

■ Analysis software



RayCAM report



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1 INSTALLATION

1.1 System requirements

XP:

SP2 or higher

Memory at least 512 MB

700 MHz or higher CPU

NET Framework 2.0 or higher

Resolution of the monitor at least 1024 x 768

Vista:

SP1 or higher

Memory at least 1 Go

1 GHz or higher CPU

NET Framework 2.0 or higher

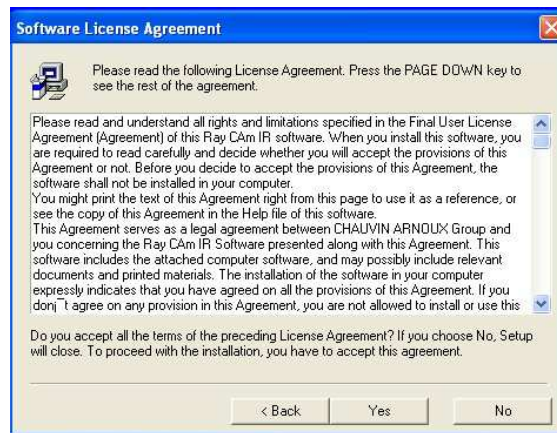
Resolution of the monitor at least 1024 x 768

1.2 Installing RayCam Report

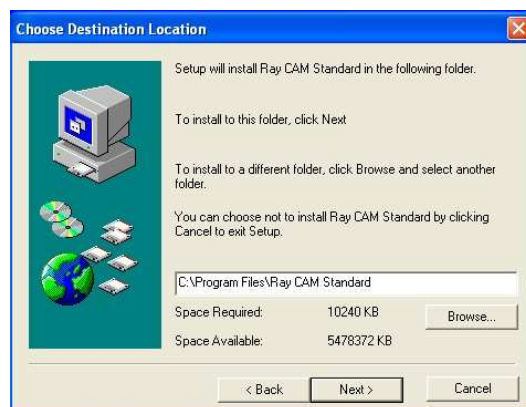
- (1) Locate the installation program and double-click on the icon of the executable (.exe);
- (2) Click on the “Next” button to continue installation or on the “Cancel” button to abort;



- (3) On the licence agreement screen below, click on the “Yes” button to continue installation or on the “No” button to abort;



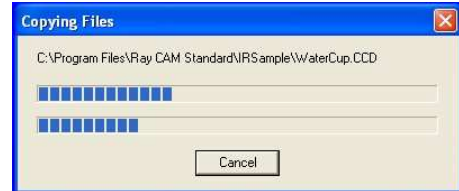
- (4) Select the installation access path by clicking on the “Browse” button or use the default path (make sure that the drive selected has enough free space)
Then click on the “Next” button;



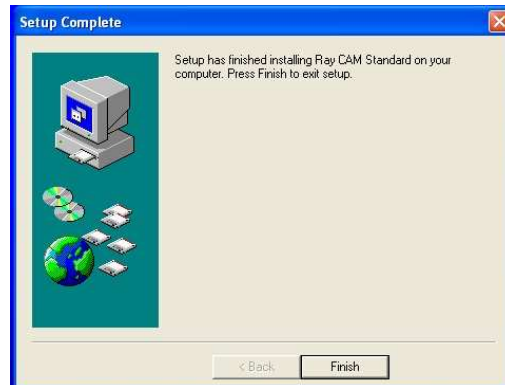
- (5) Confirm the location of the program directory and click on “Next”;



(6) Click on the “Next” button in the “Start Copying Files” dialogue window;



(7) Finally, click on the “Finish” button.



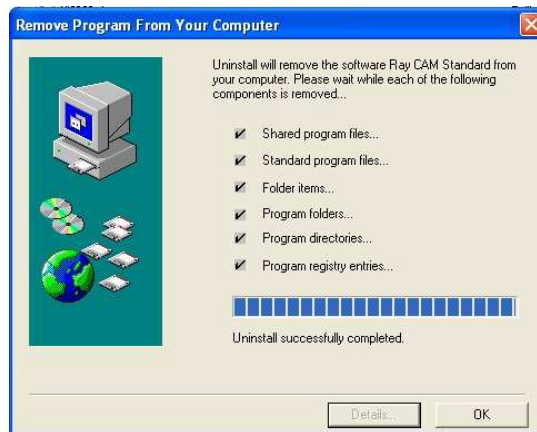
If Microsoft .NET Framework 2.0 (or a more recent version) is not installed on your computer, a message prompts you to install it. Click on the OK button and follow the installation instructions.

Remark: if you see the message “Setup cannot continue because this version of the .Net Framework is incompatible with a previously installed one”, open the configuration panel, double-click on Addition/Deletion of programs, under XP, or on Programs and functions, under Vista, to uninstall the previous version of Framework and uninstall the RayCamReport software. Repeat the steps above to reinstall the application.

(8) Click on the “Yes” button to reboot the computer when installation is over.

1.3 Uninstalling RayCam Report

Click on Start in the bottom left corner of the Windows desktop. In All programs > RayCAMReport, click on Uninstall RayCAMReport and follow the instructions to delete the RayCAMReport software



2 FIRST STEP: PRESENTATION OF THE SOFTWARE

2.1 Starting the application

The program can be started in two ways:

- Click on “Start” in the bottom left corner of the Windows desktop, then “All programs”, and select RayCamReportXXX;
- Double-click on the RayCamReport icon on your Windows desktop.

2.2 Modes of operation

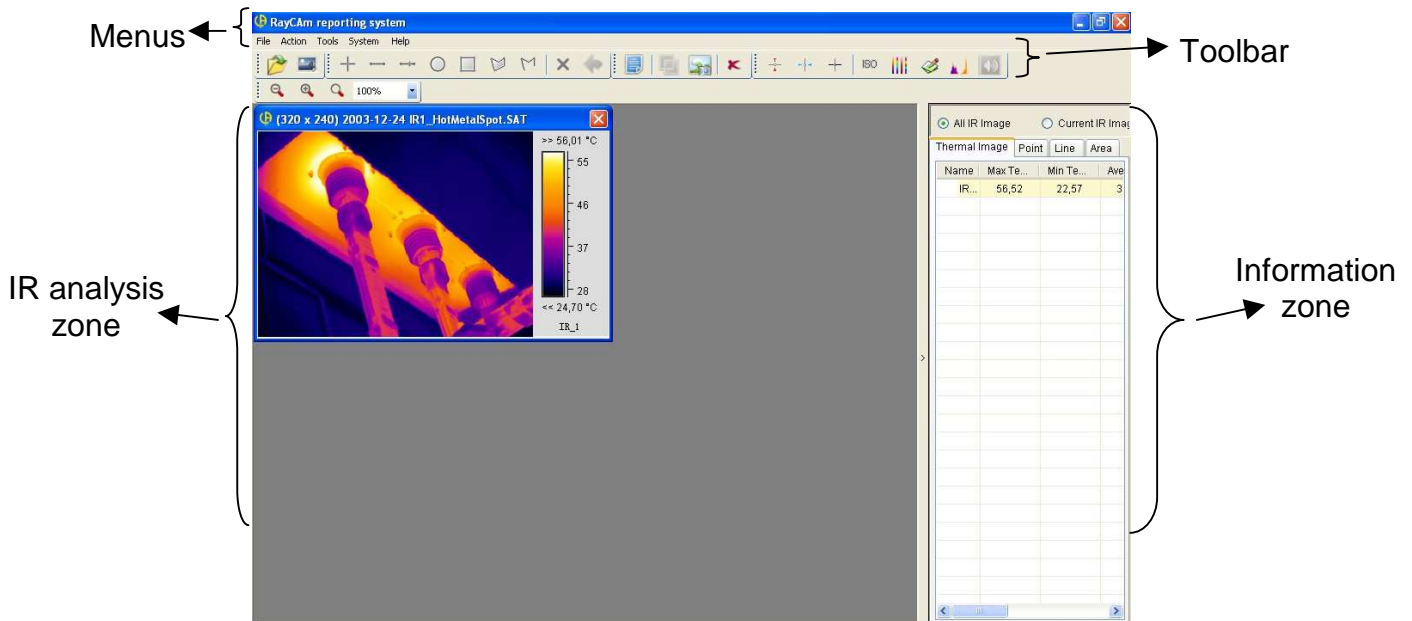
RayCam Report proposes two operating modes:

- Analysis mode to analyze infrared images;
- Report mode to create and lay out inspection reports.

2.2.1 Analysis mode

When the RayCam Report application is started, it opens in analysis mode as default.

The screen below is the main interface of the application. The operational functions can be selected using the menus or the toolbar or by right-clicking on the image itself.



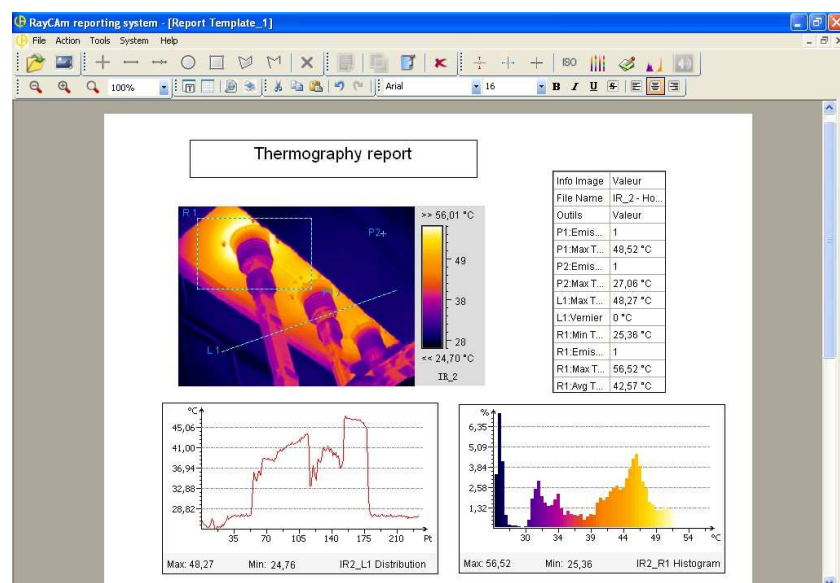
This mode is used to open one or several images, to add various analysis tools (see §4), and to obtain all results in condensed form in a table. This mode is useful for a first-level analysis, when you simply want to form an idea of the temperatures without saving the analyses.

2.2.2 Report mode

The report mode is used to create reports and/or models in A4 paper format. You can add thermal images (.sat or .jpg with temperature data), digital images (.ccd, .jpg, or .bmp), analysis tools/functions, tables with results, and text zones.

The page layout can be completely customized.

To go from the analysis mode to the report mode, click on the  shortcut in the toolbar.



The construction of a report proceeds as follows:


(1) Opening of images

- Add thermal and/or digital images to the model (see §3)

(2) Insertion of tools

- Add analysis tools to the thermal image to study it (see §4) and highlight any faults observed during your inspection.

(3) Addition of text zone

- Insert a text zone to create a title or a remark/actions to be taken zone.
- Click on the  shortcut.
- The text can be modified and formatted using the following tools:



(4) Creation of table

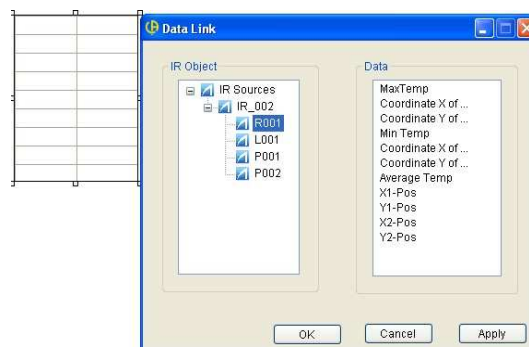
Click on the  shortcut to insert a table.

The table will let you display the various information about the analysis tools inserted in your infrared image.

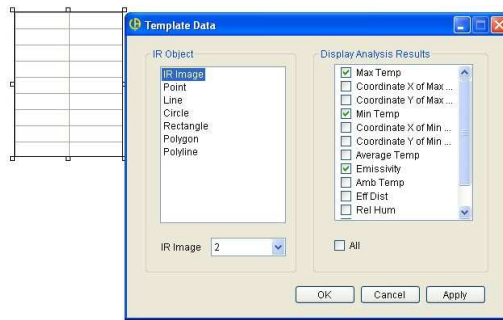
You can click with the right mouse button to perform the following operations:

- Delete => deletes the current table;
- Insert line above => adds a line above the current line;
- Insert line below => adds a line below the current line;
- Delete line => deletes the current line;
- Insert column to left => adds a column to the left of the current column;
- Insert column to right => adds a column to the right of the current column;
- Delete column => deletes the current column;
- Add free format data => adds the selected analysis data in the selected cell.


After adding the data, you can click with the right mouse button to choose, in the contextual menu, to display the value of the data or the formula.



- Add fixed format data => adds the selected analysis data of an IR image and/or its analysis tools in the table.




- Add page => to add a page to your report, set the mouse on a blank space in your report, right-click, and select “Add page before” or “Add page after” according to your need.

To return to analysis mode, click on the  shortcut in the toolbar.

Remark: When you click on the analysis mode shortcut, the Report Mode window is reduced. You can return to report mode by clicking on the Enlarge button in the top right corner of the Report Mode window.



2.3 Exiting from the application

The user can exit from the application by selecting “Exit” in the File menu or by clicking on the  button in the top right corner of the main window.

3 GENERAL FUNCTIONS

3.1 Language

This function lets the user select one of the available languages for the interface of the application.

The language is chosen by selecting “Languages” in the system menu.


3.2 Management of images and reports

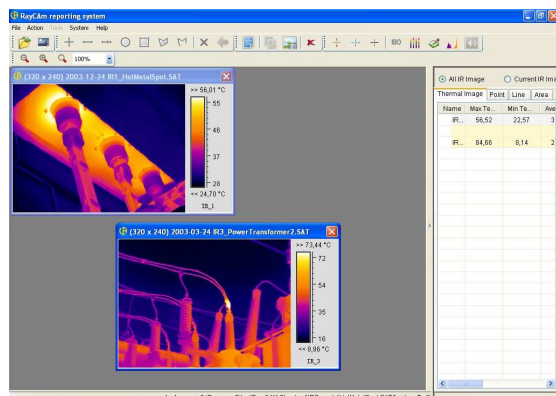
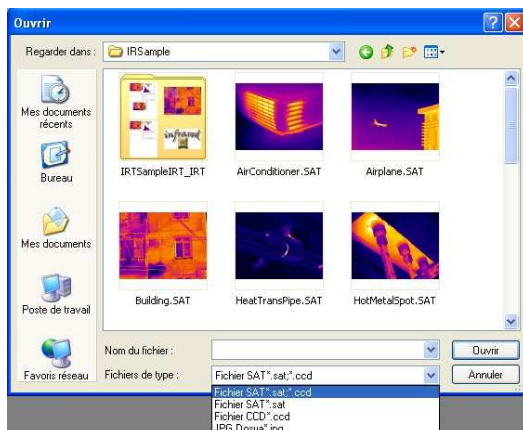
3.2.1 Open IR file

3.2.1.1 Thermal image

You can open one or more infrared images in the SAT, JPG, and BMP formats with thermal data.

These images can be opened in two ways:

- Click on “Open IR file” in the file menu;
- Click on the  shortcut in the toolbar.




Remark: In analysis mode, the resolution of the thermal image opened is displayed in its title bar (320 x 240, for example).

3.2.1.2 CCD image

You can also open the digital image associated with the CCD format to merge it with the thermal image.

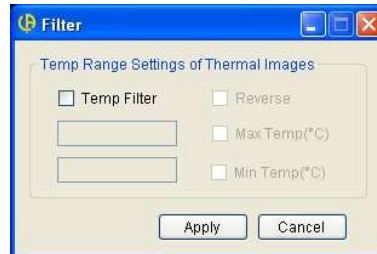
This image can be opened in two ways:

- Click on “Open IR file” in the file menu.
- Click on the  shortcut in the toolbar.

3.2.1.3 Filter (Analysis mode only)

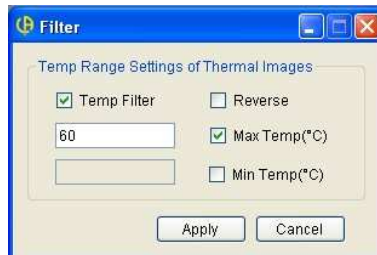
Defines a temperature range as file opening filter; in other words, opens only thermal images in which the maximum/minimum temperature lies within a specified temperature range.

This function is accessed from the File menu by selecting “Filter”

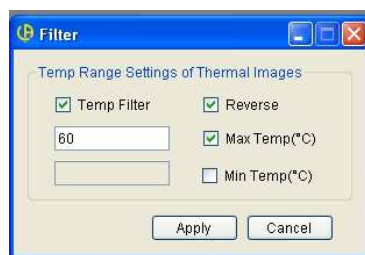


Example:

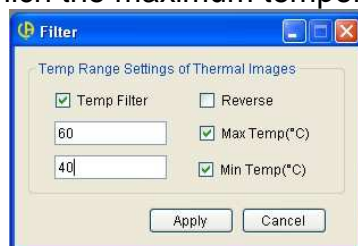
- To open IR file(s) in which the maximum temperature is less than or equal to 60°C



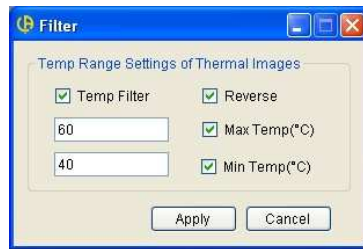
- To open IR file(s) in which the maximum temperature is greater than or equal to 60°C.



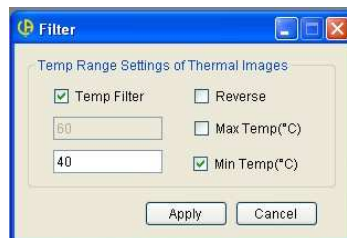
- To open IR file(s) in which the maximum temperature is between 40 and 60°C.



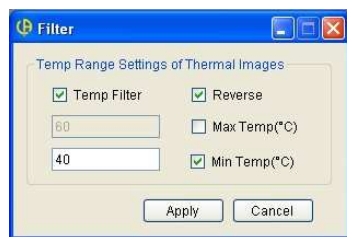
- To open IR file(s) in which the maximum temperature is not between 40 and 60°C.



- To open IR file(s) in which the minimum temperature is greater than or equal to 40°C




- To open IR file(s) in which the maximum temperature is less than or equal to 40°C



3.2.2 Open image

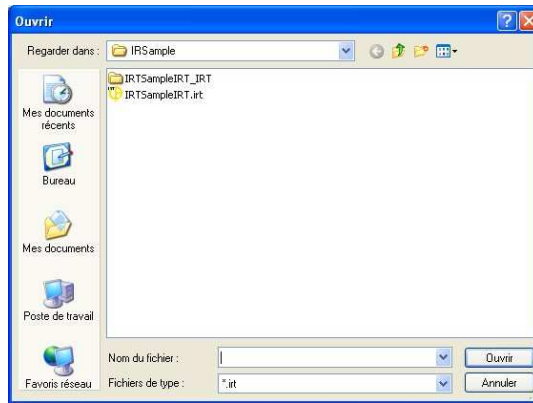
You can open one or more digital images in JPG or BMP format. The digital image can be used for analysis reports and/or fusion with a thermal image.

These images can be opened in two ways:

- Click on “Open image” in the file menu
- Click on the  shortcut in the toolbar

3.2.3 Open IRT file (Report mode only)


You can open a report type file (.irt) either to modify it or to create a new report. To access this type of file, click on “Open file IRT” in the file menu, then select the desired document in the explorer. Click on “Open” to finish.



3.2.4 Start sound

This function is used to listen to the voice records associated with a thermal image file. If the thermal image has no voice record, the shortcut is deactivated.

Listening can be started in two ways:

- Click on "Play audio" in the Action menu
- Click on the  shortcut in the toolbar

3.2.5 Copy to the clipboard


This function copies the current thermal image to the system clipboard so that you can paste it into another application, for example a Word document.

To copy the information, click with the right mouse button on a thermal image and select "Copy to the clipboard"

3.2.6 Snapshot (Analysis mode only)

This function can be used to save the thermal image being analyzed to a new image file in SAT, BMP, or JPG format. You can then open the JPG snapshot file as a thermal image from the "Open IR file" menu or as a digital image with "Open image".

Recording can be done in two ways:

- - Click on "Snapshot" in the Action menu
- - Click on the  shortcut in the toolbar

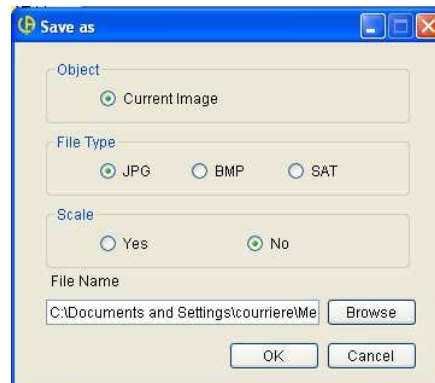
3.2.7 IR image switch

You can replace the current thermal image with another one by clicking with the right mouse button and selecting "IR Image Switch". This function is useful when you want to analyze several thermal images using the same set of analysis tools.

3.2.8 Save IR as

This function lets you record the thermal images in one or more files, in the desired format (*.jpg, *.bmp, or *.sat).

To save an image, select “Save IR as” in the File menu, select the desired output format and indicate whether or not the scale is displayed (for jpg or bmp image only), then select the access path. Click on “OK” to finish.



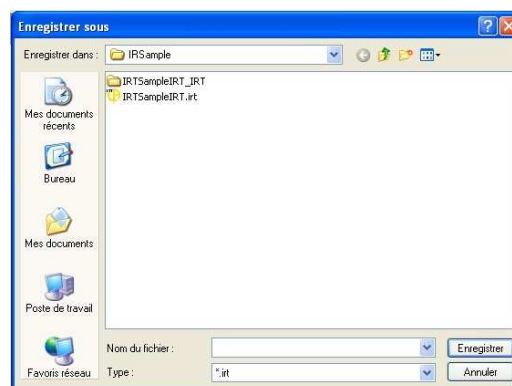
Note: If an image is recorded in JPG format with the temperature data, you can open it as a thermal image and perform an analysis on it as you would with an image in SAT format.

3.2.9 Save IRT file (Report mode only)

You can save the content of the current .irt file to make a model from it or to save your analyses and remarks.

To record a file, select «Record IRT file» in the File menu, then enter the desired name and click on the «Save» button to finish.


Note: if you save your file as a model, it will not subsequently be possible to modify the “fusion” windows created. It will be necessary to create new ones for each report.



3.2.10 Print preview (Report mode only)

This function displays a print preview of the current report.


The preview can be obtained in two ways:

- Click on “Print preview” in the file menu
- Click on the  shortcut in the toolbar

3.2.11 Print (Report mode only)

This function prints the current report.


Printing can be started in two ways:

- Click on “Print” in the file menu
- Click on the  shortcut in the toolbar

3.2.12 Close the current IR image

This function closes the window of the active IR image being analyzed.

The window can be closed in two ways:


- Click on “Close current IR image” in the Action menu
- Click on the  button in the top right corner of the window of the IR image (analysis mode)

Select the image to be deleted, then press “DEL” on your keyboard (report mode)

3.2.13 Close all analysis windows

This function closes all open analysis windows.


The windows can be closed in two ways:

- Click on “Close all analysis windows” in the Action menu
- Click on the  shortcut in the toolbar

3.2.14 Exit

To close the application.

The application can be closed in two ways:


- Click on “Exit” in the file menu
- Click on the  button in the top right corner

3.3 Display the images

3.3.1 Zoom In

This function enlarges the current thermal image.

The image can be zoomed in two ways:

- Click on “Zoom In” in the Action menu
- Click on the  shortcut in the toolbar

3.3.2 Zoom Out

This function reduces the current thermal image.


The image can be unzoomed in two ways:

- Click on “Zoom Out” in the Action menu
- Click on the  shortcut in the toolbar

3.3.3 Original size

This function restores the thermal image to its original size.

This can be done in two ways:

- Click on “Original size” in the Action menu
- Click on the  shortcut in the toolbar

3.3.4 Temperature unit

This function is used to choose the unit of the temperature scale: degrees Celsius or degrees Fahrenheit.

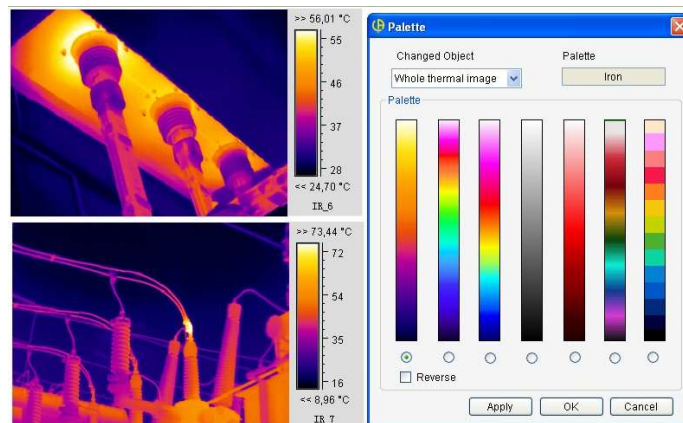
The unit is chosen by selecting “Temperature scale” in the System menu.

3.3.5 Colour palette

This tool is used to modify the colour palette for the display of the active infrared image.

The adjustment can be made in three ways:

- Click on «Palette» in the System menu
- Right-click with the mouse on the IR image, then select “Palette”
- Click on the shortcut in the toolbar




3.3.6 Adjust image

This function is used to modify the values of the temperature scale. If the temperature values of the image are not within this range, they are associated with the top or bottom end of the palette. This adjustment makes it possible to highlight or expand some parts of the thermal image.

If, for example, $>> 19.2^{\circ}\text{C}$ or $<< 3^{\circ}\text{C}$ is displayed on the scale of the palette, it means that some temperature values in the image are above $>> 19.2^{\circ}\text{C}$ or below $<< 3^{\circ}\text{C}$. These values will then all be associated with the colours of the top and bottom ends of the palette, respectively.

The adjustment can be made in three ways:

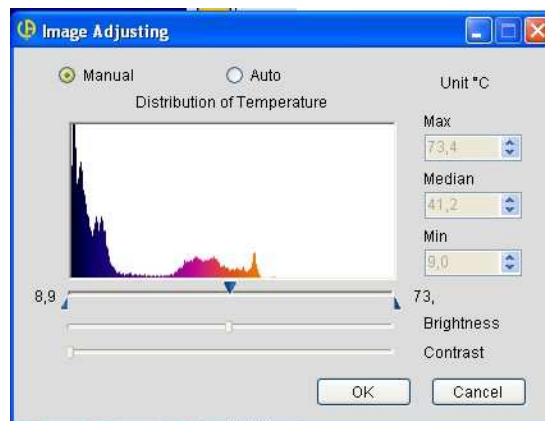
- Click on “Image Adjustment” in the System menu
- Right-click with the mouse on the IR image, then select “Image Adjustment”
- Click on the  shortcut in the toolbar

In the “Image Adjustment” window, click on the Manual button and move the green or blue button in the scroll bar to select the temperature range you want.

The blue triangle can be used to shift the whole range left or right.

The blue half-triangles can be used to shift only the high/low value of the scale.

You can also move the Brightness or Contrast buttons to adjust the correspondence between the temperature values and the image colours.




4 ANALYSIS OF THE INFRARED IMAGE


In analysis mode and in report mode, there are many tools you can use to obtain more information about the whole image or about selected zones.

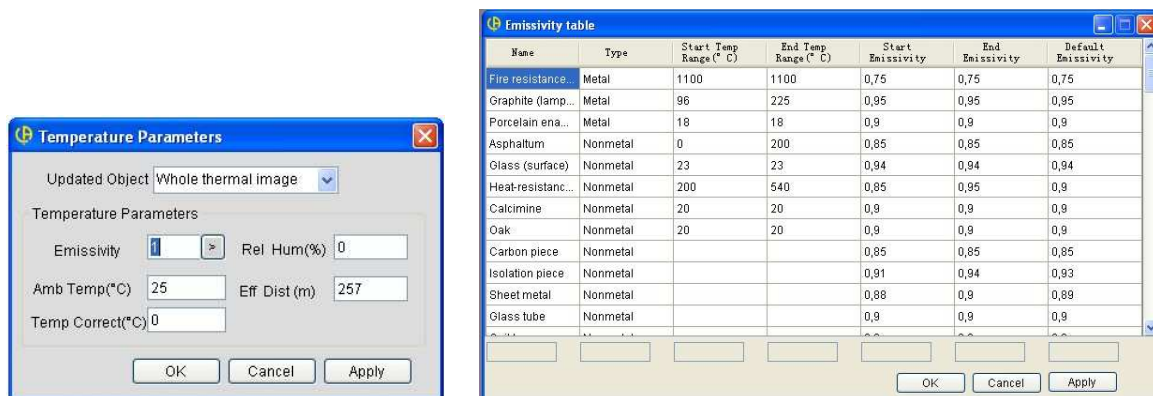
4.1 Parameters of influence

The “Temperature settings” function is used to adjust the parameters that influence the measurement, for the temperature calculation of a thermal image or an analysis tool inserted in the image. These parameters are: the emissivity of the materials, the ambient temperature, the relative humidity, and the effective distance.

The adjustment can be made in three ways:

- Click on “Temperature settings” in the System menu
- Right-click with the mouse on the IR image, then select “Temperature settings”
- Click on the  shortcut in the toolbar

For the emissivity adjustment, you can enter an emissivity value or click on  to select a value provided by the system. Each material in the list has an emissivity range and a default emissivity. When you select a line and click on OK or on Apply, the default emissivity is used. When you double-click on an emissivity value in a line, that is the value that is used.




4.2 Presentation of the analysis tools



4.2.1 The tools

This menu is used to insert various tools in your thermal image (point, line, vernier, circle, rectangle, polygon, or polyline) in order to analyze temperature changes in certain zones of a thermal image.



These tools can be inserted in two ways:

- Click on the desired type of tool in the tools menu
- Click on one of the  shortcuts in the toolbar



4.2.1.1 Point

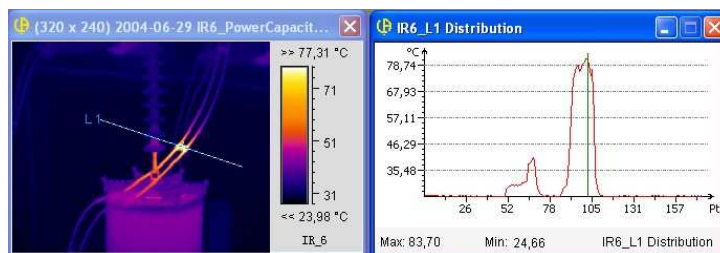
Click on the  shortcut to place one or more points on a thermal image. Click again on the  shortcut or click with the right mouse button on the thermal image to exit from the function

4.2.1.2 Line



Click on the  shortcut to plot one or more lines on a thermal image. To terminate the function, click again on  or click with the right mouse button on the thermal image.

4.2.1.3 Vernier

Click on  to place a vernier on a selected line in a thermal image. Click again on  or click with the right mouse button on the image to terminate the function. You can change the location of the vernier by placing your cursor at the desired place on the line and clicking on it: the vernier then changes position.





4.2.1.4 Circle

Click on the  shortcut to plot one or more circles on a thermal image. To deactivate the function, click again on the  shortcut or click with the right mouse button on the thermal image.





4.2.1.5 Rectangle

Click on the  shortcut to plot one or more rectangles on a thermal image. Click again on  or click with the right mouse button on the thermal image to terminate the function.





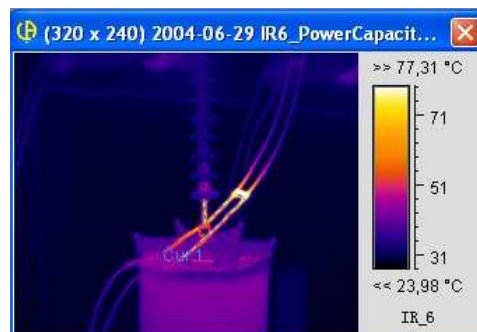
4.2.1.6 Polygon

Click on the  shortcut to plot one or more polygons on a thermal image; click once to mark each angle of the polygon and double-click to finish the last edge and close the figure. You can click again on  or click with the right mouse button on the thermal image to terminate the function.



4.2.1.7 Polyline


Click on the  shortcut to plot one or more polylines on a thermal image; click once to finish a segment and double-click to finish the last segment of the polyline. You can click again on  or click with the right mouse button to terminate the function.



4.2.2 Max Temperature

This tool displays the maximum temperature and the coordinates of the corresponding point on the active thermal image.


This tool can be inserted in two ways:

- Click on “Max Temperature” in the tools menu
- Click on the  shortcut in the toolbar

4.2.3 Min Temperature

This tool displays the minimum temperature and the coordinates of the corresponding point on the active thermal image.


This tool can be inserted in two ways:

- Click on “Min Temperature” in the tools menu
- Click on the  shortcut in the toolbar

4.2.4 Cursor

This tool displays the temperature at and the coordinates of the position of the cursor on the thermal image.

This tool can be inserted in two ways:

- Click on “Cursor” in the tools menu
- Click on the  shortcut in the toolbar

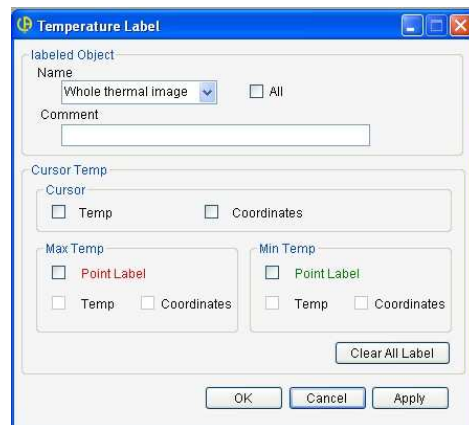
4.2.5 Temperature label

This function lets you adjust the display parameters while using the cursor tool, Min point, and Max point.

Click with the right mouse button on a thermal image, then select “Temperature label” in the contextual menu.

You can choose to display the coordinates and/or the temperature of the cursor, of the max point, and of the min point by checking or not checking the appropriate boxes.

You can also display a remark in this window.



4.3 Presentation of the analysis functions

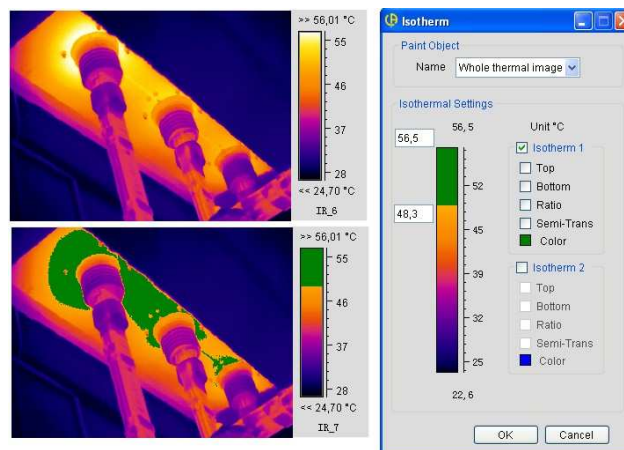
4.3.1 Isothermal surface

This tool is used to isolate a temperature range chosen by the user by displaying all points in this range in the same colour.

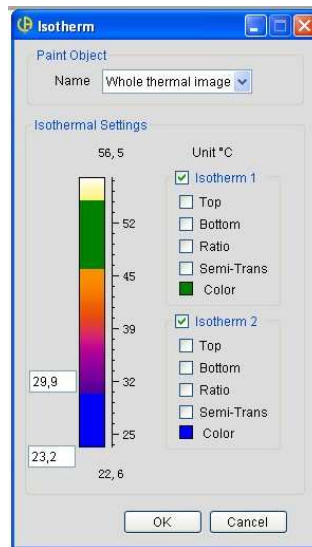
This tool can be inserted in three ways:

- Click on “Isothermal area” in the Writing tools menu
- Click on the shortcut in the toolbar
- Right-click with the mouse on the IR image, then select “isothermal area”

Two isothermal zones can be assigned per image.



The possible parameters of the isotherms are the following.



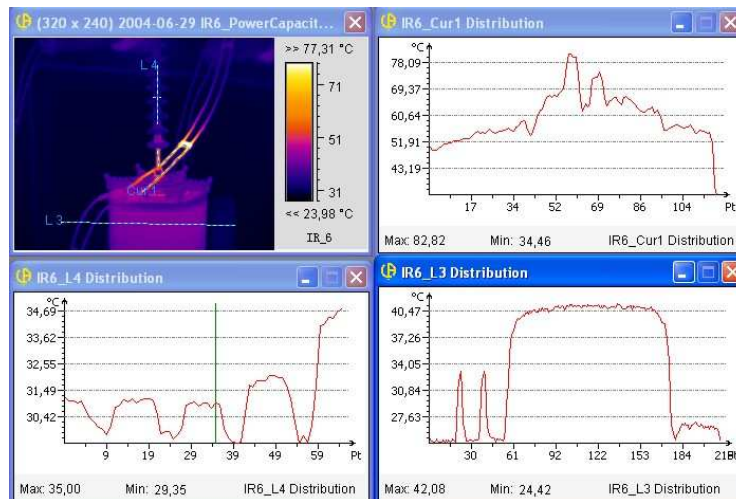
- Color – Select a colour for the isothermal zone by double-clicking on the corresponding box.
- Top – Moves isothermal range 1 or 2 up the temperature scale.
- Bottom – Moves isothermal range 1 or 2 down the temperature scale.
- Semi-Trans – Defines isothermal zone 1 or 2 with a semi-transparent colour.
- Ratio – Displays the percentage of the isothermal zone in the image (top left corner of the thermal image).
- Click on the boxes of the isothermal range to change the top and bottom temperatures.
- Move the isothermal range along the temperature scale by holding the left mouse button down on the zone of the isothermal range.

Resizing – Click and, while keeping the left mouse button pressed on one of the limits of the isothermal zone, move the cursor up or down to change the limit.

4.3.2 Distribution

This tool displays the distribution of the temperatures measured on a line or polyline inserted in the thermal image.

To create this graph, insert a line/polyline in the infrared image, then click with the right mouse button and select “Distribution”.



The figure above shows the distribution curves of line L4 with a vernier, of line L3, and of polyline Cur1. If there is a vernier on a line like L4, you can move it to display the temperature and coordinates of the point at which it is located. You can also see the variations of distribution by moving a line or a polyline. The curve is updated instantaneously.

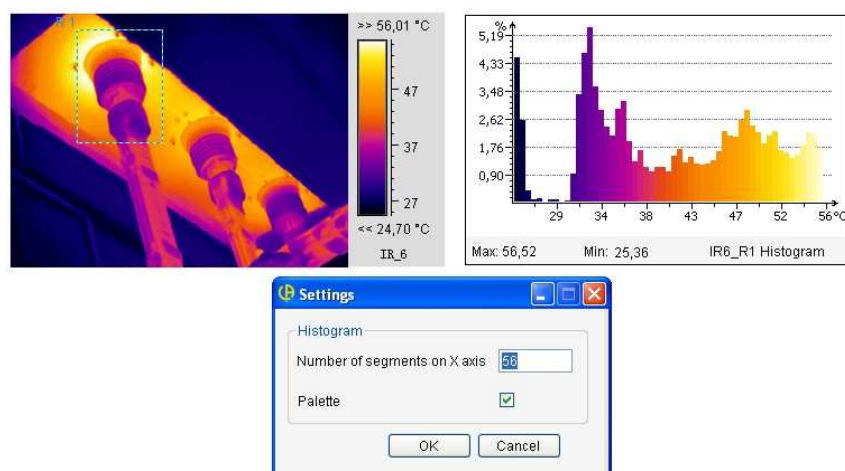
4.3.3 Histogram

This tool is used to represent in graphic form the percentage of points included in different temperature intervals.

The histogram tool is effective only from a surface (circle, rectangle, or polygon).

To activate this tool, insert an analysis surface in the IR image, then click with the right mouse button and select "Histogram".

You can click with the right mouse button on the histogram window to change the number of temperature segments (number of intervals).




4.3.4 Fusion

The Fusion function is used to merge a digital image (BMP, CCD, or JPG) with an infrared image.

This can be done only if both a thermal image and a real image have been opened.

The steps in the creation of a merged image are:

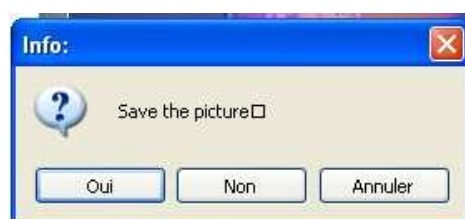
- (1) Open a thermal image (.sat file) and a digital image (.bmp, .ccd, or .jpg file).
- (2) Click on the  shortcut in the toolbar or click on «Fusion» in the Action menu;
- (3) In the fusion adjustments window, choose one thermal image and the digital image;



- (4) Click on the OK button;
- (5) Adjust the size of the digital image window so that its object matches the object in the thermal image;
- (6) Move the thermal image to superpose its object on the object of the digital image;



- (7) Adjust the percentage of fusion by moving the button on the scrollbar;
- (8) When the fusion is terminated, you can record the merged image by clicking on the "Save" button.



If you click on Yes, you can save the image in a BMP or JPG file. It then appears in the analysis or report window. Since the JPG file is recorded with the temperature data, you can analyze it like a thermal image. If you click on No, the merged image is displayed in the analysis or report window without being saved.

Click on Cancel to terminate the fusion operation.

4.4 Modify analysis tools

Place the cursor on a drawing (point, line, circle, rectangle, polygon, or polyline) to resize it or move it when none of the «analysis tool» shortcuts is selected. The following cursor shapes indicate the operation you can perform on a selected drawing.



Move a point – press the left mouse button and hold it down to drag the selected point. Release the button when the point reaches the desired location.



Move a line – press the left mouse button and hold it down to drag the selected line. Release the button when the line reaches the desired location.



Rotate/Resize a line (operation possible from either end of the line) – press the left mouse button and hold it down to pivot or resize the selected line. Release the button when the modification is terminated.



Move a rectangle – press the left mouse button and hold it down to drag the selected rectangle. Release the button when the rectangle reaches the desired location.



Resize a rectangle – press the left mouse button and hold it down to modify the size of the selected rectangle in the direction indicated by the arrow. Release the button when the operation is terminated.



Move a circle – press the left mouse button and hold it down to drag the selected circle. Release the button when the circle reaches the desired location.




Resize a circle – press the left mouse button and hold it down to modify the size of the selected circle in the direction indicated by the arrow. Release the button when the operation is terminated.





Move a polygon – press the left mouse button and hold it down to drag the selected polygon. Release the button when the polygon reaches the desired location.




Move a summit of a polygon – press the left mouse button and hold it down to move the selected summit of the polygon. Release the button when the summit reaches the desired location.

 **Add summits to a polygon** – press the left mouse button and hold it down on the point where you want to add a summit to the selected side; move the cursor to move the summit to the desired location. Release the button when the summit is in place.

 **Move a polyline** – press the left mouse button and hold it down to drag the selected polyline. Release the button when the polyline reaches the desired location.

 **Move the summits of a polyline** – press the left mouse button and hold it down to move the selected summit of the polyline. Release the button when the summit is in the desired location.

 **Add summits to a polyline** – press the left mouse button and hold it down on the point where you want to add a summit to the selected segment; move the cursor to move the summit to the desired location. Release the button when the summit is in place.

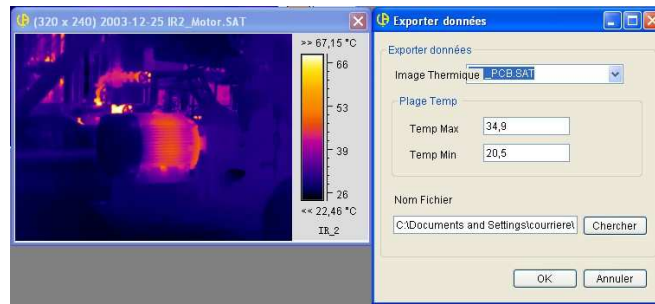
4.5 Export data

4.5.1 Thermal image

This function exports the temperature values of a selected image in a matrix of rows and columns in TXT□CSV, or Microsoft Excel format. You can specify a temperature range: the export data will be empty if the temperature value is outside the specified range.

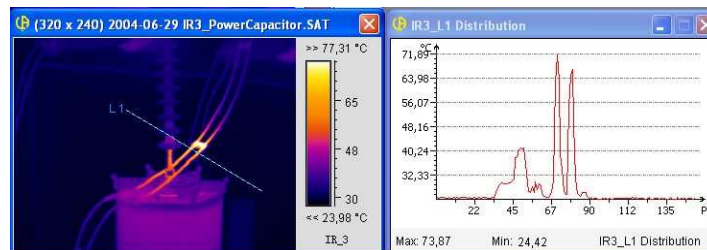
Remark: *A file in CSV format can be opened in a text editor or in Microsoft Excel. Exporting data is much faster in a CSV file than in an Excel file. For this reason, exporting data in CSV format is recommended.*

To export data, select “Data Export” in the Action menu.



4.5.2 Distribution

After generating a temperature distribution graph, you can click with the right button on this graph to export the data in a CSV file.











4.6 Delete/Restore tools

4.6.1 Delete tools

This function deletes a selected analysis tool.

The tool can be deleted in two ways:

- Click on “Delete tool” in the Writing tools menu
- Click on the  shortcut in the toolbar

When the cursor takes the shape of a deletion tool ( Point,  Line,  Circle,  Rectangle,  Polygon,  Polyline), click with the left mouse button to suppress the shape. Click again on the  shortcut to terminate the deletion operation.

4.6.2 Delete all tools

This function deletes all of the analysis tools inserted on the IR image.


This can be done in two ways:

- Click on “Delete all tools” in the Writing tools menu
- Right-click with the mouse on the IR image, then select “Delete all tools”

4.6.3 Restore tools (Analysis mode)

You can restore the various tools previously inserted, then deleted, in reverse chronological order (the last item deleted is the first restored).


Restoration can be performed in two ways:

- Click on “Restore tools” in the Action menu
- Click on the  shortcut in the toolbar

4.6.4 Cancel (Report mode)

When you are in Report mode, you can cancel the last operations performed in reverse chronological order (the last item deleted is the first restored).


Cancellation can be performed in two ways:

- Click on “Cancel” in the Action menu
- Click on the  shortcut in the toolbar

4.6.5 Restore (Report mode)

When you are in Report mode, you can restore the last operation cancelled.

Restoration can be performed in two ways:

- Click on "Restore" in the Action menu
- Click on the  shortcut in the toolbar



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