User's manual
FLIR Exx series

For use with Flir E40bx,
borrowed from CCF

Table of contents

Page numbers different from these in this short version ↓

Table of contents

Table of contents

5   Quick Start Guide

5.1   Procedure

Follow this procedure:

1. Put a battery into the battery compartment.
2. Charge the battery for 4 hours before starting the camera for the first time, or until the green battery condition LED glows continuously.
3. Insert a memory card into the card slot.
4. Push ⏻ to turn on the camera.
5. Aim the camera toward the object of interest.
6. Adjust the focus by rotating the focus ring.

> **Note**
>
> It is very important to adjust the focus correctly. Incorrect focus adjustment affects how the image modes *Thermal MSX*, *Thermal*, and *Picture-in-picture* work. It also affects the temperature measurement.

7. Push the Save button (the trigger) to save an image.
8. Go to http://support.flir.com/tools and download FLIR Tools.
9. Install FLIR Tools on your computer.
10. Start FLIR Tools.
11. Connect the camera to the computer using the USB cable.
12. Import the images into FLIR Tools and create a PDF report.

Instead of 8-12, CCF recommends transferring images via the camera's SD Card. Insert it into your PC, etc, using the included SD card to USB adaptor, if needed. It appears as an external drive (eg E:\) Save thermal and visible images from its DCIM\FLIR_100DCIM\FLIR_100 folder. Then please delete them from the card.

Flir Tools is discontinued. If you want software to optimise images etc, see Flir Thermal Studio: https://www.flir.co.uk/products/flir-thermal-studio-suite There's a free version, but you have to create an account.

`

6   Camera parts

6.1   View from the right

6.1.1   Figure
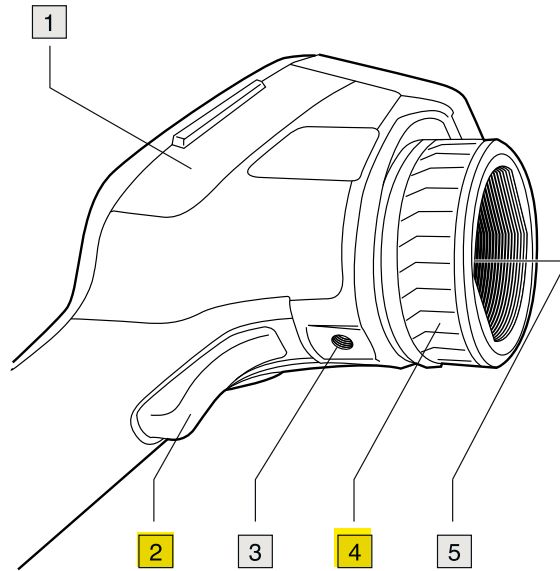
6.1.2   Explanation

1. Cover for the right-hand compartment:

    • USB-A connector.
    • USB mini-B connector.
    • Power connector.

2. Save button.
3. Tripod mount. Requires an adapter (extra accessory).
4. Focus ring.
5. Infrared lens.

6.2   View from the left

6.2.1   Figure
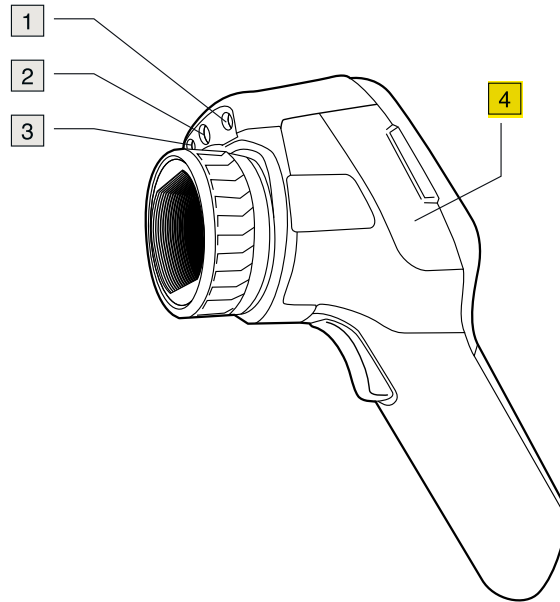
6.2.2   Explanation

1. Laser pointer.
2. Lamp for the digital camera.
3. Digital camera.
4. Cover for the left-hand compartment:

    • Video out connector (composite video).
    • Memory card slot.

6.3 LCD and keypad

6.3.1 Figure
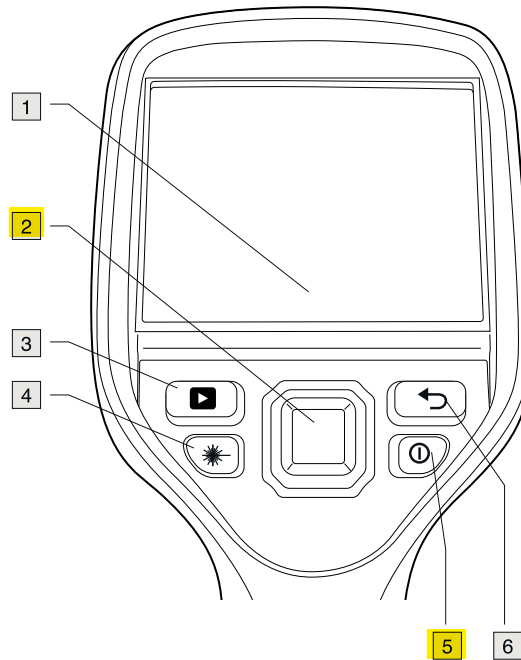
6.3.2 Explanation

1. Touch-screen LCD.
2. Navigation pad with center push.
3. Image archive button.
4. Button to operate the laser pointer.
5. On/off button.
6. Back button.

6.4   View from the bottom

6.4.1   Figure
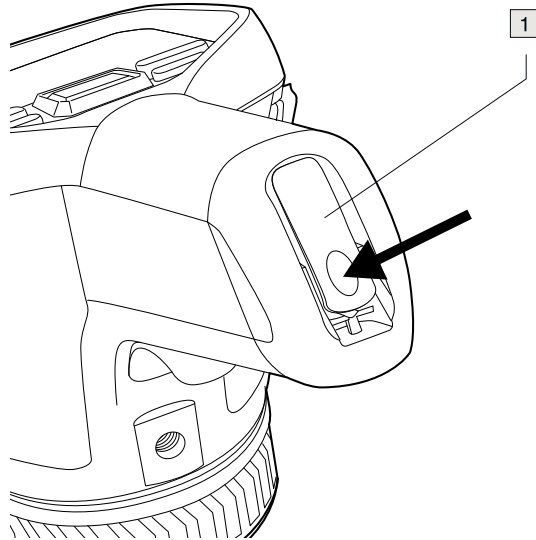
6.4.2   Explanation

1. Latch to open the cover for the battery compartment. Push to open.

6.5   Battery condition LED indicator

6.5.1   Figure

Charge Socket
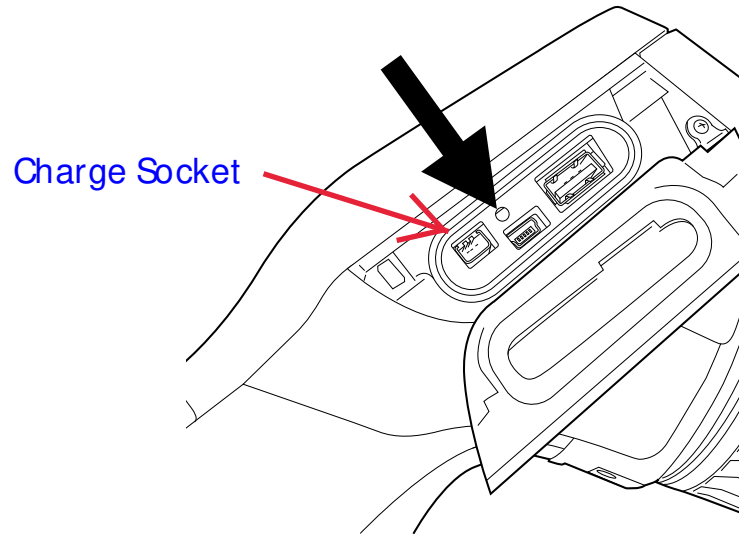
6.5.2   Explanation

Type of signal	Explanation
The green LED flashes two times per second.	The battery is being charged.
The green LED glows continuously.	The battery is fully charged.

6.6 Laser pointer

6.6.1 Figure
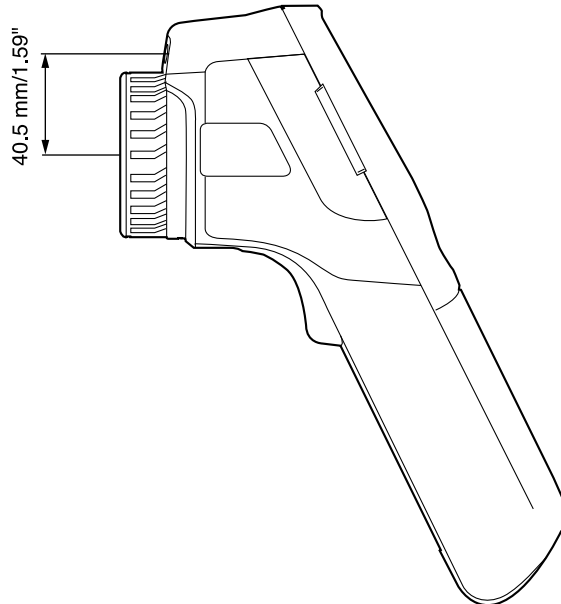
Figure 6.1 This figure shows the difference in position between the laser pointer and the optical center of the infrared lens.

⚠ WARNING
Do not look directly into the laser beam. The laser beam can cause eye irritation.

⚠ CAUTION
Protect the laser pointer with the protective cap when you are not using the laser pointer.

Note

The symbol ⚠ is displayed on the screen when the laser pointer is on.

Note
The laser pointer may not be enabled in all markets.

6.6.2 Laser warning label

A laser warning label with the following information is attached to the camera:
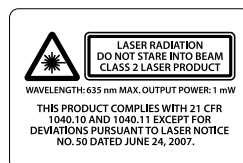
6.6.3 Laser rules and regulations

Wavelength: 635 nm. Maximum output power: 1 mW.

This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

7   Screen elements

7.1   Figure

7.2   Explanation

1. Measurement tools (e.g., spotmeter).
2. Measurement result table.
3. Status icons and notifications.
4. Temperature scale.
5. Lamp toolbar button.
6. Temperature scale toolbar button.
7. Color toolbar button.
8. Measurement toolbar button.
9. Image modes toolbar button.
10. Recording mode toolbar button.
11. Options toolbar button.

Note
To display the menu system, tap the screen or push the navigation pad.

8   Navigating the menu system
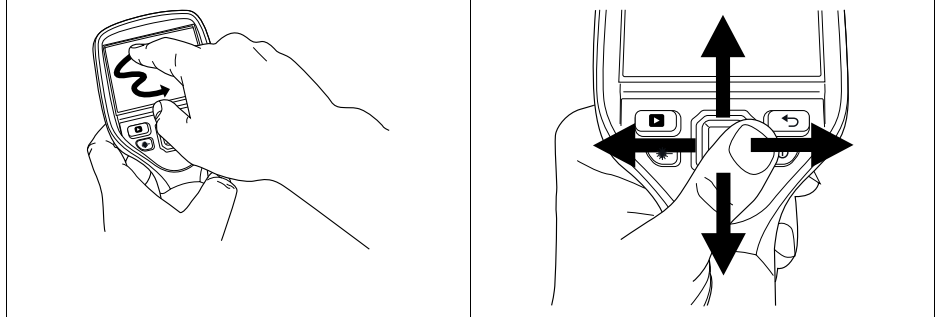
8.1   Figure

8.2   Explanation

The figure above shows the two ways to navigate the menu system in the camera:

- Using the touch screen LCD to navigate the menu system (left).
- Using the navigation pad to navigate the menu system (right).

9 Connecting external devices and storage media
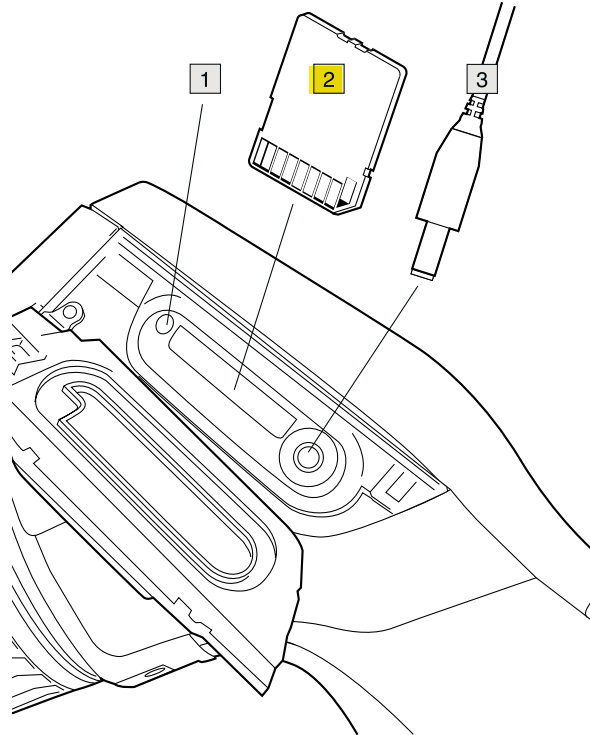
9.1 Figure

9.2 Explanation

1. Indicator showing that the memory card is busy.

   Note
   Do not eject the SD memory card when this LED is flashing.

2. Memory card (SD card)
3. Video cable.

9.3 Figure
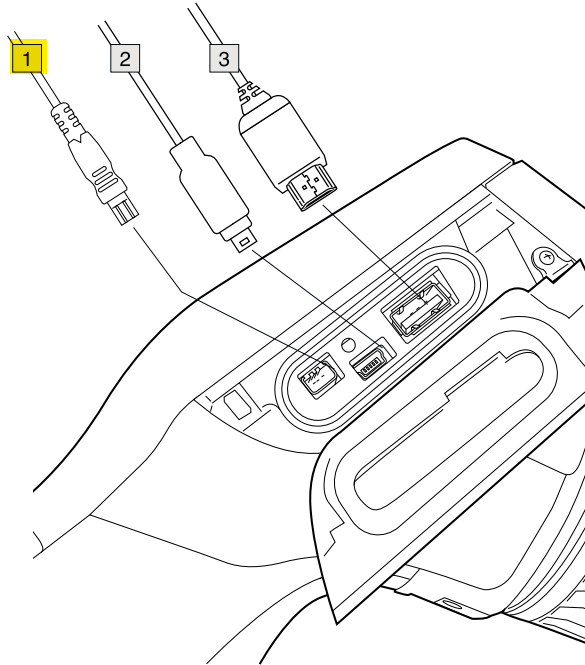
9.4 Explanation

1. Power cable.
2. USB mini-B cable (to connect the camera to a PC).
3. USB-A cable (to connect the camera to an external device, e.g., a USB memory stick).

10   Pairing Bluetooth devices

10.1   General

You can use Bluetooth-enabled headsets, and Bluetooth-enabled Extech and FLIR meters together with the camera. Before you can use the device with the camera, you need to pair the camera and the device.

10.2   Procedure

Follow this procedure:

1. Enable Bluetooth on the device. See the user documentation for that device for information on how to do this.
2. On the camera, push the navigation pad to display the menu system.
3. Use the navigation pad to go to *Settings*.
4. Push the navigation pad.
5. Select *Device settings* and push the navigation pad.
6. Select *Bluetooth & MeterLink* and push the navigation pad.
7. Enable *Bluetooth* by pushing the navigation pad.
8. Select *Scan for Bluetooth devices* and push the navigation pad right.
9. When the device is displayed in the list of devices, select it and push the navigation pad to pair the camera and the device.

Note

- You can add several devices.
- You can remove an added device by selecting the device and then selecting *Remove*.
- After adding a MeterLink device, such as the FLIR MR77 or FLIR CM78, the result from the meter will be visible in the measurement result table.

11   Configuring Wi-Fi

11.1   General

You can connect the camera in two different ways:

- *Most common use*: Setting up a peer-to-peer connection (also called an *ad hoc* or *P2P* connection). This method is primarily used with other devices, e.g., an iPhone or iPad.
- *Less common use*: Connecting the camera to a wireless local area network (WLAN).

11.2   Setting up a peer-to-peer connection (most common use)

Follow this procedure:

1. On the camera, push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Settings*.
3. Push the navigation pad.
4. Select *Device settings* and push the navigation pad.
5. Select *Wi-Fi* and push the navigation pad.
6. Select *Share IRCAMxxxx* and push the navigation pad.

Note

- If the transfer rate is low, this can be due to a crowded frequency band. Try changing the channel to increase the transfer rate.
- To enable security settings for the camera network, enable *WEP*.

11.3   Connecting the camera to a wireless local area network (less common use)

Follow this procedure:

1. On the camera, push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Settings* .
3. Push the navigation pad.
4. Select *Device settings* and push the navigation pad.
5. Select *Wi-Fi* and push the navigation pad.
6. Select *Connect to network* and push the navigation pad.
7. Select *Networks* and push the navigation pad right.
8. Select a network by pushing the navigation pad. You typically need to enter a password to access the network.

Note

To connect to a network that does not broadcast its SSID, select *Settings > Add network* and set up the parameters manually.

12 Handling the camera

12.1 Charging the battery

Note

You must charge the battery for 4 hours before you start using the camera for the first time.

12.1.1 Using the power supply to charge the battery

12.1.1.1 Procedure

Follow this procedure:

1. Connect the power supply cable plug to the power connector on the camera.
2. Connect the power supply mains-electricity plug to a mains socket.
3. Disconnect the power supply cable plug when the battery condition LED indicator is a continuous green.

12.1.2 Using the stand-alone battery charger to charge the battery

12.1.2.1 Explanation

Type of signal	Explanation
The blue LED flashes.	The battery is being charged.
The blue LED glows continuously.	The battery is fully charged.

12.1.2.2 Procedure

Follow this procedure:

1. Put the battery in the battery charger.
2. Connect the power supply cable plug to the connector on the battery charger.
3. Connect the power supply mains-electricity plug to a mains socket.
4. Disconnect the power supply cable plug when the blue LED on the battery charger is continuous.

12.2 Turning on the camera

12.2.1 Procedure

Follow this procedure:

1. To turn on the camera, push and release the button.

12.3 Turning off the camera

12.3.1 Procedure

Follow this procedure:

1. To turn off the camera, push and hold the button for more than 0.5 second.

12.4 Adjusting the infrared camera focus

12.4.1 Figure
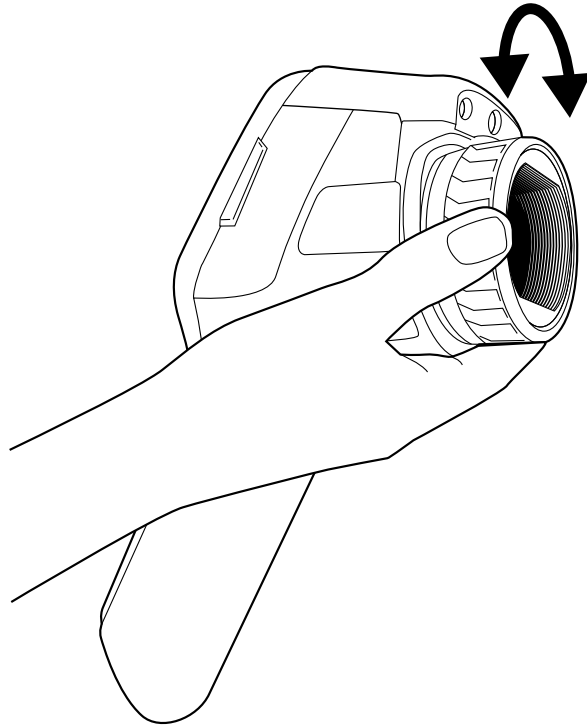
12.4.2 Procedure

Follow this procedure:

1. Do one of the following:

    • For far focus, rotate the focus ring clockwise (with the touch-screen LCD facing to-ward you).
    • For near focus, rotate the focus ring counter-clockwise (with the touch-screen LCD facing toward you).

Note

Do not touch the lens surface when you adjust the infrared camera focus manually. If this happens, clean the lens according to the instructions in 22.2 *Infrared lens*, page 46.

Note

It is very important to adjust the focus correctly. Incorrect focus adjustment affects how the image modes *Thermal MSX*, *Thermal*, and *Picture-in-picture* work. It also affects the temperature measurement.

12.5 Operating the laser pointer

12.5.1 Figure
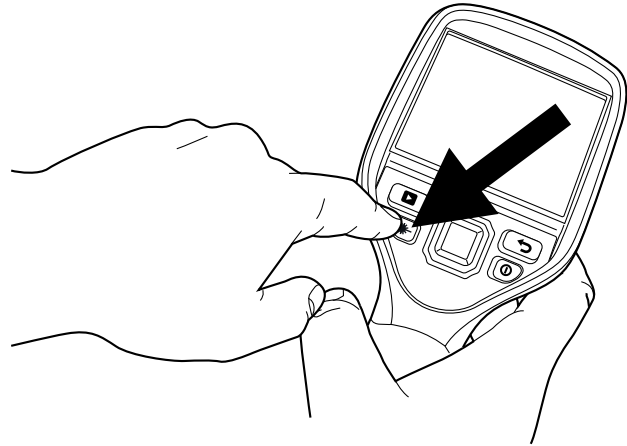
12.5.2 Procedure

Follow this procedure:

1. To turn on the laser pointer, push and hold the laser button.
2. To turn off the laser pointer, release the laser button.

Note

- A warning indicator is displayed on the screen when the laser pointer is turned on.
- The position of the laser dot is indicated on the infrared image (depending on the camera model).

12.6 Removing the battery

Follow this procedure:

1. Push the latch on the battery compartment.
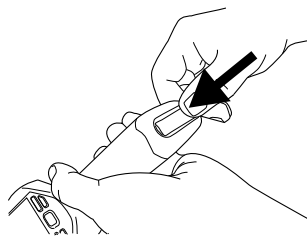
2. Open the battery cover.
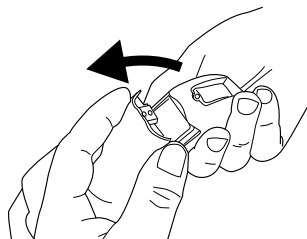
3. Pull the transparent tape to lift out the battery.
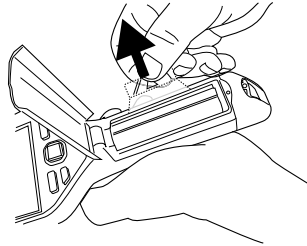
12.7   Mounting an accessory lens

Follow this procedure:

1. Note the two indents on the front of the lens and the corresponding tabs on the lens cap.
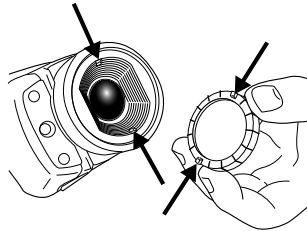
2. Use the lens cap from the accessory lens as a tool to remove the plastic front of the lens. Rotate the plastic front 30° degrees counter-clockwise.
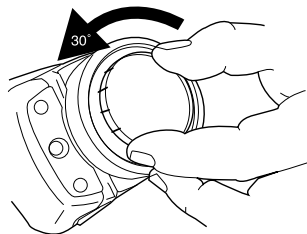
3. Note the index marks on the lens bayonet mount and on the replacement lens.
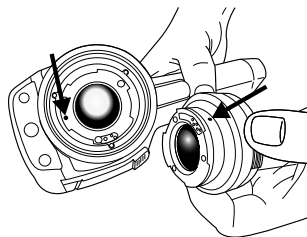
4. Carefully push the lens into position.
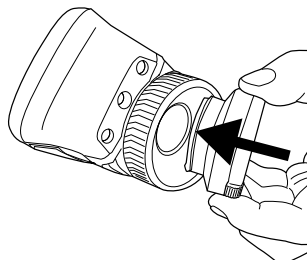
5. Rotate the lens 30° clockwise.
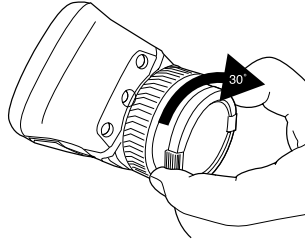
6. Turn on the camera.
7. Specify the lens under *Settings > Add-on lens*.

12.8   Calibrating the touchscreen

12.8.1   Figure
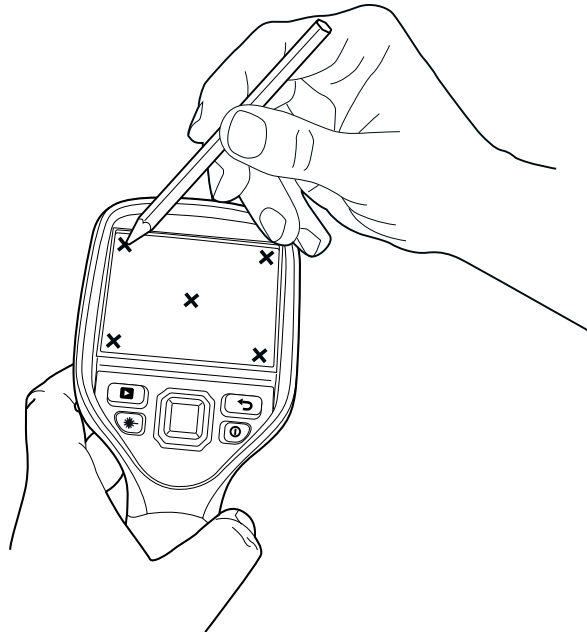
12.8.2   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Settings*.
3. Push the navigation pad.
4. Select *Device settings* and push the navigation pad.
5. Select *Setup camera* and push the navigation pad.
6. Select *Calibrate touchscreen* and push the navigation pad.
7. Follow the on-screen instructions.

13   Working with images

13.1   Saving an image

13.1.1   Image capacity

This table gives information on the *approximate* number of infrared (IR) and digital camera (DC) images that can be saved on memory cards:

Card size	IR only	IR + DC	IR + DC + 30 seconds voice annotation
1 GB	5500	850	600
2 GB	11 000	1700	1200

13.1.2   Naming convention

The naming convention for images is *FLIRxxxx.jpg*, where *xxxx* is a unique counter.

13.1.3   Procedure

Follow this procedure:

1. To save an image, push the Save button.

13.2   Opening a saved image

13.2.1   General

When you save an image, the image is stored on a memory card. To display the image again, open it from the memory card.

13.2.2   Procedure

Follow this procedure:

1. Push ▶ to open the image archive.
2. Push the navigation pad up/down or left/right to select the image you want to view.
3. Push the navigation pad to open the image.
4. Do one of the following:
   - Push the navigation pad to edit the image.
   - Push ↩ to leave the image archive.

13.3   Adjusting an infrared image

13.3.1   General

An infrared image can be adjusted *automatically* or *manually*.

13.3.2   Example 1

This figure shows two infrared images of cable connection points. In the left image, a correct analysis of the circled cable is difficult if you only auto-adjust the image. You can analyze this cable in more detail if you:

- Change the temperature scale level.
- Change the temperature scale span.

In the left image, the image is auto-adjusted. In the right image, the maximum and minimum temperature levels have been changed to temperature levels near the object. On the temperature scale to the right of each image you can see how the temperature levels were changed.

Auto is simple and good in most situations. The temperature scale adjusts to the hottest & coldest things in view. Manual is useful when:
1. You want to take images that have the same temperature/colour scaling for comparison.
2 . There are temperature extremes in view, reducing sensitivity: Manual range covering the items of interest will reveal them in more temperature detail.

A (automatic)   M (manual)
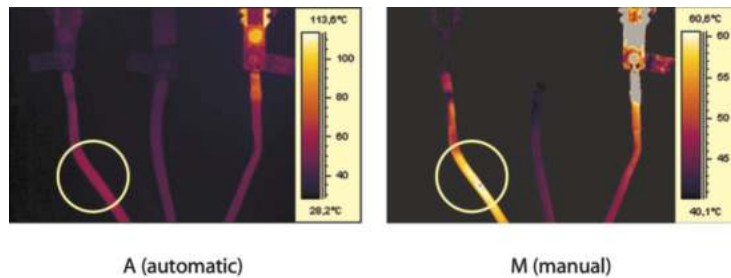
13.3.3   Example 2

This figure shows two infrared images of an isolator in a power line.

In the left image, the cold sky and the power line structure are recorded at a minimum temperature of –26.0°C (–14.8°F). In the right image, the maximum and minimum temperature levels have been changed to temperature levels near the isolator. This makes it easier to analyze the temperature variations in the isolator.

A (automatic)   M (manual)
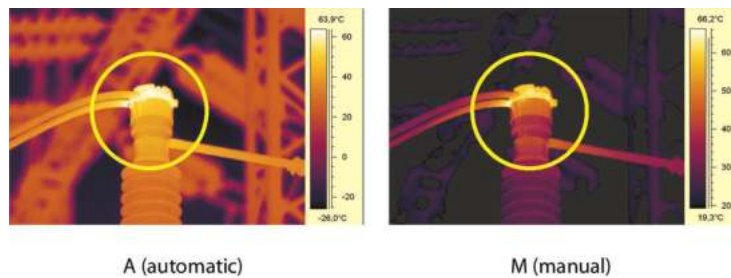
13.3.4   Changing the temperature scale level

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Temperature scale*.
3. Push the navigation pad.
4. Select *Manual* and push the navigation pad.
5. Push the navigation pad left/right to select *Max + Min*.
6. Push the navigation pad up/down to simultaneously move the minimum and maximum scale levels up/down.

13.4   Changing the temperature scale span

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Temperature scale*.
3. Push the navigation pad.
4. Select *Manual* and push the navigation pad.
5. Push the navigation pad left/right to select *Min* or *Max*.
6. Push the navigation pad up/down to move the minimum or maximum scale levels up/down. This changes the total temperature span.

13.5   Changing the color

13.5.1   General

You can change the color that the camera uses to display different temperatures. A different color can make it easier to analyze an image.

13.5.2   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Color*.
3. Push the navigation pad.
4. Use the navigation pad to select a different color.
5. Push the navigation pad to confirm the choice.

> **Note**
>
> Some colors hold specific meanings, such as acting as isotherms or alarms. For more information, see section 16.1 *Working with color alarms*, page 35 and 16 *Working with alarms*, page 35.

13.6   Zooming in on an image   Are you accidentally Zoomed in?

13.6.1   General

You can zoom in on an image using the camera's digital zoom function. You can do this on both live images and saved images.

13.6.2   Procedure

Follow this procedure:

1. To zoom in on an image, tap and hold your finger down on the screen. This displays a zoom toolbar.

2. On the zoom toolbar, tap a zoom factor.
   Once the zoom factor has been selected, it is displayed in the notification area at the top of the screen.

13.7   Deleting an image

13.7.1   Procedure

Follow this procedure:

1. Push to open the image archive.

2. Push the navigation pad up/down or left/right to select the image you want to view.
3. Push the navigation pad to open the image.
4. Push the navigation pad to display a toolbar
5. On the toolbar, select *Delete* and push the navigation pad.

6. Push to leave the image archive.

13.8   Deleting all images

13.8.1   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Settings*.
3. Push the navigation pad.
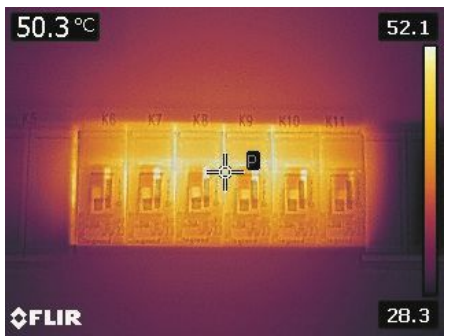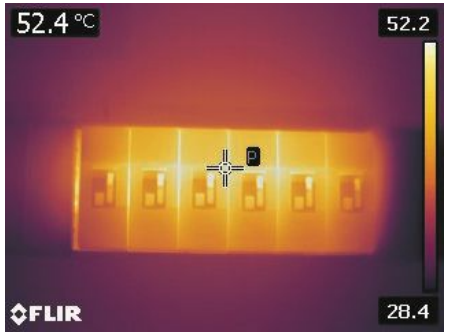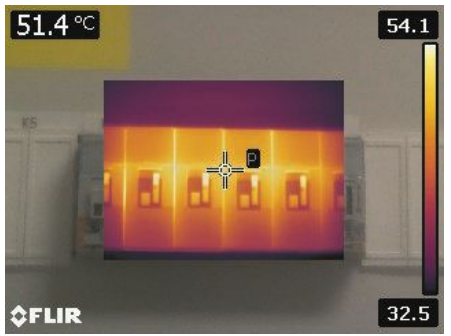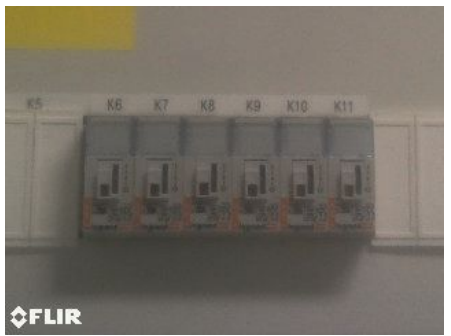
4. Select *Device settings* and push the navigation pad.
5. Select *Reset options* and push the navigation pad.
6. Select *Delete all saved images* and push the navigation pad.

14   Working with image modes

14.1   General

You can choose between different image modes when capturing an image.

14.2   Types of image modes

These are the image modes you can choose from:

Thermal MSX (Multi Spectral Dynamic Imaging): Using this mode, the camera captures infrared images where the edges of the objects are enhanced. Note that the label for each fuse is clearly legible. Recommended for most uses	
Thermal: Using this mode, the camera captures an ordinary infrared image.	
Picture-in-picture: Using this mode, the camera captures an infrared image frame that is displayed on top of a digital photo.	
Digital camera: Using this mode, the camera captures an ordinary digital photo.	

14.3   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Image modes*.
3. Push the navigation pad.
4. Select one of the following image modes:

    • *Thermal MSX*.   Recommended for most uses
    • *Thermal*.
    • *Picture-in-picture*.
    • *Digital camera*.

Note
The data for all image modes are saved when saving an image. Therefore, if you open an image in, e. g., FLIR Tools or in the image archive you can still change the image mode.

15   Working with measurement tools

15.1 Laying out measurement tools in live mode

15.1.1 General

To measure a temperature, you use one or more measurement tools, e.g., a spotmeter or a box. The camera is equipped with a number of *preset* measurement tools.

15.1.2 Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Measurement*.
3. Push the navigation pad. This displays a measurement toolbar.
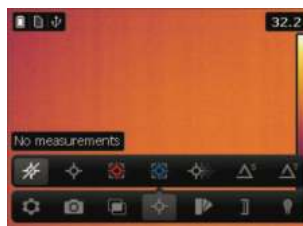
4. On the toolbar, select one of the following and push the navigation pad:

   - *No measurements*: Clears all measurement tools from the screen.
   - *Center spot*: A centered spotmeter on the screen.
   - *Auto hot spot*: A moving spotmeter indicating the hottest temperature within a box.
   - *Auto cold spot*: A moving spotmeter indicating the coldest temperature within a box.
   - *Hot spot - Spot*: The temperature difference between the hot spotmeter and the spotmeter.
   - *Hot spot - Temp*: The temperature difference between the hot spotmeter and a set temperature.
   - *3 spots*: Three spots vertically centered.

15.2 Laying out measurement tools in edit mode

15.2.1 General

You lay out measurement tools in recall mode by opening an image in the image archive.

15.2.2 Procedure

Follow this procedure:

1. Push to open the image archive.

2. Push the navigation pad up/down or left/right to select the image you want to view.
3. Push the navigation pad to open the image.
4. Push the navigation pad to display a toolbar.
5. On the toolbar, select *Edit* and push the joystick. This opens the image in edit mode.
6. Push the joystick to display a toolbar.
7. On the toolbar, select *Measurement*. This displays a toolbar.
8. On the toolbar, select one of the following and push the navigation pad:

   - *Add spot*: Adds a spotmeter.
   - *Add box*: Adds a box.
   - *Add delta*: Adds a difference calculation for two measurement tools.

9. Push the Back button to leave edit mode. A dialog box appears, asking you to cancel or save any changes.

15.3   Moving and resizing measurement tools

15.3.1   General

You can move and resize measurement tools in various ways.

15.3.2   Procedure

Note

This procedure assumes that you have laid out at least one measurement tool on the screen. An existing spotmeter is used as an example.

Follow this procedure:

1. To select a measurement tool, tap and hold, or tap and push the navigation pad. This displays a toolbar.

2. On the toolbar, select one of the following and push the navigation pad:

    -   *Remove spot*: Removes the selected spotmeter.
    -   *Move spot*: Moves the selected spotmeter.
    -   *Center spot*: Centers the spotmeter on the screen.

15.4   Setting local measurement parameters for a measurement tool

15.4.1   General

When you set measurement parameters under *Settings*, all the parameters for the whole image are changed.

However, in some situations you may want to change a measurement parameter for one measurement tool only. The reason for this could be that the measurement tool is in front of a significantly more reflective surface than other surfaces in the image, or over an object that is further away than the rest of the objects in the image, and so on.

For more information about object parameters, see section 20.3.1 *Measurement parameters*, page 42.

15.4.2   Procedure

Note

This procedure assumes that you have laid out at least one measurement tool on the screen. An existing spotmeter is used as an example.

Follow this procedure:

1. To select a measurement tool, tap and hold, or tap and push the navigation pad. This displays a toolbar.
2. On the toolbar, select *Use local parameters* and push the navigation pad.

3. On the toolbar, select one of the following and change the parameter to the desired value:

   • *Emissivity*.
   • *Reflected temperature*.
   • *Object distance*.

16   Working with alarms

16.1   Working with color alarms

16.1.1   General

A color alarm applies a contrasting color to all pixels with a temperature above, below, or between one or more set temperature levels.

Using a color alarm is a good method to easily discover anomalies in an infrared image.

16.1.2   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Color*.
3. Push the navigation pad. This displays a color toolbar.

4. On the toolbar, select one of the following and push the navigation pad:

   - *Above alarm*: A color alarm that colorizes all parts of the image that are above a set temperature level. Use the navigation pad to change the temperature.
   - *Below alarm*: A color alarm that colorizes all parts of the image that are below a set temperature level. Use the navigation pad to change the temperature.
   - *Interval alarm*: An interval color alarm that colorizes all parts of the image that fall between two set temperature levels. Use the navigation pad to change the temperature levels.

16.2   Working with insulation alarms

16.2.1   General

The Insulation alarm can detect areas where there may be an insulation deficiency in a building. It will trigger when the insulation level (termed the thermal index in the camera menu) falls below or above a preset value of the energy leakage through a wall (depending on the climate conditions).

Different building codes recommend different values for the insulation level, but typical values are 60–80% for new buildings. Refer to your national building code for recommendations.

16.2.2   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Color*.
3. Push the navigation pad.

4. Use the navigation pad to select *Insulation alarm*. This displays a dialog box.

5. Use the navigation pad to set the following parameters:

  • *Outdoor temperature*: The current outdoor temperature.
  • *Indoor temperature*: The current indoor temperature.
  • *Thermal index*: The insulation level, an integer between 0 and 100.

16.3 Working with condensation alarms

16.3.1 General

The Condensation alarm can detect areas with potential moisture problems. You can set the relative humidity above which the camera will colorize the image.

16.3.2 Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Color*.
3. Push the navigation pad.
4. Use the navigation pad to select *Condensation alarm*. This displays a dialog box.

5. Use the navigation pad to set the following parameters:

  • *Atmospheric temperature*: The current atmospheric temperature.
  • *Relative humidity*: The current relative humidity.
  • *Relative humidity limit*: The relative humidity level at which you want the alarm to be triggered—100% indicates that the water vapor condenses as liquid water (= dewpoint).

18   Annotating images

18.1   General

This section describes how to save additional information together with an infrared image by using annotations.

Using annotations makes reporting and post-processing more efficient by providing essential information about the image or the situation when it was taken.

18.2   Creating a note

18.2.1   General

A note is grouped with an image file. Using this feature, you can annotate images by entering free-form text.

18.2.2   Procedure

Follow this procedure:

1. Push to open the image archive.
2. Push the navigation pad up/down or left/right to select the image to which you want to add a text annotation.
3. Push the navigation pad to open the image.
4. Push the navigation pad to display a toolbar.

5. On the toolbar, select *Note* and push the navigation pad. This displays a keyboard.
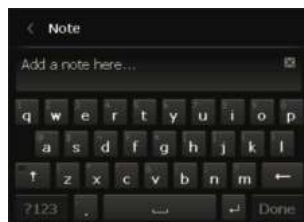
6. Enter the text and click *Done*. After the note is saved, a note icon is displayed in the bottom right corner of the image.

18.3   Creating a voice annotation

18.3.1   General

A voice annotation is an audio recording that is stored in an infrared image file.

The voice annotation is recorded using a Bluetooth headset. The recording can be played back in the camera, and in image analysis and reporting software from FLIR Systems.

18.3.2   Procedure

Note

This procedure assumes that you have paired the camera with a Bluetooth headset. For information on how to do this, see section 10 *Pairing Bluetooth devices*, page 19.

Follow this procedure:

1. Push [▶] to open the image archive.
2. Push the navigation pad up/down or left/right to select the image to which you want to add a voice annotation.
3. Push the navigation pad to open the image.
4. Push the navigation pad to display a toolbar.

5. On the toolbar, select *Voice annotation* and push the navigation pad. This displays a recording toolbar.

6. Do the following:.

    *   Click *Record* to start the recording.
    *   Click *Stop* to stop the recording. After the recording is saved, a voice annotation icon is displayed in the bottom right corner of the image.
    *   Click *Delete* to delete the recording.

19 Recording video clips

19.1 General

You can record non-radiometric video clips in the following image modes:

- *Thermal MSX*.
- *Thermal*.
- *Picture-in-picture*.
- *Digital camera*.

The video clips can be played back in Microsoft Windows Media Player, but it will not be possible to retrieve any temperature values from them.

19.2 Procedure: Recording a video clip

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Recording mode*.
3. Push the navigation pad.
4. Select *Video* and push the navigation pad.
5. Push the Save button to start the recording. A red icon at the top of the image blinks during the recording.

6. Push the Save button again to stop the recording.

19.3 Procedure: Playing a video clip

Follow this procedure:

1. Push [▶] to open the image archive.
2. Push the navigation pad up/down or left/right to select the video clip that you want to play.
3. Push the navigation pad to open the video clip.
4. Push the navigation pad to display a toolbar.
5. On the toolbar, select *Play* and push the navigation pad.

20   Changing settings

20.1   General

You can change a variety of settings in the camera. You do this in the *Settings* dialog box.

20.2   Procedure

Follow this procedure:

1. Push the navigation pad to display the menu system.
2. Use the navigation pad to go to *Settings*.
3. Push the navigation pad.
4. Select the setting you want to change. By selecting some settings, additional dialog boxes are displayed.
5. Use the navigation pad to navigate in menus or change values.
6. Push ⬅ to go back.

20.3   Description of the various settings
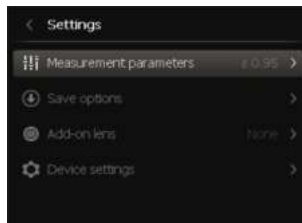
20.3.1   Measurement parameters

20.3.1.1   General

For accurate measurements, you must set the object parameters.

20.3.1.2   Types of parameters

The camera can use these object parameters:

*   *Emissivity*, i.e., how much radiation an object emits, compared with the radiation of a theoretical reference object of the same temperature (called a "blackbody"). The opposite of emissivity is reflectivity. The emissivity determines how much of the radiation originates from the object as opposed to being reflected by it.
*   *Reflected temperature*, which is used when compensating for the radiation from the surroundings reflected by the object into the camera. This property of the object is called reflectivity.
*   *Distance*, i.e., the distance between the camera and the object of interest.
*   *Relative humidity*, i.e., the relative humidity of the air between the camera and the object of interest.
*   *Atmospheric temperature*, i.e., the temperature of the air between the camera and the object of interest.
*   *Window compensation*, i.e., the temperature of any protective windows, etc., that are set up between the camera and the object of interest. If no protective window or protective shield is used, this value is irrelevant and should be left inactive.

20.3.1.3   Recommended values

If you are unsure about the values, the following are recommended:

Emissivity	0.95
Reflected temperature	+20°C (+69°F)
Distance	1.0 m (3.3 ft.)

Relative humidity	50%
Atmospheric temperature	+20°C (+69°F)

20.3.2   Save options

Photo as separate JPEG: This setting defines if a digital photo will be saved as a separate file with a full field of view. If this setting is disabled, the digital photo will be saved with the same field of view as the infrared image.

20.3.3   Add-on lens

This setting defines which accessory lens has been mounted on the camera. Available choices are *None*, *FOV45*, and *FOV15*.

20.3.4   Device settings
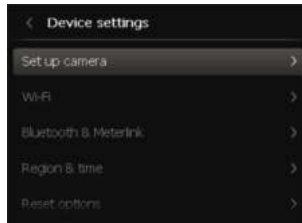
20.3.4.1   Set up camera
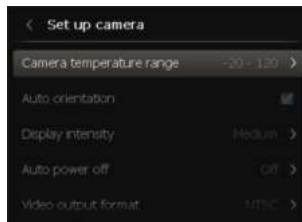
20.3.4.1.1   Camera temperature range

This setting defines the camera's calibrated temperature range. Different camera models have different temperature ranges. Select a range that suits your measurement situation.

20.3.4.1.2   Auto orientation

This setting defines whether *Auto orientation* is enabled or disabled. When *Auto orientation* is enabled, the orientation of the overlay graphics will change according to how you hold the camera.

20.3.4.1.3   Display intensity

This setting defines the light intensity of the display. Available options are *Low*, *Medium*, and *High*.

20.3.4.1.4   Auto power off

This setting defines how soon the camera is automatically turned off. Available choices are *Off*, *5 min*, and *20 min*.

20.3.4.1.5   Video output format

This setting defines the video output format from the video out connector (i.e., the TV format). Available choices are *PAL* and *NTSC*.

20.3.4.1.6   Calibrate touchscreen

This setting allows calibration of the touchscreen. For more information, see section 12.8 *Calibrating the touchscreen*, page 25.

20.3.4.2   Wi-Fi

This setting defines Wi-Fi networks. For more information, see section 11 *Configuring Wi-Fi*, page 20.

20.3.4.3   Bluetooth & MeterLink

This setting defines Bluetooth connectivity. For more information, see section 10 *Pairing Bluetooth devices*, page 19.

20.3.4.4   Region & time

This setting defines a number of regional parameters:

- *Language*.
- *Temperature unit*.
- *Distance unit*.
- *Date and time*.
- *Date and time format*.

20.3.4.5   Reset options

This setting defines a number or reset options:

- *Reset default camera mode*: This will affect color palettes and measurement tools. Saved images will not be affected.
- *Reset device settings to factory default*: This will affect all camera settings, including regional settings. Saved images will not be affected. The camera will be restarted.
- *Delete all saved images*: This setting will delete all saved images in the image archive.

20.3.4.6   Camera information

This dialog displays camera information such as the model, serial number, part number, and software version. No changes can be made.

21 Technical data

For technical data on this product, refer to the product catalog and/or technical data-sheets on the User Documentation CD-ROM that comes with the product.

The product catalog and the datasheets are also available at http://support.flir.com.

22   Cleaning the camera

22.1   Camera housing, cables, and other items

22.1.1   Liquids

Use one of these liquids:

- Warm water
- A weak detergent solution

22.1.2   Equipment

A soft cloth

22.1.3   Procedure

Follow this procedure:

1.   Soak the cloth in the liquid.
2.   Twist the cloth to remove excess liquid.
3.   Clean the part with the cloth.

⚠ CAUTION
Do not apply solvents or similar liquids to the camera, the cables, or other items. This can cause damage.

22.2   Infrared lens

22.2.1   Liquids

Use one of these liquids:

- A commercial lens cleaning liquid with more than 30% isopropyl alcohol.
- 96% ethyl alcohol (C_2H_5OH).
- DEE (= 'ether' = diethylether, $C_4H_{10}O$).
- 50% acetone (= dimethylketone, $(CH_3)_2CO$)) + 50% ethyl alcohol (by volume). This liquid prevents drying marks on the lens.

22.2.2   Equipment

Cotton wool

22.2.3   Procedure

Follow this procedure:

1.   Soak the cotton wool in the liquid.
2.   Twist the cotton wool to remove excess liquid.
3.   Clean the lens one time only and discard the cotton wool.

⚠ WARNING
Make sure that you read all applicable MSDS (Material Safety Data Sheets) and warning labels on containers before you use a liquid: the liquids can be dangerous.

⚠ CAUTION
• Be careful when you clean the infrared lens. The lens has a delicate anti-reflective coating. • Do not clean the infrared lens too vigorously. This can damage the anti-reflective coating.

23 Application examples

23.1 Moisture & water damage

23.1.1 General

It is often possible to detect moisture and water damage in a house by using an infrared camera. This is partly because the damaged area has a different heat conduction property and partly because it has a different thermal capacity to store heat than the surrounding material.

> **Note**
>
> Many factors can come into play as to how moisture or water damage will appear in an infrared image.
>
> For example, heating and cooling of these parts takes place at different rates depending on the material and the time of day. For this reason, it is important that other methods are used as well to check for moisture or water damage.

23.1.2 Figure

The image below shows extensive water damage on an external wall where the water has penetrated the outer facing because of an incorrectly installed window ledge.

Courtesy Professional Investigative Engineers
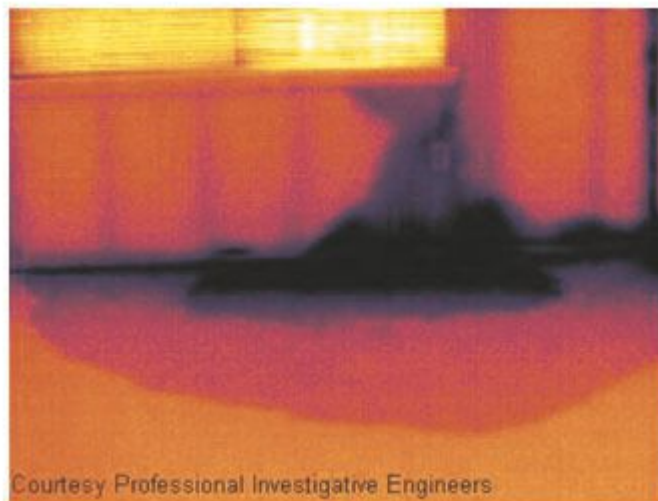
23.2 Faulty contact in socket

23.2.1 General

Depending on the type of connection a socket has, an improperly connected wire can result in local temperature increase. This temperature increase is caused by the reduced contact area between the connection point of the incoming wire and the socket , and can result in an electrical fire.

> **Note**
>
> A socket's construction may differ dramatically from one manufacturer to another. For this reason, different faults in a socket can lead to the same typical appearance in an infrared image.
>
> Local temperature increase can also result from improper contact between wire and socket, or from difference in load.

23.2.2 Figure

The image below shows a connection of a cable to a socket where improper contact in the connection has resulted in local temperature increase.
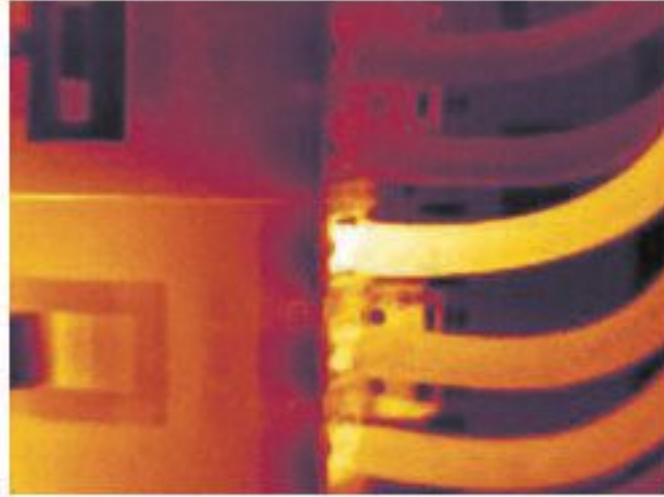
23.3   Oxidized socket

23.3.1   General

Depending on the type of socket and the environment in which the socket is installed, oxides may occur on the socket's contact surfaces. These oxides can lead to locally increased resistance when the socket is loaded, which can be seen in an infrared image as local temperature increase.

Note

A socket's construction may differ dramatically from one manufacturer to another. For this reason, different faults in a socket can lead to the same typical appearance in an infrared image.

Local temperature increase can also result from improper contact between a wire and socket, or from difference in load.

23.3.2   Figure

The image below shows a series of fuses where one fuse has a raised temperature on the contact surfaces against the fuse holder. Because of the fuse holder's blank metal, the temperature increase is not visible there, while it is visible on the fuse's ceramic material.
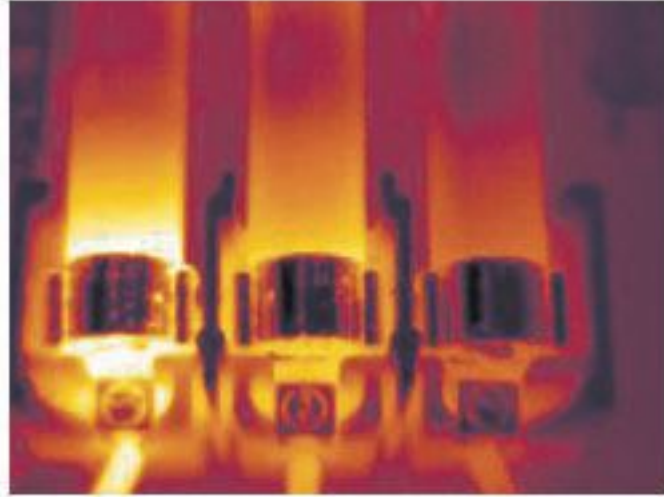
23.4   Insulation deficiencies

23.4.1   General

Insulation deficiencies may result from insulation losing volume over the course of time and thereby not entirely filling the cavity in a frame wall.

An infrared camera allows you to see these insulation deficiencies because they either have a different heat conduction property than sections with correctly installed insulation, and/or show the area where air is penetrating the frame of the building.

Note

When you are inspecting a building, the temperature difference between the inside and outside should be at least 10°C (18°F). Studs, water pipes, concrete columns, and similar components may resemble an insulation deficiency in an infrared image. Minor differences may also occur naturally.

23.4.2   Figure

In the image below, insulation in the roof framing is lacking. Due to the absence of insulation, air has forced its way into the roof structure, which thus takes on a different characteristic appearance in the infrared image.
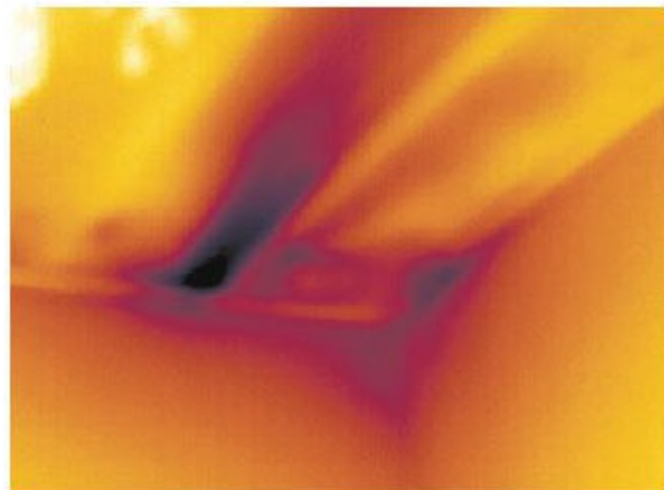
23.5 Draft

23.5.1 General

Draft can be found under baseboards, around door and window casings, and above ceiling trim. This type of draft is often possible to see with an infrared camera, as a cooler airstream cools down the surrounding surface.

> **Note**
>
> When you are investigating draft in a house, there should be sub-atmospheric pressure in the house. Close all doors, windows, and ventilation ducts, and allow the kitchen fan to run for a while before you take the infrared images.
>
> An infrared image of draft often shows a typical stream pattern. You can see this stream pattern clearly in the picture below.
>
> Also keep in mind that drafts can be concealed by heat from floor heating circuits.

23.5.2 Figure

The image below shows a ceiling hatch where faulty installation has resulted in a strong draft.

25 Glossary
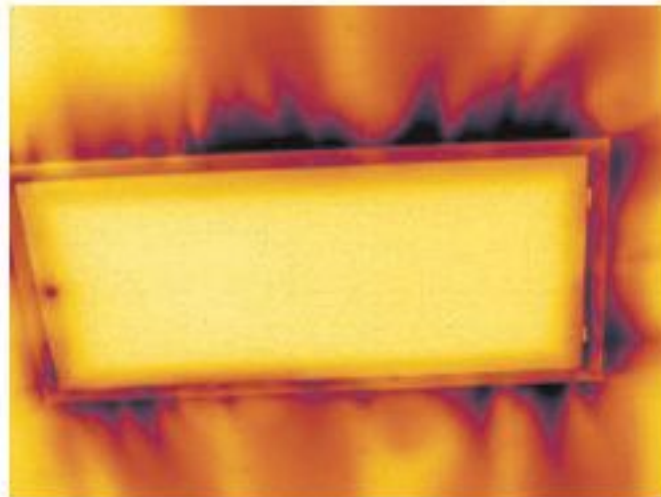
absorption (absorption factor)	The amount of radiation absorbed by an object relative to the received radiation. A number between 0 and 1.
atmosphere	The gases between the object being measured and the camera, normally air.
autoadjust	A function making a camera perform an internal image correction.
autopalette	The IR image is shown with an uneven spread of colors, displaying cold objects as well as hot ones at the same time.
blackbody	Totally non-reflective object. All its radiation is due to its own temperature.
blackbody radiator	An IR radiating equipment with blackbody properties used to calibrate IR cameras.
calculated atmospheric transmission	A transmission value computed from the temperature, the relative humidity of air and the distance to the object.
cavity radiator	A bottle shaped radiator with an absorbing inside, viewed through the bottleneck.
color temperature	The temperature for which the color of a blackbody matches a specific color.
conduction	The process that makes heat diffuse into a material.
continuous adjust	A function that adjusts the image. The function works all the time, continuously adjusting brightness and contrast according to the image content.
convection	Convection is a heat transfer mode where a fluid is brought into motion, either by gravity or another force, thereby transferring heat from one place to another.
dual isotherm	An isotherm with two color bands, instead of one.
emissivity (emissivity factor)	The amount of radiation coming from an object, compared to that of a blackbody. A number between 0 and 1.
emittance	Amount of energy emitted from an object per unit of time and area (W/m^2)
environment	Objects and gases that emit radiation towards the object being measured.
estimated atmospheric transmission	A transmission value, supplied by a user, replacing a calculated one
external optics	Extra lenses, filters, heat shields etc. that can be put between the camera and the object being measured.
filter	A material transparent only to some of the infrared wavelengths.
FOV	Field of view: The horizontal angle that can be viewed through an IR lens.
FPA	Focal plane array: A type of IR detector.
graybody	An object that emits a fixed fraction of the amount of energy of a blackbody for each wavelength.
IFOV	Instantaneous field of view: A measure of the geometrical resolution of an IR camera.

image correction (internal or external)	A way of compensating for sensitivity differences in various parts of live images and also of stabilizing the camera.
infrared	Non-visible radiation, having a wavelength from about 2–13 μm.
IR	infrared
isotherm	A function highlighting those parts of an image that fall above, below or between one or more temperature intervals.
isothermal cavity	A bottle-shaped radiator with a uniform temperature viewed through the bottleneck.
Laser LocatIR	An electrically powered light source on the camera that emits laser radiation in a thin, concentrated beam to point at certain parts of the object in front of the camera.
laser pointer	An electrically powered light source on the camera that emits laser radiation in a thin, concentrated beam to point at certain parts of the object in front of the camera.
level	The center value of the temperature scale, usually expressed as a signal value.
manual adjust	A way to adjust the image by manually changing certain parameters.
NETD	Noise equivalent temperature difference. A measure of the image noise level of an IR camera.
noise	Undesired small disturbance in the infrared image
object parameters	A set of values describing the circumstances under which the measurement of an object was made, and the object itself (such as emissivity, reflected apparent temperature, distance etc.)
object signal	A non-calibrated value related to the amount of radiation received by the camera from the object.
palette	The set of colors used to display an IR image.
pixel	Stands for *picture element*. One single spot in an image.
radiance	Amount of energy emitted from an object per unit of time, area and angle ($W/m^2/sr$)
radiant power	Amount of energy emitted from an object per unit of time (W)
radiation	The process by which electromagnetic energy, is emitted by an object or a gas.
radiator	A piece of IR radiating equipment.
range	The current overall temperature measurement limitation of an IR camera. Cameras can have several ranges. Expressed as two blackbody temperatures that limit the current calibration.
reference temperature	A temperature which the ordinary measured values can be compared with.
reflection	The amount of radiation reflected by an object relative to the received radiation. A number between 0 and 1.
relative humidity	Relative humidity represents the ratio between the current water vapour mass in the air and the maximum it may contain in saturation conditions.
saturation color	The areas that contain temperatures outside the present level/span settings are colored with the saturation colors. The saturation colors contain an 'overflow' color and an 'underflow' color. There is also a third red saturation color that marks everything saturated by the detector indicating that the range should probably be changed.

span	The interval of the temperature scale, usually expressed as a signal value.
spectral (radiant) emittance	Amount of energy emitted from an object per unit of time, area and wavelength ($W/m^2/\mu m$)
temperature difference, or difference of temperature.	A value which is the result of a subtraction between two temperature values.
temperature range	The current overall temperature measurement limitation of an IR camera. Cameras can have several ranges. Expressed as two blackbody temperatures that limit the current calibration.
temperature scale	The way in which an IR image currently is displayed. Expressed as two temperature values limiting the colors.
thermogram	infrared image
transmission (or transmittance) factor	Gases and materials can be more or less transparent. Transmission is the amount of IR radiation passing through them. A number between 0 and 1.
transparent isotherm	An isotherm showing a linear spread of colors, instead of covering the highlighted parts of the image.
visual	Refers to the video mode of a IR camera, as opposed to the normal, thermographic mode. When a camera is in video mode it captures ordinary video images, while thermographic images are captured when the camera is in IR mode.

T559845