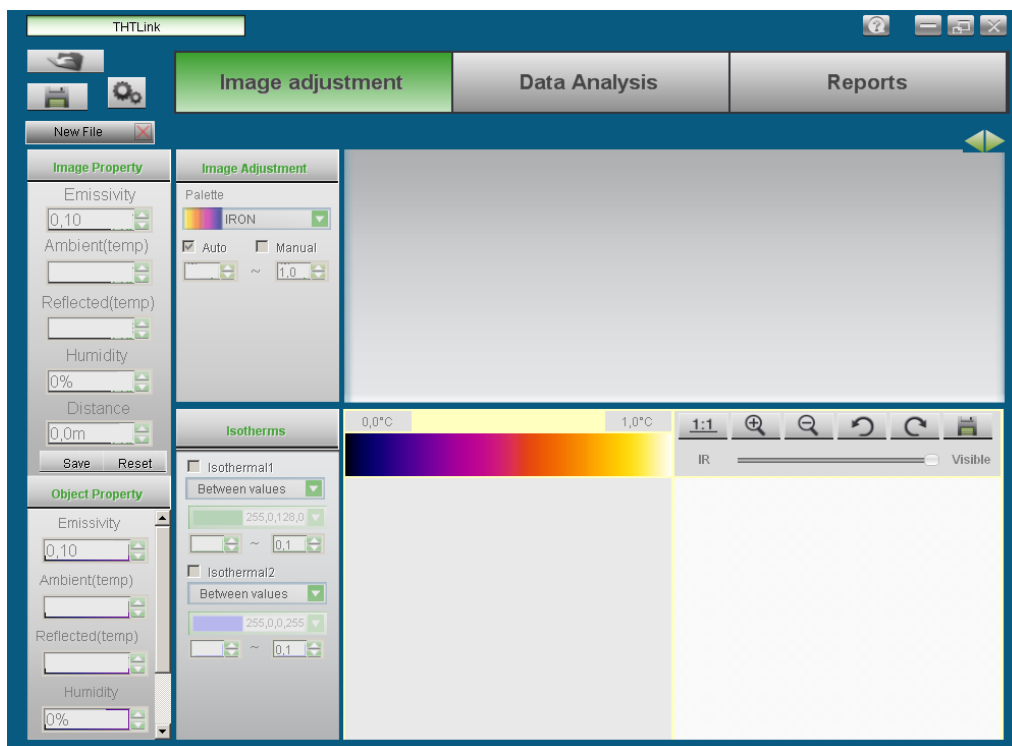


Fig. 73: Starting screen of the THTLink software

Main characteristics of the THTLink software:

- Display of IR and visual images
- Insertion of advanced analysis tools (points, lines, areas, isotherm lines)
- Realization of graphs from IR images
- Realization of print reports in RTF and PDF format
- Playback of the voice annotations saved on the images

For information about the use of THTLink, please refer to the Help on line of the software itself

7 MAINTENANCE

7.1 GENERAL INFORMATION

1. The instrument you purchased is a precision instrument. While using and storing the instrument, carefully observe the recommendations listed in this manual in order to prevent possible damage or danger during use.
2. Do not use the instrument in environments with high humidity levels or high temperatures. Do not expose to direct sunlight.
3. 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.

7.2 RECHARGING THE INTERNAL BATTERY

The instrument is designed to be supplied with a Li-ION rechargeable battery. With the symbol "" found on the display, it is necessary to recharge the battery. Recharge can be performed as follows:

- By connecting the instrument to the electric mains through the battery charger provided with the instrument
- Insert the battery into the recharging base and connect it to the electric mains.



CAUTION

- The battery must not be removed from the instrument while recharging.
- Recharge the battery at room temperature, avoiding too high or too low temperatures.
- When using the instrument for the first time, recharge the battery for at least **3 hours**.

7.2.1 Recharging the battery with direct connection to the electric mains

1. Connect the battery charger provided with the instrument to the AC electric mains and the DC output to the instrument's input (see Fig. 4 – Part 18).
2. The indicator of the battery charge level takes the flashing symbols "" → "" → "" in a sequence (see Fig. 74 – instrument off and on).



Fig. 74: Internal battery charging process

3. When the symbol "" appears on and steady on the display, the charging process is complete.
4. Disconnect the battery charger from the instrument and from the electric mains.

7.2.2 Recharging by connection to the recharging base

1. Connect the provided battery charger to the AC mains and the recharging base. The green **"Power"** LED on the base turns on.
2. Insert the battery into the recharging base provided, paying attention to the insertion direction and blocking the battery with the relevant selector. The red **"Charge"** LED on the base turns on.
3. Carry on the recharging process until the **"Charge"** LED turns off.
4. Remove the battery, disconnect the recharging base and the battery charger from the electric mains.

7.3 CLEANING THE INSTRUMENT

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

7.4 END OF LIFE



CAUTION: this symbol found on the instrument indicates that the appliance, its accessories and the batteries must be collected separately and correctly disposed of.

7.5 ACCESSORIES

7.5.1 Accessories provided

- Focal lens for IR measurements $f = 22\text{mm}$
- Lens protection cap
- BAT7X → Rechargeable Li-ION battery, 7.4V 2700mAh, 2 pieces
- A007X → AC/DC 100-240V/12V adapter + universal plugs
- Battery recharging base
- Micro SD card, 4GB
- Adapter for micro SD card
- USB cable
- RCA video cable
- Set of headphones for intercom
- SSHIELD7X → Support for display protection
- Support for tripod
- CD-ROM with Windows software THTLink
- ISO9000 calibration certificate
- Quick reference guide
- User manual on CD-ROM
- VA6070 → Rigid transport bag

7.5.2 Optional accessories

- RL-11-70 → Focal lens for IR measurements $f = 11\text{mm}$, FOV: $47.1^\circ \times 36.2^\circ$
- RL-38-70 → Focal lens for IR measurements $f = 38\text{mm}$, FOV: $14.4^\circ \times 10.8^\circ$

8 TECHNICAL SPECIFICATIONS

Range	Sensitivity	Accuracy (*)	Resolution	Image frequency
-20°C ÷ 400°C	<0.06°C@30°C	±2%reading or ±2°C	384x288pxl	50Hz

(*) With standard lens. For optional lens the accuracy is ±4%reading or ±4°C choosing the higher value

General specifications

Type of IR sensor	UFPA (384x288pxl, 25µm)
Spectrum response:	8 ÷ 14µm
Visual range (FOV) / Lens:	24.6° x 18.6° / 22mm
IFOV (@ 1m):	1.14mrad
Focusing:	manual
Minimum focus distance:	0.3m
Temperature readings:	°C, °F, °K
Available colour palettes:	8 (Standard) + 10 (Custom)
Laser pointer:	Class 2 in compliance with IEC 60825-1 (THT60)
Electronic zoom:	x1, x20
Image rotation:	0° ÷ 360° in steps of 1°
Emissivity correction:	0.01 ÷ 1.00 in steps of 0.01
Measuring modes:	Automatic / Manual / Histogram
Measuring functions:	corrections according to env. temperature, reflected temperature, distance, relative humidity, offset.
Advanced analyses:	Spots (3), Lines (2), Areas (3), Isotherm
Built-in photo camera:	CMOS sensor 640x480pxl, FOV 62.3°
Fusion PiP Function:	present (IR in Visual & Visual in IR)
Video output:	PAL/NTSC
IR video recording:	by means of micro SD card (MPEG4 format)
Voice annotation:	up to 60s / image
Text annotation:	with virtual keyboard
Memory:	Micro SD card 4GB (>1000 JPG), Max 32GB
PC interface:	USB 2.0

Power supply

Internal supply:	rechargeable Li-ION battery, 7.4V 2700mAh
External supply:	adapter 100-240VAC (50/60Hz)/12VDC
Battery duration:	4.5 hours of continuous use

Display

Characteristics:	Colour TFT LCD 3.5" with capacitive touch-screen
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Mechanical characteristics

Size (L x W x H):	243x103x160mm (10x4x6in)
Weight (battery included):	0.92kg (2lv)

8.1 ENVIRONMENT

8.1.1 Environmental conditions for use

Operating temperature:	-20°C ÷ 50°C (-4°F ÷ 122°F)
Storage temperature:	-40°C ÷ 70°C (-40°F ÷ 158°F)
Allowable relative humidity:	10 ÷ 90%RH
Mechanical protection:	IP65 in compliance with IEC 529
Fall test:	2m
Shock:	25G in compliance with IEC60068-2-29
Vibrations:	2G in compliance with IEC60068-2-6

This instrument complies with Directive EMC 2014/30/EC

9 SERVICE

9.1 WARRANTY CONDITIONS

This instrument is warranted against any material or manufacturing defect, in compliance with the general sales conditions. During the warranty period, defective parts may be replaced. However, the manufacturer reserves the right to repair or replace the product.

Should the instrument be returned to the After-sales Service or to a Dealer, transport will be at the Customers charge. However, shipment will be agreed in advance.

A report will always be enclosed to a shipment, stating the reasons for the products return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.

The manufacturer declines any responsibility for injury to people or damage to property.

The warranty shall not apply in the following cases:

- Repair and/or replacement of accessories and battery (not covered by warranty).
- Repairs that may become necessary as a consequence of an incorrect use of the instrument or due to its use together with non-compatible appliances.
- Repairs that may become necessary as a consequence of improper packaging.
- Repairs which may become necessary as a consequence of interventions performed by unauthorized personnel.
- Modifications to the instrument performed without the manufacturers explicit authorization.
- Use not provided for in the instruments specifications or in the instruction manual.

The content of this manual cannot be reproduced in any form without the manufacturers authorization.

Our products are patented and our trademarks are registered. The manufacturer reserves the right to make changes in the specifications and prices if this is due to improvements in technology.

9.2 SERVICE

If the instrument does not operate properly, before contacting the After-sales Service, please check the conditions of the batteries and replace them, if necessary. Should the instrument still operate improperly, check that the product is operated according to the instructions given in this manual. Should the instrument be returned to the After-sales Service or to a Dealer, transport will be at the Customers charge. However, shipment will be agreed in advance. A report will always be enclosed to a shipment, stating the reasons for the products return. Only use original packaging for shipment; any damage due to the use of non-original packaging material will be charged to the Customer.