User Manual
NI IR6010
Thermal Imaging Camera

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Specifications of the equipment:	NI IR6010
Specifications of the manual:	Date : 31-05-2011 Number : 561144179 Version : 001

Preface

This manual describes the NI IR6010. The information in this manual is important for proper and safe functioning of the equipment. If you are not familiar with operating this equipment then read this user manual from the beginning to the end thoroughly. After that you can use this manual for reference. You can find the information rapidly using the table of contents.

In this user manual, the following marking conventions are used to focus attention on certain subjects or actions

	***TIP:*** ***gives you suggestions and advice to perform certain tasks easier or handier.***

	***ATTENTION:*** ***A remark with additional information; draws your attention to possible problems.***

	***CAUTION:*** ***The camera may be damaged, if you do not carefully execute the procedures.***

	***WARNING FOR DANGER:*** ***You can (seriously) hurt yourself or seriously damage the product, if you do not carefully execute the procedures***

Warranty

Nieaf-Smitt B.V. guarantees the tester for a period of 12 months. The period of warranty will be effective at the day of delivery. The liability is recorded in the terms of delivery (FME).

CONTENTS

1. General safety regulations

	***WARNING DANGER:*** ***Read, before you perform any action in connection with the camera, this user manual carefully. Nieaf-Smitt B.V. is not liable for injuries, (financial) damage and/or excessive wear resulting from incorrectly performed maintenance, incorrect use of or modifications to the camera.***

	***ATTENTION:*** ***Under certain circumstances, in almost every electronic memory data are lost or changed. Therefore Nieaf-Smitt BV accepts no financial responsibility for losses or claims by lost or otherwise unusable information resulting from abuse, misuse, failure, neglect of the user manual and procedures or other related causes.***

	***It is not allowed to remove, to skirt or to tide over the enclosure or safeties of the camera, during operation.***

	***It's forbidden to place and/or to use the camera in a room where there is a risk of explosion.***

	***If the tester is used by a third party, you being the owner are responsible, unless otherwise specified.***

	***ATTENTION:*** ***Nieaf-Smitt B.V. reserves the right to, without prior notice , update the software in the camera, which is returned for either reparation or other reasons.***

	***Repair can only be done by Nieaf-Smitt BV.***

	***WARNING DANGER:*** ***It's forbidden to execute measurements if strong electrostatic or electromagnetic fields are present***

	***ATTENTION:*** ***Provide a clean and save workplace which has sufficient lighting.***

	***TIP:*** ***Contact Nieaf-Smitt B.V. if you require information concerning training for the camera. Training at Nieaf-Smitt or at customers can be arranged*** ***Nieaf-Smitt bv Vrieslantlaan 6*** ***3526AA Utrecht Holland*** ***Postbus 7023 3502KA Utrecht*** ***Tel.: 0031 30 – 2881311 (general)*** ***Tel.: 0031 30 – 2850285 (helpdesk)***

2. General

Thermal imaging cameras visualize and measure the thermal heat, which is issued by objects, in order to detect problems in a wide range of mechanical and electrical systems on a fast, accurate and highly effective manner. They identify sources of excessive friction, faulty switching, providing crucial information for many applications, including measuring heat loss from buildings and identify potential blockages in heating.

All this information is accessible without making contact with the measuring object. Since "irregular" thermal issues can be an indication for potential inefficiencies or errors, measurements can often be implemented in time for production loss, equipment failure and fire prevention.

Nieaf-Smitt forefront in adapting of radiometry and thermal systems for many more applications, so the technology can be used daily by inspectors and maintenance engineers, as ordinary tools like a screwdriver.

2.1 Intended use

Nieaf-Smitt products and solutions are used in many industries, including retail, banking, recreation, security, transportation and healthcare.

Many professionals in many industries, rely on the systems of daily Nieaf-Smitt for a wide range of thermal requirements, including:

Electric
Checking for loose / tight connections
Congested components
Disproportionate stress distribution
Faulty / fatigued components
Mechanical
Monitoring the condition of bearings
Poor motor shaft alignment
Faulty electrical connections
Domestic and industrial plumbing and heating
Floor heating control, without an equal area to break.
Detect cracked pipes
Monitoring efficiency of boilers and radiators
Food production
Monitoring temperature of food production on a tape
Monitoring the optimal operation of storage
Medical / health
Scanning of individuals at a high temperature as an indicator of virus
Control of blood flow to limbs
Emergency / Security
Monitoring of heat traces of recently displaced vehicles
Body temperature in low visibility

2.2 Target group

The group which covers this manual are been technically competent persons and competent persons.

People with certain knowledge and skills for the camera to operate in sectors including the following:

- Preventive maintenance, electrical and mechanical
- Domestic and industrial controls
- HVAC inspection and frozen
- Troubleshooting and fault detection

2.3 Operation

Thermal cameras visualize the temperature radiated by the measured object. This thermal image is shown through a display. There is also a normal image or a combination of thermal and normal image (image fusion). The recordings can be stored on a micro SD card. These images can be processed through a computer.

2.4 Specifications

Performance

Temperature range	:	-10°C to +250°C
Field of view (FOV)	:	20°x 15°
Spectral Response	:	8µm to 12 µm
Sensitivity	:	≤0.08°C @ 23°C
Detector	:	160 x 160 pixel array
Frame rate	:	8Hz
Focus Range	:	0.3m to infinity
Minimum Focus	:	30 cm

Image storage

Number	:	Up to 1000 images on SD card supplied
Medium	:	Micro SD Card

Display

3½" colour LCD with LED Backlight. 8 colour palettes. Mixed thermal and visible images. Digital zoom X2;X4

Laser pointer

A built in Class 2 laser is supplied to highlight the centre of the thermal image. (Aligned at 2 metres)

Beam Divergence	:	<0.2mrad
Maximum Output	:	<1mW

Measurement

Temperature range:	:	-10°C to +250°C
Radiometry	:	Four moveable temperature measurement cursors Temperature difference measurement
Emissivity Correction	:	User selectable 0.10 to 1.00 in steps of 0.01 with reflected ambient temperature compensation
Accuracy	:	The greater of ±2°C or ±2% of reading in °C For -15°C tot 45°C

Imager power supply

Battery	:	Lithium-ion field rechargeable.
Operation time	:	Up to 6 hours continuous operation
AC operation	:	AC adaptor supplied, 12Vdc – 1,25A

Mechanical

Housing	:	Impact Resistant Plastic with over moulded soft plastic .
Dimensions	:	130mmx95mmx220mm
Weight	:	0.80kg
Mounting	:	Handheld & tripod mounting 1/4" BSW

Settings and controls

- On/Off soft power control
- User selectable span control
- User selectable level control
- Auto adjust span and level
- Laser trigger switch
- Readout in °C or °F
- User selectable image integration
- User selectable emissivity setting
- User selectable reflected temperature
- Electronic zoom, x2 , x4.
- Four moveable temperature measurement cursors
- Area analysis
- X-Y profiles
- Isotherms
- Text annotation
- Voice annotation
- Image capture, time and date
- Visual/audio alarm high and low

Features

- Real-time image and temperature measurement display
- Four moveable temperature measurement cursors with individual emissivity values and temperature difference between two points.
- Visible/thermal/mixed image fusion (100%, 75%, 50%, 25%, 0%)
- Picture In Picture (PIP)
- Simple operation
- Multiple temperature measurement
- Image browser
- Battery Charge indicator
- Lightweight
- Laser Pointer
- Auto hot/cold seeker
- Languages

Computer requirements (for PC software)

PC: IBM compatible PC with a minimum of: 300MHz processor, MS Windows XP , Vista, or Win 7, 128MB RAM. 16 bit colour graphics with 1024x768 capability.

Environment

Temp. operating range	:	-15°C to +50°C
Humidity	:	10% to 90% non condensing
Temp. storage range	:	-20°C to +70°C
CE Mark (Europe)		
IP rating	:	IP54
Operating temp for stated accuracy	:	23 ºC

2.5 Safety precautions

The equipment described in this document uses a Class 2 laser. Under no account should anyone look directly into the laser beam or the laser beam exit aperture, irreversible damage to the eye may occur. The laser should not be operated when there are personnel in the imager's field of view.
Caution – use of controls or adjustments or performance of procedures other than those specified in this document may result in hazardous laser radiation exposure.

2.6 Certification

The tester complies with the relevant European directives. During the design of the camera directives have been taken into account, in order to comply to the fundamental demands of the directives. On the basis of this data the CE-mark has been mounted on the camera. The directives and the standards mentioned are enumerated in the EC-Declaration of Conformity. (see appendix. 3)

3. Contents of the case

1. The carrying case
2. Camera
3. PSU and International adaptors.
4. CD – user manual and software.
5. USB cable (camera to PC).
6. Quick start guide, certificate of conformity, calibration card (full manual added to CD).

4. Getting started

4.1 Charging the internal battery

	NOTE: ***When the camera is connected to a PC via the USB cable the camera will charge but extremely slowly.***

The camera's built in battery is charged via the charging port. A fully charged battery will last approximately 6 hours. A green LED indicates charging which turns to red when the battery is charged.

4.2 Changing the battery



Open the lock on the battery cover and remove the cover

- Remove battery.
- Insert new battery, ensuring the terminal pads are towards the front of the camera.
- Replace and lock the cover

4.3 Switching the camera on/off

Press the on/off button to switch the camera on.

	NOTE ***Press and hold for a few seconds to switch the camera off.***
	NOTE ***It take a few seconds before the camera is fully started up.***

After switching on, it will take up to 30 seconds for the infrared image to appear. The image will periodically freeze for one or two seconds while the camera re-calibrates itself. This is normal operation, and the time between these calibrations will increase as the operating temperature of the camera stabilizes..

4.4 Configuration of the camera

After switching the camera on for the first time it needs to be configurated. This will be explained in the underlying paragraphs.

options chosen by the user. A yellow box around the icon for Hotkey1 or Hotkey 2 indicates that this option is selected and this defines the operation of the navigation and toggle buttons. In normal imaging mode, Hotkey 3 may be used to freeze the image; pressing it again returns the camera to live operation. Hotkey 4 is used to enter and exit the menu. See appendix 2 for a full icon list.

4.4.1 Menu structure

a. Select the menu  by pressing Hotkey 4  .

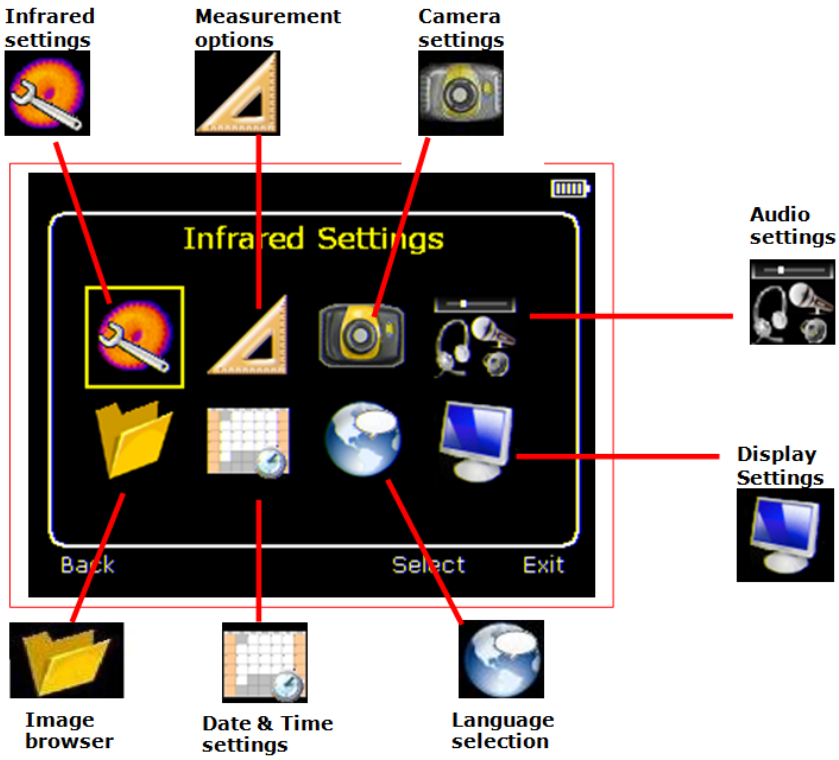
b. Navigate through the menu using the navigation buttons  and press Hotkey 3  to select the required option. The highlighted item will have a yellow box around it.

c. Use the up/down buttons  to move in the selected list and select the required item.

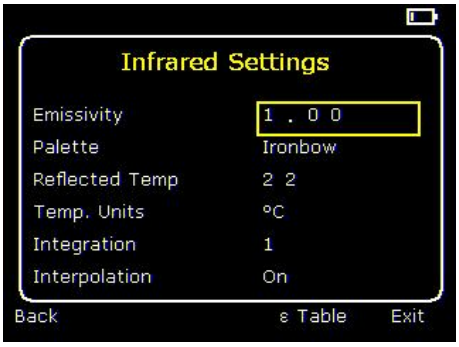
d. Use the left/right buttons  to change values and options for the specific item.

e. Press Hotkey 4  to exit or Hotkey 1  to go back to the previous menu.

Fig 1.



4.4.2 Infrared settings



See chapter “frequently asked questions” for more details of each item.

- **Emissivity**
  Set the emissivity value between 0.10 and 1.00 using the left/right navigation buttons. Pressing Hotkey 3 (ε Table) gives a table of emissivity values of common materials from which a selection can be made.

- **Palette**
  Display in image using different colour palettes.
  1. Ironbow
  2. Rainbow
  3. Isotherm Style
  4. Hot Metal
  5. High Contrast
  6. Rainbow 16
  7. Black Hot
  8. White Hot

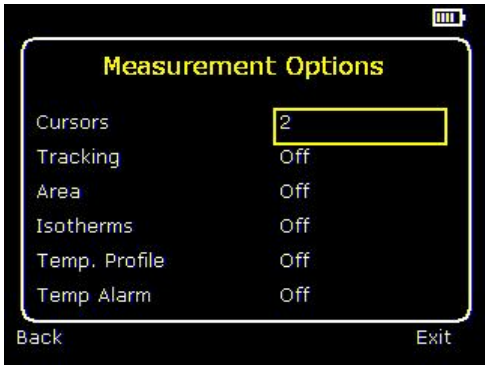
- **Reflected Temp**
  Usually set to the ambient temperature.
  Applies only when emissivity of less than 1 is selected.

- **Temp units**
  Choose between °C and °F.

- **Integration**
  Choose an integration period from 1 (fast) to 9 (slow).
  This determines the trade off between display speed and noise.

- **Interpolation**
  Choose Off or On.
  This shows or hides the thermal image pixelation.
  With this the interpolation of the thermal image can be switched on or off. If this is switched off, the shown thermal image will be displayed with the resolution of the thermal sensor.

4.4.3 Measurement options

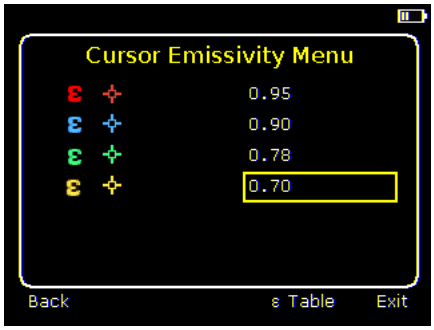


This menu enables the selection of options for temperature measurements. The symbols shown below indicate the icons shown for Hotkey 1 when the various options are selected.

♦ Cursors

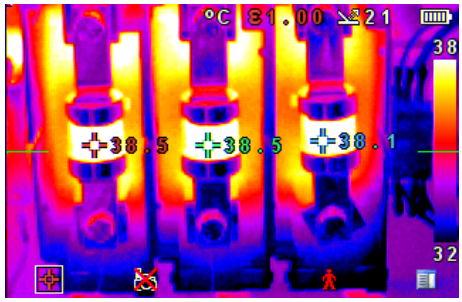
. Choose from one to four cursors. When more than one cursor is selected, the temperatures of all the cursors are displayed in a table or are tagged next to the cursors (see section 5.8). When two cursors are chosen, the temperature difference between them is also displayed. When one of the cursors is selected by Hotkey 1, it can be moved around on the display by the navigation buttons.

If two or more cursors are selected then individual emissivity values can be assigned to each cursor.



When an emissivity less than 1.00 is selected for a cursor, then that cursor flashes on the screen.

Tabular temperature values



Tagged temperature values

- **Cursor Tracking**

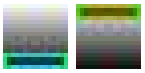
Select “High”, “Low”, or “High & Low” in order to track and measure the hottest point, the coldest point, or both hottest and coldest points in the image.

- **Area analysis**

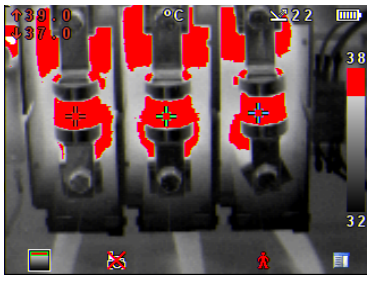
If this option is turned on, the highest, lowest, and average temperatures within the designated area will be displayed. Three different area size boxes can be selected via Hotkey 1.

✋	***NOTE:*** ***The above three items are mutually exclusive, i.e. when one is turned on the other two are disabled.***

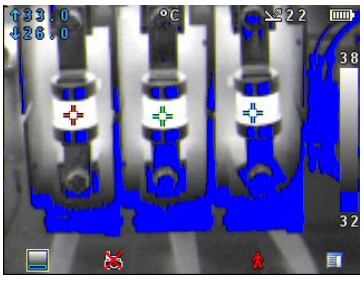
- **Isotherm**



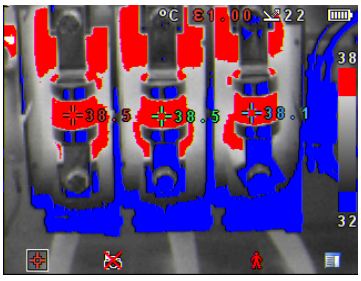
Select “High”, “Low”, or “High & Low” in order to highlight areas of the scene with temperatures within one or two temperature bands. The temperature bands are adjustable by means of Hotkey 1 and the navigation keys.



Red isotherm



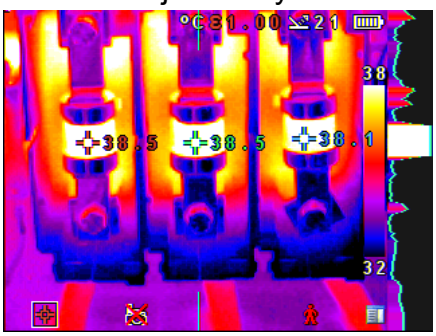
Blue isotherm



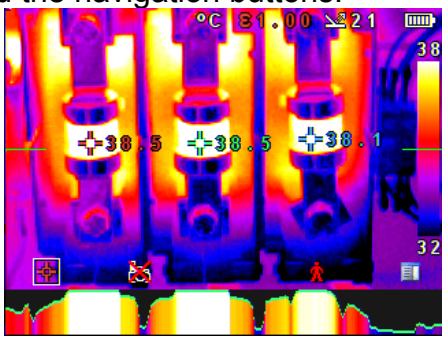
Combined isotherms

- **Temperature profile**

 Select “Horizontal” or “Vertical” to enable a histogram of temperature values along a horizontal or vertical cross section to be displayed on the right hand side of the display. The position of the cross section is indicated by small arrows at the left and right or top and bottom of the image and can be adjusted by means of Hotkey 1 and the navigation buttons.



Vertical Profile

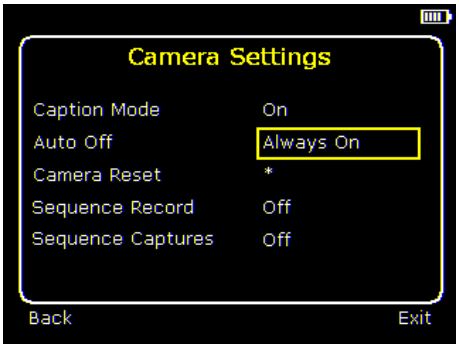


Horizontal profile

- **Temperature alarms**

 Select “High”, “Low”, or “High & Low”. Visual and audio alarms will be triggered if either cursor or a point within the designated area is higher or lower than a set temperature. The high and low set temperatures may be adjusted by means of Hotkey 1 and the navigation buttons.

4.4.4 Camera settings



See chapter “frequently asked questions” for more details.

- **Caption mode**
  Select “On” to enable the addition of a text caption when saving an image. Options will then be displayed when saving an image, to be selected by means of Hotkey 2 and hotkey 3.

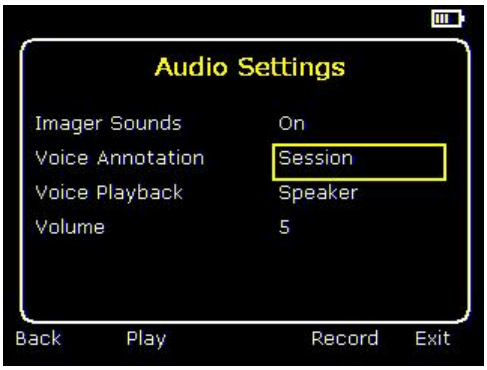
- **Auto off**
  Select “5 Mins”, “10 Mins”, “20 Mins” to allow the camera to switch itself off after a defined period of inactivity in order to save power. There is also an “Always On” option.

- **Camera reset**
  Select with Hotkey 3  to restore the factory settings.

- **Sequence Record**
  Select this to save a set of images of the scene. The images are saved to the micro SD card and an be saved at intervals of 5 Sec, 10 Sec, 20 Sec, 30 Sec, 1 Min, 2 Min, 5 Min, 10 Min, 20 Min, 30 Min, 1 Hour and on Alarm. The alarm setting works in conjunction with the high low alarm function. When the temperature in the scene exceeds the user defined high alarm threshold temperature an image is saved. Equally when the temperature in the scene goes below the user defined low alarm threshold temperature an image is saved.

- **Sequence Capture**
  If sequence record is selected, then this option is switched on and allows the user to define the number of images to be saved. Choices available are 10, 50, 100, 500 and 1000 images.

4.4.5 Audio settings



See chapter “frequently asked questions” for more details of each item.

- **Imager sounds**
  Select “Off” to mute all audible outputs.

- **Voice annotation**
  Select “Session”
  to add a voice message at the start of a set of images
  (A session ends when the imager is switched off).

  Select “Individual”
  to add a voice message to each saved image.

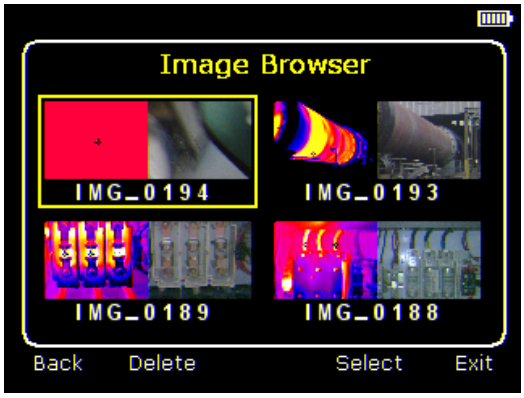
  Select “Combined”
  to add a common voice message at the start of a set of images
  and add additional comments for each image.

- **Voice playback**
  Select “speaker” or “headset” for the desired method of audible outputs**.**

- **Volume**
  Select the volume of the audible outputs from 1 to 9.

If session is selected the voice message is recorded in the audio settings by pressing Hotkey 3. Recording is stopped by pressing Hotkey 3 again. Hotkey 1 can be used to play back the recorded message. Hotkey 3 can be used to re-record if necessary.

4.4.6 Image browser

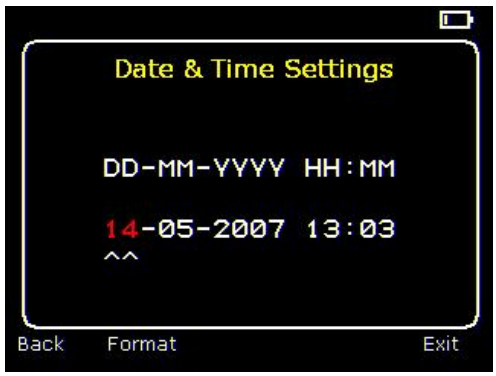


The saved images are shown on the screen with the most recently saved image first.

Select the desired image by means of the navigation keys.
To display the selected image press Hotkey 3.
To delete the selected image press Hotkey 2, to confirm deletion press Hotkey 3.

When a stored image is displayed, press Hotkey 3 to return to live imaging.

4.4.7 Date & Time settings

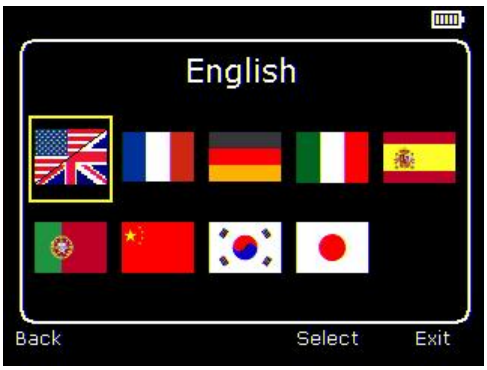


a) Use the left/right buttons  to navigate in this menu, the item that can be changed is highlighted in red. In the picture above the day (DD) 14 is highlighted.

b) Use the up/down buttons  to change the value.

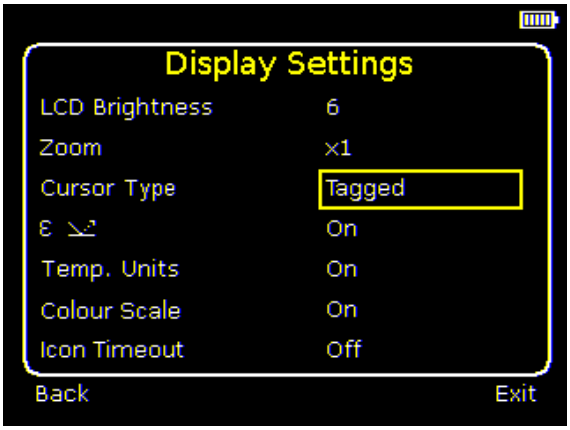
c) The date formats can be changed by pressing Hotkey 2 to cycle through DD-MM-YYYY, MM-DD-YYYY and YYYY-MM-DD options. Pressing Hotkey 4 will select the option on the display.

4.4.8 Language selection



When the language is highlighted (shown by a yellow box around it) press Hotkey 3  to select.

4.4.9 Display Settings



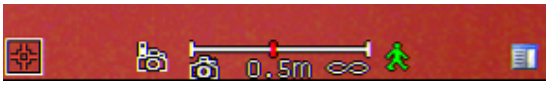
- LCD brightness
  Select from 1 (low) to 9 (high) to control the screen brightness to save battery power. . .
- Zoom
  Allows the user to digitally zoom into the image. Options are X2 and X4 zoom.
- Cursor Type
  Select how the cursor temperature values are to be displayed on the screen. The choice is between a tabular display or a tag next to the cursor.
- ε 
  Choose whether or not to display the reflected temperature. Only applicable when emissivity is selected to be less than 1.
- Temp. Units.
  Choose whether or not the temperature units (°C or °F) are displayed
- Colour Scale.
  Chose whether or not the colour scale is to be displayed.
- Icon Timeout
  The Icons above the 4 hotkeys can be displayed either continuously or for 10 seconds after a hotkey is pressed.

4.5 Focussing

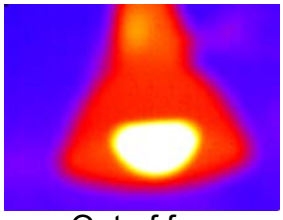
Gently rotate the lens clockwise and anti-clockwise to focus the image.

.

	***NOTE:*** **Remember to remove the lens cap.**



Focus bar



Out of focus

focused

When focusing a focus bar appears on the screen to assist in focusing the image. It indicates the approximate distance in metres (in feet when °F is selected) of a focussed target from the camera.

Hotkey buttons

Hotkey 1 Hotkey 2 Hotkey 3 Hotkey 4

The Hotkey functions are indicated by the icons or text displayed on the screen above them. These functions vary according to the operating

4.6 Saving an image.

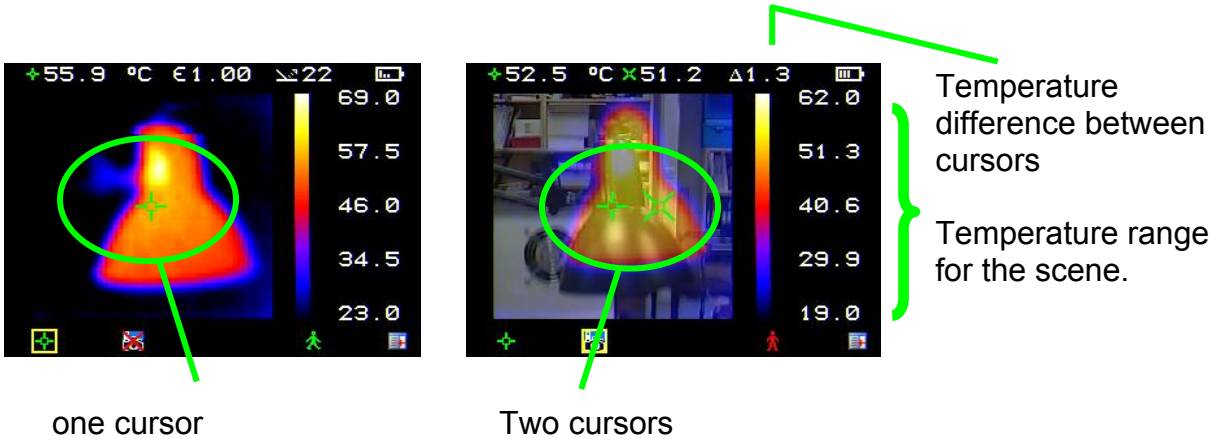
Save image button

To save a live or frozen image, press the Save button once. If Caption Mode or Voice Annotation has been turned on, a text caption or voice annotation can be attached to the image (see section 6).

5. Getting started

5.1 Temperature measurement

Temperature readings are displayed at the top of the display. In the default mode, a single temperature in °C is of the centre point of the cursor. The other readings at the top of the display are emissivity settings and reflected temperature setting. Two cursors or a measurement area can be selected from the measurement options menu (see section 5). The temperature range within the scene is indicated by a scale on the right hand side of the display



5.2 Turning the visible image off and on

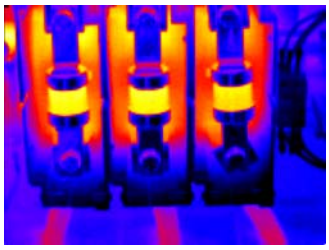
Press Hotkey 2  to toggle to the Visible On icon.

Press the centre toggle button  to toggle to Visible Off.

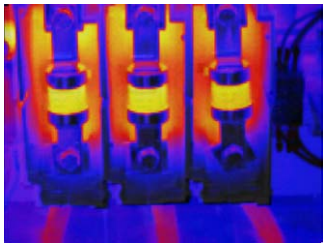
Press the centre toggle button  again to toggle to Visible On.

5.3 Thermal and visible image blending

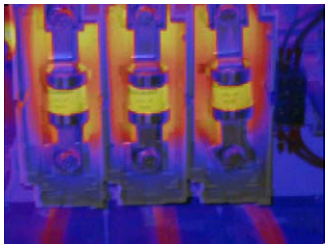
The camera can show a thermal image, a visible image of the scene, a mixed blend of both visible and thermal, a thermal picture in the visible picture (PiP) and a blended version of the thermal image in the PiP.



100% thermal



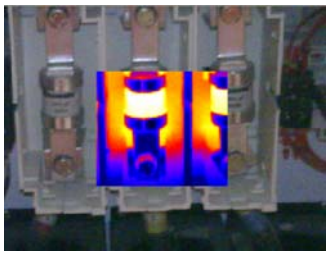
25% visible 75% thermal



50% visible 50% thermal

75% visible 25% thermal

100% visible



Picture in Picture

1. Press Hotkey 2  until the Visible On/Off icon appears  
2. If off  press the centre toggle button  to toggle to Visible On  .
3. Use the up/down navigation buttons to merge (blend) the visible and thermal images. Repeatedly pressing the up button cycles through the options 0%, 25%, 50%, 75%, 100%, PiP.
4. In the PiP mode the thermal image can also be blended using the left/right navigation buttons..

5.4 Manual control

The thermal image gain and offset are normally controlled automatically in order to give a meaningful display on the screen. However, Hotkey 2 offers the option of switching to manual control if desired:

1. Press Hotkey 2  to toggle to the Auto icon  .
2. Press the centre toggle button  to toggle to Manual  or Persistent manual.  If Persistent manual is selected, then the manual settings are stored. When the camera is switched on again, and Manual selected, the stored span and level settings are used.
3. Use the left/right navigation buttons to change the span of the displayed temperature range.
4. Use the up/down navigation buttons to change the level of the displayed temperature range
5. Press the centre toggle button again to revert to Auto.

5.5 Light

There is a visible illuminator for use in poor ambient lighting:

4.6.1. Press Hotkey 2  to toggle to the Light Off icon  .

4.6.2. Press the centre toggle button  to toggle to Light On  .

4.6.3. Press the centre toggle button again to turn the light off.

It is advisable to turn the light on only when necessary in order to conserve battery power.

5.6 Image freeze

Pressing Hotkey 3 freezes the both the infrared and the visible image. Pressing again reverts to a live image. The image save facility works with either a live or a frozen image, but once a frozen image has been saved the camera will revert to a live image.

5.7 Image alignment

As the visible and thermal cameras are not co-axial the visible and thermal image may need to be aligned. This is usually required when moving to view objects at different distances.

4.2.1. Press Hotkey 1  to toggle to the alignment icon  .

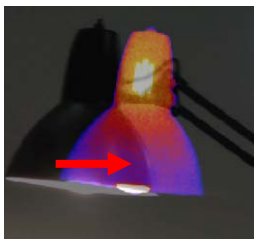
4.2.2. Use the up/down and left/right navigation buttons  to align the thermal and visible images.

Note The visible image is moved during alignment.

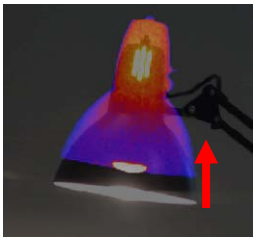
Examples of alignment.

Fully Aligned

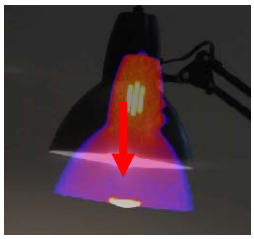
Align left



Align right



Align up



Align down

Four pre-programmed alignment distances are included. These are at 0.5m, 1m, 2m and 4m ranges. With the alignment option selected by Hotkey1, pressing the centre toggle button  once aligns at 2 metres. Pressing the toggle button repeatedly cycles through to 4m, 0.5m, 1m, and 2m.

Note: These values appear in feet if °F is selected.

5.8 Menu

Hotkey 4 opens the menus. See section 5 for details of the menu structure

6. Adding captions when saving images

6.1 Voice annotation

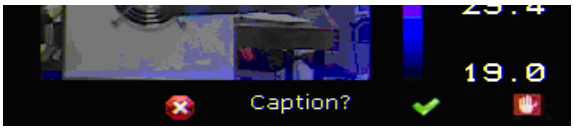
When saving an image with Individual Voice Annotation turned on, there is the option of saving a voice message with each image. The screen shots below, describe the procedure:

a) Do you wish to attach a voice message to this saved image?
Hotkey 2 for no.
Hotkey 3 for yes.

b) Start voice recording?
Hotkey 3 for yes.

c) Stop Recording Hotkey 3 to stop.

d) Option to Re-record the voice message?
Hotkey 2 for Yes
Hotkey 3 for No
Hotkey 1 for play



e) If caption mode is selected this option will now be offered to save a text caption. (see 6.2)

f) Image with voice message is being saved.

Playback

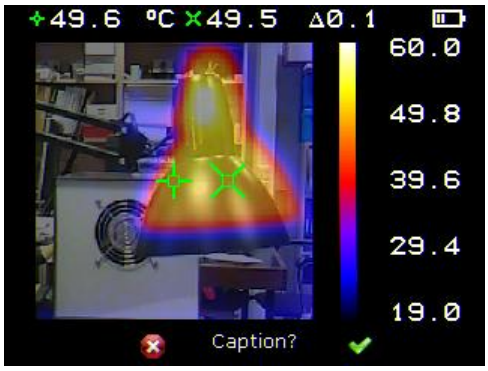
The voice recording can be played back when viewing saved images in the browser.

NOTE:
The abort Icon on Hotkey4.
Pressing Hotkey 4 at any stage aborts the saving process.

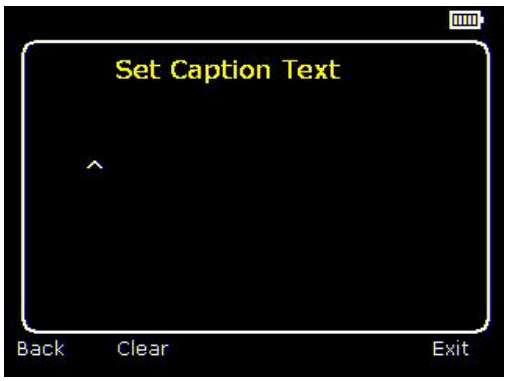
6.2 Text captions

When saving an image with Caption Mode turned on, there is the option of attaching a text caption to each image. The screen shots below, describe the procedure:

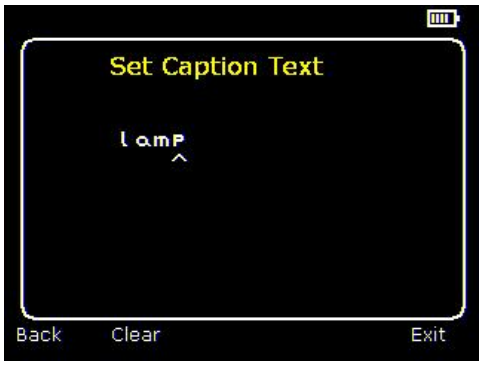
.



a) Do you wish to attach a text caption message to this image?
Hotkey 2 for No Hotkey 3 for Yes



b) start caption entry



c) Example of a caption

1. Use the up/down arrow buttons to cycle through letters and numbers until the one required appears. The available symbols are:
   ABCDEFGHIJKLMNOPQRSTUVWXYZa bcdefghijklmnopqrstuvwxyz0123456789
2. Use the left/right arrow buttons to move to the next space and repeat the above step until the caption is completed.
3. Press Hotkey 2 to clear the whole message.
4. Press Hotkey 4 to exit and save the image and caption.

	NOTE: ***Captions cannot be viewed with the saved images in the browser due to display constraints. The captions can be viewed using the PC software.***

7. Frequently asked questions

7.1 What Temperature Measurement Options are there?

1. One or two measurement cursors. (see q 7.2).
2. Area analysis (see q 7.3).
3. Tracking Hot, or Cold, or both Hot and Cold (see q 7.4).
4. Isotherms (see q 7.5).

The first three options are mutually exclusive and only one of the options can be selected at any one time.

7.2 . How do I select and move cursors?

There is a choice of one. or two cursors. The temperature measurement value of the selected cursor(s) is shown at the top of the screen. When two cursors are selected the temperature difference between them is also displayed. See Fig 4.

Fig 1.

Selection of cursors

1. Select the cursor by pressing Hotkey 1 (Fig 1).
2. Move the cursor using the navigation buttons . The cursor can be moved in both live and frozen images.
3. To select between one or two cursors press Hotkey 4 to select the menu (Fig 1).
4. Using the left/right navigation buttons move to the Measurement Options menu (See Fig 2) and Press Hotkey 3 to select it (Fig 3).
5. The cursors option will be highlighted.
6. Use the left/right navigation buttons to toggle between one or two cursors.
7. Press Hotkey 4 to exit (Fig 4).

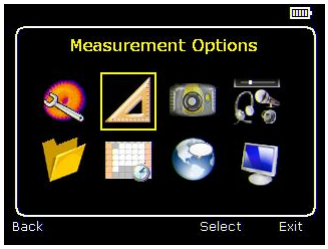


Fig. 2

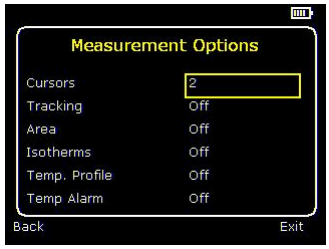


Fig. 3

Fig. 4

7.3 What is area analysis?

Area Analysis is used to measure the maximum, minimum, and average temperature within a defined region of the scene. There are three area sizes to choose from.

Selecting area analyse

1. Press Hotkey 4  to select the menu (Fig 1).
2. Using the left/right navigation buttons  move to the Measurement Options menu  (See Fig 2) and Press Hotkey 3  to select it (Fig 3).
3. Use the up/down navigation buttons  to move to the Area option.
4. Use the left/right navigation buttons  to toggle between On and Off.
5. Press Hotkey 4  to exit.
6. Use Hotkey 1  to toggle through until the area size icon appears  .
7. Use the navigation buttons  to select the different area sizes. (Figs 4 to 6).

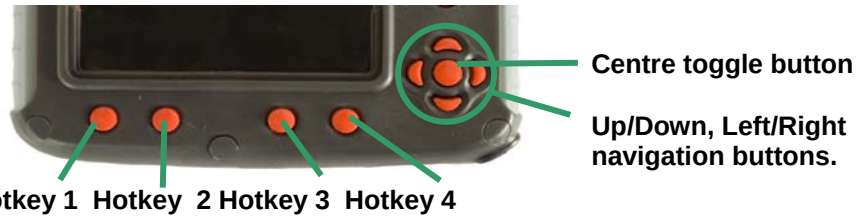


Fig 1.

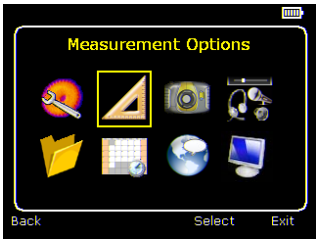


Fig. 2

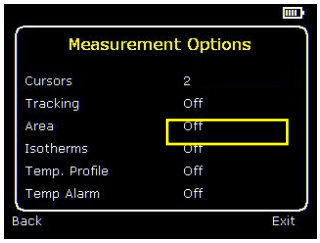


Fig 3.

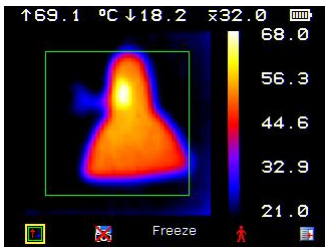


Fig. 4

Fig. 5

Fig. 6

7.4 What is tracking?

Tracking offers the choice to display the following:

- The hottest part in the area.
- The coldest part in the area.
- The hottest as well as the coldest part in the area.

How to set Tracking ?

Fig 1.

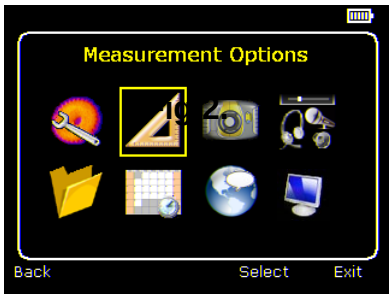


Fig. 2

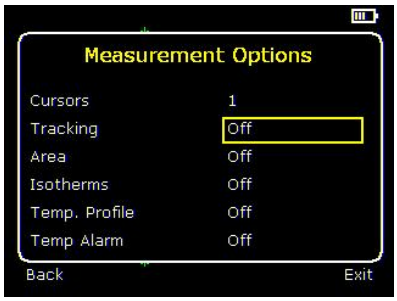


Fig. 3

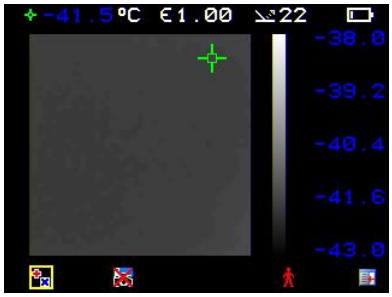


Fig. 4

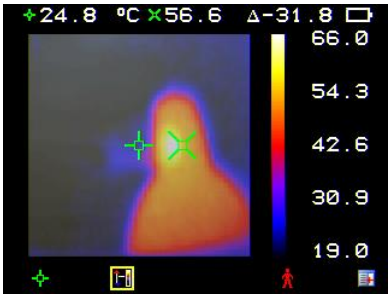


Fig. 5

1. Press Hotkey 4  to select the menu (Fig 1).
2. Using the left/right navigation buttons  move to the Measurement Options menu  (See Fig 2) and Press Hotkey 3  to select it (Fig 3).
3. Use the up/down navigation buttons  to highlight the tracking option (Fig 3).
4. Use the left/right navigation buttons  to toggle between “Off”, “High”, “Low”, and “High & Low” options.
5. Press Hotkey 4  to exit (Fig 4).

7.5 What are Isotherms and how do I select them?

Isotherms are regions within the scene having the same temperature range which are shown in the same colour. This is best seen using either the White Hot or Black Hot palettes. For example it can be useful to see all electrical connections in a electrical cabinet that are within the same, user defined, temperature range. This could very easily identify all components that may be overheating.

Fig 1.

Selecting Isotherms

1. Press Hotkey 4  to select the menu (Fig 1).
2. Use the left/right navigation buttons  move to the Measurement Options menu  (See Fig 2) and Press Hotkey 3  to select it (Fig 3).
3. Use the up/down navigation buttons  move to the Isotherms option (Fig. 3).
4. Use the left/right navigation buttons  to toggle through the Isotherms options-“High”, “Low”, “High & Low”, and “Off”.
5. Press Hotkey 4  to exit.
6. Press Hotkey 1  to toggle through until the isotherm icons appear. 
7. Use the left/right navigation buttons  to adjust the isotherm range and span (Fig 4).

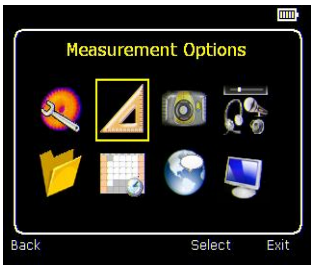


Fig. 2

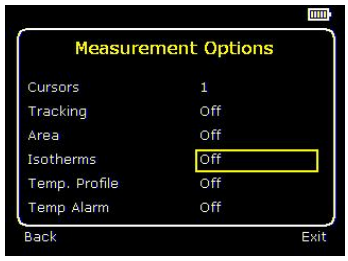


Fig. 3

Fig. 4

7.6 Why use Auto/Manual temperature range and span adjustment?

Auto.
Automatically adjusts the image to allow for the highest and lowest temperature in the scene. Useful when starting the camera to be able to view images quickly and to be able to view the full range of temperatures in the scene.

Manual.
The user defines the range of temperatures to be displayed. Manual setting is useful when the user wants to examine various pieces of similar equipment, or to exclude high or low temperatures of no interest. By having a fixed temperature range any anomalies or discrepancies can be highlighted visually very easily.

Fig 1.

How to select and use Auto.
Toggle Hotkey 2  until either the auto icon  or the manual icon  appears (Fig 1). Use the centre toggle button  to toggle between the auto and manual options. As previously stated the auto function will select the correct temperature range for the scene that is viewed. (See Fig 2).

How to select and use Manual.
Toggle Hotkey 2  until either the auto icon  or the manual icon  appears (Fig 1). Use the centre toggle button  to toggle between the auto and manual options. With the manual  function selected (Fig 3), use the navigation keys  to adjust the temperature range  and span  .

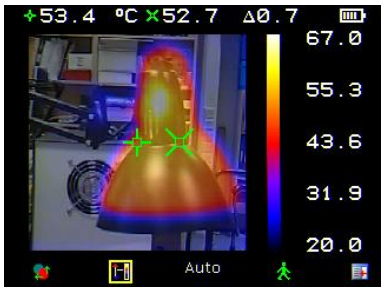


Fig. 2

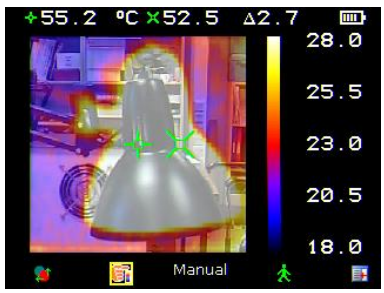


Fig. 3

7.7 What is a temperature profile?

A temperature profile is a histogram showing the temperature values through a cross-section of the scene. The profile is displayed on the right hand side of the screen. The user can choose to display either a profile of a horizontal cross-section or a profile of a vertical cross-section.

How do I set a temperature profile?

Fig 1.

1. Press Hotkey 4  to select the menu (Fig 1).
2. Using the left/right navigation buttons  move to the Measurement Options menu.  (See Fig 2) and Press Hotkey 3  to select it (Fig 3).
3. Use the up/down navigation buttons  to move to the Temp. Profile option (Fig 3).
4. Use the left/right navigation buttons  to toggle between “Off”, “Horizontal”, and “Vertical”.
5. Press Hotkey 4  to exit (Fig 4).
6. Press Hotkey 1 to select  or  then use the navigation buttons to move the position of the cross section within the image.

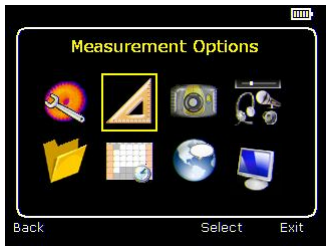


Fig. 2

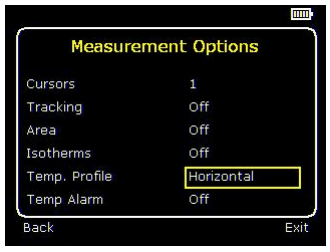


Fig. 3

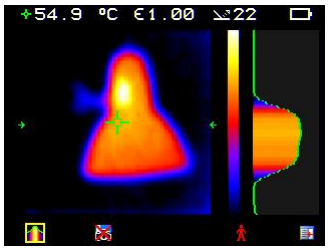


Fig. 4

7.8 How do I turn the visible camera on and off?

1. Press Hotkey 2  to toggle through to the visible camera on/off options  (Fig 1).
2. Press the centre toggle button  to toggle between visible off  and visible on  (See Figs 2 & 3).

Fig 1.

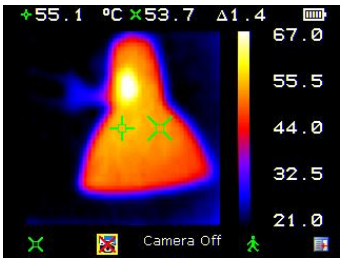


Fig. 2

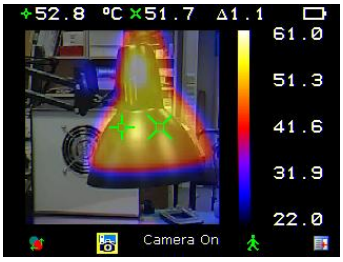


Fig. 3

7.9 How do I blend thermal and visible images (image fusion)?

The user can select to view the scene in:

1. Thermal Only. This is the default when the camera is switched on (Fig 1).
2. Visible only (Fig 2).
3. Or a blend of both. A blend superimposes the thermal image on to a visible image. The extent of the blend is adjustable (Fig 3).

In all of the above choices, all the temperature measurement options are available

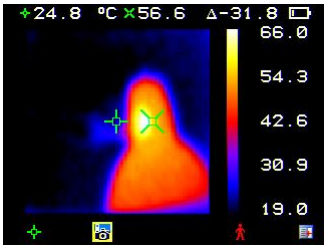


Fig. 1

Fig. 2

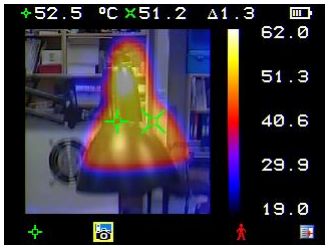


Fig. 3

Centre toggle button

Up/Down, Left/Right navigation buttons.

Hotkey 1 Hotkey 2 Hotkey 3 Hotkey 4

Fig 1.

<u>Blending Thermal and Visible Images</u>

1. Using Hotkey 2  toggle through until either the visible camera on icon  or visible camera off icon  appears. Use the centre toggle button  to toggle between visible off  and visible on  (Fig 4).
2. With the visible camera on, blend between the visible and thermal image by using the navigation keys  .
3. This will blend the thermal and visible image on a percentage scale 0%, 25%, 50%, 75%, 100% and PIP.

7.10 How do I align the thermal and visible images?

As the thermal camera and visible camera are not co-axial, the alignment controls allow the user to align the thermal and visible image. The alignment controls move the visible image.

Align images

1. Using Hotkey 2  toggle through until either the visible camera on icon  . See question 7.9
2. Use Hotkey 1  to toggle through until the alignment icon  .appears.
3. Use the navigation keys  to align the thermal and visible images (Fig 1).

Fig 1.

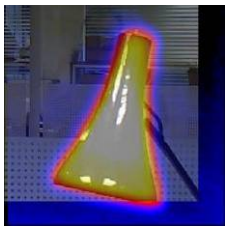


Fig. 2 Fully aligned

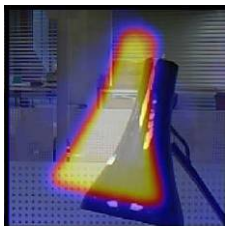


Fig.3 Align to the left

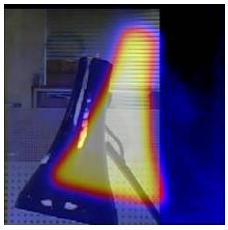


Fig. 4 Align to the right

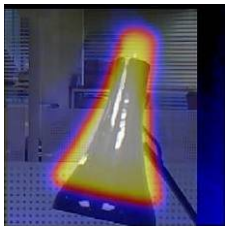


Fig. 5 Align up

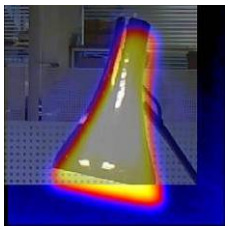


Fig. 6 Align down

Four pre-programmed alignment distances are included. These are at 0.5m, 1m, 2m and 4m ranges. With the alignment option selected by Hotkey1, pressing the toggle button once aligns at 2 metres. Pressing the toggle button again allows you to cycle through to 4m, 0.5m and 1m.

This function is only available after the visual camera has been switched on. After pressing hotkey 1 this option will is not available anymore.

7.11 How does illumination work?

In poor lighting conditions the illuminator allows the user to see the scene with the visible camera.

How to select the illumination (light) option?

1. To turn the light on press Hotkey 2 to toggle through until either the light on (See Fig 2) or light off icon appears (See Fig 1).
2. Use the centre toggle button to toggle between light off and light on .

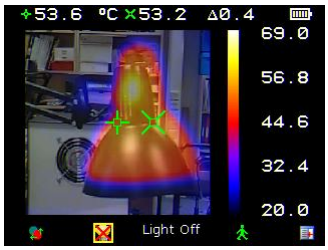


Fig. 1
Light off

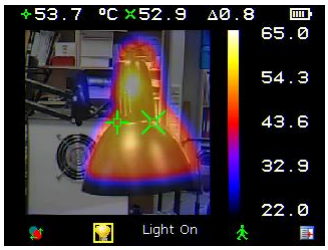


Fig. 2
Light on

Fig. 3
Position of illumination

7.12 How do I save an image?

Fig. 1 **Fig. 2**

To save either a live or frozen image, press the save button on the handle (See Fig 1 and Fig 2).
If either individual voice annotation or text caption options are switched on, these can be attached to the saved image. Default is text and voice on.
More details on voice annotation and text caption are in Q 13.

Images are saved on a micro-SD card and may be viewed using the Browser.

Saving images

1. Press Hotkey 4  to select the menu.
2. Using the up/down navigation buttons  to go to the Browser.  and press Hotkey 3  to select it.
3. Use the navigation keys  to highlight the chosen image.
   The following options are available

   Press Hotkey 3  to select it.

   Press Hotkey 2  to delete the image and press Hotkey 3  to confirm deletion.

   Press Hotkey 1  to exit from the browser.

   Press Hotkey 4  to close the menu

7.13 How does the voice and text caption recording work?

A saved image can have the following attachments to provide further information about it:

a. Voice message
b. Text caption
c. Both Voice and Text.
d. Nothing attached.

In addition, in the voice message attachment there are the following options:

i. Add voice message per image (individual).
ii. Add the same voice message to a set of images (session).
A session ends when the camera is switched off.
iii. Add both individual and session voice messages.

Setting Voice Annotation

1. Press Hotkey 4  to select the menu.
2. Using the left/right navigation buttons  move to the Audio Settings menu  and press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to “Voice Annotation” (Fig 3).
4. Use the left/right navigation buttons  to toggle through “Off”, “Individual” or “Session”.
5. Select “Individual” to record a separate message for each saved image or “Session” for a set of images.
6. Use the up/down navigation buttons  to go to “Voice Playback” and select “Speaker”  or “Headset”.

Setting Caption Mode

1. Press Hotkey 4  to exit or Hotkey1  to go back to the main menu.
2. In the main menu using the left/right navigation buttons  move to the camera settings menu  and press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to “Caption Mode”. See Fig 9.
4. Use the left/right navigation buttons  to toggle between “On” and “Off”.

Voice and Text Caption entry

1. When saving an image, the option of adding a voice message is selected by pressing Hotkey 3 for yes or press Hotkey 2 for no. See Fig. 4

2. If Yes is selected press hotkey 3 to start the recording. See Fig 5.

3. The message “Recording” appears. Stop recording by pressing hotkey 3 again. Then there is the option to “Play” the recording, “Re-record” it and then save the voice message. See Figs 6, 7 and 8.

4. After the Voice message recording is completed, there is the option to add a Text Caption if selected. Press Hotkey 3 for yes or press Hotkey 2 for no. See Fig 10.

5. Enter the text message using the up/down navigation buttons to select characters and Use the left/right navigation buttons to move to the next character. See Fig 11 and 12
   The available symbols are:
   ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789

6. Press Hotkey2 to clear the whole text.

7. Press Hotkey 4 to exit or Hotkey1 to go back.

Fig. 2

Fig. 3

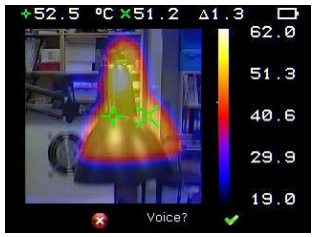


Fig. 4

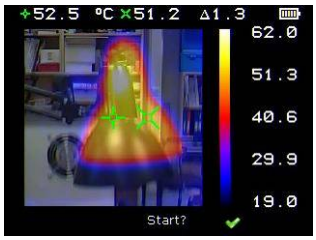


Fig. 5

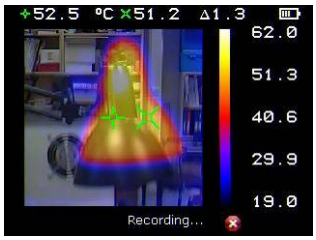


Fig. 6

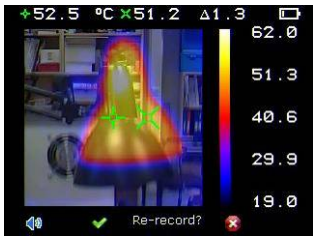


Fig. 7

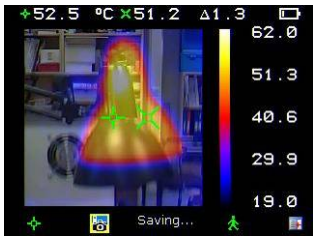


Fig. 8

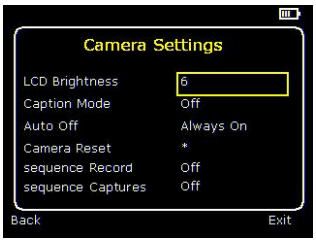


Fig. 9

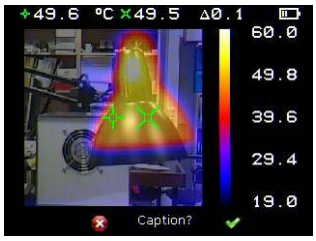


Fig. 10

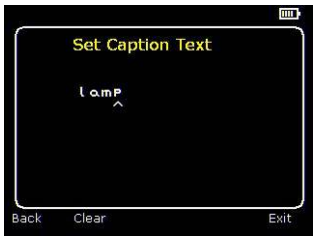


Fig. 11

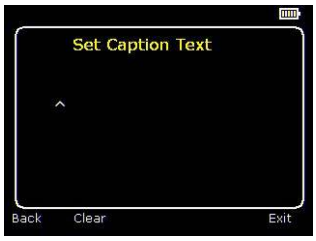


Fig. 12

	***TIP:*** **Pressing hotkey 4 at any point during the above, will abort the process and revert to a live image.**

7.14 How do I set alarms?

Fig 1.

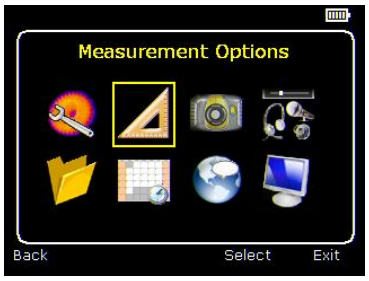


Fig. 2

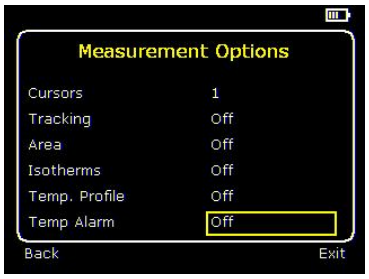


Fig. 3

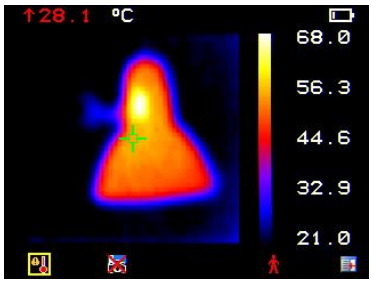


Fig. 4

<u>Setting alarms</u>

1. Press Hotkey 4  to select menu (Fig 1).
2. Use the left/right navigation buttons  to move the Measurement menu  and Press Hotkey 3  to select it (Fig 2).
3. Use the up/down navigation buttons  to move to the temperature alarm option (see Fig 3).
4. Use the left/right navigation buttons  to toggle through “Off”, “High”, “Low” or “High & Low”. (In the example below we will select a high alarm).
5. Press Hotkey 4  to exit.
6. Use Hotkey 1  to toggle through until the high alarm icon  appears (Fig 4).
7. Use the up/down navigation buttons  to select a higher limit temperature.
8. If the temperature at the cursor or within the measurement box is above the upper limit value a message “Over Limit” will flash at the bottom of the screen.

9. In addition to the visible caption an audible alarm can also be set.
   a. Press Hotkey 4  to select menu.
   b. Use the left/right navigation buttons  to go to the Audio Settings menu and press the Hotkey 3 to select it.
   c. In Imager Sounds use the left/right navigation buttons  to toggle the sound on.
   d. Press Hotkey 4  to exit.

10. If the temperature at the cursor or within the measurement box is above the upper limit an audible “Bleeping” will now be heard.

    It is also be possible to set a low limit  or both the high & low limit together  .

	***TIP:*** ***Default is sound on.***

7.15 How do I change the screen colours?

Different colour palettes are useful in viewing objects and scenes for different requirements. As a simple rule of thumb, palettes with a lot of different colours are more helpful when looking for hot spots or cold spots, whereas palettes with fewer and gradually changing colours are more useful in viewing changes of temperatures in a scene or object.

Fig 1.

Change screencolours

1. Press Hotkey 4  to select the menu (Fig 1).
2. "Infrared Settings"  is highlighted press Hotkey 3  to select it (Fig 2).
3. Use the up/down navigation buttons  to move to the palette option (see Fig 3).
4. Use the left/right navigation buttons  to toggle through the palette options which are, "Ironbow", "Rainbow", "Isotherm Style", "Hot Metal", "High Contrast", "Rainbow 16", "Black Hot" and "White Hot". (Please see examples below).
5. Press hotkey 4  to exit.

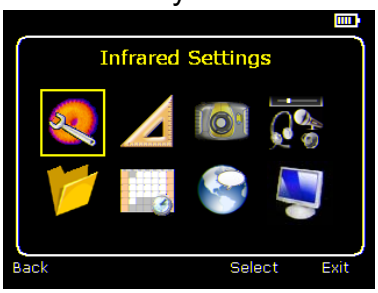


Fig. 2

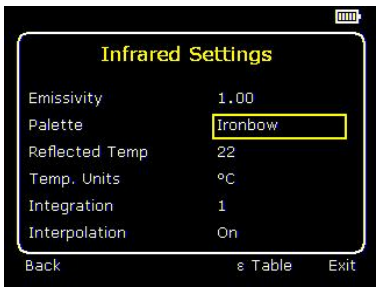
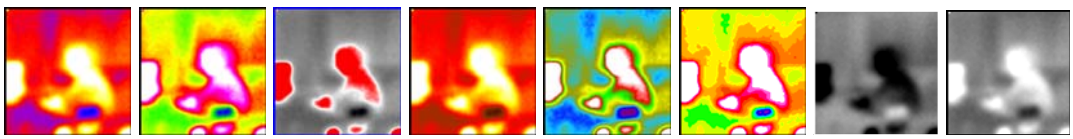


Fig. 3



1 2 3 4 5 6 7 8

1. Ironbow
2. Rainbow
3. Isotherm Style
4. Hot Metal
5. High Contrast
6. Rainbow 16
7. Black Hot
8. White hot

7.16 What is emissivity?

The amount of infrared radiation emitted by a surface depends on both its temperature and its emissivity. Surfaces that are good reflectors (e.g. polished metal) are poor emitters, and surfaces that are good emitters (e.g. human skin) are poor reflectors. A **black body** is defined as an object that absorbs all radiation falling on it; and it is a perfect emitter of radiation.

The **emissivity** of a surface (usually written ε) is the ratio of energy radiated by that surface to energy radiated by a **black body** at the same temperature. For accurate temperature measurements, the emissivity of the surface being measured must be entered into the camera. This is done by entering a number in the range 0.10 (for polished chromium) to 1.00 (for a black body). An emissivity lookup table is provided, which lists the emissivities of a range of common materials.

It is not recommended that temperature measurements be attempted when emissivity values lower than 0.70 are required, because large errors are likely due to reflected radiation from surrounding objects.

How do I set emissivity?

Fig 1.

1. Press Hotkey 4  to select the menu (Fig 1).
2. "Infrared Settings"  .will be highlighted. Press Hotkey 3  to select it.
3. Emissivity is the first item in the "Infrared Settings" menu, and will be highlighted. See Fig 2.
4. Use the left/right navigation buttons  to change the emissivity value.
5. Or select the emissivity table by pressing Hotkey 3  , and use the up/down navigation buttons  to highlight the desired value/surface.
6. Press Hotkey 4  to exit.

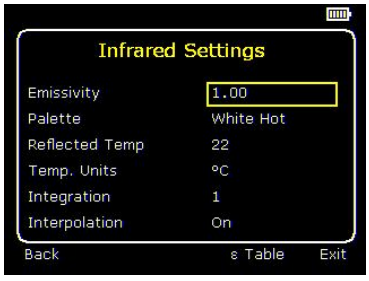


Fig 2.

7.17 What is reflected Temperature?

This is only applicable if an emissivity of less than 1 is selected.

Some of the infrared energy seen by the camera from a surface with an emissivity of less than 1.00 is reflected background energy. If there is a hot object in the background, this can have a significant effect on the temperature measured. By entering a reflected temperature value, the camera can correct for the effect of this reflected background energy.

How to set Relected Temperature?

Fig 1.

1. Press Hotkey 4  to select the menu (Fig 1).
2. "Infrared Settings"  .will be highlighted. Press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to the Reflected Temp. option.
4. Use the left/right navigation buttons  to change the value.
5. Press Hotkey 4  to exit.

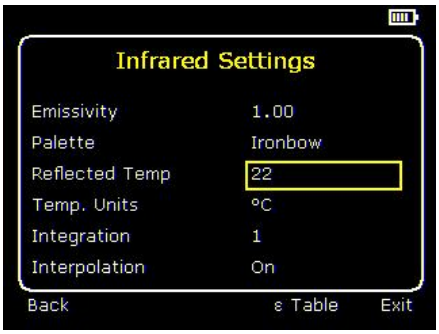


Fig. 2

	***TIP:*** ***A good method to determine the reflected temperature in a room or setting is to set the emissivity to 1.00, turn 180 degrees from the object being measured, and take an average temperature measurement, using area mode (see 7.3), of the background or of any hot object.***

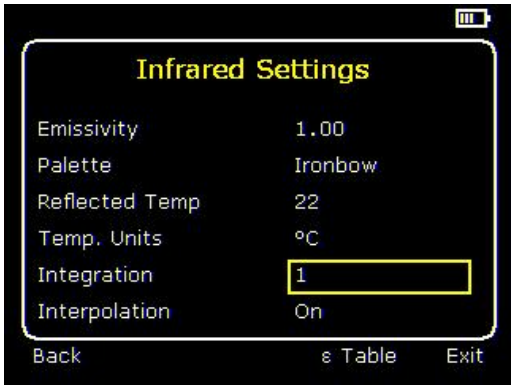
7.18 What is integration used for?

The camera normally operates at a frame rate of 8Hz (i.e. the image is updated 8 times per second). For viewing scenes in which there is very little temperature variation, however, the image may be improved by integrating over several frames to reduce the noise.

How do I set the Integration?

Fig 1.

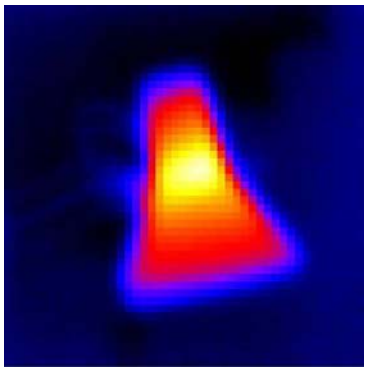
1. Press Hotkey 4  to select the menu (Fig 1).
   .
2. "Infrared Settings"  is highlighted. Press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to the Integration option.
4. Use the left/right navigation buttons  to change the value.
5. Press Hotkey 4  to exit.



	***TIP:*** ***The image update rate is slower when integration is increased, so the camera must be held still or moved very slowly when high integration numbers are used.***

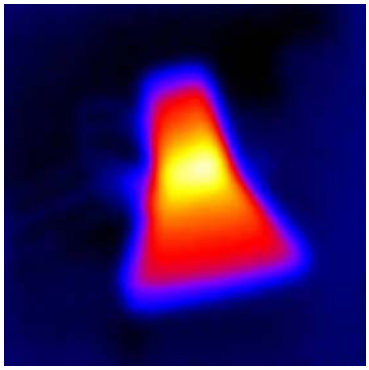
7.19 Do I need to turn Interpolation off?

Interpolation is on by default as it smoothes the image to provide a better visual image. Turning it off gives a more pixelated image. Some users may wish to observe the scene with the actual resolution of the detector.



Interpolation off

Fig 1



Interpolation on

Fig 2

How do I set Interpolation

1. Press Hotkey 4  to select the menu (Fig 3).
2. Infrared Settings"  is highlighted. Press Hotkey 3  to select it
3. Use the up/down navigation buttons  to highlight the Interpolation option (Fig 4).
4. Use the left/right navigation buttons  to toggle between on and off.
5. Press Hotkey 4  to exit.

Fig 1.

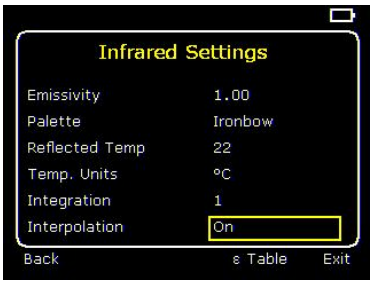


Fig. 4

7.20 Can I reduce camera battery power consumption?

Battery power consumption can be reduced by either or both of the following:

a Reducing the LCD display brightness

b Setting the camera to switch off automatically if not used for a period of time. The switch off time is defined from the last press of a button.

Setting energy saving

1. Press Hotkey 4 to select menu (Fig 1).
2. Use the left/right navigation buttons to move to the Display Settings and press Hotkey 3 to select.
3. The LCD Brightness option will be highlighted (Fig 2).
4. Use the left/right navigation buttons to adjust the LCD brightness level. Higher numbers indicate a brighter LCD. The Brightness numbers range from 1 to 9.
5. Go bachk to the main menu and use the left/right navigation buttons to move to the Camera Settings (fig.3.) and press Hotkey 3 to select.
6. Use the up/down navigation buttons to highlight the Auto Off option (Fig 4).
7. Use the left/right navigation buttons to select the automatic turn off time. The options are “5 Mins”, “10 Mins”, “20 Mins” and “Always On”. These are the times after the last button press for which the camera will stay on, before turning itself off.
8. Press Hotkey 4 to exit.

Fig 1.

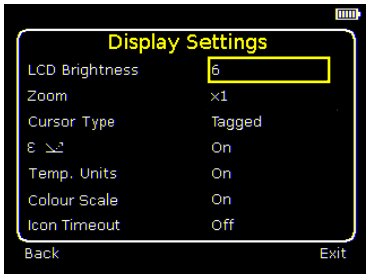


Fig 2

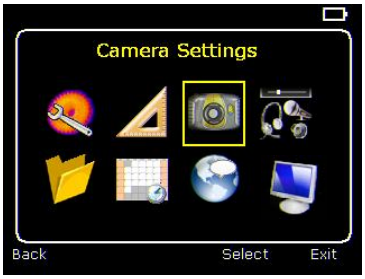


Fig 3.

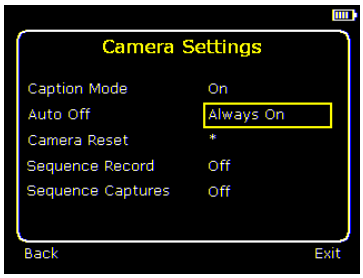


Fig. 4

7.21 What does Camera Reset do?

Camera Reset changes the following values to the factory default setting:

Infrared Settings	
Emissivity	**1.00**
Palettte	Ironbow
Reflected Temp.	**22**
Temp. Units	°C
Integration	**1**
Interpolation	Aan

Measurement Options	
Cursors	1
Tracking	Off
Area	Off
Isotherms	Off
Temp. Profile	Off
Temp. Alarm	Off

Camera Settings	
LCD Brightness	6
Caption Mode	On
Auto Off	20 min.

Audio Settings	
Camera Sounds	On
Voice Annotation	Individual
Voice playback	**Speaker**
Volume	9

Date & Time Settings	
Date format	DD-MM-YYYY

Language Selection
Engels

Camera Reset does not change the date.

	ATTENTION: ***bold items above are also reset on switching off the camera.***

How to reset the camera.

Fig 1.

1. Press Hotkey 4  to select menu (Fig 1).
2. Use the left/right navigation buttons to move to the Camera Settings  (See Fig 3) and press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to the Camera reset option. (Fig 4)
4. Press Hotkey 3  to select and activate the camera reset function.

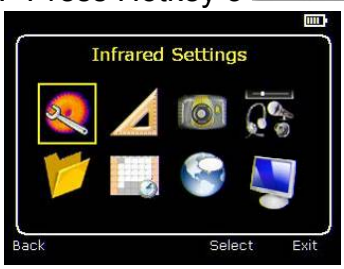


Fig 2

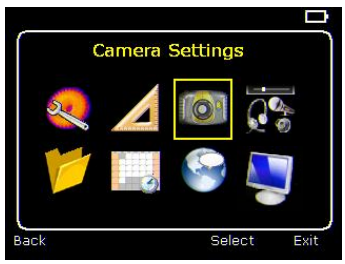


Fig 3

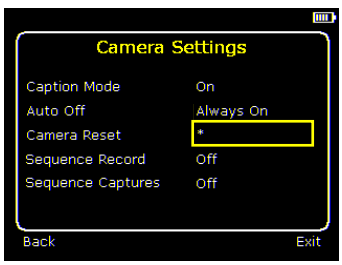


Fig 4

7.22 How do I automatically make multiple images?

The camera can be set to make multiple images based on a time delay or an alarm overrun. It can be set when an image must be created and how often it should be repeated. This option can be used for viewing a temperature curve over a longer period. Or as detection of the time a temperature alarm occurred.

Making multiple images

1. Press hotkey 4  to select the menu (Fig. 1)
2. Use the left/right navigation buttons  to move to the Camera Settings  (See Fig 2) and press Hotkey 3  to select it.
3. Use the up/down navigation buttons  to move to the “Sequence record” option. (Fig 3)
4. Use the left/right navigation buttons  to toggle between: 10 sec, 20 sec, 30 sec, 1min, 2min, 5 min, 10 min, 20 min, 30 min, 1 hour, Alarm.
5. Use the up/down navigation buttons  to select “Sequence Captures” option. (Fig. 4)
6. Use the left/right navigation buttons  to toggle between: 10, 50, 100, 500, of 1000.
7. Press hotkey 4  to exit menu.
8. If an image is made with the camera now, the abovementioned series of images will be started.

Fig 1.

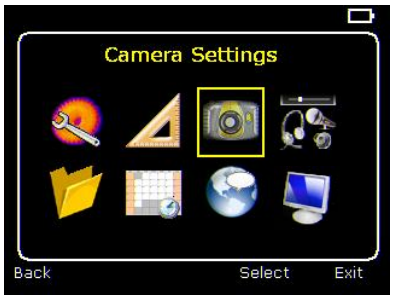


Fig 2

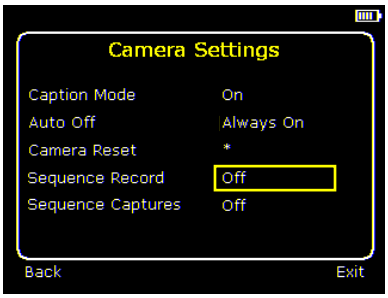


Fig 3

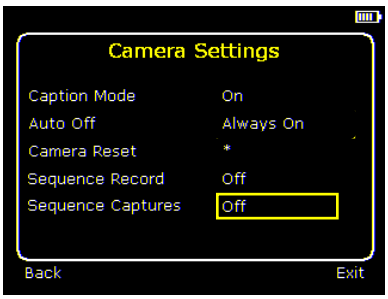


Fig 4

8. Maintenance

8.1 Calibration and Repair

	***Repairs may only be executed by Nieaf-Smitt B.V.***
	***Don't replace parts yourself but call technical qualified persons***
	***TIP:*** ***If the camera is used for tracable measurements it is advisable to calibrate the camera periodically.***

Nieaf-Smitt advises to calibrate the camera once per two years.

There are no user replaceable parts in the instrument. For calibration and/or service you can send your tester post-paid to

Nieaf-Smitt B.V..
Technical Support
Vrieslantlaan 6
3526 AA Utrecht

Tel.	:	0031 (0)30 288 13 11
Tel. Helpdesk	:	0031 (0)30 285 02 85
Fax.	:	0031 (0)30 289 88 16
E-mail	:	helpdesk@nieaf-smitt.nl
Website	:	www.nieaf-smitt.nl
		www.nieaf-instruments.com

8.2 Cleaning the camera

	***Do not use liquids based on petrol or solvent!*** ***Do not let the Camera get in contact with detergents!*** ***.***

Use soft patch moister by water or alcohol, and leave the camera to dry totally after the cleaning.

8.3 Replacing the batteries

It is not possible to replace the batteries.

Appendix 1 Emissivity table in the Camera

1.00 0.98 = Human skin 0.95 0.94 = Paint, oil 0.93 = Brick red 0.92 = Concrete 0.90 = Planed Oak Wood 0.85 0.80 0.79 = Oxidized steel 0.78 = Oxidized Copper 0.76 = Sand 0.75 0.70 = Red Rust 0.67 = Water 0.65 0.64 = Oxidized Cast Iron	

General Emissivity table

0.98 = Carbon filed surface 0.98 = Frost crystals 0.98 = Human skin 0.97 = Slate 0.96 = Water distilled 0.96 = Ice smooth 0.95 = Soil saturated with water 0.95 = Carbon candle soot 0.94 = Glass polished plate 0.94 = Paint, oil 0.93 = Brick red 0.93 = Paper white bond 0.92 = Concrete 0.92 = Soil dry 0.91 = Plaster rough coat 0.90 = Wood planed oak 0.90 = Glazed earthenware 0.89 = Snow, granular 0.88 = Glazed Silica 0.87 = Cuprous Oxide at 38°C 0.86 = Emery Corundum 0.85 = Snow 0.85 = Stainless oxidized at 800°C 0.84 = Oxidised Iron at 500°C 0.83 = Cuprous Oxide at 260°C 0.82 = Snow, fine particles 0.81 = Brass, unoxidised 0.80 = Glass, convex D	0.79 = Steel oxidised 0.78 = Copper heavily oxidised 0.77 = Cotton cloth 0.76 = Sand 0.75 = Unglazed silica 0.74 = Oxidised iron at 100°C 0.73 = Coating No. C20A 0.72 = Basalt 0.71 = Graphitised carbon at 500°C 0.70 = Red Rust 0.69 = Iron sheet heavily rusted 0.67 = Water 0.66 = Black Loam 0.65 = White cement 0.64 = Iron cast oxidised 0.63 = Lead oxidised at 1100°F 0.62 = Zirconia on inconel 0.61 = Cu-Zn, brass oxidised 0.58 = Inconel sheet at 760°C 0.56 = Smooth white marble 0.55 = Al anodised chromic acid 0.21 = Iron cast polished 0.20 = Brass rubbed 80 grit emery 0.16 = Stainless steel 18-8 buffed 0.09 = Aluminium as received 0.07 = Steel polished 0.05 = Aluminium polished sheet 0.05 = Copper polished 0.03 = Brass highly polished

Appendix 2 Complete iconlist

Hotkey one

 Cursor one.

 Cursor two.

 Alignment.

 Tracking.

 Area.

 Isotherm high.

 Isotherm low.

 Profile horizontal.

 Profile vertical.

 Alarm high.

 Alarm low.

 Playback

Hotkey two

 Camera off.

 Camera on.

 Auto temperature range.

 Manual temperature range.

 Light off.

 Light on.

 No.

 Yes.

Hotkey three

 Live.

 Freeze.

 No.

 Yes

Hotkey Four

 Menus.

 Abort

Other Icons

 Level Down

 Level Up

 Level Maximum

 Level Minimum

 No Memory Card

 Span Out

 Span In

 Span Maximum

 Span Minimum

 Persistand Manual

Appendix 3 Declaration of Conformity

Declaration of conformity of the product with the valid directives.

EU-DECLARATION OF CONFORMITY

Product: Thermal Imaging Camera

Identification of the measuring system:

Trademark : Nieaf-Smitt B.V.
Model/Type : IR6010

Nieaf-Smitt herewith declares, that the instrument which this declaration refers to is in conformity with the following standards and according to the conditions of following Directives:

(2006/95/EG) as last amended
(2004/108/EG) as last amended

Place and date

Name and signature of authorised person.

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Appendix 4 Accessories

Description	Partnumber
12V car charger	6260010XX
Light shade	626001042
Power supply	6260010XX
External charger	6260010XX
Spare Battery	6260010XX
USB cable	626001045
Carrying case	626001046
Handle	626001047