FLUKE®

SmartView IR

Software for Thermal Imagers

Users Manual

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Introduction

About the SmartView IR Software

The Fluke SmartView IR is the standard professional thermal image analysis software for Fluke Thermal imagers. It can be used for professional analysis and reporting of thermal images and fully-radiometric thermal videos.

The professional thermal image analysis software - Fluke SmartView IR can be installed and used free of charge on different PCs. It can be used to record thermal image data in the field, as well as perform analysis on the recorded fully-radiometric thermal videos and thermal image files.

The Fluke SmartView IR professional thermal image analysis software can:

- Support connection and communication between thermal imagers and PCs, and to real-time display, transfer, record, and analyze the fully-radiometric thermal video stream.
- Support secondary analysis of thermal image files, to add, delete, rename, move and resize ROIs (Region Of Interest) on thermal images or fully-radiometric thermal videos.
- Support to modify the temperature measuring parameters of thermal image files, including emissivity, reflected temperature, atmospheric temperature, relative humidity, distance from target, external optics temperature, external optics transmission, etc.
- Support to set the emissivity of different ROIs to improve temperature measurement accuracy.
- Support to display, export, save and overlay the time-temperature curve of any ROI.
- Display thermal image files in temperature plot and 3D graph.
- Support to edit personalized report templates.

How to Contact Fluke

To contact Fluke, call one of the following telephone numbers:

Customer Service Center (Fluke China): +86 400-810-3435

Maintenance Service Center (Fluke China): +86 400-921-0835

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1--800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435 (service) or +86-400-921-0835 (repair)
- Brazil: +55-11-3530-8901
- Anywhere in the world: +1-425-446-5500

To view, print, or download the latest manual supplement, visit cn.fluke.com (Chinese) or www.fluke.com/en-us/support/manuals (English).

Conventions

For keys, buttons, menus, options, fields and components mentioned in this Manual:

Bold fonts are generally used to indicate printed words or names of keys/buttons on the Product and its panel.

"Bold fonts within quotation marks" are generally used to indicate the content or options displayed on the Product's screen.

Fonts in blue generally refer to hyperlinks, including links to the Internet and cross-references within this Manual. The targeted content can be found by clicking the links directly.

For ease of reading, list items are generally not enclosed in double quotes, because it is easy to distinguish screen content from panel content by context.

System Requirements

Before installing and using the SmartView IR, make sure your computer meets the following system requirements.

Hardware Requirements

- CPU: Intel Pentium IV 3.0 GHz or higher.
- 4 GB RAM or more
- 20 GB of free hard disk space
- Display: 1024×768 resolution or higher

Software Requirements

- Microsoft Windows XP (.NET Framework 3.5 needs to be installed or the software will not work properly)
- Microsoft Windows 7, 32 Bits
- Microsoft Windows 7, 64 Bits
- Microsoft Windows 10, 32-bit Pro Edition or above (.NET Framework 4.0 should be enabled in the Windows, which is enabled by default)
- Microsoft Windows 10, 64-bit Pro Edition or above (.NET Framework 4.0 should be enabled in the Windows, which is enabled by default)

Install the SmartView IR

Note

Before installing the Fluke SmartView IR professional thermal image analysis software, please close all programs on your PC.

Precautions Before Installation

1. Ensure that your PC's hardware and software environment meets the requirements listed in section *System Requirements*.
2. You must have administrator rights to install the program.
3. If your antivirus software gives a prompt, please select “Always allow it to run”, or you can select “Trust this software”.
4. A complete installation consists of several subprogram installations, some of which are from third-party vendors. Do not abort the installation of these subprograms, as they are required for a complete installation.
5. To report and export data, please install Office software on your PC, such as Office Word, Office Excel or WPS Word, WPS Excel.

Install the SmartView IR Software

To install the SmartView IR professional thermal image analysis software:

1. Log in to the Windows OS as an administrator and close all applications.
2. Double-click the SmartView IR installation file.
3. Follow the instructions in the installation wizard step by step.
4. The installation is completed.

Uninstall the SmartView IR

To uninstall the SmartView software from your PC:

1. Open Windows Control Panel.
2. In the Control Panel, select “Add or Remove Programs”.
3. Select and check the SmartView IR and click corresponding button to remove/uninstall the SmartView IR software.
4. Follow the prompts displayed on the screen.

Report Problems

If you have problems in installing or operating the SmartView IR, or would like to report a software error, please contact our technical support team. see section *How to Contact Fluke.*

When reporting a software program error, please provide:

1. The operating system you are running.
2. The manufacturer and model of your computer.
3. The version of SmartView IR you are running.
4. A detailed description of the problem and how it arose. Be sure to correctly spell all error messages you receive. It's better to provide screenshots or error reports.

Basic of the SmartView IR

Import and Save Thermal Image Files

To import images from a thermal imager to a PC, use the removable memory card included with the imager, or connect the imager directly to your PC.

Use a removable memory card:

To transfer IR image files to a PC via removable memory card, please directly copy the files to the corresponding folder on the PC by using the card reader provided with the system or a universal card reader.

Note

When using a card reader, you may need to install necessary drivers. Please follow the instructions that come with the card reader.

Connect the imager to a PC directly:

Note

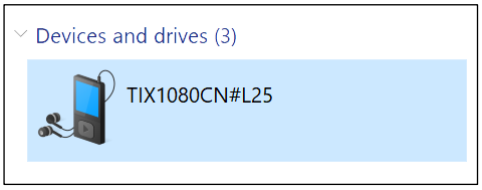
Before connecting, please refer to the corresponding imager's user manual to install the necessary USB drivers. Consult your system administrator if necessary.

1. Refer to user manual of the imager to put the imager in required condition.
2. The imager’s Type-C USB interface is directly connected to your PC’s USB interface by using the USB cable attached with the Imager.

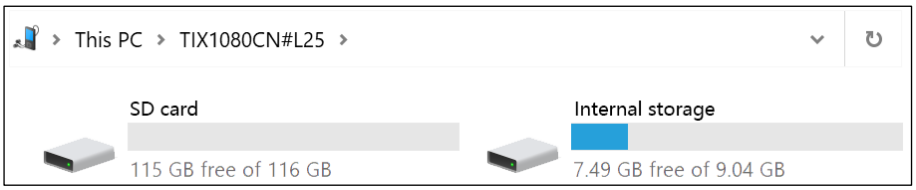
Note

The following operations on a PC may vary slightly depending on different operating system, but they are all very much the same. Please refer to the specific screen information for operation.

3. On your PC, find "**This PC**" in the left column of the "**File Explorer**", and click to select it.
4. In the "**Devices and Drives**" on the right side of the "**File Explorer**" window, you should see an icon of the multimedia device with the imager’s name below or next to it, for example "TIX1080CN#L25", as shown in the figure below.



5. Double-click the icon of the imager, you will see 1 or 2 mobile storage devices, such as "**SD card**" and "**Internal storage**", which correspond respectively to the external memory card and internal flash memory of the Imager. as shown in the figure below.



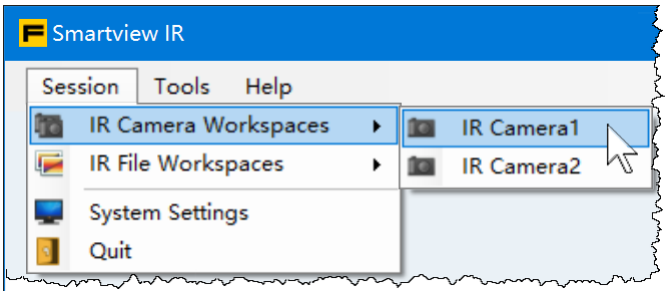
6. Copy thermal image files from the SD card or the Imager's internal flash memory to a folder on your PC as needed. Users can create a target folder according to their own habits.

Note

For the specific storage location of thermal image files in the SD card or the internal flash memory, please refer to user manual of the Imager.

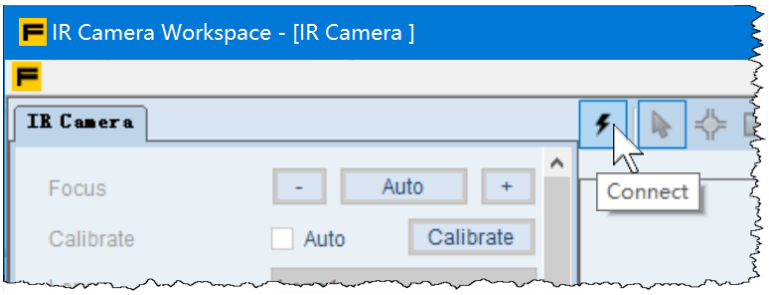
Transfer Fully-Radiometric Thermal Video Stream

1. Refer to user manual of the imager to put the imager in required condition.
2. Connect the Imager to your PC via the LAN interface or the USB interface depending on the specific imager model.
3. Run the SmartView *IR* software on your PC.
4. In the SmartView IR software, select **Session** -> **IR Camera Workspaces** -> **IR Camera1** or **IR Camera2** from the menu, as shown in the figure below.



The software should now display a separate interface of "**IR Camera Workspace**", where an "**IR Camera**" window is already opened by default. The window can be manually reduced, enlarged or filled to the entire "**IR Camera Workspace**".

5. Click **Connect** button in the upper left corner of **"IR Camera** window.



6. In the "**Connect**" dialog that pops up, several connection methods are listed, as shown in *Figure 1* and *Table 1*.

   Fill in each connection parameter according to the specific Camera Type of the imager, and then click "**OK**" button.

Note

For the TiX1000 Series Thermal Imager, select zUSB; for the RSE30/60 Series and the Pi30/60 Series Thermal Camera, select Ethernet+.

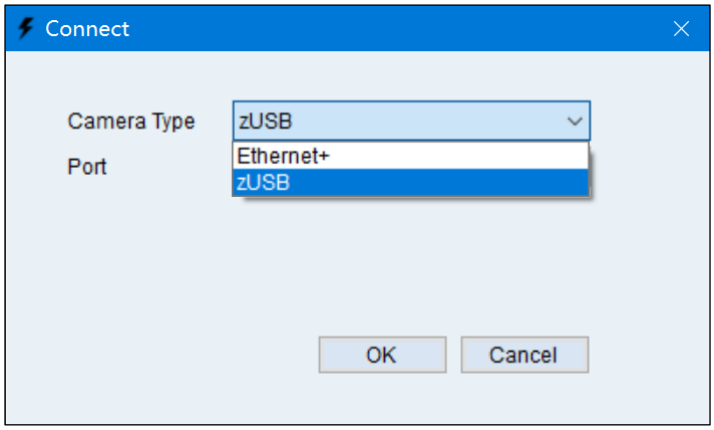


Figure 1. Connection methods

Table 1. Connection parameters

Camera Type	Options and Description
Ethernet+	**IP Address:** The imager's IP address. For default IP address of the imager, please refer to its user manual. **Port:** For information on the port used by the imager, please refer to its user manual. **User Name:** Please refer to the imager's user manual to fill in correct User Name (or leave it blank). **Password:** Please refer to the imager's user manual to fill in correct Password (or leave it blank).
zUSB	**Port:** Please refer to the imager's user manual to fill in correct Port Number (or leave it blank).

7. After the connection is successful, the real-time fully-radiometric IR videos captured by the imager will be displayed in the "IR Camera" window, as shown in *Figure 2*.

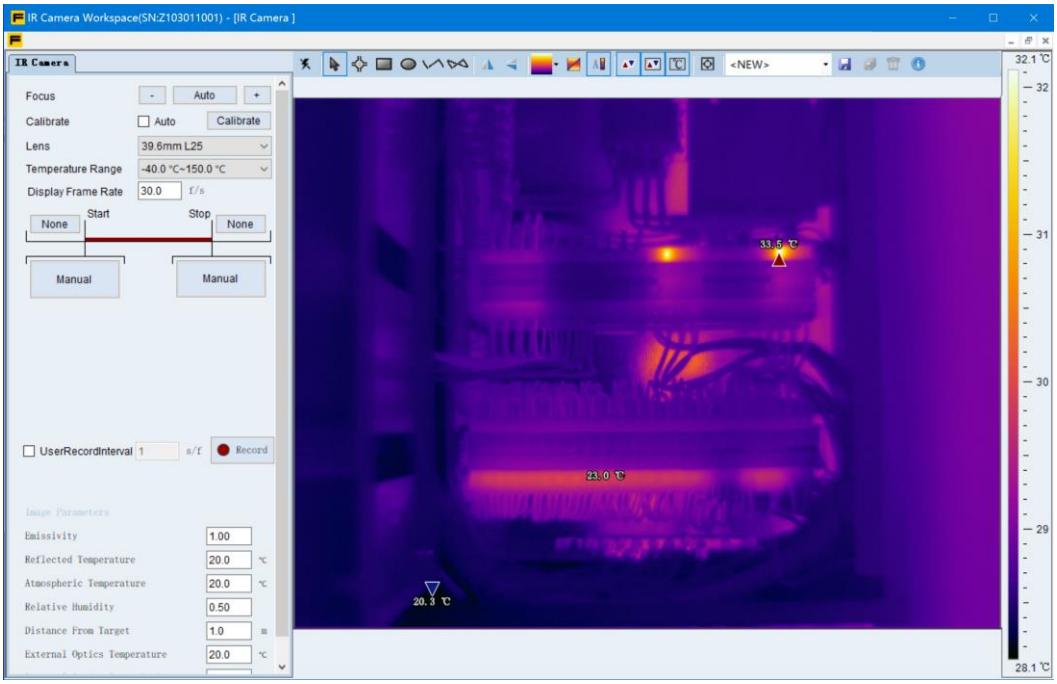


Figure 2. Real-time fully-radiometric IR video window

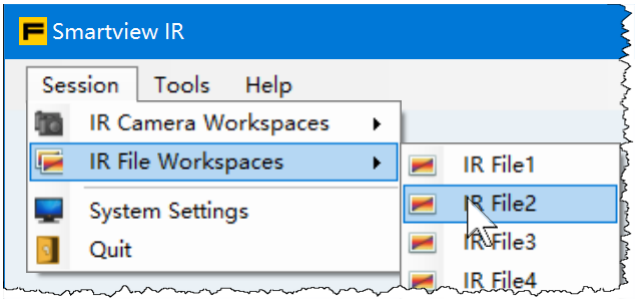
Open a Thermal Image file

Users can open thermal image files in the following 2 ways.

- IR File Workspaces
- Favorites Bar

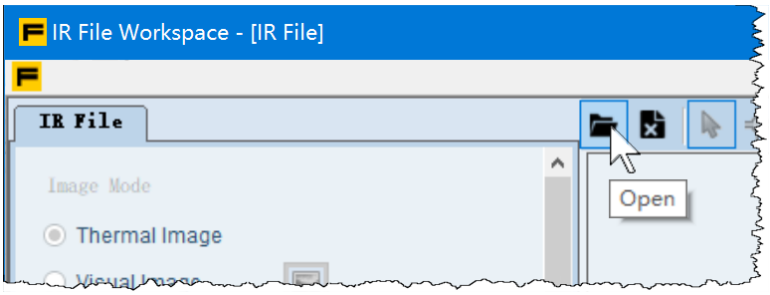
*To Open a Thermal Image File from the **IR File Workspaces**:*

1. In the SmartView IR software menu, select **Session** -> **IR File Workspaces** -> **IR FileX** (x is 1 to 10), as shown in the figure below.

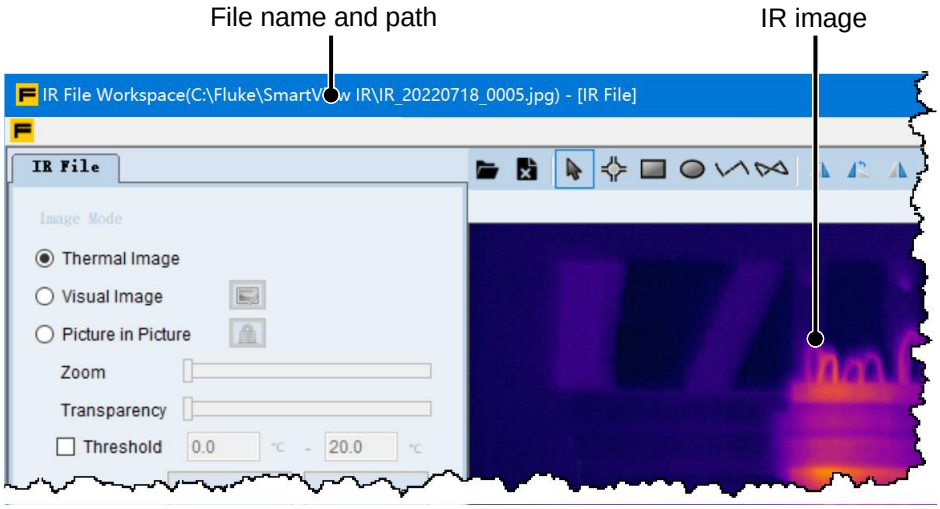


The software should now display a separate interface of the "**IR File Workspaces**", where a blank "IR File" window is already opened by default. The window can be manually reduced, enlarged or filled to the entire "**IR File Workspaces**".

2. Click "**Open**" button in the upper left corner of the "**IR File**" window, as shown in the figure below.

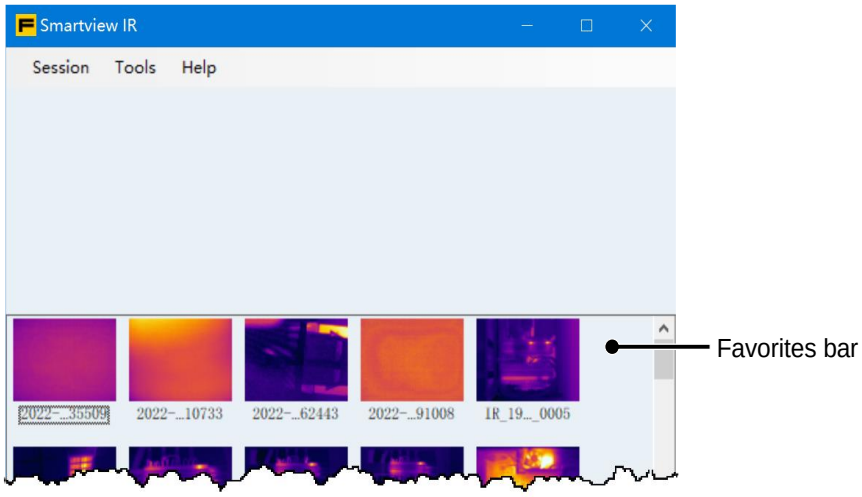


3. Find a thermal image file to be opened in the "**Open**" dialog, and then click "**Open**" button.
4. A thermal image will be displayed in the "**IR File**" window, and the file name and storage path will be displayed on the title bar of the "**IR File Workspaces**", as shown in the figure below.



Open a Thermal Image File from "Favorites Bar":

- In "**Favorites Bar**" at the bottom of the SmartView IR's main window, double-click the thumbnail of a thermal image, this image will be directly opened in the "**IR File Workspaces**".



Understand the SmartView IR Window

The Fluke SmartView IR software adopts a multi-window design. In section *Transfer Fully-Radiometric Thermal Video Stream* and *Open a Thermal Image file* above, we have opened "**IR Camera Workspaces**" and "**IR File Workspaces**" windows. Both windows are opened from the main window of the SmartView IR software.

From the SmartView IR main window, "**IR Camera Workspaces**" and "**IR File Workspaces**" window can be opened in several ways, of which up to 2 "**IR Camera Workspace**" windows and up to 10 "**IR File Workspace**" windows can be opened.

For more about "**IR Camera Workspace**" and "**IR File Workspace**" windows, please see section *Fully-Radiometric Thermal Video Stream* and *Analyze Thermal Image Files* respectively.

The SmartView IR Main Window

The SmartView IR main window is shown in *Figure 3*. The main window is divided into 3 areas:

- Menu Bar
- Workspace
- Favorites Bar

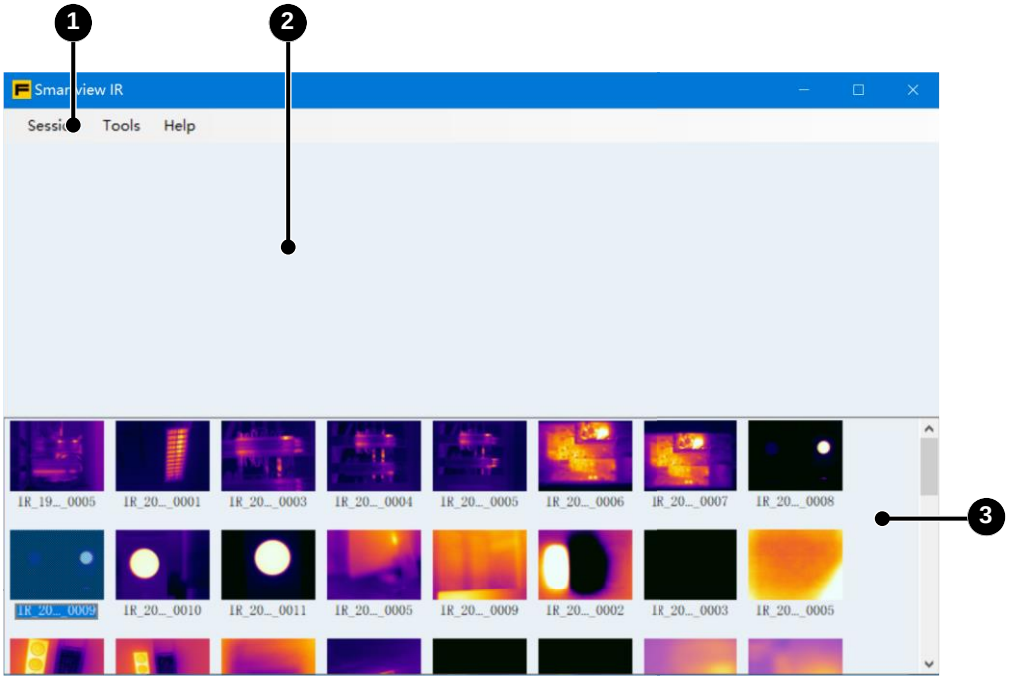


Figure 3. Main Window

Table 2. Main Window

Item No.	Description
1	**Menu Bar** The menu bar contains drop-down menus for starting various SmartView IR software functions and configuring/changing its preferences. Each menu and submenu will be described in details in the following sections of this Manual.
2	Workspace See section *Transfer Fully-Radiometric Thermal Video Stream* and *Open a Thermal Image file* for details.
3	**Favorites Bar** Favorites Bar save shortcuts to recorded or captured thermal image files. Users can: ● Drag and drop thermal image files directly from the PC's local hard drive to the Favorites Bar. ● Double-click a thermal image file's thumbnail in the Favorites Bar to open it directly. ● Quickly locate the folder where the thermal image file is located using the right-click menu. ● Remove thermal image files from Favorites Bar using the right-click menu.

Analyze Thermal Image Files

The thermal image files are analyzed mainly in "**IR File Workspace**" window. For information on how to open a thermal image file, please see section *Open a Thermal Image file*.

IR File Workspaces

As shown in *Figure 4*, the "**IR File Workspace**" is a standalone window that is also a multi-document window. When opening a thermal image directly or opening a blank "**IR File Workspace**", it may contain up to 3 windows:

- Thermal image
- Temperature plot
- 3D graph

Note

Depending on the state of IR File Workspace window the last time you closed it, when you open it again, it may contain only one IR File window.

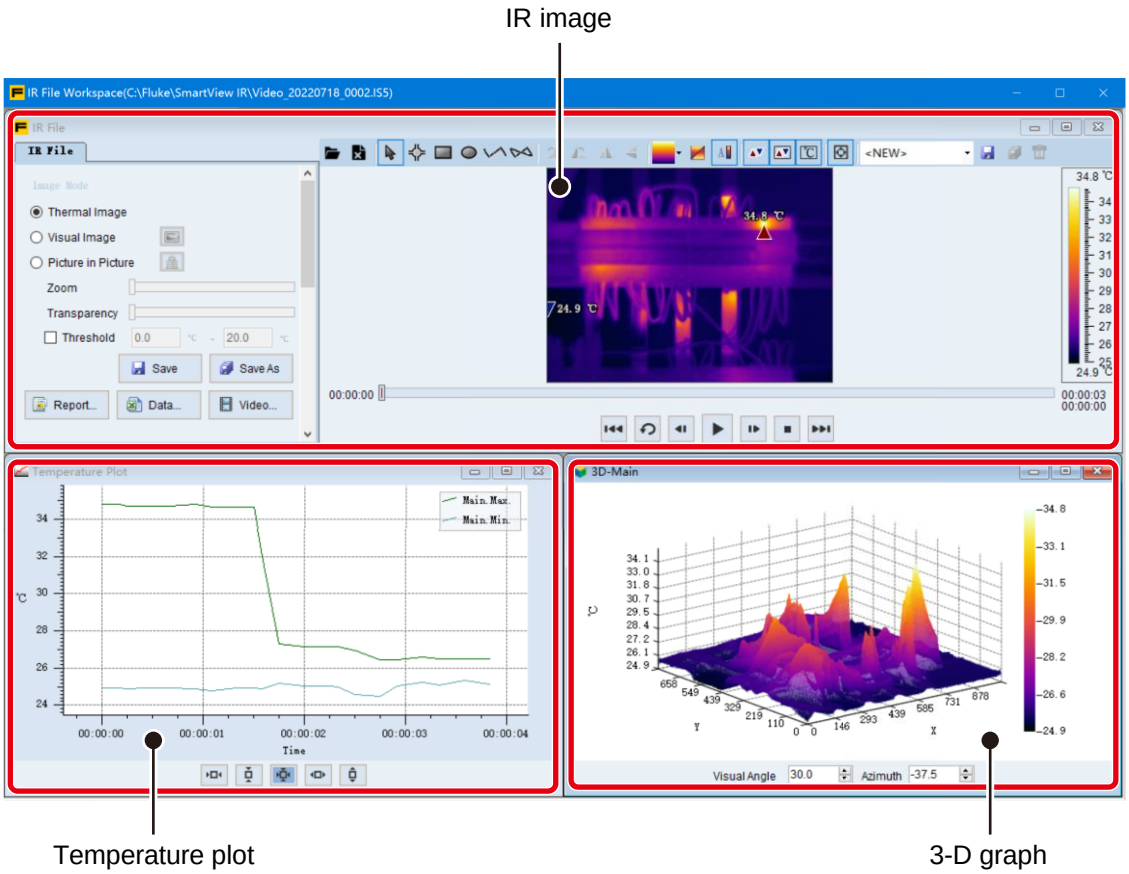


Figure 4. IR File Workspace

Each of these sub-windows can be independently manually reduced, enlarged or filled to the entire "**IR File Workspaces"**.

In the workspace, all windows except the "**IR File**" window itself are based on the "**IR File**" window. So we call "**IR File**" window the "**Parent Window**" and all other windows are its "**Child Window**". They are also collectively referred to as windows in the case of no confusion.

The operations of "**Parent Window**" and "**Child Window**" have the following characteristics:

- A workspace contains one and only one "**Parent Window**" (including the blank parent window).
- A workspace may have no "**Child Windows**", or there may be one or more "**Child Windows**".
- The "**Parent Window**" and each "**Child Window**" can be freely moved, zoomed in or out, or filled to the entire workspace.
- Closing a "**Child Window**" does not affect its "**Parent Window**" and any other "**Child Windows**".
- Closing the "**Parent Window**" will cause the workspace itself and all its "**Child Windows**" to close.

Workspace Layout

Right-click on the blank area of a workspace, or right-click on the non-control area of any window, a pop-up menu as shown below will appear, where you can organize the layout of workspace.

Option	Description
Reset Workspace Layout	Automatically arrange windows in the workspace.
Save Workspace Layout	Save the current window layout, including all child windows opened in the workspace, the overall layout, and the location of each child window.
Load Workspace Layout	Automatically recall the layout settings last saved using the "**Save Workspace Layout**" option.

Note

Each time you open a new IR File Workspace, it always takes the same layout as the last closed IR File Workspace.

Thermal Imager Analysis Window

As shown in *Figure 5*, the IR File window consists of the following sections:

- Control panel
- Tool bar
- Thermal image / video

- Temperature Bar
- Play control for thermal image/video

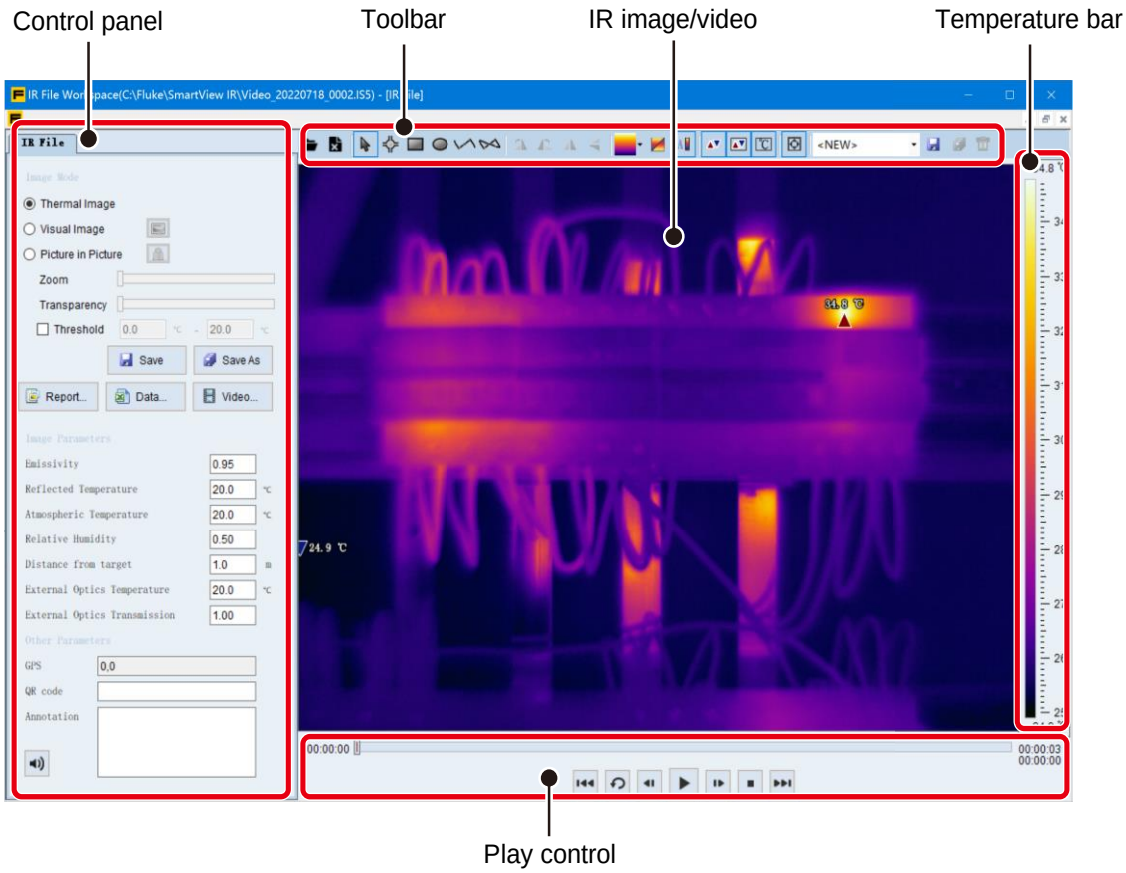
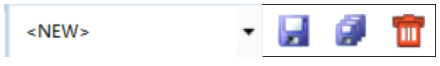
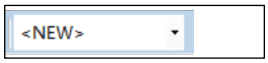


Figure 5. Thermal image analysis window

Item	Description
Control panel	Select image mode, correction parameters, image parameters; perform save, data and reports export; and other additional information on images.
Tool Bar	Include buttons for file operation, measurement mode, measurement tool, image operation, on-screen display, and configuration management. See section *Tool Bar* for details.
Thermal Image / Video	A window for displaying thermal images or videos, where information such as display area and temperature can be superimposed.
Temperature Bar	Display relationship between color and temperature of the current thermal image.
Play Control	Play videos and select images.

Tool Bar

The tool bar contains various tools for analyzing thermal images, which are logically divided into multiple tool groups, and they are separated by a separator , as shown in the table below.

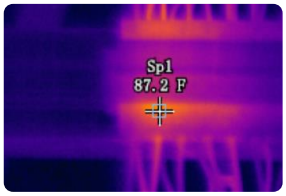
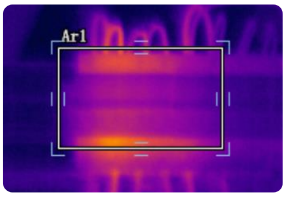
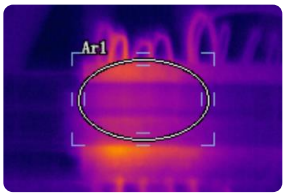
Item	Description
Files	 Open and close thermal image files.  Open a thermal image file  Close the current thermal image file. If the thermal image or video has been edited, users will be prompted whether to save the current thermal image file
Temperature Measurement Tools	 Provide a variety of temperature measurement and analysis tools. See section *Temperature Measurement Tools* for details.
Image operation	 Rotate or flip the current thermal image. This set of tools is invalid for thermal radiometric videos.  Rotate right 90°.  Rotate left 90°.  Flip horizontally.  Flip vertically.
Palette	 Palette settings. See section *Palette* for details.
Data Display	 Data such as maximum/minimum temperature points and temperature values are superimposed on the image. See section *Data Display* for details.
Fill the window	 With this button, the thermal image/video can be automatically filled to the entire window. Click this button, the software will automatically zoom out or zoom in the thermal image/video until the it is filled to the entire window.
Measurement template	  Measurement template drop-down list. It contains measurement templates saved in the system.  Save This is a multi-function button. Click shortcut button for measurement template, and then click drop-down menu. Select

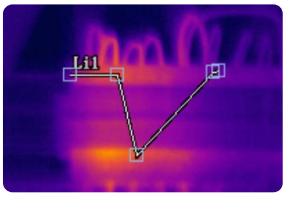
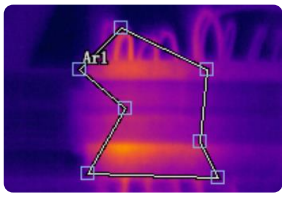
Item	Description
	"**New**", and click "**Save**" button, "**Save**" dialog will appear. Name the template, and it will be saved with the set name. Click shortcut button for measurement template, and then click drop-down menu, select a measurement template with an existing name, and click "**Save**" button, the current measurement template will be automatically updated and saved.  Save As. Click Save As button, "**Save**" dialog will appear. Enter name of the measurement template, it will be saved as a new measurement template with the set name.  Delete. Click "**Delete**" button, the currently selected measurement template will be automatically deleted.
Information	 **About the IR Camera** If a thermal imager is connected, an imager information icon will be displayed on tool bar. Click this icon, "**About the Imager**" dialog will pop up, which displays model, version and serial number of the currently connected imager.
More...	 When "**IR File**" window is small, there are no enough room for showing all buttons on tool bar, some of them will be hidden. Click this button to display the hidden buttons below.

Temperature Measurement Tools

The SmartView IR provides a variety of temperature measurement and analysis tools to create regions of various shapes (ROI, region of interest), superimposes the outline of each region, maximum/average/minimum temperature, and displays temperature difference between regions. In addition, you can set the partial emissivity in the image by creating a ROI.

Item	Description
	**Arrow** Mouse pointer and ROI selection tool. After it is selected, as the mouse moves over the thermal image, the temperature value of the current pixel will be displayed at the lower right corner of the pointer, for example  . When the mouse is hovered over an ROI, it will change to  , click to select the ROI. Click and hold left mouse button on an ROI to move the current ROI by dragging. When the mouse is hovered over a control point of the selected ROI, it may change to  ,  ,  ,  ,  depending on the type of the ROI. Then click and hold left mouse button and drag to move the control point of ROI.
	**Spot** After it is selected, when the mouse is moved over the thermal image, the mouse changes to a hollow cross which displays the current pixel temperature next to it, as shown in the figure below: 

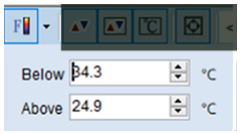
Item	Description
	When move the mouse to the corresponding point and click it, a cross mark will be displayed on the thermal image, and the default name of the ROI will be shown, which is in the form of "Sp + number", where the number refers to serial number of the spot, as shown in the figure below. 
	**Rectangle** After it is selected, when the mouse moves over a thermal image, it changes to  . To create a rectangular temperature measurement region, click and hold left mouse button on the upper left corner of the target region, then drag it to the lower right corner, and release the mouse button after reaching the corresponding position, that is, a rectangle temperature measurement region is drawn on the thermal image, as shown in the figure below. The rectangle is also marked with control points at its four corners. Click the mouse on other position in the thermal image, control points of the rectangle disappear, indicating that the rectangle is not currently selected.  Name of a rectangular region is prefixed with Ar.
	**Ellipse** After it is selected, when the mouse moves over the thermal image, it changes to  . Similar to the method of drawing a rectangle region, you can create an elliptical temperature measurement region on the thermal image with drag-and-drop, as shown in the figure below.  Name of an ellipse region is prefixed with Ar.
	**Polyline** After it is selected, when the mouse moves over the thermal image, it changes to  . To create a polyline, click and hold left mouse button on the beginning point of a line and move it along the region to be measured. When reaching the desired turning point, click left mouse button again to generate a node; repeat the above steps to draw a polyline. Double-click at a point, it will become the end point of the polyline, then the drawing of a polyline is completed.

Item	Description
	 Name of a temperature measurement line is prefixed with Li.
	**Polygon** After it is selected, when the mouse moves over a thermal image, it changes to  . A Polygon is drawn much like a temperature polyline, except that the starting point is always connected to the current point of the mouse; When double-clicking the mouse, a polygon is formed, as shown in the figure below.  Name of a polygon is prefixed with Ar.

Palette

Although all SmartView IR palettes can be used for any image, you may find that your images will be analyzed better by using some palettes than using others depending on different situations. The SmartView IR provides a set of palette tools in the tool bar, as shown in the table below.

Item	Description
	**Color palette** Choose a palette: The SmartView IR has 16 built-in palettes: Blue, GlowBow, Grey, Grey10, GreyRed, Iron, Iron10, Medical, Medical10, MidGreen, MidGrey, Prism, Rain, Rain10, RainBow, and Yellow. Users can select an appropriate palette from the drop-down list as required; In general, warm colors correspond to high temperatures, and cool colors correspond to low temperatures.
	**Invert** Invert the palettes After the inversion, the relationship between temperature and color will be inverted: the warm colors correspond to the low temperature, and the cool colors correspond to the high temperature.
	**Temperature scale** The soft key provides 2 temperature scale modes: Auto-scale  and Fixed Scale  . Auto-scale is used by default. When this button is clicked, it will be switched between Auto Scale and Fixed Scale modes. ● Auto-scale  : The temperature bar automatically displays color distribution in a linear

Item	Description
	way according to the highest and lowest temperature on the screen. ● Fixed Scale : In Manual Scale mode, a drop-down menu will appear on the right, as shown in the figure below. Users can set the minimum and maximum temperature value of the screen according to needs; or you can click Temperature Bar button and drag up and down to adjust color display of the current thermal image. In Auto-scale, when the temperature bar is dragged to adjust the temperature scale, it will automatically change to Fixed Scale 

Data Display

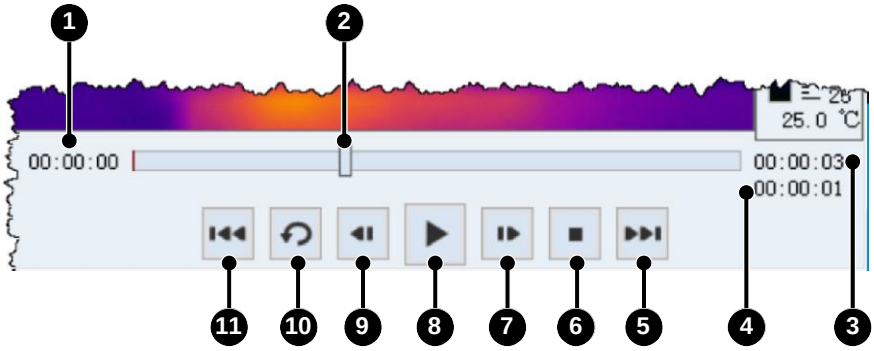
Annotating images with various types of markers or data can help interpret or analyze images. Users can use markers to highlight specific regions or points of interest in an image, as well as to display statistics, which simplifies the monitoring of critical targets.

Data displayed by the SmartView IR software is shown in the table below:

Item	Description
	maxmum/minimum temperature of measurement regions Display the maximum/minimum temperature values and their positions in a temperature measurement region. This is a multi-function button, click it once, only a red triangle will be displayed, indicating that the maximum temperature point in region(s) is shown; click it again, neither red nor blue triangles are displayed, indicating that the maximum/minimum temperature point in region(s) is not shown; click it thrice, only a bule triangle is displayed, indicating the minimum temperature point in region(s) is shown; click it four times, both red and blue triangles are displayed, indicating that the maximum/minimum temperature points in region(s) are shown.
	The maxmum/minimum of entire image Display the maximum/minimum temperature values and their positions of the entire thermal image. This is a multi-function button, click it once, only a red triangle will be displayed, indicating that the maximum temperature point in the entire image is shown; click it again, neither red nor blue triangles are displayed, indicating that the maximum/minimum temperature point in the entire image is not shown; click it thrice, only a blue triangle is displayed, indicating that the minimum temperature point in the entire image is shown; click it four times, both red and blue triangles are displayed, indicating that the maximum/minimum temperature points in the entire image are shown.
	Temperature value Display or hide temperature values displayed on the image. When temperature values are hidden, temperature values and temperature statistics of the marked points will not be displayed on the screen.

Play Control

At the bottom of the thermal image/video, there is a set of play control buttons, as shown in the figure below.



Note

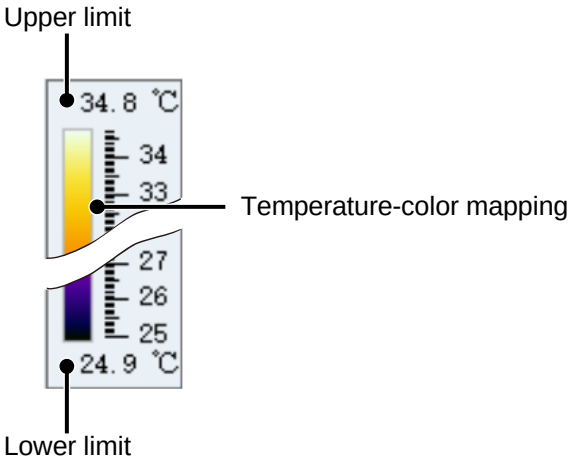
Some of the information or buttons shown in the Figure are only available for short fully-radiometric videos. For thermal images, those information or buttons will not be displayed in the window.

Item	Description
❶	**Short Fully-Radiometric Video Starting Point** There are 3 ways to display the starting point of a short video: - **Relative Time.** The starting point of a short video is displayed as time zero, that is, 00:00:00. - **Starting Frame.** The starting frame of a short video is always the first frame, which is displayed as 1. - **Absolute Time.** The absolute time when a short video is shot, such as 15:38:25. Click left mouse button in this area will cycle through 3 display modes. And the display mode of the current frame time (d) and end time (c) also changes accordingly.
❷	**Time Cursor** Indicate the current play progress. Click and hold the cursor, you can drag it forward and backward along timeline to achieve fast-forward or fast-rewind during video playing; when dragging the cursor, the thermal video in the IR File Workspaces will be played synchronously with the time cursor.
❸	**Short Fully-Radiometric Video End Point** Length of the short fully-radiometric video The display mode is the same as the starting point. Clicking left mouse button in this area can switch 3 display modes cyclically. Please refer to the introduction (a) about the starting point of a short video.
❹	**Current Play Position of a Short Fully-Radiometric Video** The display mode is the same as the starting point. Clicking left mouse button in this region can switch 3 display modes cyclically. Please refer to the introduction (a) about the starting point of a short video.
❺	**Next File** Clicking this button will switch to the next short fully-radiometric video or thermal image in the same directory.
❻	**Stop** Clicking this button will stop playing the current short fully-radiometric video and return the time cursor to starting point of the video.

Item	Description
❼	**Next Frame** Clicking this button will display the next frame of the short fully-radiometric video.
❽	**Play/Pause** Clicking this button will play or pause the current video. The button function will switch between Play and Pause.
❾	**Previous Frame** Clicking this button will display the previous frame of a short fully-radiometric video.
❿	**Loop** When pressing this button, the current short fully-radiometric video will be played in a loop; when the button is inactive, the video will automatically stop when it reaches the end and return to the starting point.
⓫	**Previous File** Clicking this button will switch to the previous short fully-radiometric video or thermal image in the same directory.

Temperature Bar

Temperature Bar represents the corresponding relationship between color and temperature of the current thermal image, as shown in the figure below. The temperature value at the top of the Temperature Bar represents upper temperature limit, and the temperature value at the bottom of the Temperature Bar represents lower temperature limit.



Users can click and hold down left mouse button on the Temperature Bar and drag up and down to adjust the maximum and minimum temperature values and display effects of the temperature bar. Click upper half of the Temperature Bar and drag the mouse to adjust upper limit; click lower half of the Temperature Bar and drag the mouse to adjust lower limit.

When adjusting Temperature Bar range by clicking and dragging, if the current temperature scale mode is "Auto Scale" ( ), it will automatically change to "Fixed Scale" ( ), see section *Palette*.

Control Panel

When a thermal image is opened, the parameter information about the thermal image and the operations that can be performed by users to the file are displayed in the Control Panel.

If a temperature measurement region on a thermal image is selected, the name and emissivity of the selected region will also be displayed in "**Marker Parameters**", which can be modified by users according to actual situation, as shown in the figure below.

Please refer to the table below for meaning and description of each parameter on the panel.

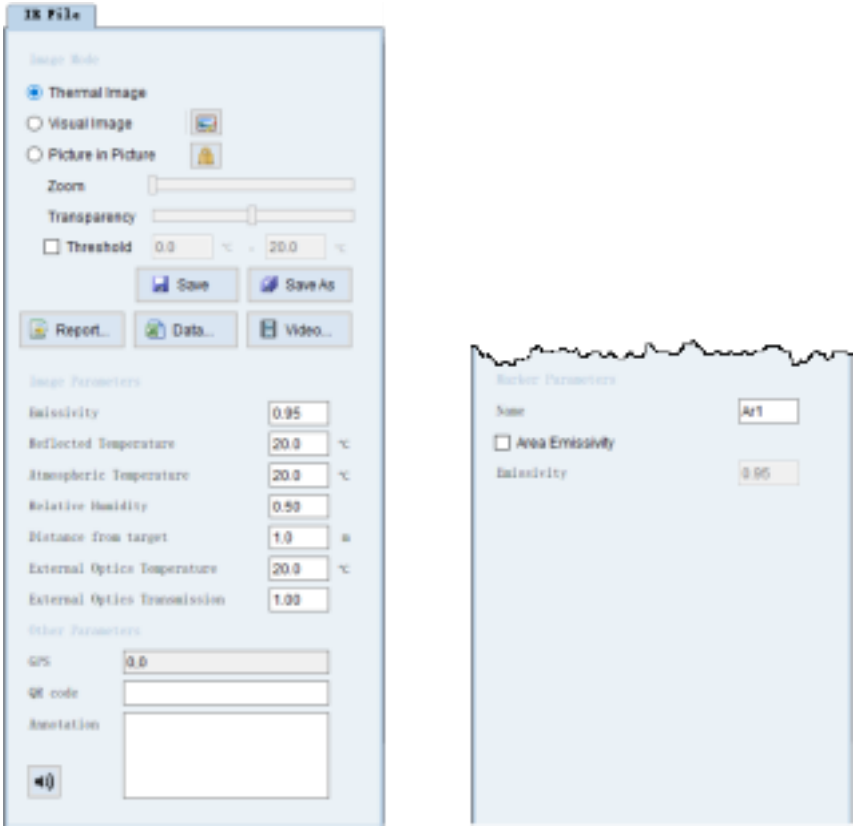
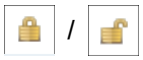
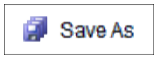


Table 3. Thermal image parameters and control panel

Item	Description
Image Mode	
Thermal Image	Check and select Thermal Image mode to display the normal thermal image in the thermal image area on the right. For Picture in Picture (PIP) images, only the fully-radiometric image are displayed.
Visual Image	Check Visual Image mode to display the normal visual image in the thermal image area on the right. If there are no visible light photos, the thermal image area on the right is blank and nothing is displayed.  **Add/Change**

Item	Description
	Click this button to add or change the visible image. The newly added or changed visible image will be used as the default background when the thermal image is opened later, except to the thermal image containing visible images.
Picture in Picture	When this option is selected, the thermal image area on the right will display the picture-in-picture (PIP) image that includes a fully-radiometric thermal image and a visible image, with the visible image serving as the background for the fully-radiometric thermal image. Then you can adjust size of the image and transparency of the fully-radiometric thermal image by using "**Zoom**" and "**Transparency**" sliders.  **Lock/Unlock**  means locked state, position and size of the thermal image in a PIP image cannot be adjusted. In Picture-in-Picture (PIP) mode, click the icon to make it in unlocked state () to adjust position and size of the thermal image in the PIP image. In the unlocked state, a hollow cross mark  is displayed in the center of a fully-radiometric thermal image. Keep pressing left mouse button and drag the mark to move position of the fully-radiometric thermal image to align with the visual image. And an arrow mark  pointing to the center will be displayed respectively on each of four corners of the fully-radiometric thermal image. Keep pressing left mouse button and drag the mark to reduce or enlarge the fully-radiometric thermal image.  **Zoom** Drag "**Zoom**" slider left and right to adjust size of the image, size of the fully-radiometric thermal image and that of the visible image are adjusted at the same time. **Transparency** Drag "**Transparency**" slider to adjust transparency of the fully-radiometric thermal image.
Threshold	 By clicking the checkbox to activate threshold function, users can enter temperature threshold range to be displayed in user-defined temperature input box on the right. For example, if you enter 20°C – 40°C, PIP image will automatically display the area within the range of 20°C to 40°C as a thermal image, and the remaining area will be displayed as a visible image.
Save	 Save the currently opened thermal image file. Clicking this button will automatically update the thermal image edited.
Save As	

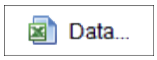
Item	Description
	Save the current thermal image file as a new file. For "**Save As**" operation of a short fully-radiometric video, please refer to section *Save as a New Fully-Radiometric Thermal Video*.
Report	 When clicking this button, a professional report will be automatically generated from the currently analyzed thermal image according to the default report template. For more information on report, please see section *Create and Customize a Report*.
Data	 Export the analyzed thermal image to a temperature data matrix file in .CSV format. For more information on exporting data, please see section *Export Temperature Data Matrix Files*.
Video	 Export the currently analyzed thermal image file as a video file in .mp4 format. For more information on exporting video files in MP4 format, please see section *Export a Video in MP4 Format*.
Image Parameters	
This set of parameters lists parameter settings and environmental information when taking thermal images, including Emissivity, Reflected Temperature, Atmospheric Temperature, Relative Humidity, Distance from Target, External Optics Temperature, and External Optics Transmission, See section *Image Parameters* for details.	
Other Parameters	
GPS	GPS information provided by the imager when taking fully-radiometric thermal images. This information is for reference only and cannot be modified.
QR Code	QR code information recorded by the imager when taking fully-radiometric thermal images, which can be modified according to actual situation.
Annotation	Text annotations accompanying fully-radiometric thermal images, which can be added or modified according to actual situation.
Voice notes	 Clicking this button will play the voice annotation accompanying fully-radiometric thermal images.
Marker Parameters	
Name	Name of the selected temperature measurement region. It can be modified according to the situation.
Area Emissivity	Click "Area Emissivity" checkbox to adjust area emissivity value of the selected region as required. The emissivity is between 0.01 and 1.00. If the entered emissivity value is less than or equal to 0, or greater than 1, the system will set it to 0.01 or 1.00 after confirmation. If "Area Emissivity" is not enabled, emissivity of the selected region is the same as the emissivity of entire image.

Image Parameters

In Image Parameter area, users can modify listed parameters as needed.

Enter/modify the value in input box on the right and press Tab to confirm. The software will update thermal images displayed based on new parameters.

Emissivity

Emissivity refers to ratio of the energy radiated by the target under measurement to the energy radiated by a black body at the same temperature and wavelength, and it is between 0.01 and 1.00. Emissivity of material is one of the important parameters that affects whether an imager can accurately measure temperature of the target to be measured.

The professional thermal image analysis software — SmartView *IR* ' emissivity settings include global emissivity correction and region emissivity correction. Here is the global emissivity.

Emissivity value can be adjusted within a range of 0.01 to 1.0. After entering settings, press Tab or Enter key to confirm.

Reflected Temperature

Reflected temperature is used to compensate for or correct the thermal radiation reflected from the target under measurement.

If emissivity of the target under measurement is relatively low, and its actual temperature is much lower than the temperature of its reflector, setting this parameter correctly and compensating for the reflected temperature is crucial for accurate temperature measurement.

To set reflected temperature:

1. Use a thermal imager to measure the actual temperature of the reflector near the target.
2. Click the thermal image, fill in/modify the reflected temperature according to the actual temperature of the reflector measured by the thermal imager.
3. Press Tab or Enter to confirm.

Note

If field test conditions permit, avoiding reflection interference as much as possible can greatly improve measurement accuracy.

Atmospheric Temperature

Atmospheric temperature refers to the air temperature between the imager's lens and the target.

To set atmospheric temperature:

1. Use a thermometer to measure the actual air temperature near the target.
2. Click the thermal image, fill in/modify the atmospheric temperature according to the actual temperature data.

3. Press Tab on keyboard to confirm.

Note

Atmospheric temperature is usually a default value, it needs to be set only when the air temperature is higher than actual temperature of the target under measurement.

Relative Humidity

The imager can compensate for the partial effects of air relative humidity on thermal radiation transmission. Therefore, you need to set relative humidity correctly.

To set relative humidity:

1. Use a hygrometer to measure the actual air humidity near the target.
2. Click the thermal image, fill in relative humidity according to the actual humidity data.
3. Press Tab on keyboard to confirm.

Note

For short distances and normal humidity, Relative Humidity is usually a default value of imagers.

Distance From Target

The Distance From Target refers to the distance between the target under measurement and the imager's lens. It is used to compensate for:

- The thermal radiation from the target being measured absorbed by the air between the target and the imager's lens.
- Thermal radiation from the air itself and detected by the imager.

To set measurement distance:

1. Use a rangefinder to measure the distance from the target to the imager's lens.
2. Click the thermal image, fill in Distance From Target settings according to the actual distance data.
3. Press Tab on keyboard to confirm.

Note

At short distance or the distance shorter than the farthest distance that the imager can measure accurately, the measurement distance is usually the default value of the imager.

External Optics Temperature

External optical temperature settings are used to compensate for or correct influence of the temperature of the external optical device itself on the target under measurement.

Note

This parameter will be set only when temperature of the external optical device is higher than that of the target under measurement. Typically, External Optics Temperature is set to 20°C by default.

External Optics Transmission

External Optics Transmission refers to the transmittance of external lens or IR window used in front of the imager's lens.

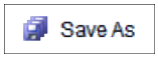
Note

If optional external optical lens has been calibrated at the factory, or there is no external infrared window, the external optical transmittance is usually the default value of the imager.

Save as a New Fully-Radiometric Thermal Video

When a fully-radiometric thermal video is analyzed in the IR File Workspaces, the "**Save As**" button on the Control Panel can be used to save the fully-radiometric thermal video as a new file.

To save as a new fully-radiometric thermal video:

1. Open the fully-radiometric thermal video (.IS5 file) to be edited.
2. Click "**Save As**" button 

on the control panel.
3. Input a file name in "**Save As**" dialog, then click "**OK**" button. The fully-radiometric thermal video will be saved as a new video file in IS5 format.

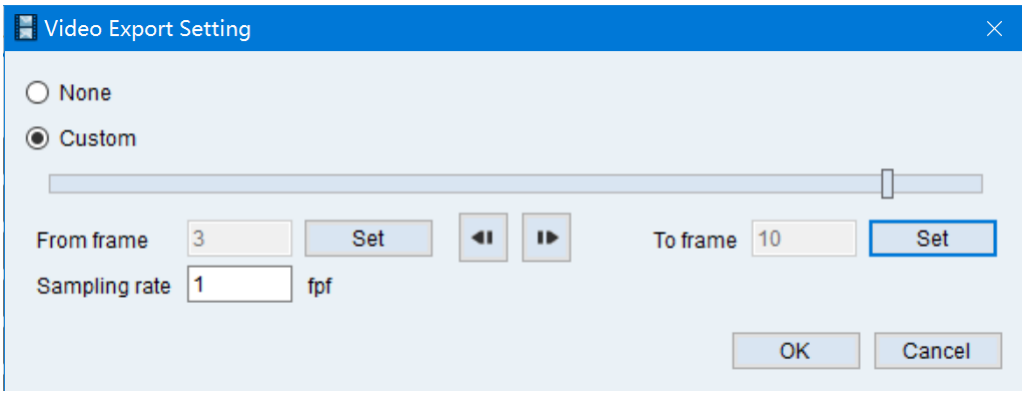
Export a Video in MP4 Format

The SmartView IR software can export the fully-radiometric thermal video to a video in standard MP4 format, which can be viewed with a common media player.

To export a video in MP4 format:

1. Open a fully-radiometric thermal video (.IS5 file) as the video source.
2. Click "**Video**" button 

on the control panel. The "**Video Export Setting**" dialog is displayed, as shown in the figure below.



3. In the “**Video Export Setting**” dialog, check “**Custom**” option.
4. Drag the slider left and right. When the slider is at the starting point of the video you want to export, click "**Set**" on the right below. The frame number where the slider is located will be displayed in "**From frame**" field, indicating the starting point of the video to be exported.

Note

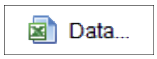
You can also click or to move the slider backward or forward one frame.

5. Drag the slider further to the right to the end point of the video you want to export, click "**Set**" button on the right below. The current frame number where the slider is currently located is displayed in "**To frame**" field, indicating the end point of the video to be exported.
6. Enter an appropriate sampling rate in "**Sampling Rate**" input box, the unit is fpf. 1 fpf means saving all frames, 2 fpf means saving one frame every 2 frame, 3 fpf means saving one frame every 3 frames, and so on for the subsequent numbers.
7. Click "**OK**" button and input a file name in "**Save As**" dialog that displays. Click "**OK**" button. The selected video clip is saved as as a file in .mp4 format.

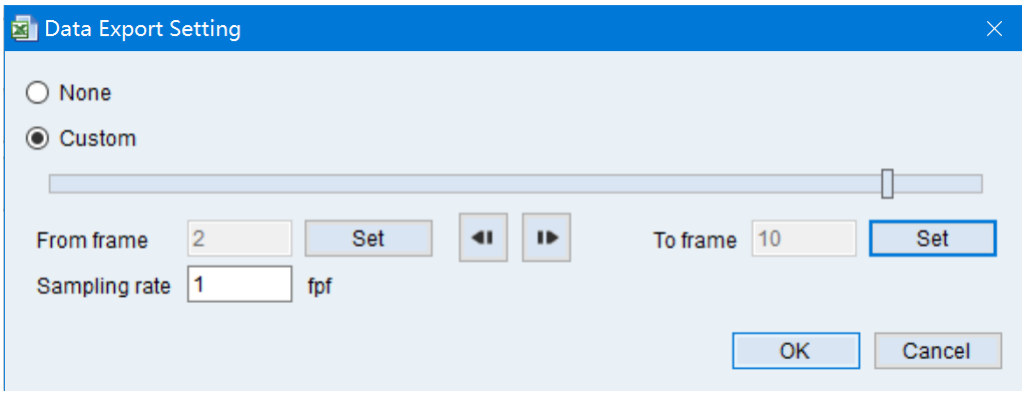
Export Temperature Data Matrix Files

The SmartView *IR* software can export the temperature data in the thermal image file to a matrix file in CSV format.

To export a temperature data matrix file:

1. Open a fully-radiometric thermal file as the data source.
2. Click “**Data**” button 

on the control panel. The “**Data Export Setting**” dialog is displayed, as shown in the figure below.



3. In “**Data Export Setting**” dialog, check “**Custom**” option.
4. Drag the slider left and right. When the slider is at the starting point of the video where you want to export temperature data, click "**Set**" on the right below. The frame number where the slider is located is displayed in "**From frame**" field, indicating the starting point of the video for exporting temperature data.

Note

You can also click ***or*** ***to move the slider backward or forward one frame.***

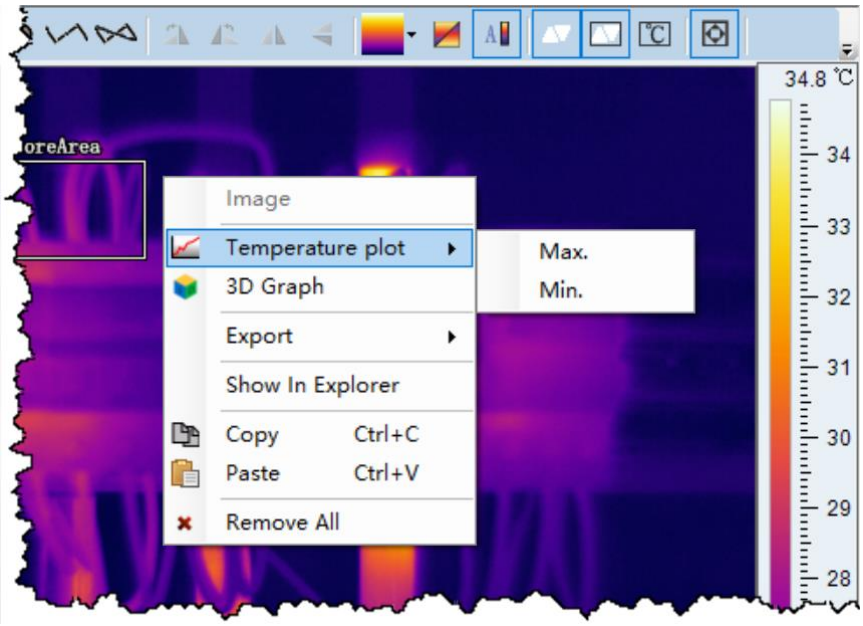
5. Drag the slider further to the right to the end point of the video where you want to export the temperature data, click "**Set**" button on the right below. The current frame number where the slider is currently located is displayed in "**To frame**" field, indicating the end point of the video in which the temperature data is exported.
6. Enter an appropriate sampling rate in "**Sampling Rate**" input box, the unit is fpf. 1 fpf means saving all frames, 2 fpf means saving one frame every 2 frame, 3 fpf means saving one frame every 3 frames, and so on for the subsequent numbers.
7. Click "**OK**" button and enter a file name in "**Save As**" dialog that displays. Click "**OK**" button. The data of the selected video clip is exported as a file in .CSV.

Other Analysis Functions

Right-click on an image in the thermal image analysis window to display a pop-up menu where you can perform additional analysis functions or shortcuts for actions is provided, as shown in the figure below.

If you select a temperature measurement region and right-click on it, the pop-up menu will be slightly different from that of the "**Image**". The top of the pop-up menu now displays the name of the temperature measurement region, such as "Ar2".

The pop-up menu is also slightly different when analyzing fully-radiometric thermal images and videos.



The table below shows the functions in the pop-up menu.

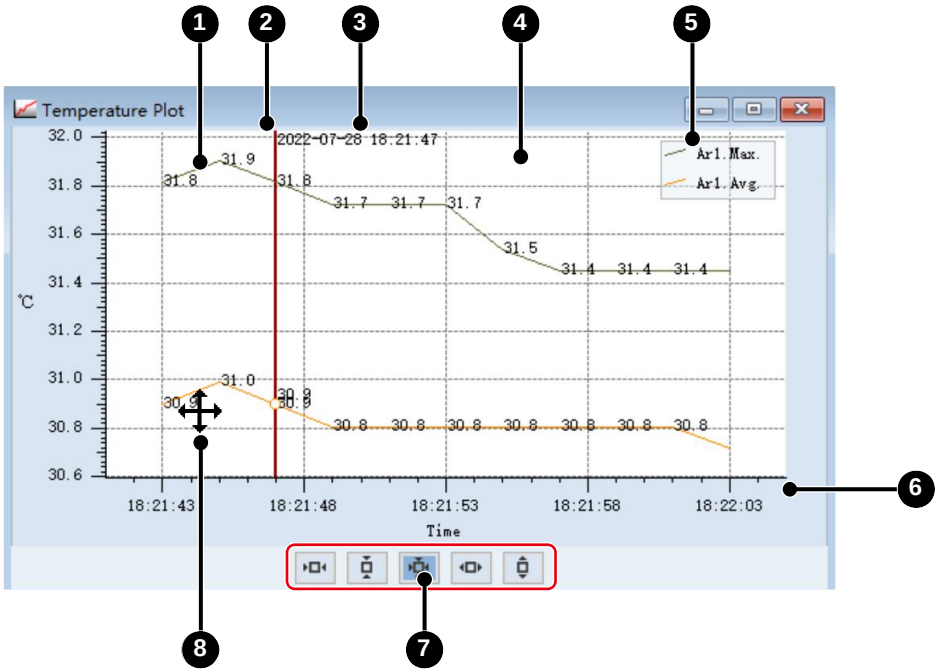
Item	Description
Image/region name	Indicate objects to work with in the current menu. For example, if a region is selected, only the temperature plot of the selected region is drawn, instead of that of the entire thermal image.
Temperature plot	Draw a temperature plot of the selected region. You can select to draw: ● Max temperature ● Min temperature ● Average temperature See section *Temperature Plot* for details. For a single-frame thermal image, the temperature plot cannot be drawn.
3D Graph	Draws a 3D graph of the currently selected target. See section *3D Graph* for details.
Export	The currently selected target can be exported as: ● Single Frame Image (only for fully-radiometric thermal video) ● Single Frame Data ● BMP, Non-Radiometric Thermal Image ● Report
Show in Explorer	Directly open the folder where the current thermal image file is located.
Copy	Copy the current thermal image directly to the clipboard. If a temperature measurement spot, line or area is currently selected, copy this temperature measurement marker to the clipboard.
Paste	If there are selected and copied markers such as spots, lines and boxes, they can be directly pasted into the thermal image analysis area with the same size and type.
Remove All	Directly delete all temperature measurement marks on the thermal image.

Temperature Plot

The Fluke SmartView IR software can draw a temperature plot of a fully-radiometric thermal video, which can display the curves of the maximum, minimum and average temperature (only for temperature measurement regions) over time of an entire image or of a temperature measurement region.

To add a temperature plot:

1. Right-click on the thermal image or on the selected temperature measurement region.
2. Select "**Temperature Plot**" from the pop-up menu, then select "**Max.**", "**Min.**", or "**Average**" temperature as required.
3. The "**Temperature Plot**" sub-window is displayed, showing the trend of temperature change over time, as shown in the figure below.



4. If necessary, repeat step 2 to add multiple temperature plots.

The content displayed in the Temperature Plot window is shown in the table below.

Item	Description
1	**Temperature trend curve** Represent the trend of temperature change over time.
2	**Indicator** The intersection of the measurement cursor and the selected temperature curve displays the temperature value at that point. Drag the measurement cursor with the mouse to move left and right, and the thermal image video in Thermal Image window also moves forward or backward synchronously.

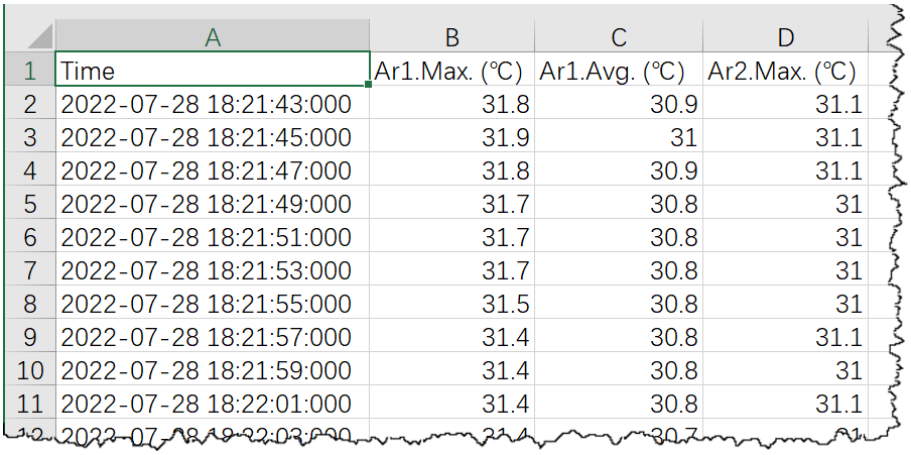
Item	Description
	The measurement cursor always snaps to the nearest data point.
❸	**Time of the Indicator's position** Time of the point where the measurement cursor is located. It is always the absolute time, which is not affected by the "**Actual Time**" option.
❹	**Data Value** When the function is activated by right clicking, the temperature value of each data point on the curve is displayed.
❺	**Legend** Legend shows the name of each curve and its corresponding color, where "Main" represents the temperature of the entire thermal image.
❻	**Time** You can choose to display actual time or relative time through the right-click menu.
❼	**Zoom buttons** The trend graph can be enlarged and reduced vertically or horizontally using the zoom buttons.  **Condense horizontal axis** Zoom out graph along timeline. You can also use shortcut key "Ctrl" + "←".  **Condense vertical axis** Zoom out graph along temperature axis. You can also use shortcut key "Ctrl" + "↓".  **Auto-fit to window** Temperature plot will automatically fill to the entire tab window with an appropriate size and scale.  **Expand horizontal axis** Zoom in graph along timeline. You can also use shortcut key "Ctrl + →".  **Expand vertical axis** Zoom in graph along temperature axis. You can also use shortcut key "Ctrl + ↑".
❽	 **Panning**

Item	Description
	Keep pressing left mouse button on a Temperature Plot, the Arrow will turn into a cross shape. Dragging and dropping the mouse can move the Temperature Plot.

Other Operations

You can also perform the operations listed in the table below in "**Temperature Plot**" window by right-clicking pop-up menu.

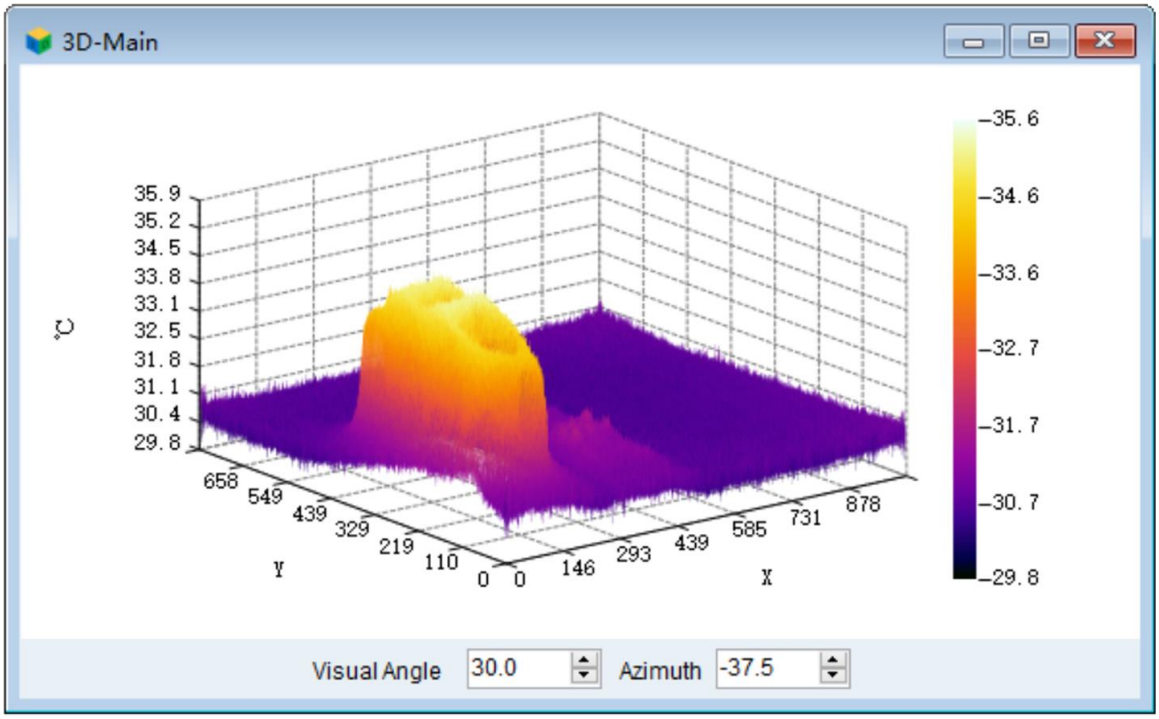
Item	Description
Auto-fit to window	 The function is the same as the button  at the bottom of the window. The same function can be achieved by double-clicking the mouse on the trend graph.
Show Indicator	 **Show/hide the Indicator** Select a curve from the pop-up menu on the right, and the measurement cursor displays temperature value based on that curve.
Display Data Value	 **Show/hide data value**
Actual Time	 **Absolute time/relative time**
Export	 **Picture** Export a Temperature Plot as a picture in .BMP or .JPG format. When selecting it, the software pops up a dialog box, prompting users to input size of the picture. If "**Remember current setting**" is checked, users will no longer be prompted to set the size of the picture ext time when it is exported.  **Data** Exports all current curves to a file in .CSV that can be opened with a spreadsheet program, as shown in the figure below.

Item	Description
	 In the .CSV file, the first column is time value, which may be absolute or relative time, depending on "**Actual Time**" option in "**Temperature Plot**" window. Each curve then occupies a column listing all temperature data on that curve.
Copy	 You can copy the data of the current temperature plot window and paste it in text format into a MS Word, PPT, Excel andTxt file.
Remove	 Select to delete a currently displayed temperature plot from the pop-up menu on the right.
Remove All	 Deletes all temperature plots displayed in the window.
Panning	 Keep pressing left mouse button in the Temperature Plot, and the mouse will turn into a cross shape. Dragging the mouse can pan the curve in four directions.

	A	B	C	D
1	Time	Ar1.Max. (℃)	Ar1.Avg. (℃)	Ar2.Max. (℃)
2	2022-07-28 18:21:43:000	31.8	30.9	31.1
3	2022-07-28 18:21:45:000	31.9	31	31.1
4	2022-07-28 18:21:47:000	31.8	30.9	31.1
5	2022-07-28 18:21:49:000	31.7	30.8	31
6	2022-07-28 18:21:51:000	31.7	30.8	31
7	2022-07-28 18:21:53:000	31.7	30.8	31
8	2022-07-28 18:21:55:000	31.5	30.8	31
9	2022-07-28 18:21:57:000	31.4	30.8	31.1
10	2022-07-28 18:21:59:000	31.4	30.8	31
11	2022-07-28 18:22:01:000	31.4	30.8	31.1
12	2022-07-28 18:22:03:000	31.4	30.7	31

3D Graph

The Fluke SmartView IR can represent temperature distribution of the measured target in 3D graph. The X-axis represents pixel value in the length direction of a thermal image, the Y-axis represents pixel value in the width direction of a thermal image, and the Z-axis represents temperature. The temperature value of each pixel is represented by different amplitudes and colors on Z-axis, as shown in the figure below.



To add a 3D graph:

1. Right-click on a thermal image or on the selected temperature measurement region (circle, rectangle, polygon).
2. Choose "**3D Graph**" from the pop-up menu.
3. Adjust "**Visual Angle**" and/or "**Azimuth**" below 3D graph as needed for the best viewing.

Other Operations on 3D Graph

You can also perform the operations listed in the table below in "**3D Graph**" window by right-clicking the pop-up menu.

Item	Description
Export	**Picture** Export the temperature plot as a picture in .BMP or .JPG format. When selecting it, the software pops up a dialog box, prompting users to input size of the picture. If "**Remember current setting** " is checked, users will no longer be prompted to set the size of the picture ext time when it is exported.
Copy	The current 3D graphics can be copied and pasted as a picture directly into MS Word, PPT, Excel and other image-supporting documents.

Fully-Radiometric Thermal Video Stream

When the Fluke Thermal Imagers are connected via a USB interface to a PC running the Fluke SmartView IR software, a fully-radiometric thermal video stream can be displayed in real time in IR Camera Workspaces.

In the SmartView IR software, measurement tools can be arranged, parameters can be changed, real-time alarms and real-time recording can be enabled, and a temperature plot can be created.

See section *Transfer Fully-Radiometric Thermal Video Stream* for more information on connecting a thermal imager to a PC.

The "IR Camera Workspace" is shown in *Figure 6*.

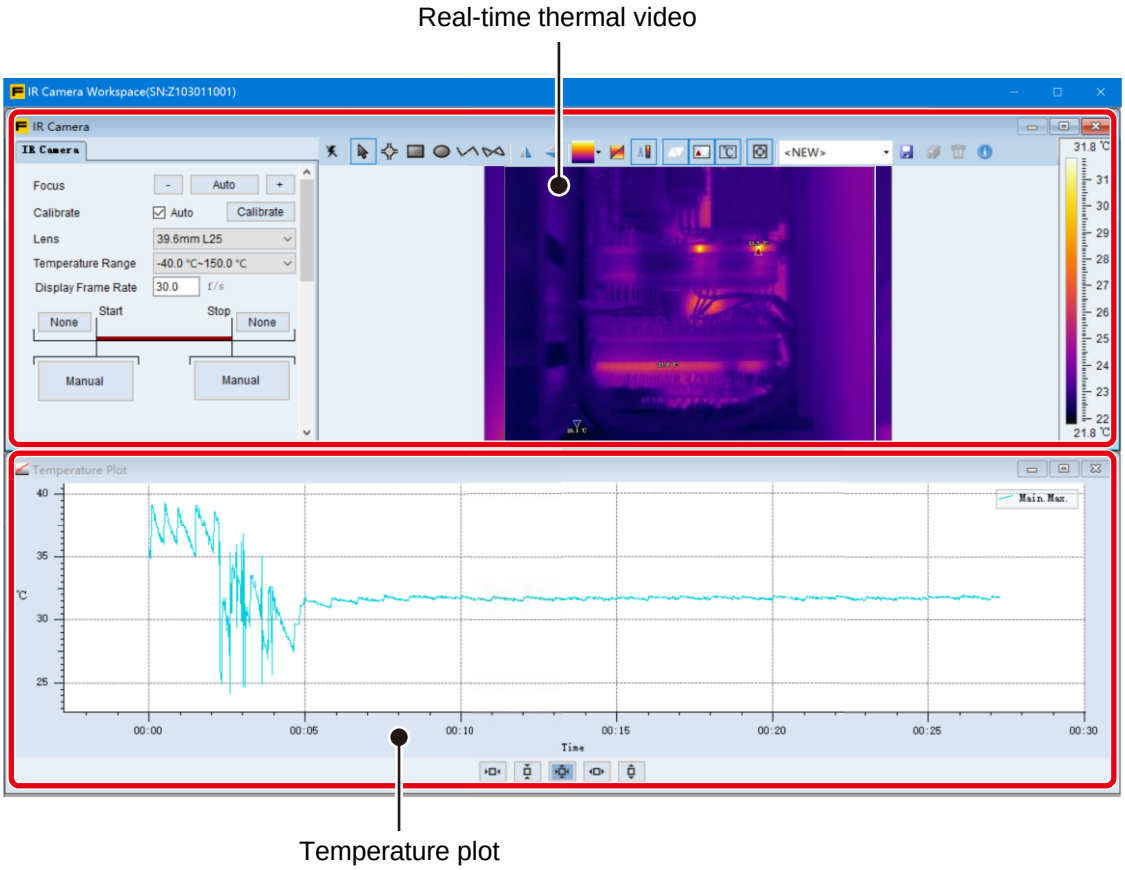


Figure 6. IR Camera Workspace

Similar to “**IR File Workspace**”, “**IR Camera Workspace**” is also a multi-document window, which may contains up to 2 windows:

- Real-time Thermal Video
- Temperature plot

The operation and layout of each sub-window in "**IR Camera Workspce**” is similar to those of "**IR File Workspace**”, please refer to section *IR File Workspaces*.

Real-time Thermal Video

As shown in *Figure 7*, similar to a Thermal Image Analysis window, a Real-time Thermal Video window consists of the following parts:

- Control Panel
- Tool Bar
- Real-time Thermal Video
- Temperature Bar

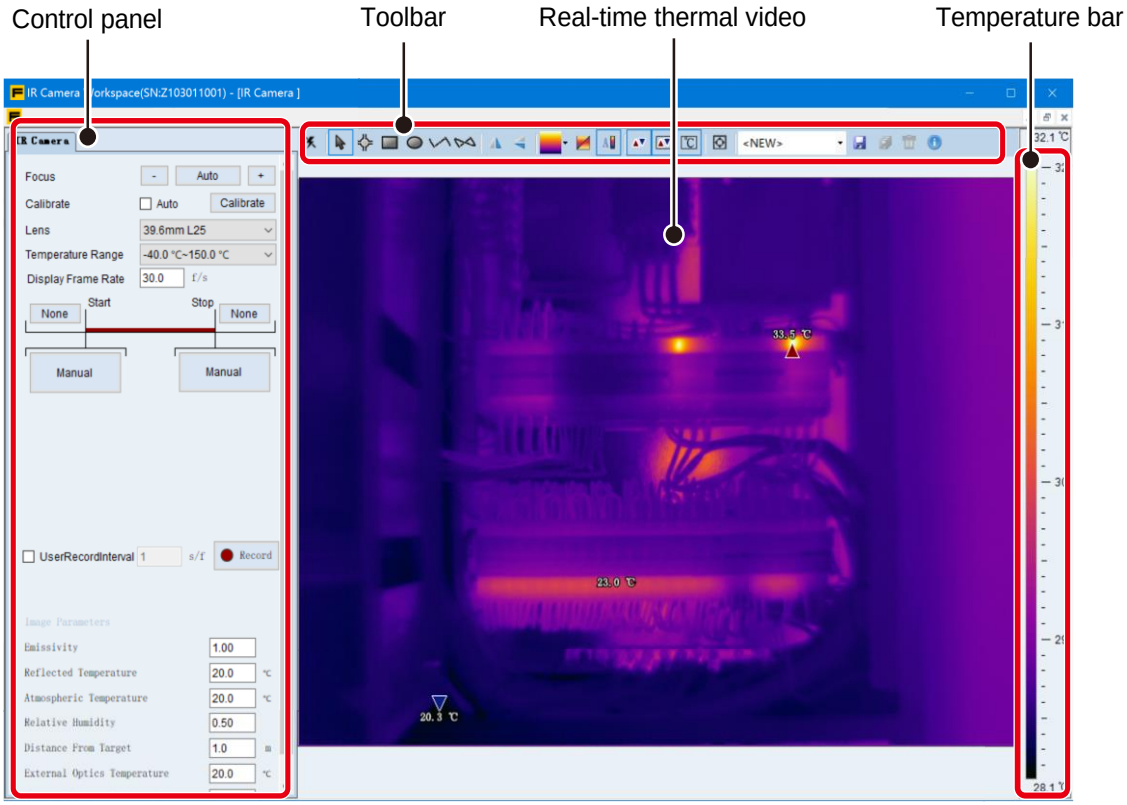


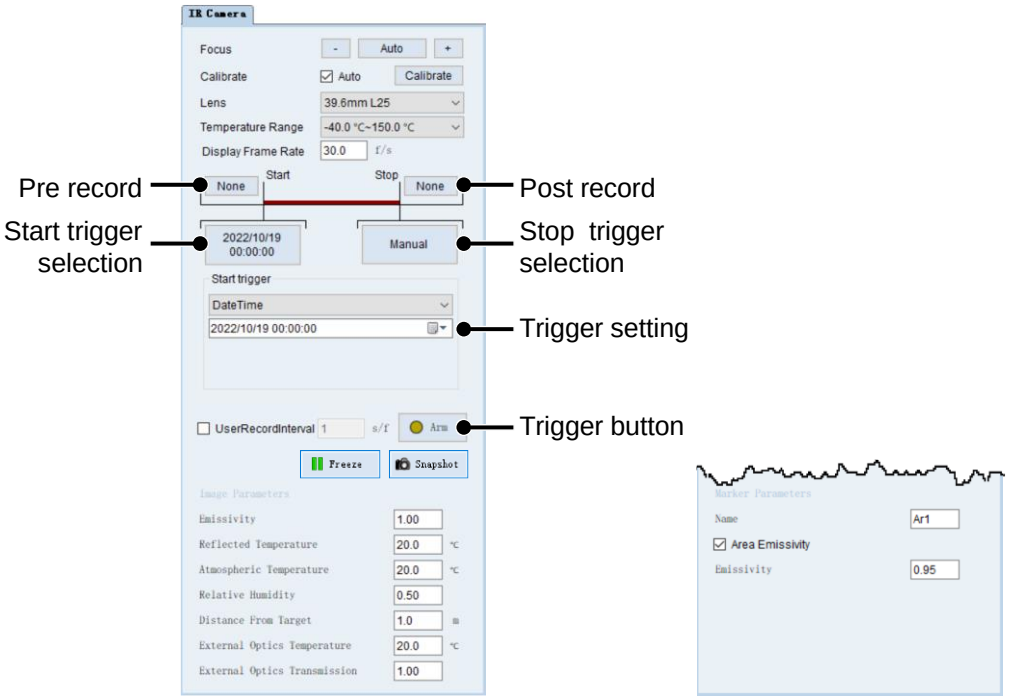
Figure 7. Real-time Thermal Video Window

Most of operations of the toolbar, temperature bar, and control panel in a real-time thermal video window are exactly the same as those of a thermal image analysis window. This section only introduces the operations that are different. See section *Thermal Imager Analysis Window* for more details.

Control Panel

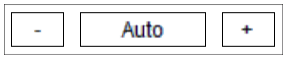
After one imager is connected to the SmartView IR software, the control panel displays parameters of the thermal video and the operations that users can perform, such as focusing, recording and taking pictures.

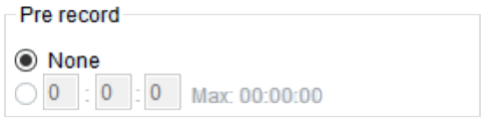
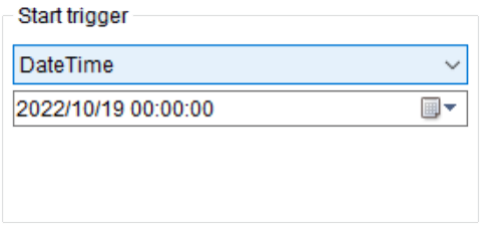
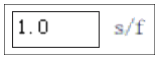
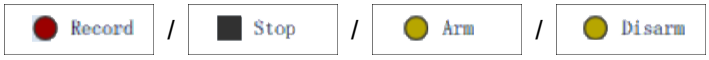
If a temperature measurement region on a thermal video is selected, the name and emissivity of the selected region will also be displayed in "**Marker Parameters**", which can be modified by users according to the actual situation, as shown in the figure below.



Please refer to the table below for meaning and instructions of each parameter on the panel.

Table 4. Thermal Video Parameters and Control Panel

Item	Description
Focus	 Manual focus and auto focus buttons.
Calibrate	 Auto and manual calibration
Lens	The button for selecting a thermal imager lens; it is usually recognized automatically, and can also be manually selected to ensure temperature measurement accuracy.
Temperature Range	The button for selecting temperature range of the thermal imager. Click the drop-down menu to select different temperature ranges to meet the test requirements.
Display Frame Rate	 The frame rate to display a fully-radiometric thermal video; frame rate can be set from 0.1 f/s to the maximum frame rate supported by the thermal imager.
Pre/Post Record	The pre/post record function can be used to automatically record a thermal video with a certain period of time before the start trigger point and/or after the stop trigger point set by users. You can choose not to use pre/post record, or set the length of pre/post record. See the figure below.

Item	Description
	
Start/Stop Trigger Selection	 With the trigger selection button, you can select a trigger mode from 4 trigger modes provided by the system: Manual, DateTime, Duration and Conditional Trigger. You can separately select the same or different trigger modes for starting and stopping video recording. When a trigger mode is selected, the corresponding trigger information will be displayed on the button. In the above figure, for example, the start trigger mode is "**DateTime**", and the stop trigger mode is "**Manual**". Please refer to section *Trigger Mode* for details about the trigger modes.
Trigger Setting	 Depending on the trigger mode selected, the trigger setting area displays setting parameters corresponding to the current trigger mode. For setting different trigger modes, see section *Trigger Mode*.
User Record Interval	 You can customize recording interval, the interval range can be set from 1 s/f to 10000 s/f (it is automatically rounded to an integer).
Manual Trigger	 It is a multifunction button. This button has different functions depending on the currently selected start and/or stop trigger mode, and the current recording state. See section *Trigger Mode* for more information.
Freeze	 The Freeze button will automatically freeze the current screen and pause it.
Snapshot	 The Snapshot button will automatically capture and save the current thermal image with temperature data, which support secondary analysis. The captured thermal image will be automatically saved to the save path specified by users. See section *System Settings* for details.

For information on other parameters and operations on the control panel, see section*Control* Panel in *IR* File Workspacesabove.

Trigger Mode

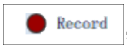
The SmartView IR software provides 4 trigger modes to start and/or stop recording:

- Manual
- DateTime
- Duration
- Condition

You can independently set the trigger mode for starting and stopping video recording as required.

Manual Trigger

Manual trigger is the simplest and most direct trigger mode.

When you click manual trigger 

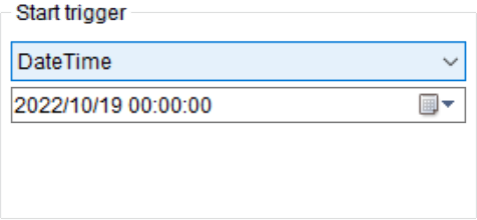
, the software starts recording; When you click 

again, the recording stops.

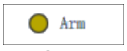
Trigger by DateTime

This trigger mode enables the software to start and/or stop recording at the specified time.

As shown in the figure below, when you select “Trigger by DateTime” mode, a time setting control will be displayed in the trigger setting area. You can enter the DateTime directly into the control, or click  button on the right to select a data, and then manually enter a time.



For Trigger by DateTime:

- If the start trigger is set to Trigger by DateTime, you need to click manual trigger 

to trigger the software to record at the specified time after the start and stop trigger settings are completed.
- After button 

is clicked, the manual trigger changes to 

and remains unchanged until the actual trigger occurs. During this period, you can click button 

at any time to cancel the trigger, that is, to cancel the recording.

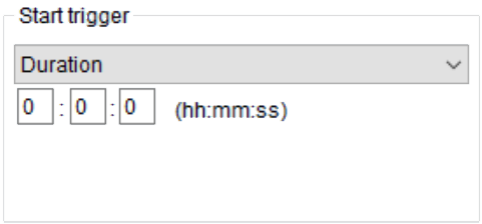
- After the start trigger actually occurs, the manual trigger will change to 

during recording, and you can click it to stop recording at any time, no matter what the current stop trigger mode is.

Duration Trigger

Duration trigger is to start and/or stop recording after a specified length of time.

As shown in the figure below, when you select “Duration” tirgger mode, a time setting control will be displayed in the trigger setting area. You can specify the time length in terms of hour, minute and second.



For duration trigger:

- After the duration is set, you need to click manual trigger 

to enable trigger function correctly.
- The duration is calculated from the moment when you click 

button.
- The time when recording stops is calculated from the moment when the start trigger actually occurs.
- Similar to trigger by "**DateTime**", you can click 

button to cancel the trigger at any time, or click 

button to stop recording.

Conditional Trigger

Conditional Trigger refers to starting and/or stopping recording when the specified conditions are met. The trigger condition is a combination of the 3 conditions below:

1. **Measurement parameter.** The optional measurement parameters include the maximum temperature and the minimum temperature. If no temperature measurement region is selected, it refers to the maximum/minimum temperature of the entire image; If a temperature measurement region is selected, it refers the maximum/minimum temperature of the region.
2. **Conditions.** The optional conditions include that the measured parameter is lower than or higher than the specified threshold, or is between two specified thresholds.
3. **Temperature threshold**. You need to specify one or two temperature thresholds based on the selected condition.

See the figure below.

For conditional trigger:

- You need to set the conditions (the maximum or minimum temperature) and temperature thresholds (select Below, Above or Between, and then set 1 or 2 temperature thresholds as prompted).
- After the condition are set, you need to click manual trigger Arm to enable trigger function correctly.
- Similarly, you can click Disarm button to cancel the trigger at any time, or click Stop button to stop recording.

Record Fully-Radiometric Thermal Videos

It is recommended that you set frame rate before recording a fully-radiometric thermal video.

There are two ways to set the frame rate:

1. If recording frame rate is greater than 1 f/s, you can modify it in "**Dispaly Frame Rate**" 1.0 f/s, ranging from 0.1 f/s to the fastest frame rate supported by the thermal imager.
2. If recording frame rate is less than 1 f/s, you can tick "√" in "**Custom Recording Interval**" 1.0 s/f check box, and value range of the custom recording interval is from 1 s/f to 10000 s/f.

Manual Recording

To manually record a fully-radiometric thermal video:

1. Click "**Record**" button Record to start recording a fully-radiometric thermal video, and the Record button will automatically change to "**Stop**" button Stop;
2. Click Stop button Stop to automatically store the recorded thermal video files to the storage path configured by the system.
3. Complete the recording of a fully-radiometric thermal video.

Recording by Trigger

To record a fully-radiometric thermal video by trigger:

1. Click Start/Stop trigger selection button.
2. In Trigger Settings area, select an appropriate trigger mode.
3. Set start and/or stop trigger conditions as described in section *Trigger Mode* above.

4. Click manual trigger 

and wait for the software to start recording.
5. You can click 

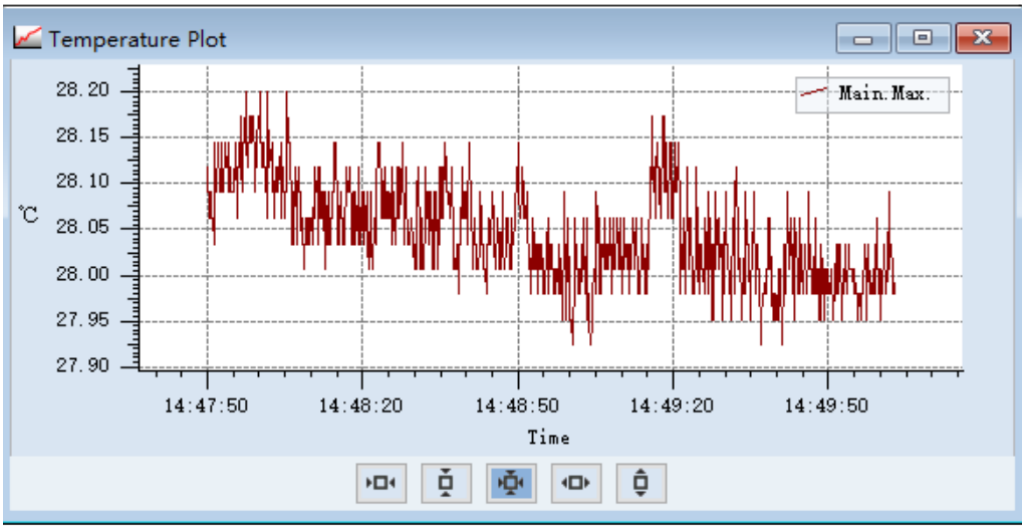
button to cancel the trigger at any time, or click 

button to stop recording and save the video.
6. When the stop trigger condition is met, the software stops recording and stores the thermal video to the storage path configured by the system.

Temperature Plot

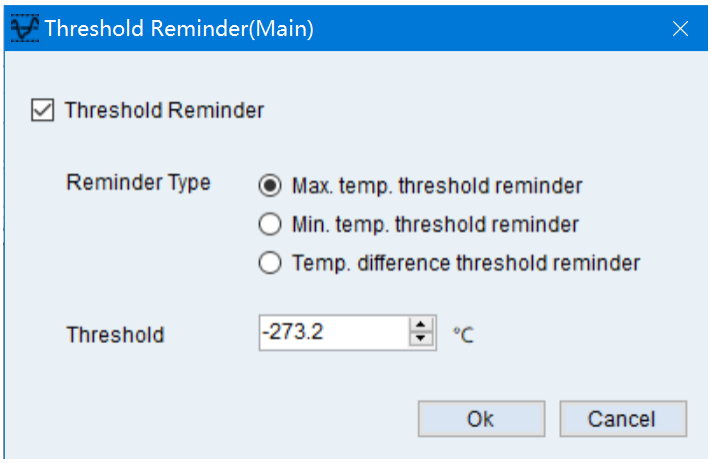
Similar to thermal image file analysis, the Fluke SmartView IR software can also draw a temperature plot of a thermal video in real time. For instructions on adding a temperature plot of a Real-time thermal video, please see section *Temperature Plot* in *Analyze Thermal Image Files*.

As shown in the figure below, the temperature plot of a real-time thermal video is very similar to that of a thermal image/thermal video, the only difference is that the temperature rplot of a real-time thermal video changes in real time.



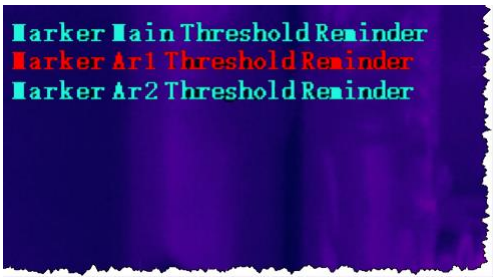
Threshold Reminder

The Fluke SmartView IR software provides threshold reminder in the real-time thermal video window. Users can set threshold alerts for full thermal images or temperature measurement regions. When the target temperature meets the conditions, the PC will emit a rapid "beep" sound, and the text in the upper left corner of the Real-time thermal video will turn red (green when it is not triggered).



There are 3 types of threshold reminder:

1. **Max. temp. threshold reminder**. Alerts when the maximum temperature in the selected region is higher than the set threshold.
2. **Min. temp. threshold reminder**. Alerts when the minimum temperature in the selected region is lower than the set threshold.
3. **Temp. difference threshold reminder.** Alerts when the temperature difference exceeds the set threshold.



To Set a threshold reminder:

1. Right-click on a Real-time thermal video or on the selected temperature measurement region.
2. Select "Threshold reminder" from the pop-up menu.
3. Check “Threshold reminder” check box if it is not checked.
4. Select appropriate alert type from “**Reminder Type**” option group.
5. In "**Threshold**" input box, adjust the threshold using up and down arrows, or enter the threshold directly through the keyboard.
6. Click "**OK**" button to save settings, or click "Cancel" button to cancel the operation.

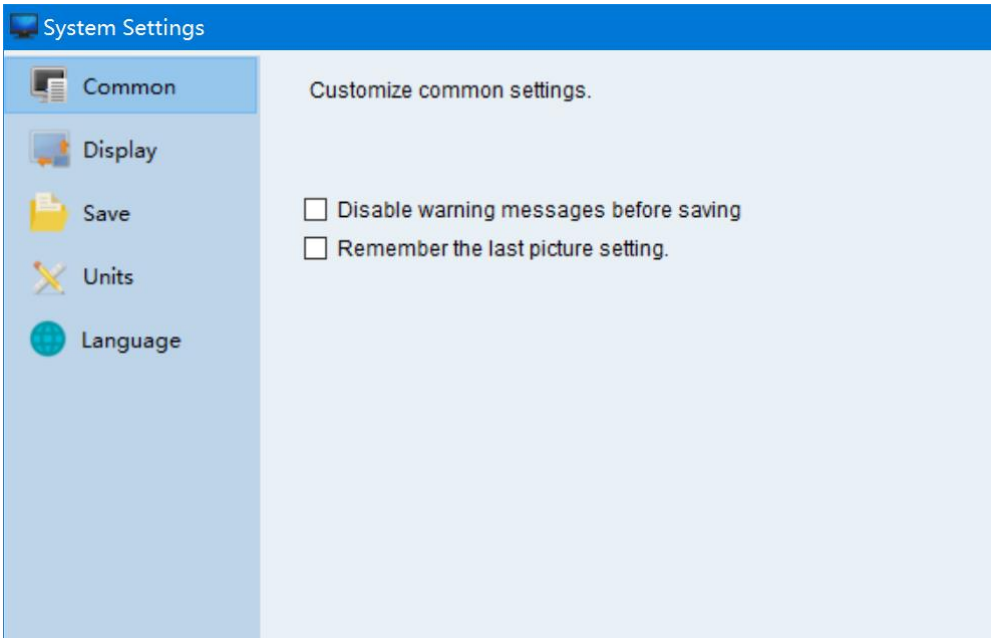
System Settings

It includes some configurations about software environment, display functions and user preferences, which can be modified by users according to their needs.

To go to the System Settings:

- From the main window menu of the Fluke SmartView IR software, select “**Session**” -> “**System Settings**”.

The System Settings dialog is shown in the figure below:



Various configuration items are listed by category in the System Configuration dialog, please see *Table 5* for details.

Click "**Reset Default**" button to restore all settings to their default values.

Click "**Save**" button to save the changes.

Click icon in the upper left corner of the dialog to close the window without saving any changes.

Table 5. System Settings

Item	Description
Common	☑ **Disable warning messages before saving** After it is selected, the system will not pop up a warning message about whether to save the image change (such as a prompt to save when the interface is closed after a temperature measurement spot is added). ☑ **Remember the last picture setting** Remember the last image export settings: save the image size, width and height when exporting an image before.

Item	Description
Display	☑ **Display max. temp. spot of entire image** Automatically capture the highest temperature point of a image ☑ **Display min. temp. spot of entire image** Automatically capture the lowest temperature point of a image ☑ **Display max. temp. spot of measurement tools** Automatically capture the highest temperature point in a temperature measurement region ☑ **Display min. temp. spot of measurement tools** Automatically capture the lowest temperature point in a temperature measurement region ☑ **Display max. temp. value of measurement tools** Display temperature value of the highest temperature point captured automatically in a temperature measurement region ☑ **Display min. temp. value of measurement tools** Display temperature value of the lowest temperature point captured automatically in a temperature measurement region ☑ **Display average temp. value of measurement tools** Automatically calculate average temperature in a temperature measurement region and displays the value next to the marker ☑ **Display temp. differrence of measurement tools** Automatically calculate the maximum temperature differrence (the highest temperature value - the lowest temperature value) in a temperature measurement region, and display the value next to the temperature measurement region. ☑ **Display max. and min. temp. value of flying spots** The maximum/minimum temperature value is displayed next to the highest/lowest temperature point. If it is not checked, they will be displayed next to the temperature measurement region. ☑ **Automatically adjust label position** Automatically adjust display position of temperature values according to the position of temperature points to ensure no overlap. If it is not checked, they will be displayed above the temperature measurement region.
Save	**File Location**

Item	Description
	The hard disk path for saving thermal images or fully-radiometric thermal videos. ☑ **Display color palette** When it is checked, thermal images saved contains the Temperature Bar of the palette. - **Inside image.** The palette's Temperature Bar is saved inside the image as translucent. - **Outside image.** The palette's Temperature Bar is kept outside the image. ☑ **Customize image size** You can customize image size when saving it, and customize the width and height pixels of a thermal image, which will only change the size of the image displayed and will not affect the actual number of temperature measurement pixels.
Units	**Temperature Units** - Celsius - Fahrenheit - Kelvin **Distance Units** - Meter - feet
Language	- Auto - English (United States) - 中文(简体)

Create and Customize a Report

The SmartView IR software will generate a report using the default report template. See section *Set/Cancel Default Templates* for more information about how to set the default report template.

Create a Report

To create a measurement report:

1. Right-click on a thermal image analysis window or thermal video window (not a temperature measurement region) and choose "**Export**" -> "**Report**"; or directly press the button “Report” on the control panel to open the report editing window, where you cank edit the report content.
2. The software displays a preview of the report in "**Report Template: XXX**" (where XXX indicates the name of the report template). See the figure below.

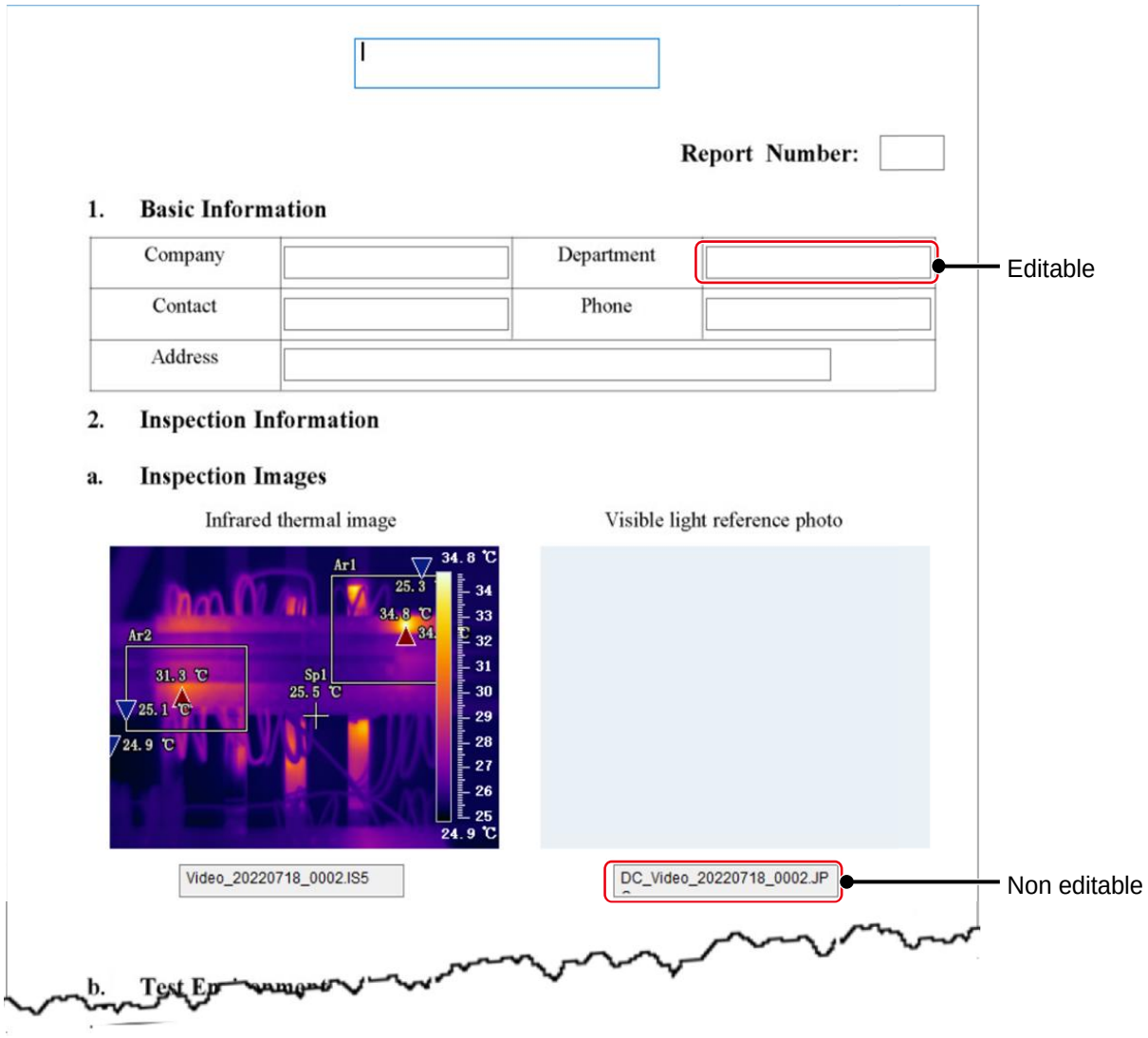


Figure 8. Report Example

On a report page, as shown in the figure above, the input box with white shading is editable, and users can fill in/edit it as needed; the content in the input box with gray shading is automatically generated by the software and cannot be edited.

3. After making necessary edits on the report page, click "**OK**" button.
4. In "**Save As**" dialog, select an appropriate path and enter a file name, then click "**Save**" button.
5. After the software saves it successfully, a message is displayed indicating that it is saved. Click "**OK**" button. The report preview view automatically closed.

Customize a Report Template

In addition to the 2 standard templates included with the Fluke SmartView IR software, you can also add and delete templates as needed, edit existing templates and export them for other users, or import templates from files provided by other users.

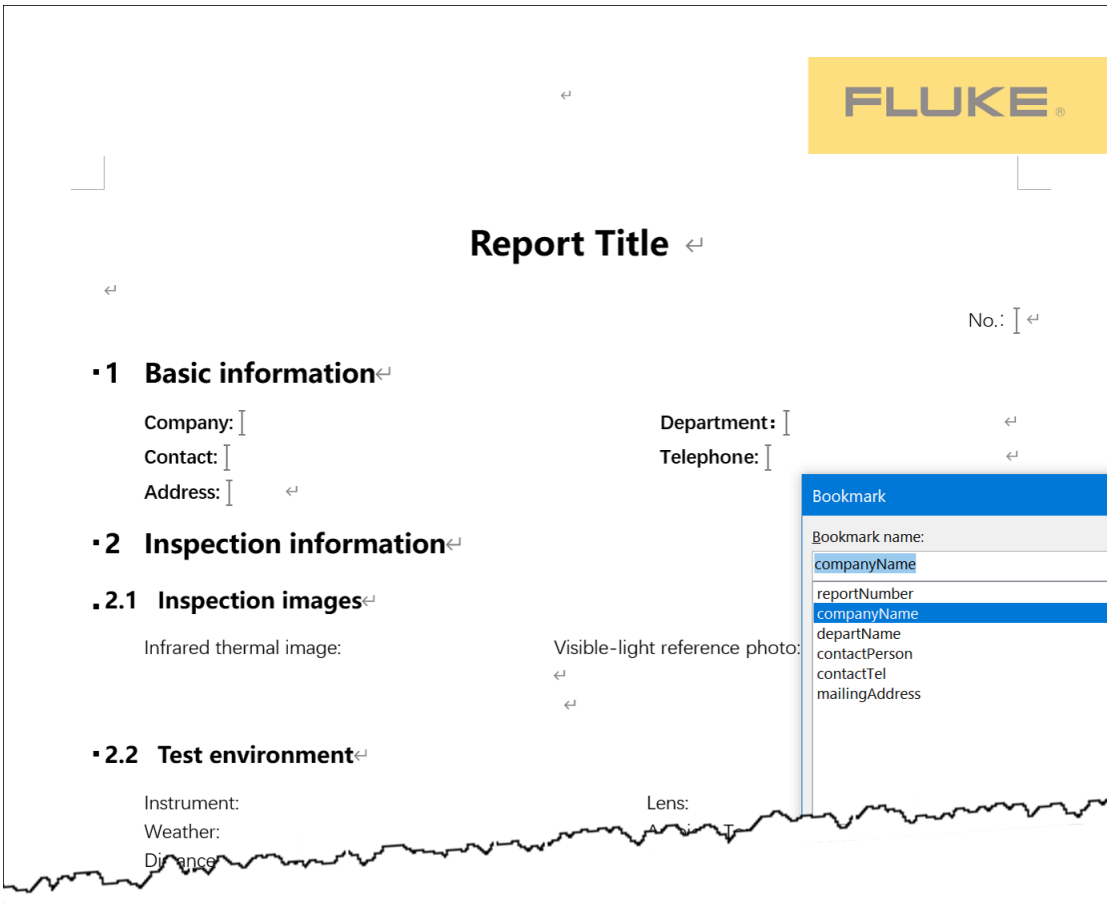
Preparation

The appearance and format of user-defined templates depend entirely on user-defined WPS Word files or Office Word files. The SmartView IR software inserts corresponding data or information into the template through the bookmarks defined by the user in the Word file, and finally generates a formatted report.

Use Microsoft Office Word as an example to describe how to create a template file below. For detailed instructions on how to use the Microsoft Office Word program, see its Help information.

To create a Word document as a template file:

1. First, create a new formatted Word file in your Microsoft Office Word application. Except for the space for information or data that you want the SmartView IR software to insert and the part for content filled in by users when generating reports, other parts can be formatted as needed. For example, add your company logo, various titles, descriptive text, etc.
2. Insert bookmarks in Word files at locations where the software is required to insert information or data, and at locations where the content filled by users when generating reports. As shown in the figure below, bookmarks have been inserted after "**Company**", "**Department**", etc.



Note

In order to check the position of the inserted bookmark easily, it is recommended to enable the label display function in Microsoft Office Word: File ->Options ->Advanced ->Show Document Content ->Show Bookmark. A placeholder is displayed at the location where the bookmark is in the document.

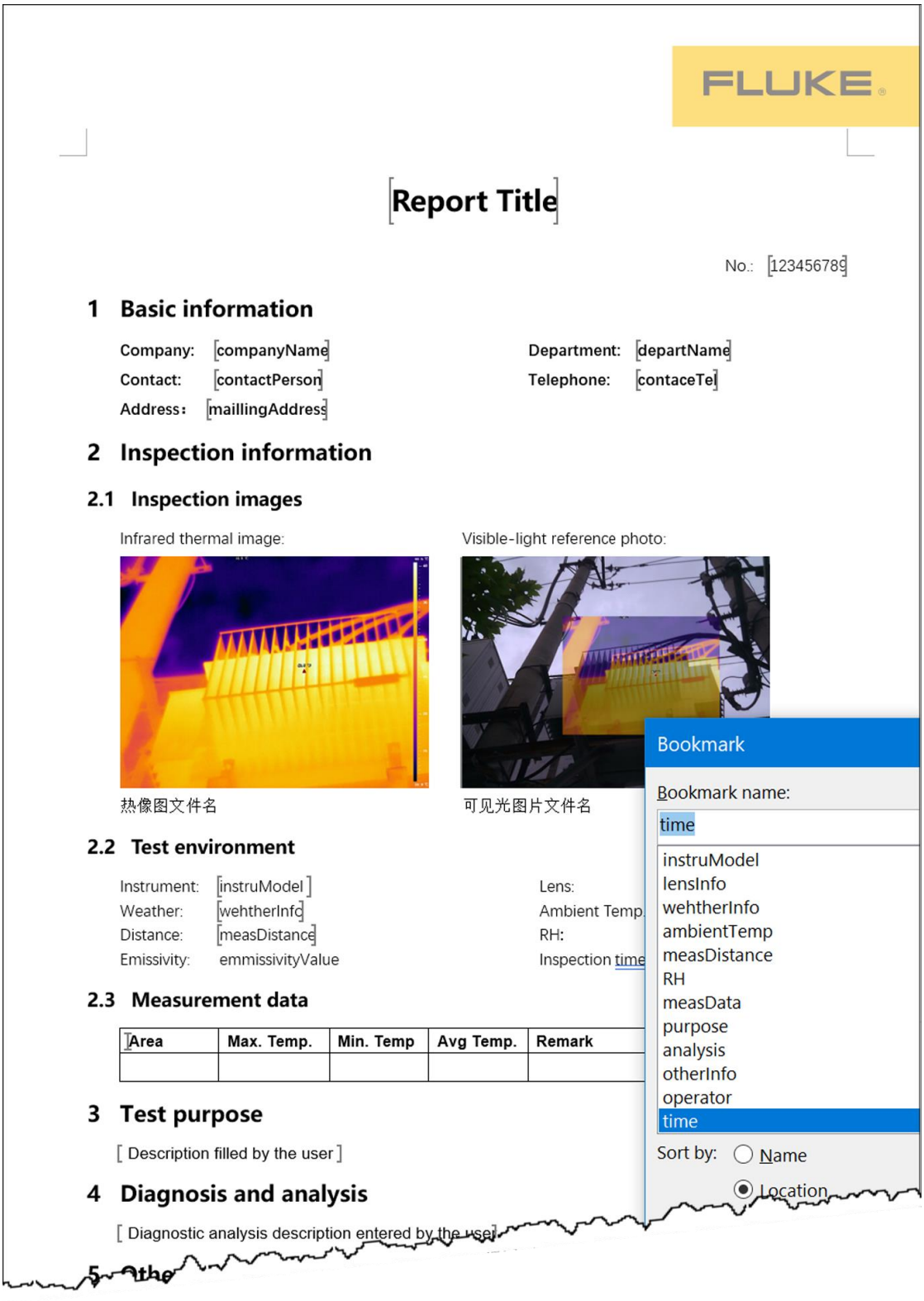
For instructions on adding a bookmark, see the figure below:

- To facilitate formatting and for aesthetic considerations, it is better to enter the corresponding content as a placeholder at the location where the bookmark is to be inserted and set its format. Then select the content with the mouse and add a bookmark with the "**Insert a Bookmark**" command in Office.
  The bookmark appears as a pair of brackets, with the selected placeholder inside them. When generating a report, the SmartView IR software will replace the content in the brackets with the data or information that is specified. For example, text such as "**Report Title**" and "**CompanyName**" in the figure below will be replaced with what the user entered when generating the report.
- To ensure that the picture inserted by the SmartView IR software works as expected and to avoid formatting errors, insert a picture in advance as a placeholder at the location where a picture needs to be inserted and set its size. Then select the picture and use

"**Insert a Bookmark**" command in Office to add a bookmark. Please see the infrared thermal image and the visible light reference photo in the figure below.

- If you want to insert temperature statistics of the entire image or a region, add a table to your Word file. The table should contain at least two rows: a header row and a blank row. The number of columns in the table can be set as needed to match the desired amount of data. See section *Property Settings for Data Table* for details. See "**Measurement data**" in the figure below.
  To bookmark a table, position the cursor in the upper-left cell of the table, and then use "**Insert Bookmark**" command in Office to add a bookmark.
- The bookmark name can be set based on your preferences. To facilitate memory, try to set the bookmark name to the same as the placeholder.

The Word document is similar to the file in the figure below.

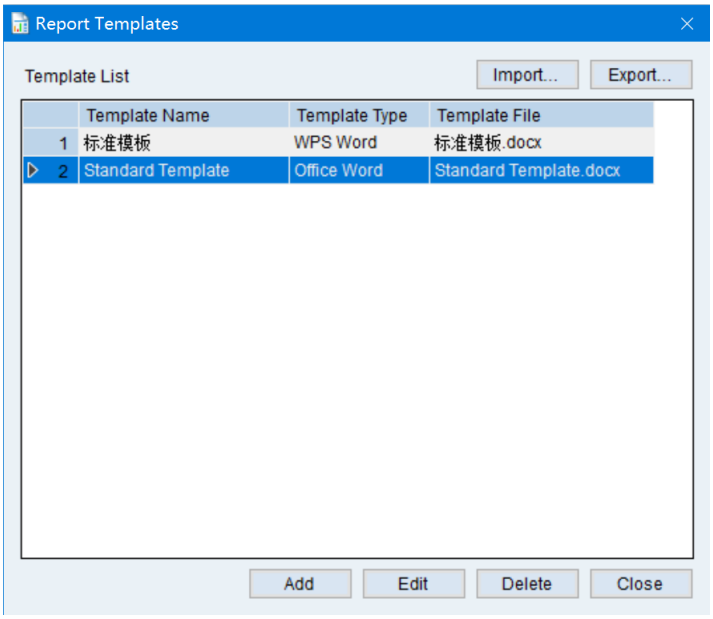


3. Save the Word document. The supported formats include .doc, .docx, .dot and .dotx. For example, it is saved as "Transformer Inspection Report. docx".

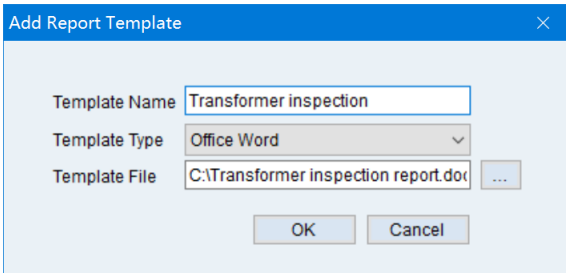
Add a Template

When users need report formats for specific purposes, they can add corresponding report templates by following the steps below:

1. From the menu in the SmartView IR's main window, select **Tools**->**Report Templates**. The dialog below is displayed.



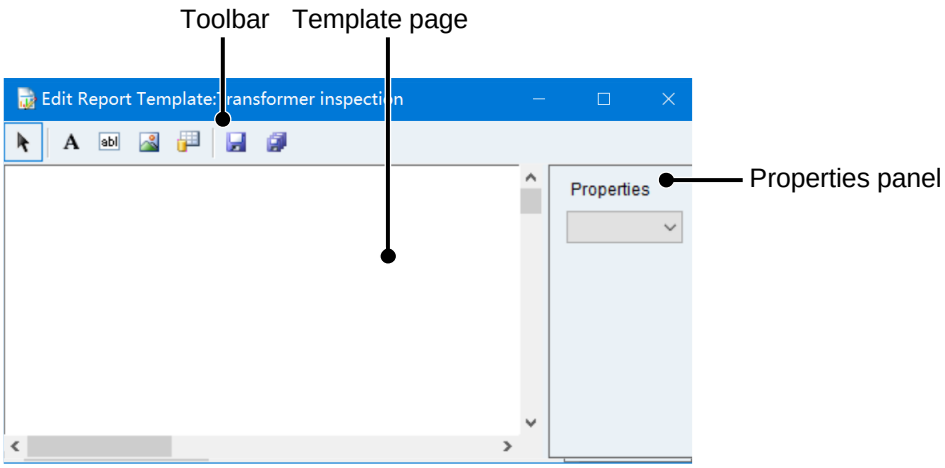
2. In "**Report Templates**" dialog, click "**Add**" button at the bottom. The dialog below is displayed.



3. In "**Add Report Template**" dialog, enter a "**Template Name**" that is easy to remember, such as "**Transformer inspection**";
   Set Template Type to "**Office Word**" or "**WPS Word**" based on the word processing software used;

4. Click ··· button to the right of the "**Template File**" input box, and select the Word document prepared earlier, such as "Transformer Inspection Report.docx", and click "**OK**" button.

   The Edit Report Template window is shown in the figure below, including toolbar, template page and properties.



Toolbar

The toolbar provides the tools required for customizing reports.

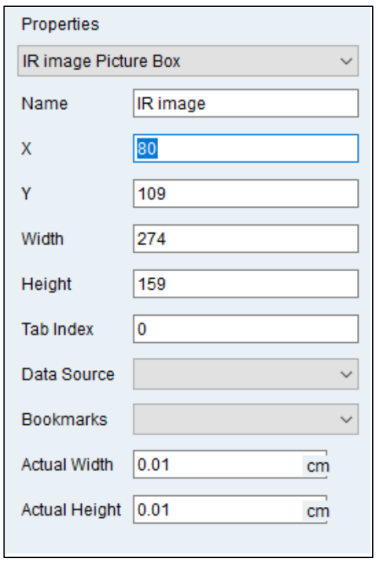
Item	Description
	**Arrow** It is used for users to select controls on the template page. After a control is selected, hold down the left mouse button to move the control up, down, left, or right. When the mouse is hovered over a control, it will change to  , click it to select the control. Click and hold left mouse button on a control to move it by dragging. When the mouse is hovered over control points of the selected control, it may change to  , ,  ,  . Then click and hold left mouse button and drag to move the control.
	**Label** After the tool is selected, when the mouse moves over the template page, it changes to  . To create a label, click and hold left mouse button on the upper left corner of the corresponding region, then drag it to the lower right corner, and release the mouse button after reaching the corresponding position, that is, a label control is created on the template page, as shown in the figure below. The label is also marked with control points at its four corners. Click on other position in the template page, control points of the label disappear, indicating that the label is not currently selected.  The background color of the label control is light cyan, in which the "text" of the label is displayed, such as "label1" in the Figure above.
	**Text Box** After the tool is selected, when the mouse moves over the template page, it changes to  .

Item	Description
	Similar to the method of creating a label, you can create a text box on the template page with drag-and-drop. as shown in the figure below.  The text box control has a light yellow background and black borders, as shown in the Figure above.
	**Picture Box** After the tool is selected, when the mouse moves over the template page, it changes to  . You can create a picture box on the template page in the same way you create a label or text box. as shown in the figure below.  The picture box control has a light cyan background with no text content.
	**Data Table** After the tool is selected, when the mouse moves over the template page, it changes to  . Similarly, you can create a data table on the template page with drag-and-drop, as shown in figure below.  The data table control has a dark gray background and black borders, as shown in the Figure above.
	**Save** Save a template. If you do not want to save the changes to the template, you can directly click  in the upper right corner of the window and click “No” in the pop-up dialog box.

Properties

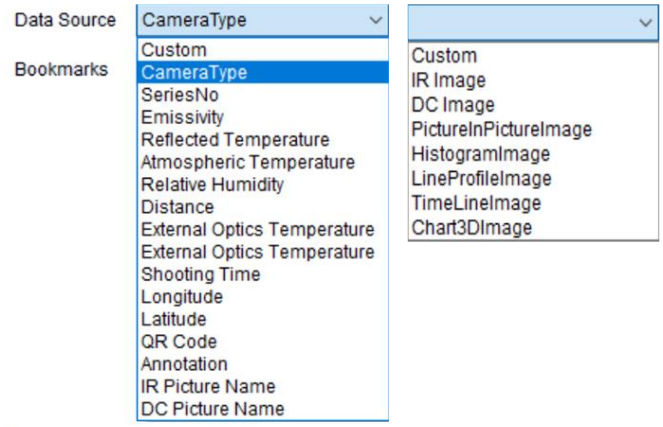
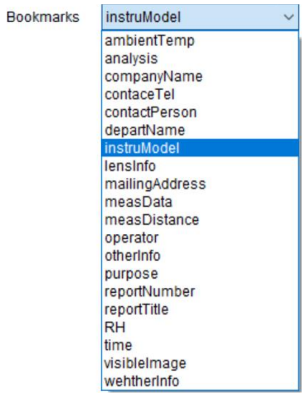
When you select a control with the mouse or select a control from “**Properties**” drop-down list, the properties of the control will be displayed.

The content displayed in the Properties varies depending on the type of control currently selected (label, text box, picture box, data table). For example, the figure below shows the properties of a picture box control.



The meanings of properties are shown in the table below.

Item	Description
Control list	In the control list of the Properties, all controls in the template page are listed in the form of "control name+control type". For example, "IR Image Picture Box" in the list, where "IR Image" is the user-defined control name, and "Picture Box" means that the control is a picture box.
Name	**Control name** You can customize the control name, mainly for easy memory and recognition.
X	**X coordinate of the control** Represents the horizontal position of a control on the template page. Generally, you don't need to enter this value, you can just drag a control on the template page to the desired location; If you need to align multiple controls, you can enter an exact X coordinate value in this input box.
Y	**Y coordinate of the control** Represents the vertical position of a control on the template page. Generally, you don't need to enter this value, you can just drag a control on the template page to the desired location; If you need to align multiple controls, you can enter an exact Y coordinate value in this input box.
Width	**Width of a control** The horizontal length of a control. Generally, you don't need to enter this value, you can just drag a control on the template page to the desired width; If you need to align multiple controls, you can enter an exact width value in this input box.
Height	**Height of a control** The vertical height of a control.

Item	Description
	Generally, you don't need to enter this value, you can just drag a control on the template page to the desired height; If you need to align multiple controls, you can enter an exact height value in this input box.
Tab index	**Sequence number of a control** Generally, when you add a control, the software automatically generates a sequence number for each control (except the label), and you can also modify it as needed. When generating a report, you can press Tab on the keyboard to select each control in order by tab index, so that you can enter values or text in a certain order. It starts from 0.
Data Source	Data or information that the system can automatically obtain from a thermal image file. The figure below shows the data sources available for text box controls and picture boxes respectively. 
Bookmarks	Bookmarks added by users in Word files used as templates. The SmartView IR software can automatically identifies the bookmarks in the selected Word file and list them all in the “Bookmarks” list. The figure below shows all bookmarks in the Word file created in section *Preparation*. 
Actual Width	**The actual width of the inserted picture.** This property applies the picture box control. It refers to the actual width of the inserted picture on the template file, regardless of the width and height of the picture box.

Item	Description
Actual Height	**The actual height of the inserted picture.** This property applies the picture box control. It refers to the actual height of the inserted picture on the template file, regardless of the width and height of the picture box.
Column	**Columns of the data table** For a data table control, you can use this button to define the columns of a data table. See section *Property Settings for Data Table* for details.
Include Main Marker	This option determines whether to include the global data of a thermal image in the data table. If this option is unchecked, the table will only contain the data of each temperature measurement region defined by users.

5. Create controls.

   Use the tools provided on the toolbar to create controls on the template page. The position and size of the control are not so important for the time being. Taking the template created in section "*Preparation*" as an example, we create a text box and set its name as "**Device**". We want the text box to show the model of the thermal imager that captured the thermal image.

6. Link the control's "**Bookmarks** to "**Data Source**".

   Make sure that the newly created text box control "**Device**" is selected. Click "**Data Source**" drop-down list in Properties, and select "**CameraType**".

   Click "**Bookmarks**" drop-down list and select "**instruModel**".

   We linked the bookmark "**instruModel**" in Word file to the "**CameraType**" from a thermal image file. When generating a report, the SmartView IR software will insert the "**CameraType**" of the imager used to capture thermal images at the location of the bookmark "**instruModel**".

   When creating controls and linking data sources to template bookmarks, please follow the guidelines:

   - The position and size of each control will not affect generating the final report. As long as it does not affect the user's operation and understanding, the position and size of each control can be set at will.
   - For "**Label**" control, you can set its "**Text**" and display it in the centre of the control. However, the "**Label**" control only appears in the preview of a report and is not actually displayed in the generated report.
   - For data or information that needs to be automatically inserted by the software, create a "**Text Box**" control and link its bookmark to the corresponding data source.
   - For text information that needs to be filled in or entered by users when generating reports, create a "**Text Box**" control and bookmark it to the data source "**Custom**", which means that users will customize the text when generating reports.
   - If you want the software to insert pictures automatically, create a "Picture Box" control and set its properties "**Actual Width**" and "**Actual Height**" correctly.

Note

To determine the appropriate width and height of a picture, you can insert a picture as a placeholder when creating a Word file, and set its size according to the layout requirements. Right click the picture, and then select "Size and Position". In the "Layout" dialog box, select "Size" tab to view the height and width of the picture. Take these 2 values as the "Actual Height" and "Actual Length" of the "Picture Box".

- For linking a data table, see section *Property Settings for Data Table* below.

Property Settings for Data Table

The "Data Table" control is used to list temperature data of the entire image or each temperature measurement region in the form of a table, and allows users to input customized text information.

To set data table properties:

1) Create an appropriately sized "**Data Table**" control on the template page.
2) With the "Data Table" selected, select the corresponding bookmark of the Word template from the "**Bookmark**" list in Properties, such as "**Measurement data**" in the above example.
3) Click "**Column**" button.
4) In "**Edit Columns**" dialog, click "**Add**" button. The software adds a column to the "**Selected Columns**" box and automatically names it "**Column1**".
5) You can modify the "**Name**" and "**Title**" of the column as needed. The"**Name**" works the same as the "**Name**" of other controls. The "**Title**" will be used as the header for that column in the table.
6) Select data source for this column from "**Data Source**" list. The meaning of the data source is similar to that of other controls.
7) Repeat steps 4) to 6) according to the required number of columns until all columns of the table defined in the template file are created.

   To delete a column, select it in "**Selected Columns**" box and click "**Delete**" button.

   You can adjust the order of a column in the table by using ↑ (up) or ↓ (down).
8) Click "**OK**" button. The created "Data Table" is similar to the table in the figure below.

	ROI	Max. Temp.	Min. Temp.	Avg. Temp.	Remark
▸*					

9) If you want to contain the data of an entire image in the data table, select option "**Include Main Marker**".

Note

For "Data Table" controls, you do not need to care about the number of rows in the table. The SmartView IR software will automatically expand the number of rows in the table based on the current number of temperature measurement regions.

7. For each bookmark in the report template, repeat step 5 to 6 until each bookmark has a data source (including "**Custom**").
8. Click "**Save**" button  , then close "**Edit Report Template**" window and return to "**Report Templates**" dialog box.
9. In "**Template List**", you will see the newly added template, such as the "**Transformer Inspection**" template in this example.

Report Preview View Formatting

In principle, when editing a report template, as long as the template bookmark is properly linked to the data source, a formatted report can be generated, regardless of the position of each control on the template page. However, in order to facilitate the creation of controls, ensure the correct link to data source, ensure the correct input of text information, and ensure the consistency between the preview view and the actual report, it is recommended that users add a screenshot of Word template as a background image to the template page when editing it. You can then add each control and set its layout by referring to the background.

Add a Background Image

1. Right click on the blank area of the template page, and then select "**Choose Background Image**" from the pop-up menu.
2. Specify the screenshot of a Word template file (.jpg, .jpeg, .bmp, .png and .gif are supported), and click "**Open**".

Import/Export Templates

To export an existing report template for other users, select it in "**Template List**" and click "**Export**". The software exports the template as a .zip file.

Copy the .zip file to another computer. The template can also be imported by clicking "**Import**" on "**Report Templates**" dialog box, and the template name and settings remain unchanged.

Set/Cancel Default Templates

To set a template as the default template for generating reports, or cancel to use the current default template, select the corresponding template in "Template List", right-click on the template and select "**Set as Default**" or "**Clear Default**" from the pop-up menu.