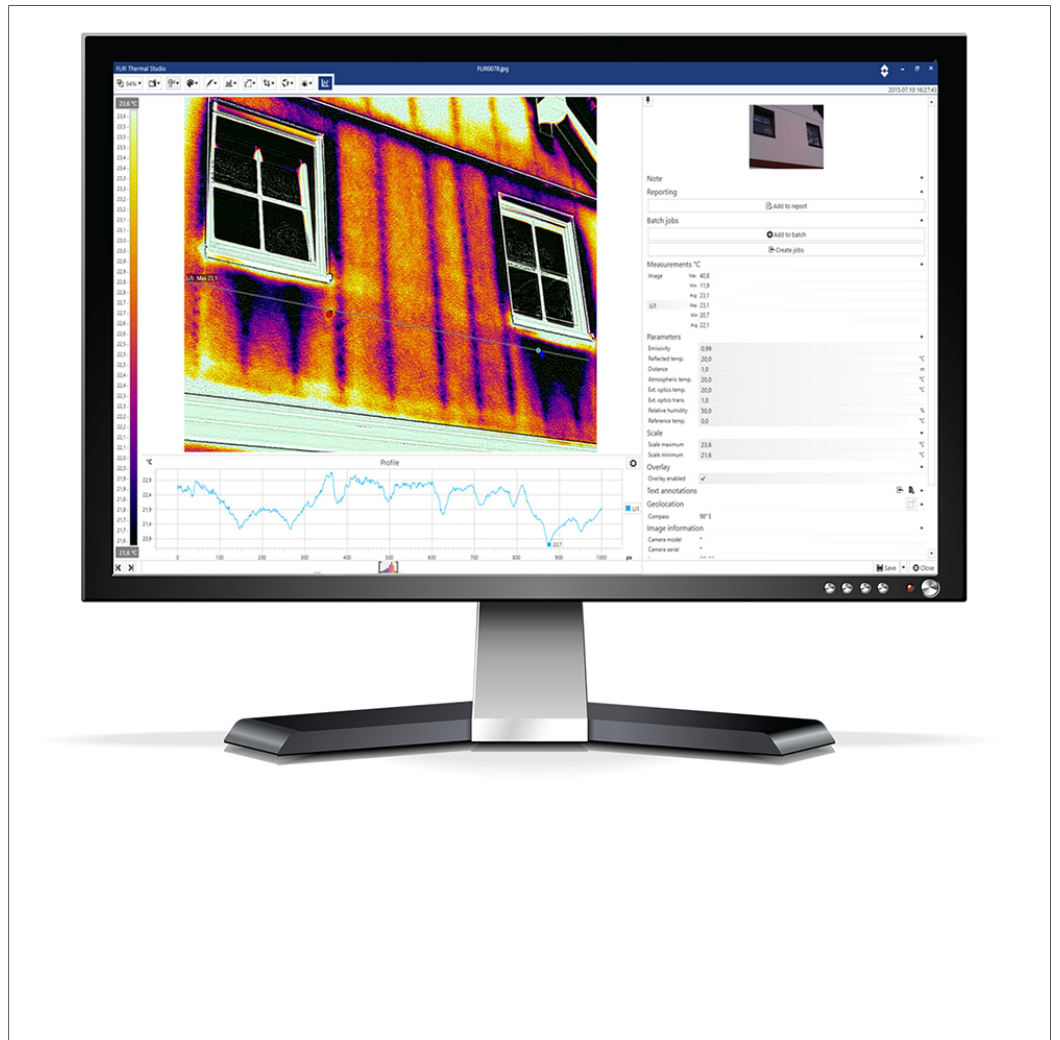




User's manual FLIR Thermal Studio





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1.1 Legal disclaimer

All products manufactured by FLIR Systems are warranted against defective materials and workmanship for a period of one (1) year from the delivery date of the original purchase, provided such products have been under normal storage, use and service, and in accordance with FLIR Systems instruction.

Products which are not manufactured by FLIR Systems but included in systems delivered by FLIR Systems to the original purchaser, carry the warranty, if any, of the particular supplier only. FLIR Systems has no responsibility whatsoever for such products.

The warranty extends only to the original purchaser and is not transferable. It is not applicable to any product which has been subjected to misuse, neglect, accident or abnormal conditions of operation. Expendable parts are excluded from the warranty.

In the case of a defect in a product covered by this warranty the product must not be further used in order to prevent additional damage. The purchaser shall promptly report any defect to FLIR Systems or this warranty will not apply.

FLIR Systems will, at its option, repair or replace any such defective product free of charge if, upon inspection, it proves to be defective in material or workmanship and provided that it is returned to FLIR Systems within the said one-year period.

FLIR Systems has no other obligation or liability for defects than those set forth above.

No other warranty is expressed or implied. FLIR Systems specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

FLIR Systems shall not be liable for any direct, indirect, special, incidental or consequential loss or damage, whether based on contract, tort or any other legal theory.

This warranty shall be governed by Swedish law.

Any dispute, controversy or claim arising out of or in connection with this warranty, shall be finally settled by arbitration in accordance with the Rules of the Arbitration Institute of the Stockholm Chamber of Commerce. The place of arbitration shall be Stockholm. The language to be used in the arbitral proceedings shall be English.

1.2 Usage statistics

FLIR Systems reserves the right to gather anonymous usage statistics to help maintain and improve the quality of our software and services.

1.3 Copyright

© 2019, FLIR Systems, Inc. All rights reserved worldwide. No parts of the software including source code may be reproduced, transmitted, transcribed or translated into any language or computer language in any form or by any means, electronic, magnetic, optical, manual or otherwise, without the prior written permission of FLIR Systems.

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Names and marks appearing on the products herein are either registered trademarks or trademarks of FLIR Systems and/or its subsidiaries. All other trademarks, trade names or company names referenced herein are used for identification only and are the property of their respective owners.

1.4 Quality assurance

The Quality Management System under which these products are developed and manufactured has been certified in accordance with the ISO 9001 standard.

FLIR Systems is committed to a policy of continuous development; therefore we reserve the right to make changes and improvements on any of the products without prior notice.

2.1 User-to-user forums

Exchange ideas, problems, and infrared solutions with fellow thermographers around the world in our user-to-user forums. To go to the forums, visit:

<http://forum.infraredtraining.com/>

2.2 Training

To read about infrared training, visit:

- <http://www.infraredtraining.com>
- <http://www.irtraining.com>
- <http://www.irtraining.eu>

2.3 Documentation updates

Our manuals are updated several times per year, and we also issue product-critical notifications of changes on a regular basis.

To access the latest manuals, translations of manuals, and notifications, go to the Download tab at:

<http://support.flir.com>

It only takes a few minutes to register online. In the download area you will also find the latest releases of manuals for our other products, as well as manuals for our historical and obsolete products.

2.4 Software updates

FLIR Systems regularly issues software updates. Depending on software, the location of the update service will vary. Refer to the documentation of the software you are using.

2.5 Important note about this manual

FLIR Systems issues generic manuals that cover several software variants within a software suite.

This means that this manual may contain descriptions and explanations that do not apply to your software variant.

2.6 Note about authoritative versions

The authoritative version of this publication is English. In the event of divergences due to translation errors, the English text has precedence.

Any late changes are first implemented in English.

2.7 Additional license information

For each purchased software license, the software may be installed, activated, and used on two devices, e.g., one laptop computer for on-site data acquisition, and one desktop computer for analysis in the office.

3.1 General

For customer help, visit:

<http://support.flir.com>

3.2 Submitting a question

To submit a question to the customer help team, you must be a registered user. It only takes a few minutes to register online. If you only want to search the knowledgebase for existing questions and answers, you do not need to be a registered user.

When you want to submit a question, make sure that you have the following information to hand:

- The camera model
- The camera serial number
- The communication protocol, or method, between the camera and your device (for example, SD card reader, HDMI, Ethernet, USB, or FireWire)
- Device type (PC/Mac/iPhone/iPad/Android device, etc.)
- Version of any programs from FLIR Systems
- Full name, publication number, and revision number of the manual

3.3 Downloads

On the customer help site you can also download the following, when applicable for the product:

- Firmware updates for your infrared camera.
- Program updates for your PC/Mac software.
- Freeware and evaluation versions of PC/Mac software.
- User documentation for current, obsolete, and historical products.
- Mechanical drawings (in *.dxf and *.pdf format).
- Cad data models (in *.stp format).
- Application stories.
- Technical datasheets.

FLIR Thermal Studio is a software developed to provide its' users with an easy way to create thermal inspection reports and to automate editing tasks in thermal images. The software provides features where the user can:

- **Use report templates**

Instead of manually creating an inspection report, design your own template and include the information your need for this particular report. Working with templates makes the work easier especially when you handle a large number of images.

- **Customize overlay and palettes**

Select what information you want to see in the image, for example measurements, emissivity, compass (when applicable), and date/time. Import palettes and apply colorization from other thermographers.

- **Correct thermal fusion alignment**

Respond to any alignment issues caused by thermal cameras.

- **Use batch processing**

Automate the tasks that need to be repeated for each thermal image like normalization, modifying measurements, changing palettes, and customizing image overlay.

This chapter describes the system requirements of the FLIR Thermal Studio application, and how the application is installed and activated.

5.1 System requirements

Operating system	<ul style="list-style-type: none"> • Microsoft Windows 10 (32-bit and 64-bit) • Microsoft Windows 8.x (32-bit and 64-bit) • Microsoft Windows 7 SP1 (32-bit and 64-bit)
Hardware requirements	<ul style="list-style-type: none"> • RAM: Minimum 2 GB, 3 GB is recommended • Disk space: Minimum 100 MB
Additional requirements	<ul style="list-style-type: none"> • .NET Framework 4.6 needs to be installed • Recommended screen resolution is 1024 x 768

5.2 Installation

Note To complete the installation of FLIR Thermal Studio, the computer might need to be restarted. Follow the instructions.

To install FLIR Thermal Studio, follow this procedure:

1. Download the FLIR Thermal Studio Installer package from the product page, <https://support.flir.com/thermalstudio>.
2. To start the installation, double-click the executable file **FLIR_Thermal_Studio_Installer**.
3. Read and accept the license terms and conditions of the End User Software License Agreement.
4. Click *Install*.
5. Click *Finish*.
6. Run the application from the Start menu or by double-clicking the desktop icon.
7. The *FLIR Thermal Studio* dialog box appears where you can activate your license key.

5.3 License activation

The first time you start FLIR Thermal Studio you will be prompted to activate your license key. Do this either as an *Online activation* (internet access) or as an *Offline activation* (no internet access).

5.3.1 Online activation

1. Run the application from the Start menu or by double-clicking the desktop icon. The *FLIR Thermal Studio* dialog box appears.
2. Click *Online activation*.
3. In the *Software license key* text box, type the license key obtained at the time of purchase.
4. Type your contact details in the *Customer name* and *Customer e-mail* text boxes.
5. Click *Validate*.
6. The activation is completed and FLIR Thermal Studio is started.

5.3.2 Offline activation

1. Run the application from the Start menu or by double-clicking the desktop icon. The *FLIR Thermal Studio* dialog box appears.
2. Click *Offline activation - no internet access*.
3. Copy the information in the *Machine identifier* text box.
4. Go to the FLIR Thermal Studio product page, <https://support.flir.com/thermalstudio>, and then click the link *Offline activation, FLIR Thermal Studio*.
5. Click the link of your preferred language.
6. Type your contact details in the *Name* and *E-mail* text boxes.
7. In the *Serial number* text box, type the license key obtained at the time of purchase.
8. In the *Machine code* text box, paste the *Machine identifier* that you copied in an earlier step (step 3 above).
9. Click *Request activation code*.
10. Copy the generated activation code that appears at the top of the page.
11. Return to the *FLIR Thermal Studio* dialog box, and then paste the copied code into the *Activation code* text box.
12. Click *Validate*.
13. The activation is completed and FLIR Thermal Studio is started.

This chapter describes the available application pages: *Home*, *Library*, *Reporting*, and *Batch processing*. It also describes the different settings that can be configured.

6.1 General

When the FLIR Thermal Studio application is started, the user is presented with four tabs representing the *Home*, *Library*, *Reporting*, and *Batch processing* pages.

6.2 Home

The *Home* page represents the start page of FLIR Thermal Studio. To the left you find shortcuts to some of the available reporting and batch processing tasks. To the right you find shortcuts to the most recent files that you have been working with. Note that the tasks and the files can be accessed from the toolbars, as well

6.3 Library

The *Library* page shows the File Explorer of the computer you are working on. Here you can navigate to any folder where you have saved your thermal images, both locally on your computer and on any connected network shares.

When you click a folder, the images in that folder are presented in the center pane. When you click an image in the center pane, information about that image is shown in the pane to the right

6.4 Reporting

The *Reporting* page is the page where you create your reports. Create them from scratch or by using templates.

6.5 Batch processing

The *Batch processing* page is the page where you create and run jobs in batches. Create a batch by selecting and combining the jobs in the *Job toolbox* pane to the left. Note that the jobs are available in the toolbar, as well.

6.6 Settings

Go to the *Settings* page to change, for example, settings for the user interface or how to manage updates of the FLIR Thermal Studio application.

You access the *Settings* page via the toolbar on the *Home* page. To exit the *Settings* page, click *Close* in the bottom right corner of the page.

6.6.1 Output

Change file path to the folder where you want to put the result files. Click *Browse* and then select the folder.

When the *Open output folder when done* check box is selected, the folder with the result files will open when the task is completed.

6.6.2 Reporting

Click the *Auto associate photos* check box, if you want to add any associated visual images when adding thermal images to a report. Applicable to grouped camera images.

6.6.3 Editor

Change file path to the folder where your palettes are located. Click *Browse* and then select the folder.

6.6.4 Overlay — File explorer and Batch processing

Select if and how you want to use image overlay when editing images manually in the File Explorer and when running batch processing. When you select or deselect a check box in the list of settings, the result is immediately presented in the example image. Note that the *Overlay enabled* check box must be selected before the settings can be changed.

6.6.5 Regional settings

Select language and units to be used in the user interface.

6.6.6 Updates

Select how you want to manage updates of the FLIR Thermal Studio application.

- Check if updates are available (check box)
With this option enabled, a check for updates will be automatically performed every time the application is started.
- Prompt to install updates
With this option enabled, the user will be asked to install any available updates, given that the *Check if updates are available* option is enabled.
- Check if updates are available (button)
Click to manually discover if any updates are available for download.
- Proxy settings
If updates need to be downloaded via a proxy service, configuration needs to be done. In the *Proxy settings* dialog box, select the *Use proxy* check box, and then enter the requested information. Click *OK* to save.

6.6.7 Theme

Change the theme of the user interface, choose between *Light* and *Dark*. Note that the FLIR Thermal Studio application needs to be restarted before the change goes into effect.

This chapter describes the screen elements of the *Reporting* page.

7.1 General

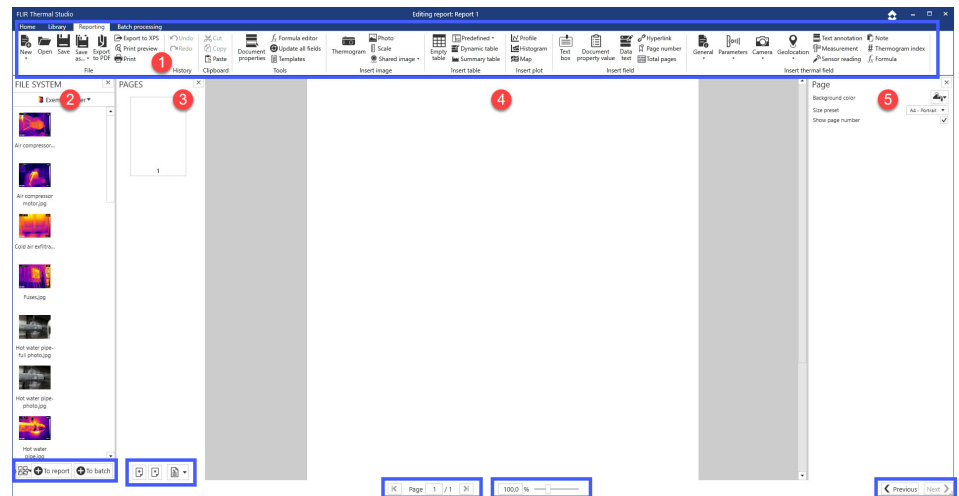
The *Reporting* page is the page where you create your report. Create it from scratch or by using a template; either select one of the available templates or create a new one.

Reports are saved in the .atr (advanced thermal report) file format and report templates are saved in the .att (advanced thermal template) file format. Both formats can be exported to Adobe PDF or Microsoft XPS.

Note When images are added to a report, copies of the images are made. This means, when changes are made to an image that has been added to a report, the original image stays unchanged.

7.2 Navigation

This image shows what the user interface looks like when you have selected to *Create blank report*. The user interface looks similar when you have selected to *Generate report using template* and selected the template, and then added the images.



1. **Toolbar**
The toolbar includes options for creating, saving, exporting, and printing reports, and for editing the reports by inserting images and other items.
2. **File system**
Navigate to image files in folders both locally on your computer and on any connected network shares, and then insert them into the report. Use the icons at the bottom of the pane to change size of the image icons, to add any selected image files to a report, or to add all image files in a selected folder to a report.
3. **Pages**
See all pages included in the report. Use the icons at the bottom of the pane to add or remove pages. Change the order of the pages by right-clicking a page, and then clicking *Move up* or *Move down*.

4. Report workspace

This is the workspace where you create and edit the report. Use the toolbar to insert images, tables, plots, fields, thermal fields, and formulas into the report. To move the items around the page, click and hold the item and then place it where you want it to be. Note the page navigation and page zoom at the bottom of the pane.

5. Properties and settings

Click an item in the report workspace to see and change settings like position on the page (*Left* and *Top*) and image size (*Width* and *Height*). Click *Overlay...* to open the image in the overlay view and do changes for this particular image. When you select or deselect a check box in the list of settings, the result is immediately presented in the image. To close the overlay view and return to the *Reporting* page, click *OK* or *Cancel*.

This chapter describes step by step how a reporting template is created and edited, in general. For details on how to add objects like images, tables, plots, fields, thermal fields, and formulas to the template, refer to chapter 10 *Edit reports*.

8.1 General

The FLIR Thermal Studio application comes with a set of predefined reporting templates. If these templates do not meet your requirements, you can create your own custom templates.

8.2 Create new reporting template

On the *Reporting* page:

1. Click *New*, and then click *Create a new report template*.
A blank report page is added to the *Pages* pane.
2. Use the toolbar to insert images, tables, plots, fields, thermal fields, and formulas into the report.
3. To save the template, click *Save as template*.
4. In the dialog box that appears, type a name for the template, and then click *OK*. The template will now be visible in the *Available templates* list.

8.3 Edit a reporting template

On the *Reporting* page:

1. Click *New*, and then click *Generate report using template*.
A page with the *Available templates* and *Template preview* panes appears.
2. In the *Available templates* pane, right-click the template you want to edit, and then click *Edit*.
The template is opened.
3. Edit the template.
4. To save the changes, click *Save*.

This chapter describes step by step how a report is created in general. For details on how to add objects like images, tables, plots, fields, thermal fields, and formulas to the report, refer to chapter 10 *Edit reports*.

9.1 Create blank report

On the *Reporting* page:

1. Click *New*, and then click *Create blank report*.
A blank report page is added to the *Pages* pane.
2. In the *File system* pane, navigate to the folder where you have stored the images you want to create a report of.
3. Add images to the report:
 - to add a single image, click the image and then click *Add selected to report* (plus button).
 - to add multiple images, click the images while pressing the CTRL key on your keyboard, and then click the *Add selected to report* (plus button).
 - to add all images in the folder, click the *Add folder to report* (folder button).

The selected images are added to the blank report.

4. Use the toolbar to insert images, tables, plots, fields, thermal fields, and formulas in the report.
5. To save the report, click *Save as report*.
6. In the *Save as* dialog, browse to the folder where you want to store the report, type a name for the report, and then click *Save*.

9.2 Generate report using template

On the *Reporting* page:

1. Click *New*, and then click *Generate report using template*.
A page with the *Available templates* and *Template preview* panes appears.
2. Click the template you want to use, and then click *Select*.
3. In the *File system* pane, navigate to the folder where you have stored the images you want to create a report of.
4. Add images to the report:
 - to add a single image, click the image and then click the *To report* (plus button), or drag the image to the *Pages* pane.
 - to add multiple images, click the images while pressing the CTRL key on your keyboard, and then click the *To report* (plus button), or drag the images to the *Pages* pane.
 - to add all images in the folder, click the *To report* (folder button).

The selected images are added to the report template in the *Pages* pane.

5. Click *Next*.
6. Review the report.
7. To save the report, click *Save as report*.
8. In the *Save as* dialog, browse to the folder where you want to store the report, type a name for the report, and then click *Save*.

9.3 Generate report using Rapid Report

With the Rapid Report functionality, you can create a shortcut to a FLIR Thermal Studio report on your computer desktop, and then drop images or a folder of images on the shortcut to create a report. Follow this procedure:

1. On the *Reporting* page and in the *Available templates* pane, right-click the template you want to create a shortcut to, and then click *Create RapidReport shortcut*. The *Shortcut created on desktop* message appears in the upper right corner of the page.
2. Navigate to the images (or to the folder of images) that you want to create a report of.
3. Drag the images (or the folder of images) and drop them on the newly created shortcut on the desktop. The *Open with FLIR Thermal Studio* message appears.
4. The report is created and then opened in FLIR Thermal Studio.

You can create one or several Rapid Report shortcuts on your desktop.

This chapter describes how to add objects like images, tables, plots, fields, thermal fields, and formulas to the report. Note that these objects and the thermal images they refer to must be on the same page in the report. The exception is the *Summary table* which is normally placed at the end of the report.

10.1 Insert image

The following toolbar options are available:

- Thermogram (thermal image)
- Photo (visual image)
- Scale (temperature)
- Shared image (e.g. a logotype image)

10.1.1 Add image

1. In the *Pages* pane, click the report page where the images are to be added.
2. Click *Thermogram*.
A placeholder for a thermal image is added to the report page.
3. Click *Photo*.
A placeholder for a visual image is added next to the placeholder for the thermal image.
4. In the *File system* pane, click an image and drag it to the *Thermogram* placeholder. The corresponding visual image is shown in the visual image placeholder.
5. To verify that the visual image is referencing the correct thermal image, click the visual image (*Source*), and then its *Reference* is shown in the properties pane.

10.1.2 Add temperature scale

By default, a temperature scale is visible in the thermal image. To add a scale and place it anywhere on the report page, follow this procedure:

1. In the report, click the thermal image for which a temperature scale is to be added.
2. Click *Scale*.
A scale is added to the report page.
3. Click and hold the scale, and then move it into position.
4. To verify that the scale is referencing the correct thermal image, click the scale and then its *Reference* is shown in the properties pane.

10.1.3 Remove or hide temperature scale

To remove an added temperature scale, follow this procedure:

1. In the report, click the scale to be removed.
2. Right-click the scale, and then click *Remove*.

To hide the temperature scale in the thermal image, follow this procedure:

1. In the report, click the thermal image with the scale to be hidden.
2. In the properties pane, deselect the *Show scale* check box.
3. To bring back the scale, select the *Show scale* check box.

10.2 Insert table

A table can show any type of information like measurements, parameters, and camera information. Add a table and reference it to one of the thermal images on the report page. Modify the table by adding or removing table rows and columns, or by changing row and column order.

The following toolbar options are available:

- **Empty table**
An empty table with two columns and one row.
- **Predefined**
A set of predefined tables with information on, for example, parameters, geolocation, and isotherms.
- **Dynamic table**
- **Summary table**
A table that lists the included images in the report, The table shows information on the file name, creation date and time, maximum temperature, and on what report page the image can be found. More columns can be added, if needed.

10.2.1 Add table

1. In the report, click the image for which a table is to be added.
2. Click to insert the preferred type of table.
The table is added to the report page.
3. Click and hold the table, and then move it into position.
4. To verify that the table is referencing the correct thermal image, click the table and then its *Reference* is shown in the properties pane.

10.2.2 Remove table

1. In the report, click the table to be removed.
2. Right-click anywhere in the table, and then click *Remove table*.

10.2.3 Add table row

1. In the report, right-click anywhere in the table.
2. Click *Add row*, and then select which information to add.
The new row is added at the bottom of the table.

10.2.4 Move table row (change row order)

1. In the report, click the table.
2. Right-click the row to be moved, and then click *Move up* or *Move down*.

10.2.5 Remove table row

1. In the report, click the table.
2. Right-click the row to be removed, and then click *Remove row*.

10.2.6 Add table column

Note Not available for all types of tables.

1. In the report, click the table.
2. In the table, right-click the column to the left of where you want to add the new column.
3. Click *Add column*, and then select which information to add.

10.2.7 Move table column (change column order)

Note Not available for all types of tables.

1. In the report, click the table.
2. Right-click the column to be moved, and then click *Move left* or *Move right*.

10.2.8 Remove table column

Note Not available for all types of tables.

1. In the report, click the table.
2. Right-click the column to be removed, and then click *Remove column*.

10.3 Insert plot

Add a plot and reference it to one or several thermal images.

The following toolbar options are available:

- Profile
- Histogram
- Map

10.3.1 Add plot (single thermal image)

1. In the report, click the thermal image for which a plot is to be added.
2. Click to insert the preferred type of plot.
The plot is added to the report page.
3. Click and hold the plot, and then move it into position.
4. To verify that the plot is referencing the correct thermal image, click the plot and then its *Reference* is shown in the properties pane.

10.3.2 Add plot (several thermal images)

1. In the report, click one of the thermal images for which a plot is to be added.
2. Click to insert the preferred type of plot.
The plot is added to the report page.
3. Click and hold the plot, and then move it into position.
4. Click the plot.
Settings for the plot are shown in the properties pane.
5. In the *Reference* list, click the check boxes of all images that you want the plot to be referencing.

10.3.3 Remove plot

1. In the report, click the plot to be removed.
2. Right-click the plot, and then click *Remove*.

10.4 Insert field

A field is a single object that can be placed anywhere in the report.

The following toolbar options are available:

- Text box
- Document property value (date and time)
- Data text

- Hyperlink
- Page number
- Total pages

10.4.1 Add field

1. In the *Pages* pane, click the report page where the field is to be added.
2. Click to insert the preferred type of field.
The field is added to the report page.
3. Click and hold the field, and then move it into position.
4. Click the field.
Settings for the field are shown in the properties pane.

10.4.2 Remove field

1. In the report, click the field to be removed.
2. Right-click the field, and then click *Remove*.

10.5 Insert thermal field

The following toolbar options are available:

- General
- Parameters
- Camera
- Geolocation
- Text annotation
- Measurement
- Sensor reading
- Note
- Thermogram index
- Formula

10.5.1 Add text annotation field

1. In the report, click *Text annotation*.
A dialog box appears.
2. In the text box, type a name of the text annotation field to be added, and then click *OK*.
The field is added to the report page.
3. Click and hold the text annotation field, and then move it into position.
4. Click the text annotation field.
Settings for the field are shown in the properties pane.
5. As an option, select the *Treat as title* check box to show the name of the field at the top of the field.

10.5.2 Add measurement field

1. In the report, click *Measurement*.
A dialog box appears.
2. In the dialog box, click the preferred *Selected measurement* and *Property* check boxes.
3. As an option, change the *Reference name* and *Property* check boxes, and then click *OK*.
The field is added to the report page.
4. Click and hold the measurement field, and then move it into position.

5. Click the measurement field.
Settings for the field are shown in the properties pane.
6. As an option, select the *Treat as title* check box to show the name of the field at the top of the field.

10.5.3 Add sensor reading field

1. In the report, click *Sensor reading*.
A dialog box appears.
2. In the text box, type a name of the sensor reading field to be added, and then click *OK*.
The field is added to the report page.
3. Click and hold the sensor reading field, and then move it into position.
4. Click the sensor reading field.
Settings for the field are shown in the properties pane.
5. As an option, select the *Treat as title* check box to show the name of the field at the top of the field.

10.5.4 Add formula

1. In the report, click the thermal image for which a formula is to be inserted.
2. Click *Formula*.
The formula field is added to the report page.
3. To verify that the formula is referencing the correct thermal image, click the formula field and then its *Reference* is shown in the properties pane.
4. In the *Title* list, click the formula that you want to use for this field.
The field content is updated according to selected formula.
5. Click and hold the formula field, and then move it into position.

10.5.5 Remove thermal field

1. In the report, click the thermal field to be removed.
2. Right-click the field, and then click *Remove*.

This chapter describes how to create, import, and export formulas in the *Formula editor* of the FLIR Thermal Studio application.

11.1 General

By using formulas, the user can carry out advanced calculations in the reports based on information from the thermal images. A formula can include all mathematical operators and functions, and it is possible to export formulas from one report and then import them into another report.

The FLIR Thermal Studio application comes with a set of predefined formulas. If these formulas do not meet your requirements, you can create your own. Create them from scratch or use one of the predefined formula as basis.

The formulas are created, edited, imported, and exported in the *Formula editor*.

11.2 Create formula

On the *Reporting* page:

1. Click *Formula editor*.
A separate window appears.
2. Click *Create*.
A formula named *Formula [X]* is created and listed in the *Stored formulas* list.
3. Click the new formula.
The *Editor* section appears at the bottom of the window.
4. In the *Title* text box, type the name of the formula.
5. In the *Expression* text box, define the expression of the formula.
6. In the *Precision* text box, type the number of decimals to be used for accuracy.
7. To save the formula, click *Save and exit*.

11.3 Import formula

On the *Reporting* page:

1. Click *Formula editor*.
A separate window appears.
2. Click *Import*.
3. In the *Open* window, browse to the formula file (.json) that you want to import, and then click *Open*.
4. The imported formulas are listed in the *Stored formulas* list.

11.4 Export formula

On the *Reporting* page:

1. Click *Formula editor*.
A separate window appears.
2. Click *Export*.

-
- In the *Save as* window, browse to the folder where you want to store the exported formula file (.json), and then click *Save*.

11.5 Delete formula

On the *Reporting* page:

- Click *Formula editor*.
A separate window appears.
- In the *Stored formulas* list, point to the formula to be deleted, and then click the trash bin that appears on the row.
The formula is removed from the *Stored formulas* list.

11.6 Use predefined formulas

The following predefined formulas are available:

- Difference in temperature from first image
The difference between the maximum temperature and the minimum temperature of the first thermal image on the current report page. The calculated temperature is written in blue.
- Difference in temperature from second image
The difference between the maximum temperature and the minimum temperature of the second thermal image (Img2) on the current report page.
- Difference in temperature between two spotmeters
The difference in temperature between spotmeter 1 (Sp1) and spotmeter 2 (Sp2) of the first thermal image (Img1) on the current report page.
- Difference in average temperature between boxes from two thermal images
The difference in average temperature between box 1 (Bx1) of the first thermal image (Img1) and box 1 (Bx1) of the second thermal image (Img2) on the current report page.
- Default rating formula
The formula compares the maximum temperature of box 1 (Bx1.Max) and the temperature of spotmeter 1 (Sp1). By using the temperature differences defined in the formula, one of the texts **Normal** (lime green text), **Investigate** (orange text), **Repair next time** (orange text), or **Repair immediately** (red text) will appear on the report page.

11.7 Reset the predefined formulas

The predefined formulas are editable. If you happen to change them by mistake and need to reset them, follow this procedure.

Note Any custom formulas need to be removed as well. Make sure that you have exported them so that you can reimport them afterwards.

On the *Reporting* page:

- Click *Formula editor*.
A separate window appears.
- In the *Stored formulas* list, delete all listed formulas.
- Click *Save and exit*.
- On the *Reporting* page, click *Formula editor*.
- The predefined formulas are now back in the *Stored formulas* list.

This chapter describes the screen elements of the image editor included in the FLIR Thermal Studio application.

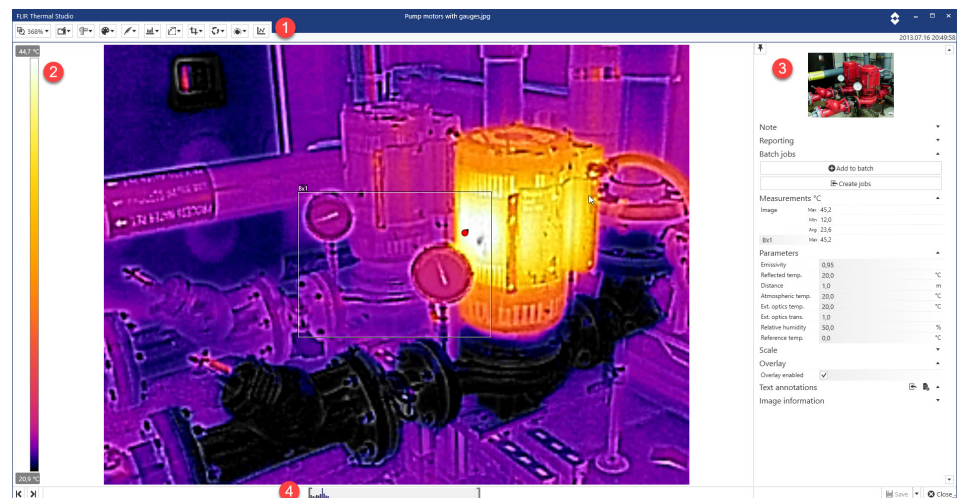
12.1 General

The FLIR Thermal Studio application includes an embedded image editor where the user can edit thermal images and sequences (videos).

To edit an image in a report, either double-click the image or right-click the image and then click *Edit*.

12.2 Navigation

This image shows what the image editor looks like when you have selected to edit an image.



1. Image editor toolbar
The toolbar includes options such as zooming, adding measurements, changing palettes, and controlling isotherms and color distribution. For more information on these features, see the chapter that follows.
2. Temperature scale
3. Properties pane
4. Temperature span and level control

12.3 Temperature span and levels

At the bottom of the infrared image you have two sliders. By dragging these sliders to the left or to the right, you can change the top and bottom levels of the temperature span. If you change the span to temperatures closer to the temperature of the object you are analyzing, it will be easier to analyze any temperature anomalies.

12.3.1 Change temperature span and levels

To move the temperature span, follow this procedure:

1. In the image editor, click and hold the temperature span and then move it into position. Watch the image change as you move the span.

To change the bottom and top levels of the temperature span, follow this procedure:

1. In the image editor, click and drag the left (bottom level) and the right (top level) sliders into position. Watch the image change as you move the sliders.

This chapter describes how to use the embedded image editor included in the FLIR Thermal Studio application.

13.1 Measurement tool

The user can add one or more measurement tools to the image:

- spotmeter
- line
- rectangle
- ellipse
- delta
- polygon
- magic wand

Each measurement tool has its own settings which are shown in the *Measurements* section of the properties pane.

13.1.1 Add measurement tool

1. In the image editor, click *Add measurement*, and then click the preferred type of tool.
2. Move the tool pointer over the image and into position.
Note that the pointer shows the temperature as it is moved around the image.
3. Click to place the tool in the image; click to place the start point, drag the pointer to the desired size, and then click to place the end point.
For the *Polygon* shape; click to place the start point, and then drag the pointer to the next point. Continue until you have the desired shape. Finish by right-clicking the shape.
4. Click the measurement tool.
Properties of the tool are shown in the *Measurements* section of the properties pane.

13.1.2 Edit measurement tool

To move the measurement tool, follow this procedure:

1. In the image editor, move the pointer to the center of the measurement tool.
2. Click and hold the measurement tool, and then move it into position.

To change size of the measurement tool, follow this procedure:

1. In the image editor, move the pointer to the outline of the measurement tool.
2. Click and hold the outline, and move it to the desired size and shape.

13.1.3 Change settings of a measurement tool

1. In the image editor, move the pointer to the center of the measurement tool.
2. Right-click the tool.
A dialog box appears with the current settings of the tool.
3. Change the settings by selecting and deselecting the available check boxes.
Any changes are immediately presented in the *Measurements* section of the properties pane.
4. To close the settings dialog box, click anywhere on the screen.

13.1.4 Delete measurement tool

1. In the image editor, move the pointer to the measurement tool.
2. Right-click the tool, and then click *Remove*.

13.1.5 Use the magic wand

Use the magic wand to capture an area in the image based on pixel temperature. This is a kind of advanced type of polygon measurement tool, but easier to use when you want to capture and measure more complex shapes.

1. In the image editor, click *Add measurement*, and then click *Magic wand*.
2. Move the tool pointer over the image and into position.
Note that the pointer shows the temperature as it is moved around the image.
3. Click to place the tool in the image.
An area that has the same temperature as the selected point appears in the image.
4. In the *Measurements* section of the properties pane, move the *Tolerance* slider to adjust the area and include pixels that are close in temperature with the selected point.

13.1.6 Export to csv file

Use the *Export to csv* functionality to export detailed temperature information. The export will include the temperature values of every pixel within the selected measurement tool.

1. In the image editor, right-click the measurement tool.
A dialog box appears with the current settings of the tool.
2. Click *Export to csv*.
3. In the *Save as* dialog, browse to the folder where you want to store the exported file, and then click *Save*.

13.1.7 Use coverage

Use the *Coverage* functionality to see, in percentage, the number of pixels in the image that are above or below a certain temperature.

1. In the image editor, right-click the measurement tool.
A dialog box appears with the current settings of the tool.
2. Click the *Use coverage* check box.
Use the *Above* and *Below* boxes to change the temperature. Any changes are immediately presented in the *Measurements* section of the properties pane.
3. To close the settings dialog box, click anywhere on the screen.

13.2 Palette

You can change the palette that is used to display the temperatures within an image. A different palette can make it easier to analyze the image.

The FLIR Thermal Studio application comes with a set of predefined palettes, but custom palettes can also be used.

13.2.1 Change palette

1. In the image editor, click *Select palette*.
2. Select one of the predefined palettes, or click *From file* to select a custom palette.

13.2.2 Export palette

1. In the image editor, click *Select palette*.
2. Click *Export palette*.
3. In the *Save as* dialog, browse to the folder where you want to store the exported palette, and then click *Save*.

13.3 Isotherms control

Use the isotherm tool to apply a contrasting color to all pixels with a temperature *Above* or *Below* a certain temperature, or within a certain temperature *Interval*.

Using isotherms is a good method to easily discover anomalies in a thermal image.

13.3.1 Add isotherm

1. In the image editor, click *Isotherms control*.
2. Select one of the following options:
 - Above
 - Interval
 - Below
3. Select a color that will be applied to the areas that meet the temperature settings.
4. In the *Isotherms* section of the properties pane, either set the temperature *Limit* for the *Above* and *Below* options, or set the *High* and *Low* temperatures for the *Interval* option.

13.4 Color distribution

Use the *Color distribution* option to change the distribution of colors in the image. A different color distribution can make it easier to analyze the image more thoroughly. The following distributions are available:

- Histogram equalization
The color information is distributed over the existing temperatures of the image. This method of distributing the information can be particularly successful when the image contains few peaks at very high temperature values
- Signal linear
The color information in the image is distributed linearly to the signal values of the pixels.
- Temperature linear
The color information in the image is distributed linearly to the temperature values of the pixels.
- Digital Detail Enhancement (DDE)
The high-frequency content in the image, such as edges and corners, are enhanced to increase the visibility of details.

13.4.1 Change color distribution

1. In the image editor, click *Color distribution*.
2. Click one of the available color distributions.

13.5 Auto-adjust control

When you auto-adjust a thermal image, you adjust it for the best image brightness and contrast. This means that the color information is distributed over the existing temperatures of the image.

In some situations the image may contain very hot or very cold areas outside your area of interest. In such cases you might want to exclude those areas and use the color information only for the temperatures in your area of interest. You can do so by defining an auto-adjust region. Note that the defined regions will not be saved in the image.

13.5.1 Auto-adjust an image

1. In the image editor, click *Auto-adjust control*.
2. Select the *Enable scale auto-adjust* check box.

13.5.2 Define an auto-adjust region

1. In the image editor, click *Auto-adjust control*.
2. Select the *Enable scale auto-adjust using defined rectangle* check box. A dotted rectangle is added to the image.
3. Move and change the size of the rectangle to suit your area of interest. Watch the image change as you make your changes.
4. To exit, click one of the icons in the bottom right corner of the rectangle;
 - to confirm the change, click the check mark
 - to cancel the change, click the cross.

13.6 Crop image

Use the *Crop image* option to trim the image.

13.6.1 Crop an image

1. In the image editor, click *Crop image*.
2. Select the *Show crop rectangle* check box. A dotted rectangle is added in the center of the image.
3. Move the pointer to the outline of the rectangle, either one of the sides or one of the corners.
4. Click and hold the outline, and then change the shape of the rectangle to the desired size.
5. To exit, click one of the icons in the bottom right corner of the rectangle;
 - to confirm the change, click the check mark
 - to cancel the change, click the cross.

13.6.2 Revert to the uncropped image

Note As long as the cropped image has not been saved, it is possible to revert to the original image size.

1. In the image editor, click *Crop image*.
2. Click *Reset image*.

13.7 Image rotation

Use the *Image rotation* option to rotate the image.

13.7.1 Rotate an image

1. In the image editor, click *Image rotation*.
2. Move the *Image rotation* slider to rotate the image to the desired angle, or click one of the available predefined angles.
As an alternative, type the desired angle in the *Angle* text box.

13.8 Fusion mode

Use the *Fusion mode* feature to mix a visual image with its corresponding thermal image. The following fusion modes are available:

- **MSX (Multi Spectral Dynamic Imaging)**
This mode displays a thermal image where the edges of the objects are enhanced. The thermal/visual balance can be adjusted.
- **Thermal only**
This mode displays a fully thermal image.
- **Thermal fusion**
This mode displays a visual image where some parts are displayed in thermal, depending on the temperature limits.
- **Blending**
The mode displays a blended image that uses a mix of thermal image pixels and visual image pixels. The thermal/visual balance can be adjusted.
- **Picture in picture**
This mode displays a thermal image frame on top of a visual image.
- **Visual only**
This mode displays a fully visual image.

13.8.1 Set fusion mode

1. In the image editor, click *Fusion mode*.

2. Select the preferred fusion mode.

Note that some of the modes have additional settings;

- *MSX*;
 - move the *Alpha* slider to show more or less contours in the image
 - if necessary, select the *Adjust fusion alignment* check box to manually align the images.
- *Thermal fusion*;
 - if necessary, select the *Adjust fusion alignment* check box to manually align the images
 - select *Color mode* of the visual image, either *Color* or *Black and white*.
- *Blending*;
 - move the *Blending level* slider to change the proportions of the thermal image and the visual image
 - if necessary, select the *Adjust fusion alignment* check box to manually align the images
 - select *Color mode* of the visual image, either *Color* or *Black and white*.
- *Picture in picture*;
 - select the *Use blending* check box, and then move the *Blending level* slider to change the proportions of the thermal image and the visual image
 - select the *Adjust picture-in-picture rectangle* to provide the possibility to move the rectangle or change the size of it
 - if necessary, select the *Adjust fusion alignment* check box to manually align the images
 - select *Color mode* of the visual image, either *Color* or *Black and white*.
- *Visual only*;
 - select *Color mode* of the visual image, either *Color* or *Black and white*.

13.9 Show profile plot

The plot shows the temperature profile along a drawn measurement line in the image.

1. In the image editor, click *Show profile plot*.
An empty plot is added under the image.
2. In the image editor, click *Add measurement*, and then click *Line*.
3. In the image, draw a measurement line of interest.
The plot now shows the temperature profile along the drawn measurement line.
4. If necessary, click the end points of the line and move them into new positions.
Watch the profile plot change as you change the position of the line.
5. To change temperature unit (Celsius, Fahrenheit, or Kelvin) or color of the plot, click *Settings* (the icon is located to the right of the plot).

This chapter describes the screen elements of the *Batch processing* page.

14.1 General

The *Batch processing* page is the page where you create and run batches of jobs. Use the batch processing feature for automation of repetitive tasks when editing and normalizing thermal images. Operations that can be automated are for example:

- set parameters
- change settings
- modify measurements
- apply isotherms
- change palette
- add logo.

When processing batches of jobs, the following outputs are available:

- radiometric images (.jpeg) for further processing
- plain overlay images for sharing online or with customers
- transcoder from radiometric sequence to .AVI video file
- radiometric data exported to CSV files.

Go to *Settings* to configure if and how you want to use image overlay for batch processing.

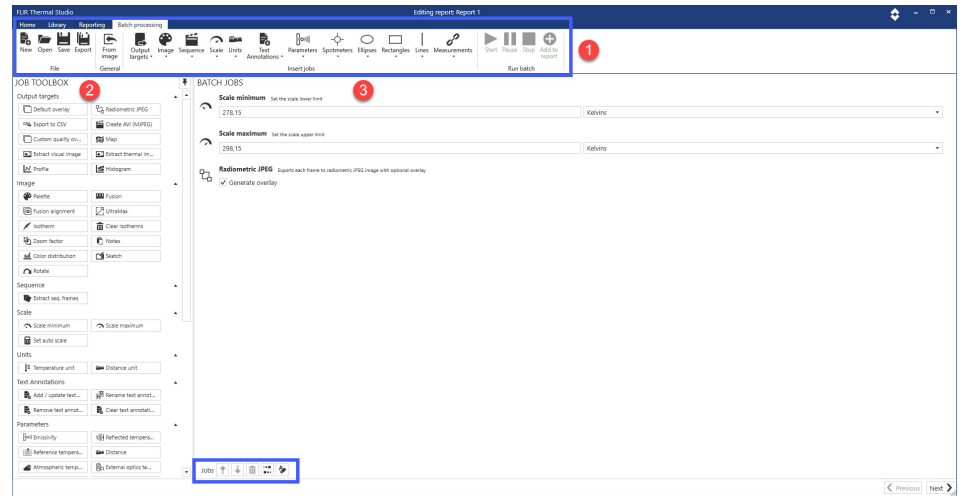
Batch jobs are saved in the .atb (advanced thermal batch) file format.

14.2 Navigation

The FLIR Thermal Studio application guides the user through the batch processing steps which can be summarized as;

- select which jobs to run
- place the jobs in the correct order, and set values where applicable
- select which images to be processed in the batch
- place the images in the correct order
- start processing.

This image shows what the user interface looks like when you have selected to run the predefined batch *Normalize temperature scale*.



1. **Toolbar**
The toolbar includes options for creating, opening, saving, and exporting batches, and for selecting and adding available jobs to a batch. The jobs are grouped in menus, such as the *Output targets*, *Image*, and *Parameters* menus.
2. **Job toolbox**
The toolbox lists all the jobs that can be run in a batch. The jobs are grouped into categories, such as the *Output targets*, *Image*, and *Parameters* categories.
3. **Batch jobs workspace**
This is the workspace where you create the batch by adding jobs and setting values. As more jobs are added, a batch execution list is created.

A new job is normally added at the end of list. Use the icons at the bottom of the pane to move the jobs up or down the list, to reverse the execution order of the jobs, to remove jobs from the list, or to clear the list of all jobs.

Note All jobs can be selected from both the *Insert jobs* toolbar and from the *Job toolbox*.

14.3 Predefined batches

The FLIR Thermal Studio application comes with a set of predefined batches of jobs;

- Create video from images
- Normalize temperature scale

The batches are accessed from the *Home* page.

15.1 Start new batch

On the *Batch processing* page:

1. Click *New*.
2. In the *Job toolbox* pane, click the jobs you want to add to the batch. Point to the job to see a short description.
The jobs are added to the *Batch jobs* workspace pane.
3. Use the icons at the bottom of the pane to:
 - move a selected job up or down the list
 - remove a selected job from the list
 - reverse the order of the selected jobs
 - remove all jobs and clear the list.
4. Verify that you have added an *Output target* job as the last job in the batch.
Note At least one *Output target* job must be run in the batch. If no output target has been selected, the job *Radiometric JPEG* will be added automatically and run as the last job in the batch.
5. Click *Next*.
6. In the *File system pane*, navigate to the folder where you have stored the images you want to run the batch on.
7. Add images to the batch:
 - to add a single image, click the image and then click *To batch* (plus button).
 - to add multiple images, click the images while pressing the CTRL key on your keyboard, and then click *To batch* (plus button).
 - to add all images in the folder, click *To batch* (folder button).

The selected images are added to the *Batch files* pane.
8. Use the icons at the bottom of the pane to:
 - move a selected file up or down the list
 - remove a selected file from the list
 - sort the files by name, or by date and time
 - reverse the order of the selected files
 - remove all files and clear the list.
9. Click *Next*.
10. To make changes to the overlay settings or to change the output folder, click *Settings*.
11. To run the batch, click *Start processing*.
12. The output files are shown in the *Processed files* pane. If the *Open output folder when done* check box is selected in *Settings*, the File Explorer will open and show the output files in the defined output folder, as well.
13. To take a closer look at a result file and edit it if necessary, right-click the file in the *Processed files* pane, and then click *Edit*.
The image is opened in the image editor. For more information, see 13 *Edit images manually*.

Note If you conduct two consecutive runs of the same batch, the *Start processing* icon will not be displayed to start the the second run. Instead, click *Start batch execution* in the toolbar.

15.2 Save batch as template

Create a batch and save it as a template to be used at a later time.

On the *Batch processing* page:

1. Click *New*.
2. In the *Job toolbox* pane, click the jobs you want to add to the batch. Point to the job to see a short description of it.
The jobs are added to the *Batch jobs* pane.
3. Use the icons at the bottom of the pane to:
 - move a selected job up or down in the list
 - remove a selected job from the list
 - reverse the order of the selected jobs
 - remove all jobs and clear the list.
4. Verify that you have added an *Output target* job as the last job in the batch.
Note At least one *Output target* job must be run in the batch. If no output target has been selected, the job *Radiometric JPEG* will be added automatically and run as the last job in the batch.
5. Click *Export*.
6. In the *Save as* dialog, browse to the folder where you want to store the batch template, type a name for it, and then click *Save*.

15.3 Open saved batch

To open a previously created and saved batch template, follow this procedure:

1. On the *Batch processing* page, click *Open*.
2. In the *Open* dialog, browse to the folder where you have saved the batch template.
3. Click the batch template, and then click *Open*.
The jobs included in the batch are listed in the *Batch jobs* workspace pane.

15.4 Create videos from images

Use the predefined batch *Create videos from images* to put together a number of thermal images into a video (MJPEG format):

1. On the *Home* page, click *Create video from images*.
2. On the *Batch processing* page, click *Next*.
3. In the *File system* pane, navigate to the folder where you have stored the images you want to create a video of.
4. Add images to the batch:
 - to add a single image, click the image and then click *To batch* (plus button).
 - to add multiple images, click the images while pressing the CTRL key on your keyboard, and then click *To batch* (plus button).
 - to add all images in the folder, click *To batch* (folder button).

The selected images are added to the *Batch files* pane.

5. Use the icons at the bottom of the pane to:
 - move a selected file up or down the list
 - remove a selected file from the list
 - sort the files by name, or by date and time
 - reverse the order of the selected files
 - remove all files and clear the list.
6. Click *Next*.
7. To make changes to the overlay settings or to change the output folder, click *Settings*.
8. To run the batch, click *Start processing*.
9. The output video file is shown in the *Processed files* pane. If the *Open output folder when done* check box is selected in *Settings*, the File Explorer will open and show the output video file in the defined output folder, as well.



Website

<http://www.flir.com>

Customer support

<http://support.flir.com>

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