TI Studio Temperature Analysis Software

User Manual v1.1.7

RayThink Technology Co.,Ltd.

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Special Statement

When using the software, please strictly adhere to applicable laws and regulations regarding the use and maintenance of monitoring interfaces. The use of the software for illegal purposes or for listening in on others' privacy constitutes illegal monitoring.

Symbol Convention

In this document, the following symbols may appear, and their meanings are as follows:

Explanation, prompt symbol: Provides necessary supplements and explanations to the main text.

Caution, Attention: General warning symbol, reminders for operation.

Version Information

Version	Date	Update Contents
V1.0.0	2024-07-01	Initial creation
V1.0.1	2024-08-07	1. Update the definition and related functions of "Local Resource Library - Material Collection" in section 2.3.5 Gallery; 2. Update the "Dynamic Import" function in the "2.3.6 Offline Analysis" section to include the ability to directly import resources from external devices such as USB drives or mobile devices into the offline analysis module for measurement and analysis; 3. Compatible with new device TN220
V1.0.2	2024-10-21	1. Compatible with IX2 compatible with UVC interface; 2. Add "regional focus" function to the online and offline analysis modules
V1.0.3	2025-01-07	1. 2.3.2.3 Online analysis, real-time temperature curve supports up to 30 minutes; 2. 2.3.7.1 System configuration, add "preference configuration"; 3. Online and offline analysis modules, with the addition of the "S-Smart" function in the "Analysis Tools"; 4. 2.3.5.2 Gallery - Resource Preview, added "Composite Panorama" function.
V1.0.4	2025-02-27	1. Provide additional information on the range of values for the five environmental parameters; 2. Delete section 2.3.7.2 on password control
V1.1.1	2025-04-08	1. Online and offline analysis modules, supporting up to 10 "difference temperature measurement rules"; 2. Compatible with TN460U; 3. Temperature measurement analysis report, adding a "cover page", providing built-in cover page templates and supporting customization. Support exporting reports in both TMR private format and PDF format. The TMR format report can be imported into the software for further editing and secondary analysis of the images in the report. 4. Add 2.3.8 AI Assistant -- Raya

V1.1.2	2025-06-25	Update the content of the "Temperature Analysis Report Component" in section 2.3.6.1.4, adding "Ordinary Table", expanding the "ROI Temperature Information List", "Remarks Information", and "Ordinary Text" component attributes
V1.1.3	2025-07-17	1. "2.3.7 Temperature Measurement Analysis Report" supports exporting Word format reports; 2. Compatible with TL1280; 3. Revise the content of "2.2.2 Material Secondary Analysis Usage Process"
V1.1.5	2025-09-10	1. Compatible with RG630; 2. The "2.3.6.2 Offline Video Analysis" module supports the analysis of "videos containing gas information" captured by RG630
V1.1.7	2025-12-18	1. Compatible with TF1280; 2. In the sections "2.3.2.3.2 Online Analysis - Analysis Tools" , "2.3.6.1.3 Offline Image Analysis - Analysis Tools" and "2.3.6.2.3 Offline Video Analysis - Analysis Tools", add the "Super-Resolution" feature; 3. In the section "2.3.5.2 Gallery - Resource Preview - exporting temperature data", add the function to "Export temperature data of all measurement areas in the selected image(s) to a CSV file"; 4. In the sections "2.3.6.1.3 Offline Image Analysis - Analysis Tools" and "2.3.6.2.3 Offline Video Analysis - Analysis Tools"， add the function to "Export temperature data of measurement areas to a CSV file.

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1 Overview

1.1 Product Introduction

TI Studio Temperature Analysis Software , abbreviated as TI Studio, is a PC-based temperature analysis tool designed to be compatible with various series of industrial temperature measurement thermal imaging cameras manufactured by RayThink Technology. TI Studio provides clear image presentation, precise temperature measurement, comprehensive analysis tools, flexible alarm and linkage mechanisms, as well as multi-dimensional data acquisition and comprehensive statistical analysis. With its simple and efficient operation, TI Studio is widely used in industrial temperature measurement, experimental analysis, and other scenarios.

1.2 Software Operating Environment

Category	Configuration Requirements
Operating system	64-bit Win7, 64-bit Win10(recommended),64-bit Win11
CPU	Intel i5-9500 or above
Memory	8GB or above
Hard disk	100GB or above
NIC	Gigabit Ethernet Card
Display	1920*1080 or higher resolution
Others	Output audio

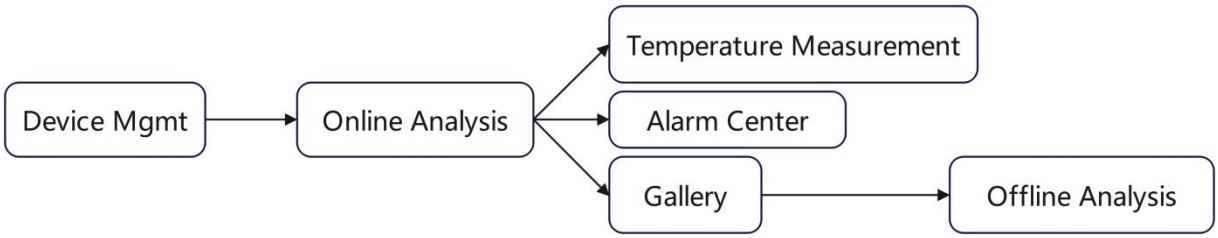
1.3 Supported Hardware Products

Device Type	Specific Device Models
Online device	TN200：TN220 TN400：TN430, TN460, TN460U TN401：ATR31U, ATR61U TN600：ATR31, ATR61 TN601：ATR1280(Ethernet port)
Handheld device	RM200, RM305, RM315, RM320, RM600, RM620, CX200+series, RT400, RT630, RS600, RS1280, RG600, RG630, IX2

Thermal imaging modules	TAX6, TLX2, TLX3, TLX6, TLXS, ATR1280(USB port), TL1280, TF1280
IO device	MOXA, TASTEK(IO-231R)

2 Software Usage Instructions

2.1 Module and Function Overview



Name	Function Description
Device Mgmt	1.The management ledger for "Online Devices" only supports searching for “devices within the same LAN according to the "RayThink proprietary protocol". 📖 **"Online Devices" must be added here first before they can be previewed in the "Online Analysis"**. 2.The management ledger for "IO Linkage Relay Devices". When configuring "IO alarm linkage for temperature measurement rules" in the online analysis, it is necessary to associate with the IO devices maintained here. 📖 **"IO Linkage Relay Devices" must be added here first before they can be associated in configuring alarm linkages.**
Online Analysis	1.Real-time preview and multi-dimensional analysis can be conducted on the "Online Devices", "Handheld Devices", and "Core Devices" listed in section "*1.3 Supported Hardware Products*". 2.Basic attribute information for "Online Devices" and "Core Devices" can be configured.
Temperature Measurement Center	Display and statistical analysis of temperature data collected by the "Online Analysis".
Alarm Center	Real-time reception and display of alarm data generated by the "Online

	Analysis", with the ability to query historical alarm information.
Gallery	Centralized management of images and videos used for secondary analysis, sourced from the following: 1.Images captured and videos recorded during real-time preview in the "Online Analysis" . 2.Images and videos captured on handheld devices.
Offline Analysis	Perform multi-dimensional secondary analysis on images and videos with temperature data. Customize analysis report templates and quickly export temperature analysis reports.
Temperature measurement report	Generate a temperature analysis report for images with temperature data, provide a report editor, and modify the content and style of the report in a "what you see is what you get" manner.

2.2 Main Workflow

2.2.1 Workflow for Online Devices

2.2.1.1 Modify PC IP Address

Before connecting online devices through the TI Studio software, ensure that the PC and the device are on the same local area network (LAN).

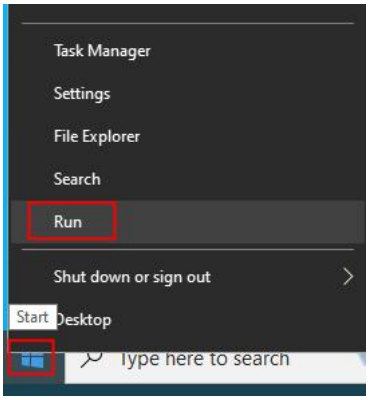
The default IP, username, and password are as follows:

Device Type	Default IP	Default Account/Password
TN200	192.168.1.123	admin/admin
TN400	192.168.1.123	admin/admin
TN401	192.168.1.29	888888/888888
TN600	192.168.1.123	admin/admin

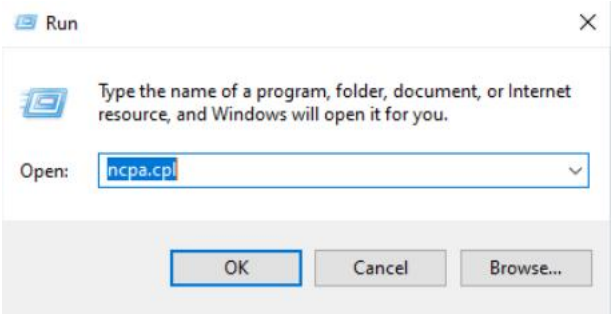
*If there are any changes, please contact technical support personnel.

Below is the method to change the IP address on a PC running "Windows 10 Home Chinese Edition"

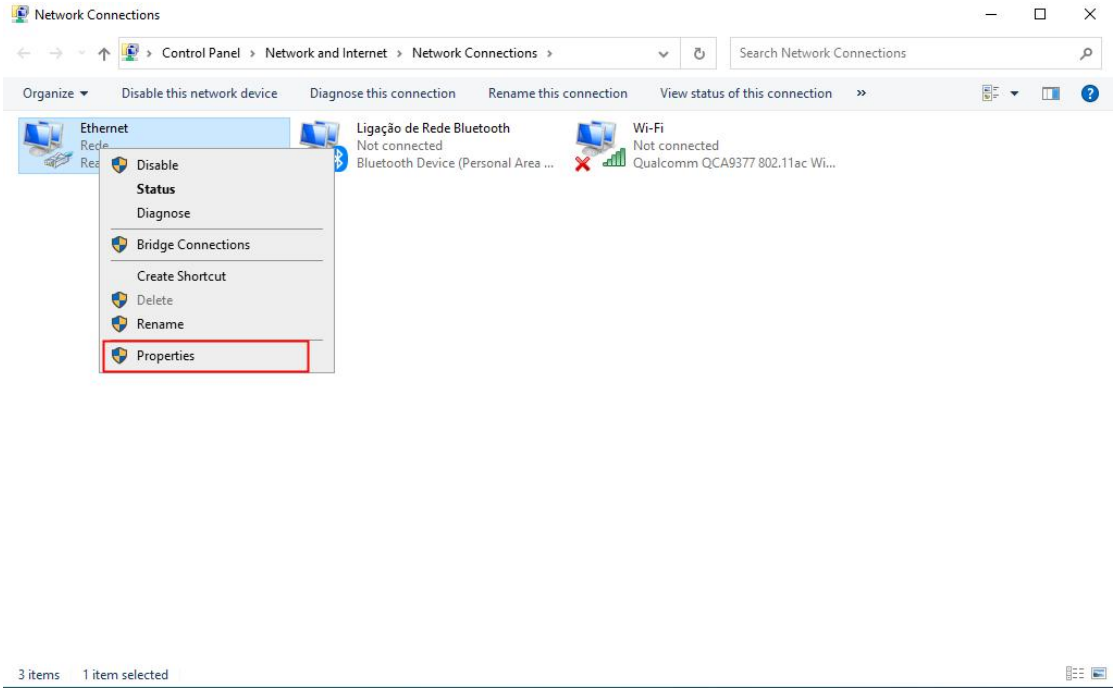
1. Right-click on the computer's "Start menu" and select "Run" to open the Run command window.



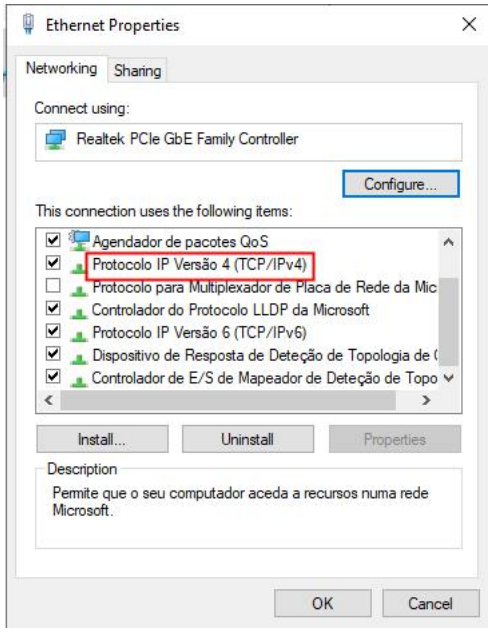
2. In the popped-up command window, type "ncpa.cpl", and then click the "OK" button.



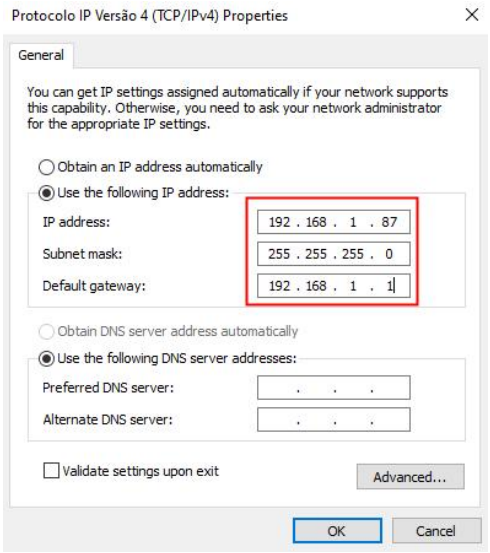
3. Right-click on the network connection you want to set the IP address for on the opened "Network Connections" page, then select the "Properties" option from the context menu.


Network Connections
Control Panel › Network and Internet › Network Connections ›
Search Network Connections
Organize
Disable this network device
Diagnose this connection
Rename this connection
View status of this connection
Ethernet
Ligação de Rede Bluetooth
Not connected
Bluetooth Device (Personal Area ...
Wi-Fi
Not connected
Qualcomm QCA9377 802.11ac Wi...
Disable
Status
Diagnose
Bridge Connections
Create Shortcut
Delete
Rename
Properties
3 items
1 item selected

4. Double-click on "Internet Protocol Version 4 (TCP/IPv4)" in the popped-up "Properties" window.



5. In the window shown below, adjust the IP information. Change the IP address of the computer to the 192 network segment, and adjust the "Subnet mask" and "Default gateway" accordingly. Finally, click the "OK" button in each popped-up window in sequence.



Note:

After changing the device's IP address, follow these steps to modify the IP address on the computer side accordingly.

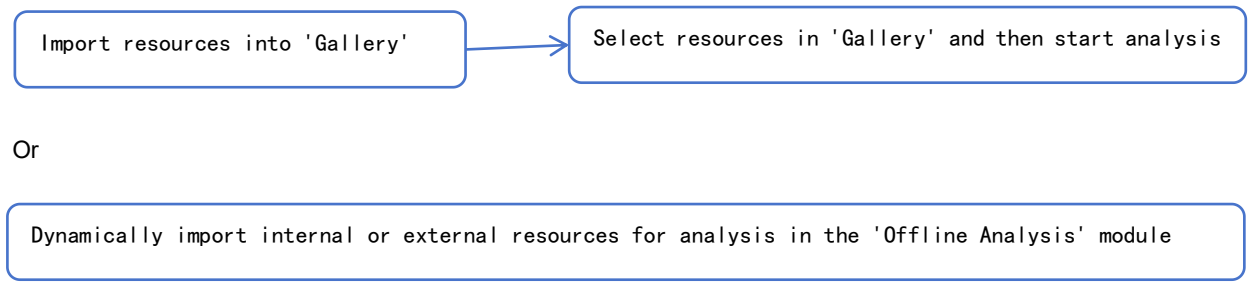
2.2.1.2 Add Device

Please refer to the "*2.3.1.2 Encoding Device Management*" section for detailed instructions.

2.2.1.3 Online Analysis

Please refer to the "*2.3.2 Online Analysis*" section for detailed instructions.

2.2.2 Workflow for Offline Analysis of Materials



Note:

Images captured and videos recorded in the "Online Analysis" will be automatically imported into the "Gallery" and do not require additional importation.

You can initiate "Offline Analysis" by selecting the desired resources in the "Gallery", or you can choose to import existing resources from the 'Gallery' module or import resources from a computer, USB drive, or handheld device that has been connected to the computer, and then perform analysis.. Please refer to "*2.3.5 Gallery*", "*2.3.6.1.1 Image Import*", and *"2.3.6.2.1 Video Import*" for details.

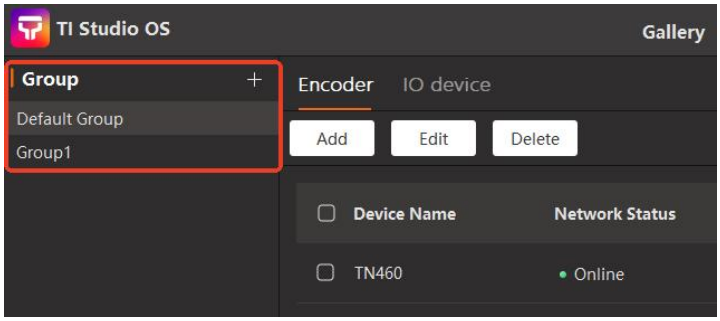
2.3 Detailed Explanation of Functions

2.3.1 Device Management

Maintenance and Management of Online Devices and IO Devices.

2.3.1.1 Group Management

Organize and maintain online devices and IO devices into groups based on "groupings." These "groupings" can represent "device organizational structure" or "physical distribution of devices" in practical applications.



Add Group:

Click the button + on the right side of the "Group" title bar. In the pop-up Add Group window, fill in the group name and click the "OK" button to add a new group.

Note:

The group name must be unique.

Edit Group:

Right-click on the group item, select "Edit" from the context menu, and in the subsequent window, you can modify the current group name. Click "OK" to confirm.

Delete Group:

Right-click on the group item, and select "Delete" from the context menu to delete it.

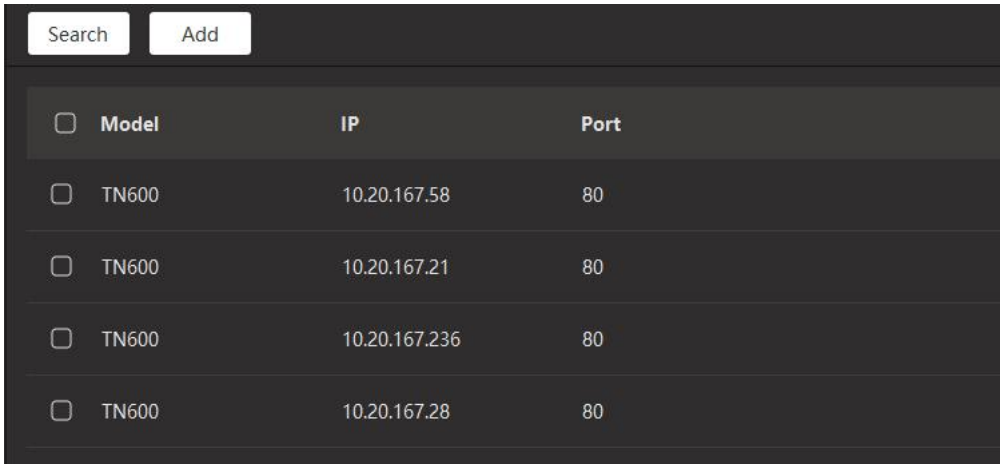
⚠ ***Caution***

Deleting a group will also delete the devices under that group, so please proceed with caution.

The "Default Group" cannot be edited or deleted.

2.3.1.2 Encoding Device Management

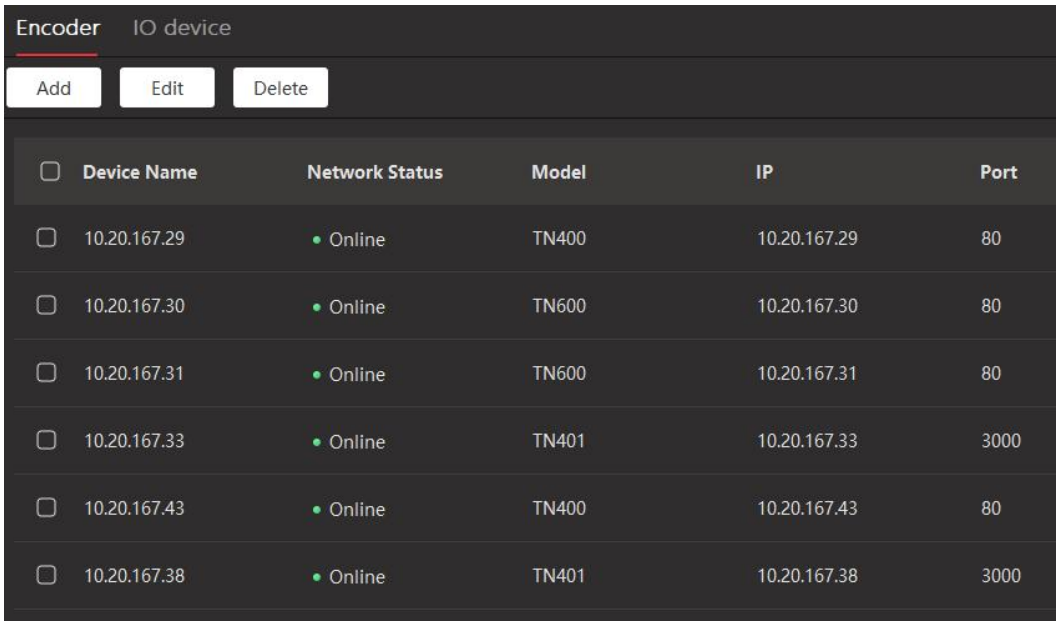
Search and Add:



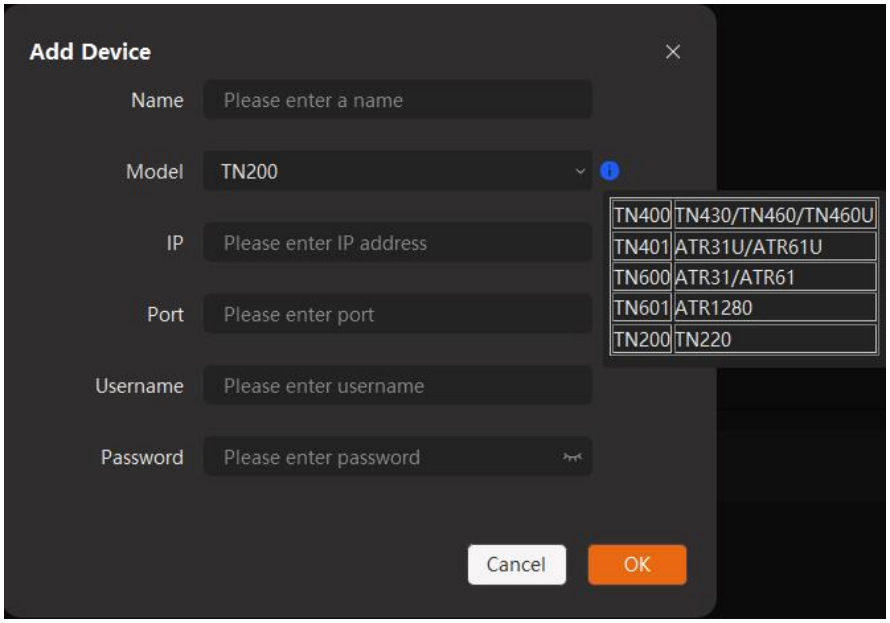
Click the "Search" button, and the system will automatically search for encoding devices in the **current local area network.**

Select one or more devices to add, then click the "Add" button. In the pop-up window, enter the device's username and password, and click the "OK" button. The system will add the encoding device to the device list at the top of the page and automatically connect and log in to the device.

Manual Add:



Click on the "Add" button to open the add device window, as shown in the image below. Fill in the device information as prompted. Click "Confirm" to complete the addition.

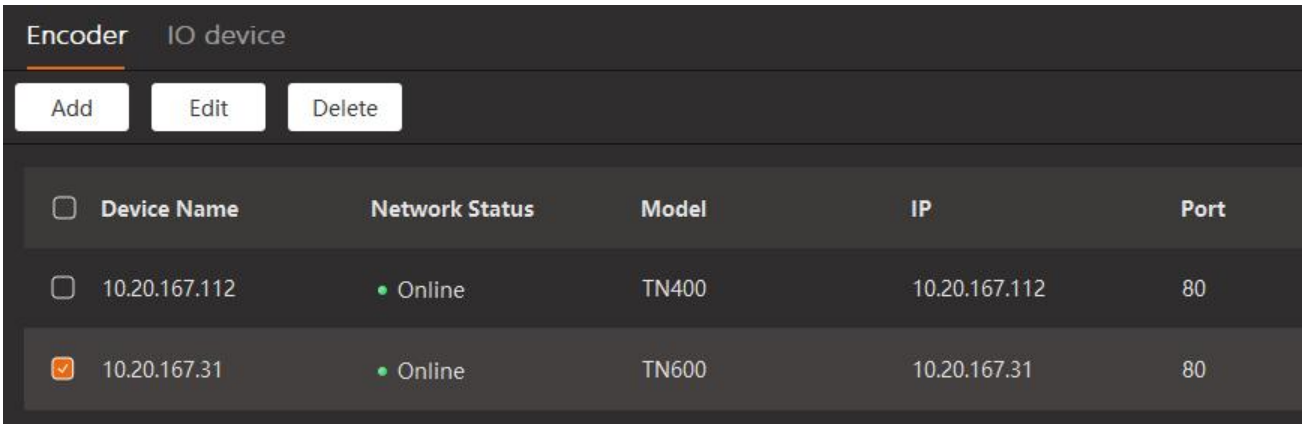


Click on the icon in the above picture, on the right side, "Specific device types included in each model" will be displayed.

Note:

The "Model" field includes five types: TN600, TN401, TN601 , TN400 and TN200. *The specific device types corresponding to each model are detailed in section "*1.3 Supported Hardware Products".

Edit Device Information:

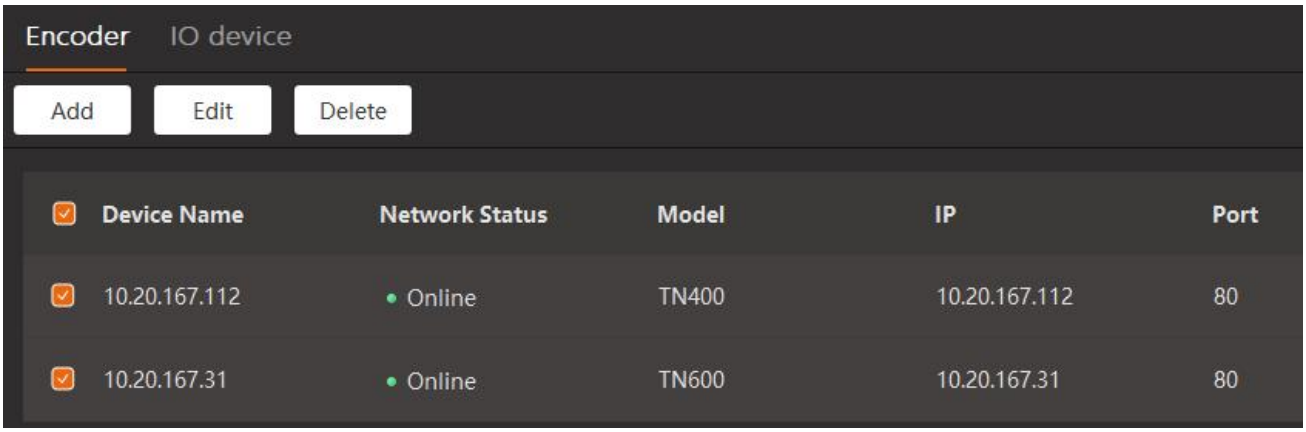


In the page shown above, check the checkbox in front of the record to be edited, then click the "Edit" button. In the pop-up window, edit and modify the device information. After finishing, click "Confirm" to save the changes.

Note:

Only one device information can be edited at a time. If multiple records are selected, only the last one will be edited.

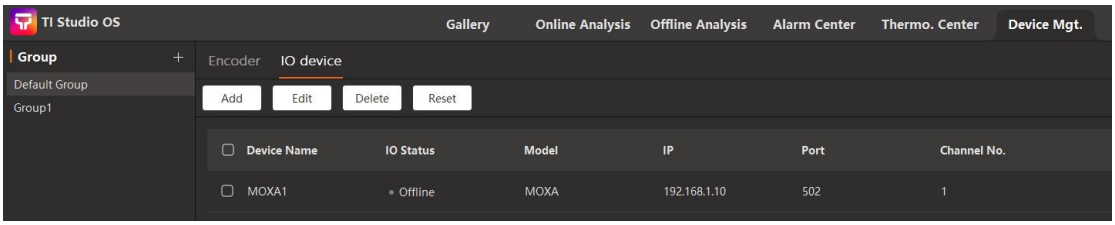
Delete Device:



In the page shown above, check the checkbox in front of one or more records to be deleted, then click the "Delete" button to delete the device(s).

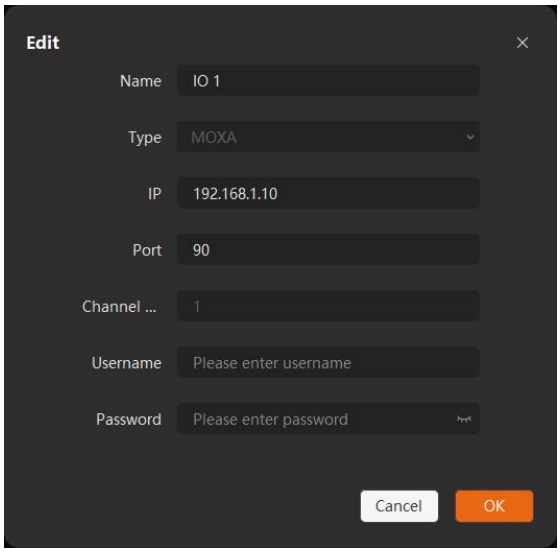
2.3.1.3 IO Device Management

Currently, only MOXA and TASTEK(IO-231R) devices are supported.



Add Device:

Click the "Add" button, and in the pop-up window shown below, fill in the device information as prompted. Click the "OK" button to complete the addition.



Edit Device:

Select the device that has already been added, then click the "Edit" button. In the pop-up edit window, you can modify the device information. Click "Confirm" to save the changes.

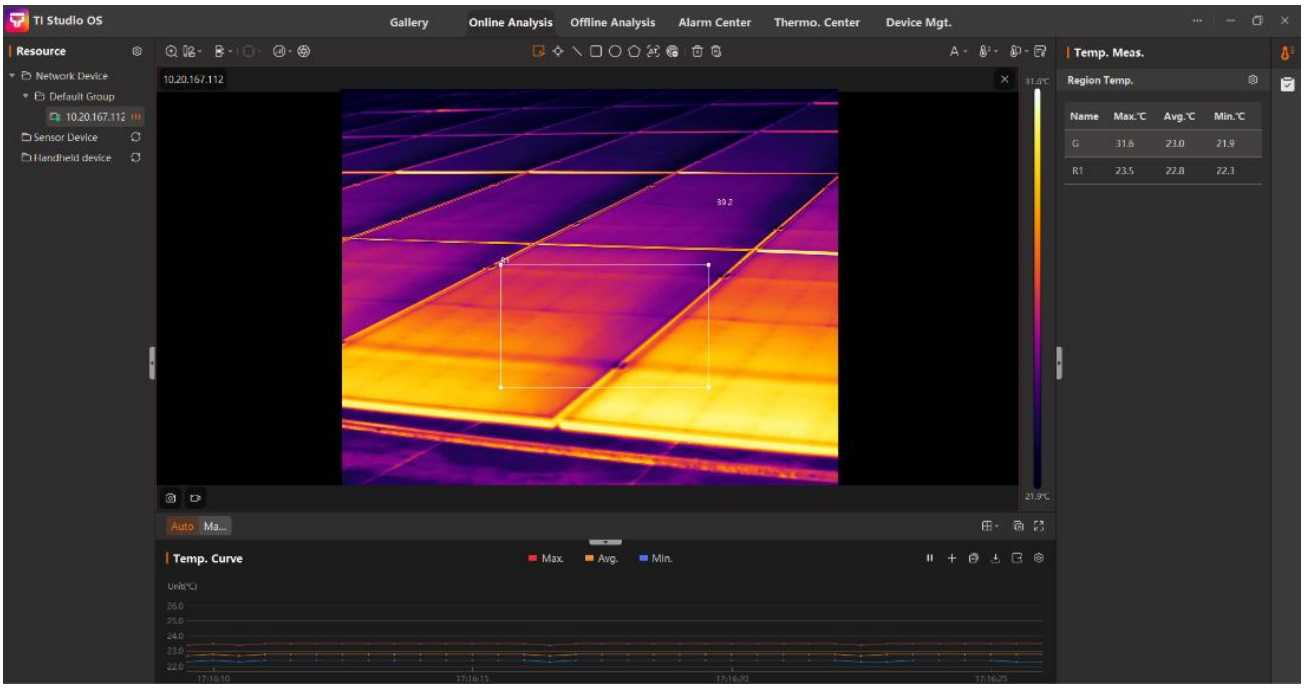
Delete Device:

Select the device that has already been added, then click the "Delete" button to remove the selected device.

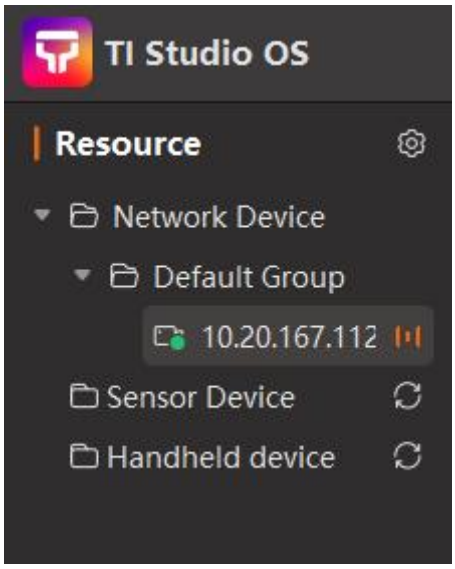
Reset Device:

Select the added device, then click the "Reset" button to reset the IO device from "Alarm State" to "Initial (Non-Alarm) State".

2.3.2 Online Analysis



2.3.2.1 Device Resource Loading



Device Resources on the far left include: Network Devices, Core Devices, and Handheld Devices. These three types of devices can undergo online analysis.

Network Devices refer to "Online Encoding Devices" maintained in the "Device Management" under "*2.3.1 Device Management*". Once added in the "Device Management", they are automatically synchronized to the "Online Analysis" .

Core Devices and Handheld Devices simply need to be connected to the computer via a USB cable. The software will automatically search and load the devices. You can also click the refresh button next to the "Core Devices" or "Group Devices" directory to manually refresh and load the devices.

Device Status Explanation:

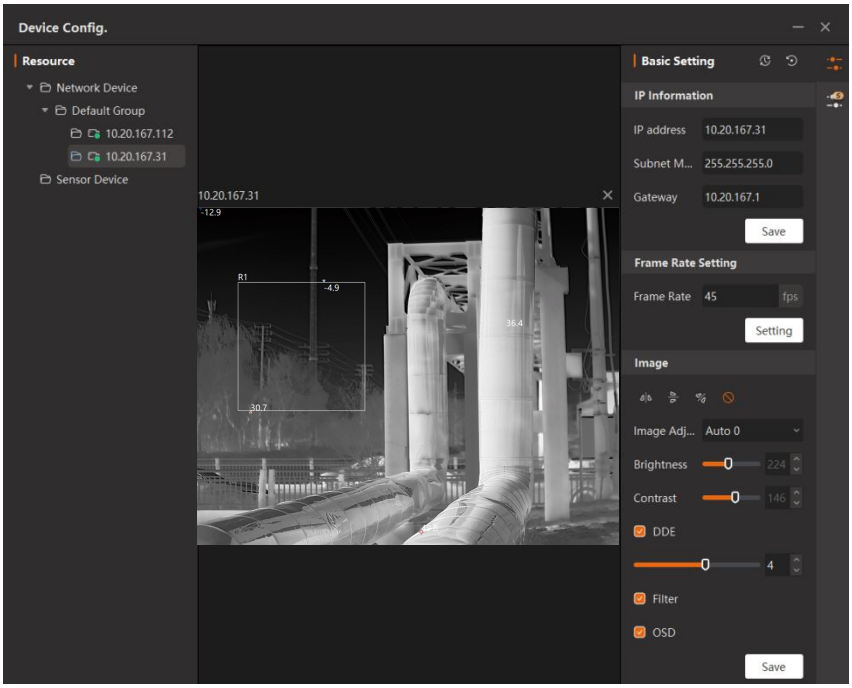
	Previewing
	Online
	Offline

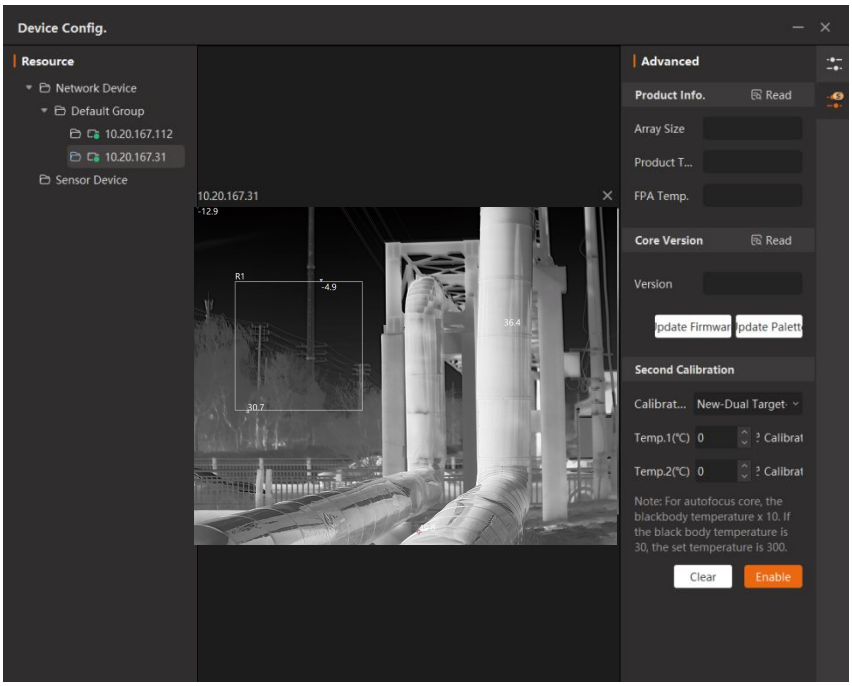
Note:

For some handheld devices, it's necessary to set the device to "USB Mode" in the device's "System Settings". Otherwise, the software won't recognize the device.

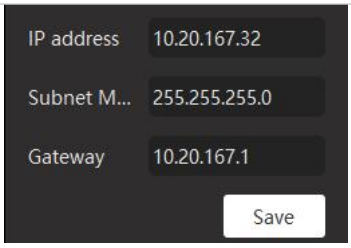
2.3.2.2 Device Configuration

Select a "Network Device" or "Core Device", then click the settings button on the right side of the "Resources" title bar. In the pop-up window shown below, you can configure some properties of the device.





Functional Description:

Function Page	Function	Description
Basic Settings		Sync Time. Clicking this icon will automatically synchronize the system time of the current PC to the device.
		Factory Settings. Clicking this icon will restore the device to its factory settings.
	IP Information Modification	 You can modify the device's IP address, subnet mask, and gateway information. Changes take effect after clicking the "Save" button. Note: After modifying the device's IP address, if the device and the current PC are not on the same local network, the software will be unable to connect to the device. You can follow the method outlined in section *2.2.1.1 'Modifying the Computer's IP Address'* to change the computer's IP and then attempt to reconnect.

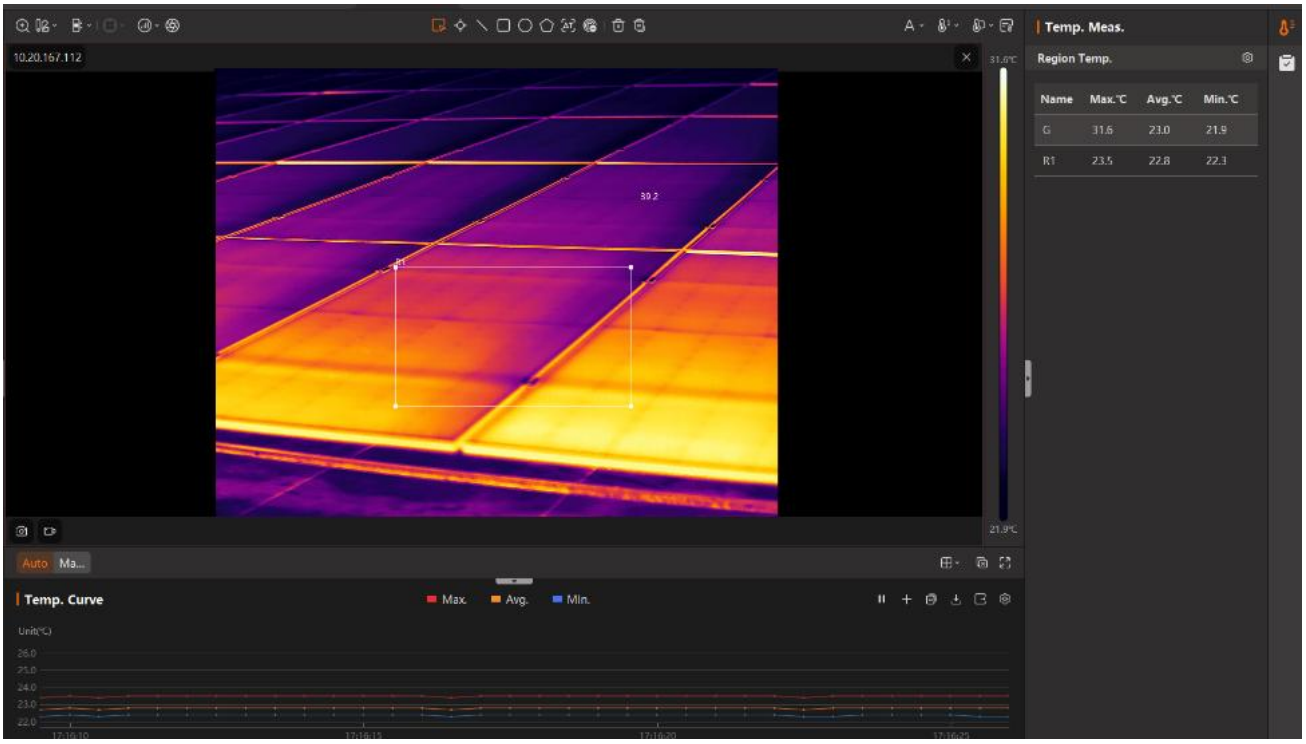
	Frame Rate Settings	You can modify the **video frame rate** output by the device, and it will take effect after clicking the 'Settings' button.
		Image flipping options include 'Horizontal Flip,' 'Vertical Flip,' 'Diagonal Flip,' and 'No Flip' (default). Changes take effect after clicking the 'Save' button.
	Image Mode Adjustment	It includes three modes: Manual, Auto 0, and Auto 1. In Manual mode, you can adjust 'Brightness' and 'Contrast' below. Changes take effect after clicking the 'Save' button.
	DDE	When enabled, the image will be in enhancement mode, consisting of 7 levels, with enhancement level increasing sequentially. Changes take effect after clicking the 'Save' button.
	Filtering	When enabled, it filters out noise in the image and enhances clarity. Changes take effect after clicking the 'Save' button.
	Network Board Overlay OSD	When enabled, it will display the temperature measurement rules (points, lines, boxes, etc.) drawn on the device via the browser. When disabled, it will not display. Changes take effect after clicking the 'Save' button.
Advanced Settings	Product Info.	Click the 'Read' button on the right side of the title bar to retrieve the device's basic information, including PN, SN, resolution (array size), product temperature, and FPA (detector) temperature.
	Core Version	Click the 'Read' button on the right side of the title bar to retrieve the device's firmware version information. Click the 'Update Firmware' button to select a firmware file from your local system and upload it to the device to update its firmware. Click the 'Update Palette' button to select a color palette file from your local system and upload it to the device to update its palette.
	Secondary Calibration	This function allows for recalibrating the device's temperature measurement accuracy. Calibration methods include 'Single Target Calibration' and 'Dual Target Calibration.' Enter the blackbody temperature in the input field and click the 'Calibrate' button on the right side of the input field, then

		click the 'Apply' button. Clicking the 'Clear' button will remove the current calibration. ⚠ *Caution:* *Please use this function with caution. It is recommended to contact our technical support personnel for assistance before use.*

📖 ***Note:***

Due to differences in device capabilities, the functions available in the 'Configuration' may vary between different devices.

2.3.2.3 Preview & Analysis



2.3.2.3.1 Real-time Preview

Double-clicking on a device listed on the left side resource list allows you to preview the real-time video feed from the device in the preview area.

The software supports previewing up to four devices simultaneously. As shown in the figure below, you can switch between different window layouts by clicking on the 'Window Layout Switch' icon located in the bottom right corner of the preview area.

Clicking on the icon in bottom right corner of the preview area allows you to close all currently active preview channels.

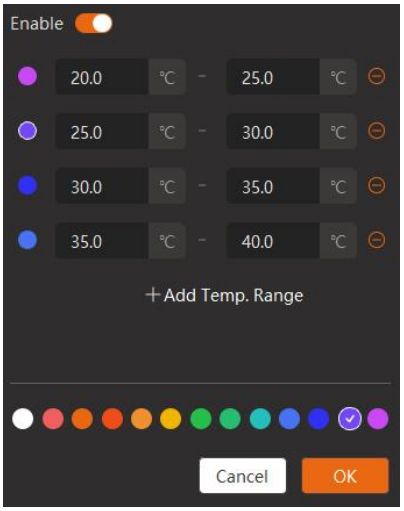
Clicking on the icon in bottom right corner of the preview area enables full-screen display of the preview area.

Additionally, below each preview window, there are 'Capture' and 'Record' buttons. Clicking on these buttons allows you to capture images or record videos of the real-time preview. For specific settings related to 'Capture' and 'Record,' please refer to section *2.3.7.1 'System Configuration'*.

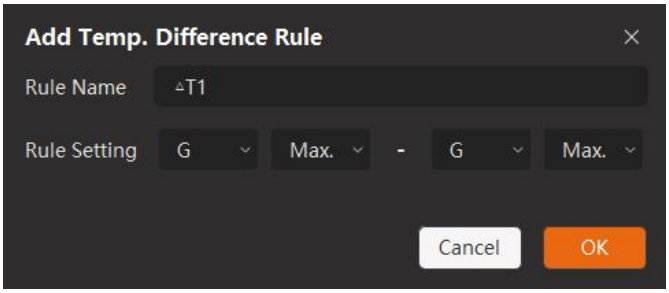
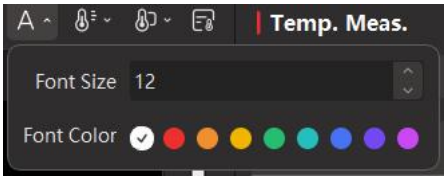
2.3.2.3.2 Analysis Tool

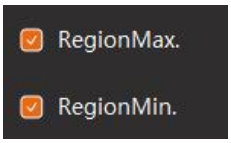
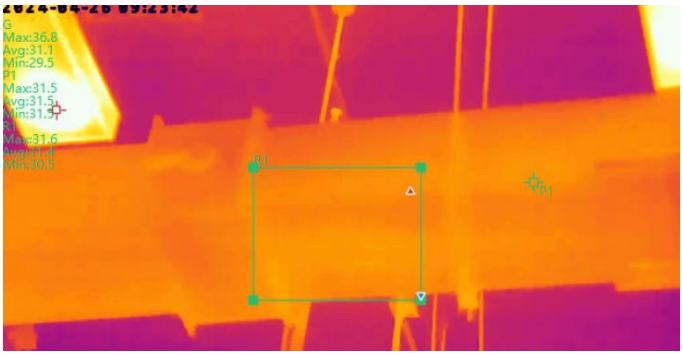
(1) The toolbar above the preview area is an analysis toolset, with each tool serving specific functions as follows:

Function	Descriptions
Digital Zoom	Clicking on the icon toggles the "Digital Zoom" feature on when it becomes selected. When activated, scrolling the mouse wheel on the current preview allows zooming in or out. Clicking the icon again toggles the feature off, when the icon changes to , the digital zoom function is disabled.
Color Palette Settings	Clicking on the icon allows you to choose the desired color palette from the dropdown menu. Once selected, the current live preview will switch to this color palette mode. Note After setting the color palette here, **it will only synchronize with the device once the live preview is closed or the software is closed**. During this period, when viewing the screen through other channels (such as a browser, software developed through SDK, or streaming preview tools like VLC), the image will appear in white-hot mode.
	Clicking on opens a window where you can click the "Add

Isothermal Settings	Temperature Range" button to add isothermal settings. Currently, you can add up to 5 isothermal zones. After setting, the corresponding temperature range areas in the live preview will overlay the colors set in the rule settings.  You can select the color icon in front of each record, and then choose a color from the available options below to replace the display color for the area within that temperature range. After setting, make sure the "Enable" toggle is turned on and then click the "OK" button to confirm.
Super-Resolution	Currently, real-time super-resolution is only supported for TN220. This feature option is unavailable when previewing other devices. When the super-resolution function is enabled, the video feed will be super-resolved by a factor of 4. Once super-resolution is activated, all subsequent capture images, video recordings, and scheduled captures will be saved as files in the super-resolved state.
Focus settings	For zoom devices, this button is enabled. Clicking on opens a dropdown menu where you can choose from "Auto Focus", "Focus +", and "Focus -". Selecting "Focus +" or "Focus -" allows you to manually adjust the focus.
Gain switching	It's also referred to as "Temperature measurement mode switching" or "Temperature measurement range switching". Clicking on opens a dropdown menu where you can choose from "High Gain", "Low Gain", and "Auto Gain". ***Note:***

	Some devices do not support "Auto Gain".
Manual shutter calibration	Clicking enables you to manually perform shutter calibration once .
Temperature measurement rule drawing	: After clicking this icon, you can add a temperature measurement point by single-clicking the mouse on the live preview. ***Note:*** *The current software supports drawing "array length * array width" temperature measurement points.* : After clicking this icon, you can add a temperature measurement line by clicking and dragging the mouse on the live preview. : After clicking this icon, you can add a temperature measurement rectangle by clicking and dragging the mouse on the live preview. : After clicking this icon, you can add a temperature measurement circular box by clicking and dragging the mouse on the live preview. : After clicking this icon, you can add a temperature measurement polygonal box by clicking and dragging the mouse on the live preview. **This polygon supports up to 10 points.** : S-Smart: After clicking the icon, please draw a rectangle over the target object in the preview area. Based on the image segmentation algorithms, the system automatically selects the edges of the target object within the rectangle. At present, the preview area only supports using this function once to select the target object frame. ***Note:*** *The software currently supports drawing up to 20 combined "temperature measurement lines + temperature measurement rectangles + temperature measurement circles + temperature measurement polygons.*

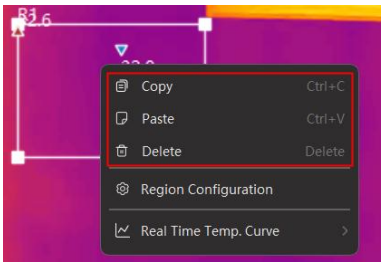
	:Difference Temperature Measurement Rule. After clicking this icon, you can set the difference between "the max, min, and avg temperatures of two temperature measurement rules" or "the max, min, and avg temperatures of one temperature measurement rule and a constant" in the pop-up window.  ***Note:*** *The software currently supports defining up to 10 difference temperature measurement rules.* :Delete a single temperature measurement rule. After clicking this icon, click on the previously drawn temperature measurement rule in the preview to delete it. : Delete all temperature measurement rules. After clicking this icon, all temperature measurement rules drawn in the preview will be deleted at once.
Preview Font Settings	Click this icon, and in the pop-up window, you can set the **name of the temperature measurement rule in the preview, the font size and color of the highest and lowest temperature values, and the color of the temperature measurement rule's border.** 
Settings for displaying the highest and lowest temperatures for the full frame.	After clicking, you can set whether to display the highest and lowest temperatures for the full frame in the **preview** from the drop-down menu. By default, both are displayed.
Settings for	After clicking, you can set from the drop-down menu whether to display the highest and lowest temperatures for each temperature

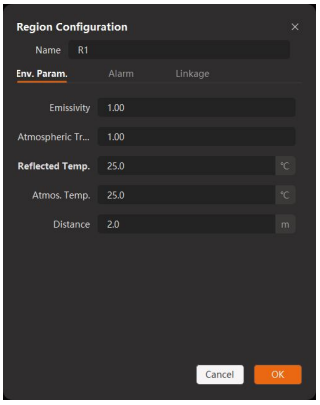
displaying the highest and lowest temperatures of the temperature measurement rule.	measurement rule in the **preview**. By default, both are displayed. 
 Settings for displaying temperature information in the real-time preview area.	Settings for the position of displaying the highest and lowest temperatures of temperature measurement rules. By default, they are displayed within each temperature measurement rule. Clicking this icon, when it turns to , the high and low temperature information of the temperature measurement rules will be displayed on the left side of the preview. Clicking the icon again will revert to the default state. As is shown in the figure below: Default: After switching: 

(2) The functionality of each submenu in the right-click menu of the preview screen is as follows:

A) Right-clicking on an individual temperature measurement rule.

<table>
<tr><th>Function</th><th>Description</th></tr>
<tr><td>Copy Ctrl +C</td><td rowspan="3">In the real-time preview area, right-clicking on a specific temperature measurement rule allows you to quickly "copy", "paste", or "delete" that individual rule. You can also use the keyboard shortcuts "Ctrl + C", "Ctrl + V", and "Delete" for quick copying, pasting, and deleting of individual temperature measurement rules.

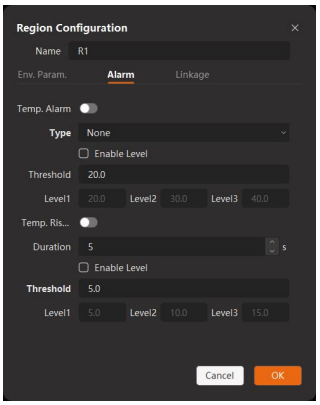
 
</td></tr>
<tr><td>Paste Ctrl +V</td></tr>
<tr><td>Delete</td></tr>
<tr><td>Region Settings</td><td>In the popped-up window below, you can configure the settings for the current temperature measurement rule as follows:

1.Name and Environmental Parameters Settings
 

You can set the name and environmental parameters for the current individual temperature measurement rule.
Currently supports setting five environmental parameters:
Emissivity, ranging from 0.00 to 1.00;
Atmospheric transmittance, ranging from 0.00 to 1.00;
Reflection temperature, ranging from -40.0 degrees Celsius to 70.0 degrees Celsius;
Ambient temperature , ranging from -40.0 degrees Celsius to 1500.0 degrees Celsius;
Target distance, ranging from 0.0 to 100.0 meters.</td></tr>
</table>

Once you have finished setting them, click the "OK" button to confirm.

2. Alarm: You can set "Temperature Alarm" and "Temperature Rise Alarm" for the current temperature measurement rule. Both types of alarms can be activated simultaneously.

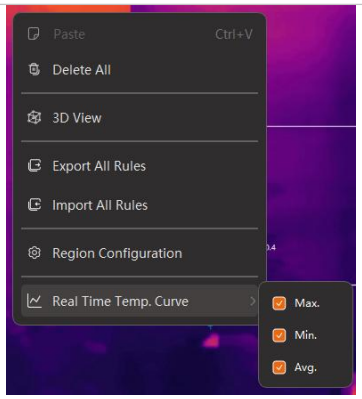


①**Temperature alarm** includes six types: above/below Max temperature, above/below Avg. temperature, above and below Min temperature.
When "Enable Level" is not checked, you only need to maintain the "Threshold" field, indicating a single level alarm.
When "Enable Level" is checked, the system supports monitoring alarms for three levels, and you need to maintain values for "Level 1", "Level 2", and "Level 3".

②**Temperature rise alarm**: You need to set the "Time Period" and the "Temperature Change Threshold", indicating the temperature change range within that time period. An alarm will be triggered when the temperature change reaches or exceeds this threshold.
The "**Temperature Change Threshold**" can be a positive number, indicating temperature rise, or a negative number, indicating temperature decrease.
When "Enable Level" is not checked, you only need to maintain the "Threshold" field, indicating a single level alarm.
When "Enable Level" is checked, the system supports monitoring alarms for three levels, and you need to maintain values for "Level 1", "Level 2", and "Level 3"
.

3.Alarm Linkage
After enabling the alarm, you can configure the alarm linkage for the corresponding alarm types. Currently, it supports four types of linkage: **sound,**

	snapshot, recording, and IO linkage. ➢ Sound: Plays a built-in alarm sound from the computer's playback software. ➢ Snapshot: Automatically captures the real-time screen when an alarm occurs. ➢ Recording: Starts recording the real-time screen from the time of the alarm trigger. ➢ IO Linkage: Links to relay devices maintained in the "Device Management - IO Devices". If alarm conditions are set with levels, you can also configure specific IO devices and corresponding channels based on the alarm level. ***Note:*** *For details regarding alarm snapshot and recording storage paths, recording duration, data retention period, alarm filtering time, automatic alarm condition settings, and more, please refer to the "2.3.7.1 System Configuration" section.*
Region focus	If the current mouse click is on a "closed temperature measurement rule", such as a rectangle, circle, or polygon, the "region focus" function in the right-click menu is available. If it is a point or line, the "region focus" function is unavailable. Click on the "Region Focus" function menu to enable it on . Click on it again or click on other closed area "Region Focus" submenus to cancel it. At the same time, there can only be one enclosed area with the "Region Focus" function enabled. After enabling 'Region Focus', ① The enclosed areas of rectangles, circles, and polygons will overlay color palette of the current frame, and the outside area becomes white hot; ② The temperature span and pseudo color switching only apply to the area where the "region focus" is enabled;
Real-time Temperature Curve	You can check one or more of "Max Temperature", "Min Temperature", or "Avg Temperature" in the right-click menu . The curve display panel will automatically expand to show the real-time temperature trends of the selected temperature measurement rule. It Supports displaying real-time temperature curves for up to 30 minutes(It is necessary to ensure that the temperature data acquisition frequency is between 0.5 seconds/time and 1 second per time. When the acquisition frequency is between 0.1 seconds/time and 0.5 seconds/time, the maximum support time is 5 minutes.) and 20 curves simultaneously.



Click the button on the top of the curve display panel to expand or collapse the panel.

Click on the start icon in the upper right corner of the panel to start collecting temperature data and drawing statistical curves. It is enabled by default. Click the stop icon in the upper right corner of the panel to stop temperature data collection and curve drawing. At this point, you can copy and export the curves and data within the display area. After clicking the start icon again, the curves in the display area will be cleared, and temperature data collection and curve drawing will resume.

Click the button on the top right corner of the panel, then select to add a new curve from the pop-up window .

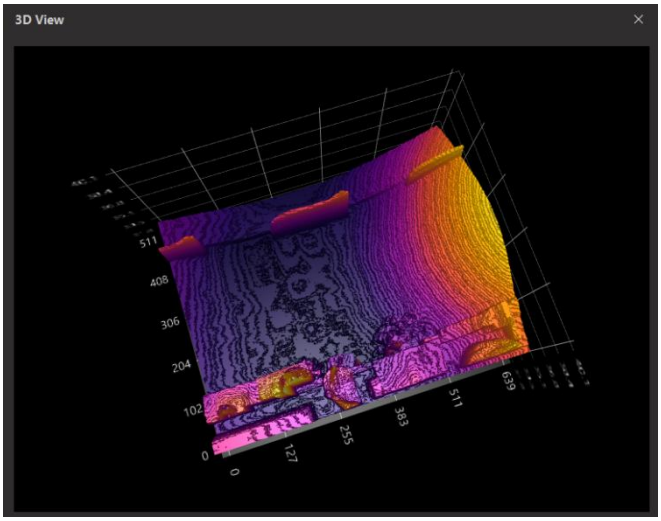
Click the button on the top right corner of the panel to copy the current curve on the panel, which can be directly pasted into other documents such as Word or PowerPoint.

Click the button on the top right corner of the panel to save the current statistical graph as a JPG image.

Click the button on the top right corner of the panel to export the temperature data of the current statistical graph to a CSV file.

Click on the settings icon in the upper right corner of the panel to set the temperature data collection frequency, which supports once every 0.1 seconds to once every 1 second.

B) Right-clicking on a non-temperature measurement rule area (i.e., the full frame).

Function	Description
Paste Ctrl +V	You can quickly paste a single temperature measurement rule that was previously copied.
Delete All	You can delete all temperature measurement rules from the preview screen.
3D View	After clicking, it will display the 3D imaging mode of the current real-time screen, as shown in the following figure:  Right-clicking and dragging on the image above allows you to adjust the viewing angle of the 3D view.
Export All Rules	You can export all the analysis rules set in the current preview screen to a template file, including: 1.Environmental parameters and alarm settings (alarm conditions, linkage settings) for the full frame. 2.Information for each temperature measurement rule, including type, coordinates, environmental parameters, and alarm settings (alarm conditions, linkage settings).
Import All Rules	You can import the "Analysis Rules Template" exported from the software to quickly copy and reuse analysis rules.
Region Settings	Same as the "Region Settings" menu in the "**Right-click on a Single Temperature Measurement Rule**" menu, here you can set the information for the full frame.
Real-time Temperature Curve	Same as the "Real-time Temperature Curve" option in the "**Right-click on a Single Temperature Measurement Rule**" menu.

(3) Other Analysis Tools

A) Mouse Tracking:

In the preview area, to the right of the mouse cursor icon, it displays the real-time temperature value of the location where the mouse is pointing.

B) Temperature Scale

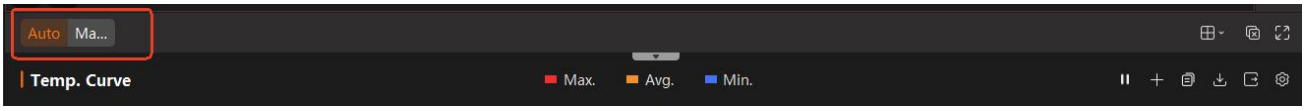
Explanation:

What is temperature scale?

The software displays images after overlaying color palettes. When overlaying color palettes, the temperature range of the current image is used as the mapping range for the entire pseudo-color rule. The "temperature scale" function adjusts this temperature range to enhance the display effect of the target temperature segment.

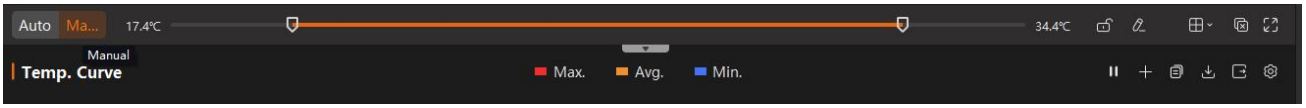
In the area below the real-time preview, as shown in the following figure, there are two modes: Auto (default) and Manual.

Auto Mode:



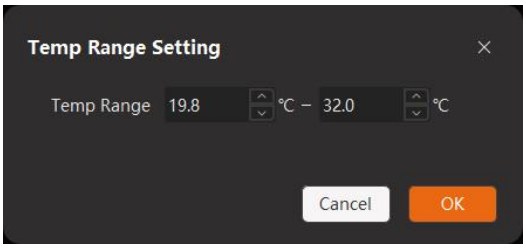
The software automatically adjusts the color palettes overlay effect based on changes in the temperature range (maximum and minimum temperatures) of the preview screen.

Manual Mode:



You can manually adjust the temperature range for color palettes overlay to highlight the display effect of the target area.

① Click on the icon in the above figure. In the popped-up window below, you can accurately set the temperature scale range.

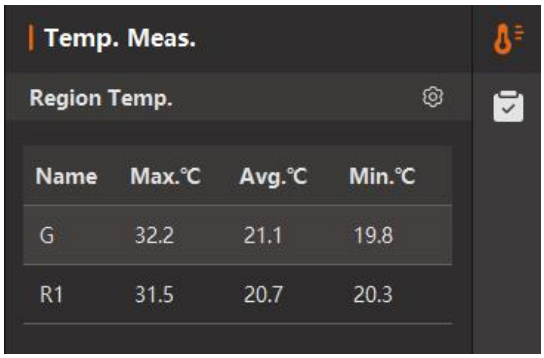


② Click on the icon. This icon toggles between "Lock" and "Unlock" states. When it is in the "Lock" state, the system will automatically save the currently set temperature scale range, and the next time you open the preview screen, it will be automatically set to that temperature range. When it is in the "Unlock" state, the system will not save the set temperature scale range.

B) Real-time Temperature Display for Temperature Measurement Rules

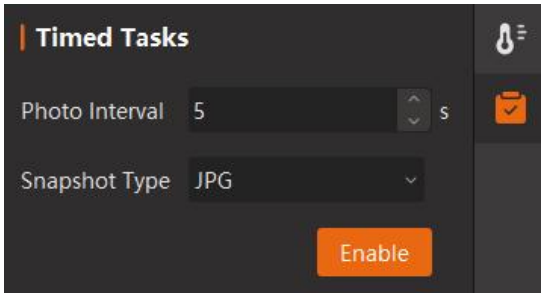
In the right-hand area of the window, under the "Temperature Measurement" tab, it displays the real-time temperatures (maximum, minimum, average) of all temperature measurement rules in the current temperature measurement area.

After selecting a specific temperature measurement rule, clicking on the "Settings" icon on the right side of the title bar opens the "Region Settings" window, which is the same as the one opened through the right-click menu in the real-time preview window. In this window, you can set the "Environmental Parameters", "Alarms", and "Alarm Linkage" for the selected temperature measurement rule.



C）Scheduled Tasks

In the right-hand area of the window, under the "Scheduled Tasks" tab, it displays the scheduled tasks applicable to the current preview window. Currently, only "Scheduled Snapshot" is supported.



You can set the "Capture Interval" and "Snapshot Type".

Capture Interval: The time interval between two consecutive snapshots, with a minimum setting of 5 seconds.

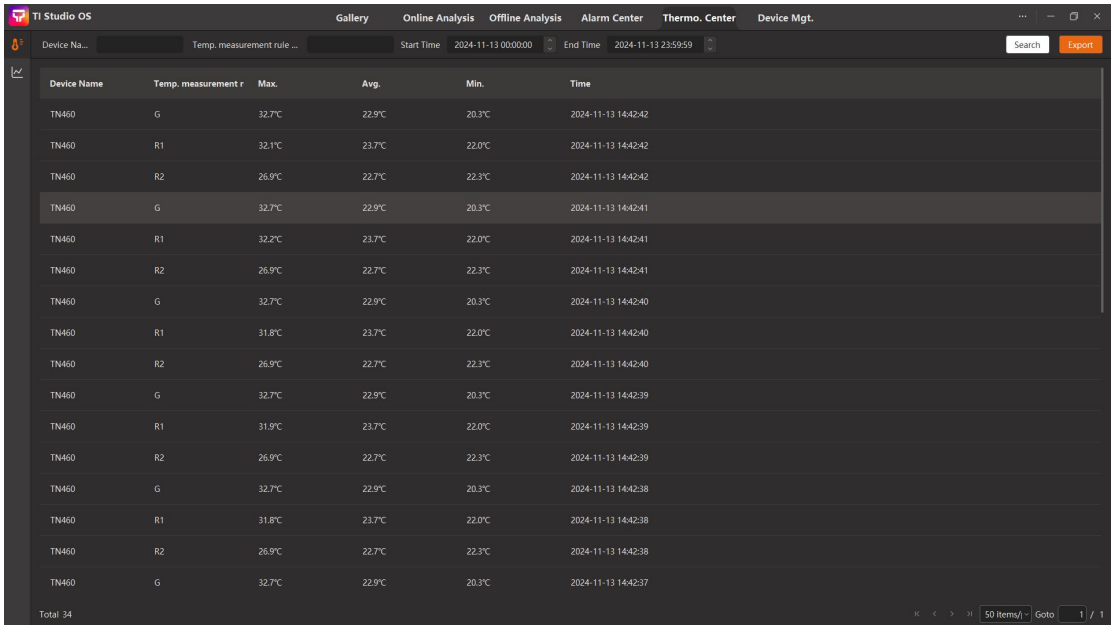
Snapshot Type: Sets the type of snapshot image. It supports JPG (without temperature data, not analyzable) and GW (national grid format, with temperature data, for secondary analysis).

2.3.3 Temperature Measurement Center

Note:

Before the software begins data collection, you need to configure temperature measurement rules and enable temperature measurement in the "System Configuration - Temperature Measurement". For detailed setup instructions, please refer to section "2.3.7.1 System Configuration".

2.3.3.1 Temperature Record Data Query



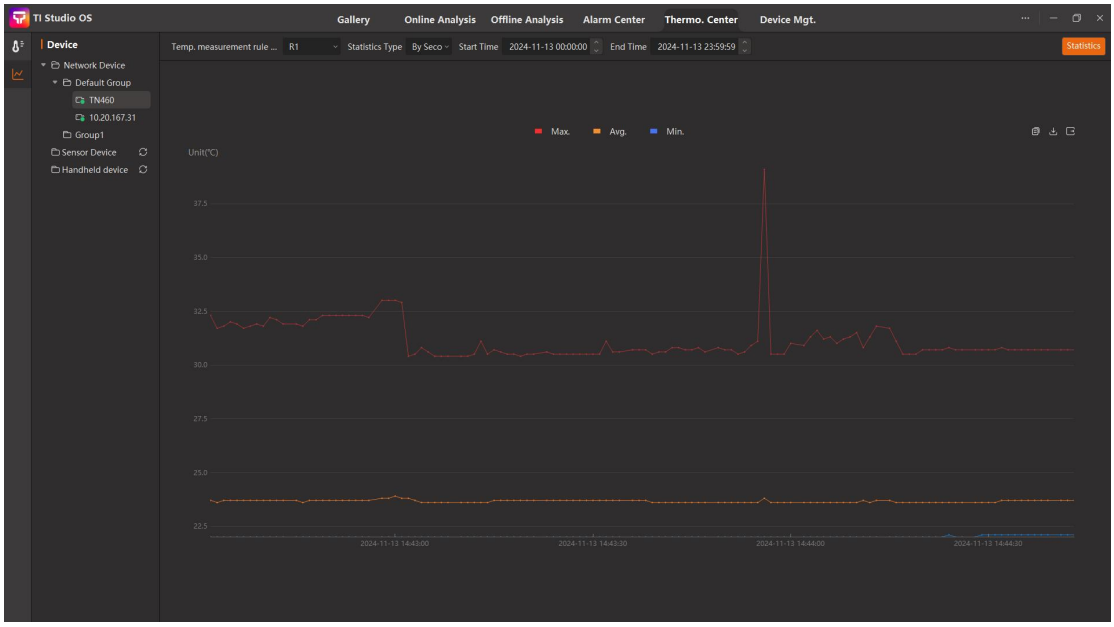
In the page above, you can search and export temperature record information.

You can perform a fuzzy search by "Device Name" and "Temperature Measurement Rule Name", and search by "Collection Time Period" (default is today).

After the query is complete, clicking the "Export" button will export the query results to a CSV file.

At the bottom of the page, it displays the total number of records found according to the current query conditions. You can set the number of records displayed per page and quickly jump to a specified page number.

2.3.3.2 Temperature Data Statistics



In the page above, after selecting a device from the left-hand device list, in the right-hand area above, choose "Temperature Measurement Rule", set the "Statistical Type" and "Time Period", then click the "Statistics" button to generate the temperature data statistical curve for that rule.

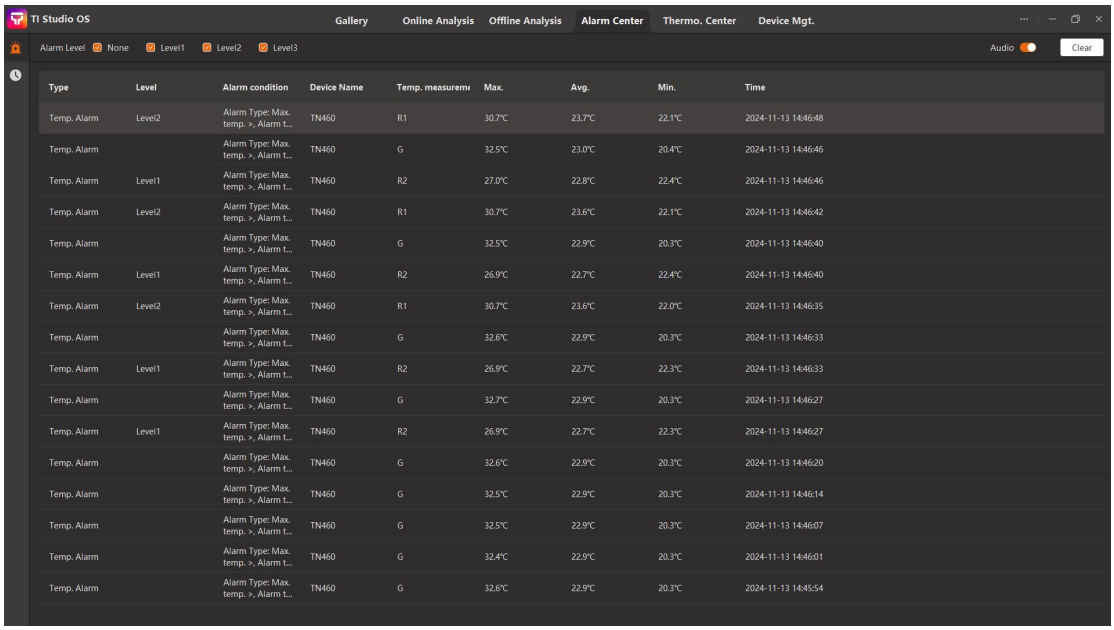
Note:

1.You need to first turn on the temperature collection switch and collect temperature data to generate the curve.

2.The "Statistical Type" currently supports three statistical granularities: "By Hour", "By Minute", and "By Second". When statistics are made "By Hour", the data in the curve represents "the highest temperature, lowest temperature, and average temperature within the hour", when statistics are made "By Minute", the data in the curve represents "the highest temperature, lowest temperature, and average temperature within the minute".

2.3.4 Alarm Center

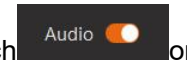
2.3.4.1 Real-time Alarms



In the "Online Analysis", when alarm rules are set for temperature measurement rules, the generated alarm information will be displayed in real-time on the page above.

1. Alarm Level Setting:

After setting the "Alarm Level", subsequent incoming alarm information will be automatically filtered to display only alarms of the corresponding level.

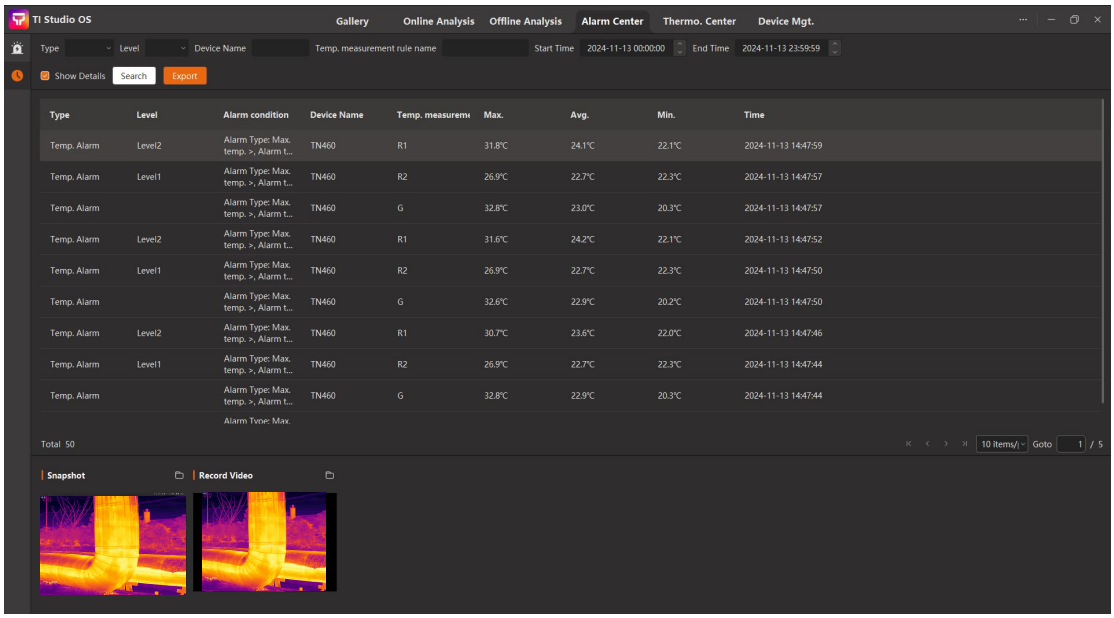
2. If the "Sound" is set in the alarm linkage rules in the "Online Analysis" , you can click the "Audio" switch 

on the page above to quickly "Enable/Disable Alarm Sound".

Note:

Turning off the alarm sound here simply stops the computer from playing the alarm ringtone and does not modify the alarm rules set in the "Online Analysis".

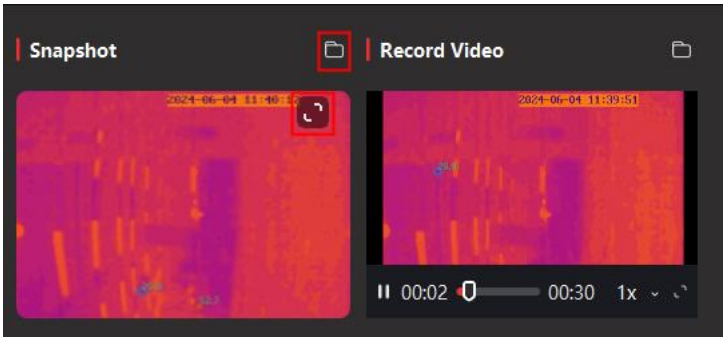
2.3.4.2 Historical Alarms



On the "Historical Alarms" page, you can query and export alarm information based on query conditions. Currently, the query conditions include: Alarm Type (All, Temperature Alarm, Temperature Rise Alarm), Alarm Level (All, Level 1, Level 2, Level 3), Device Name (supports fuzzy search), Temperature Measurement Rule Name (supports fuzzy search), and Alarm Time Period (default is today).

After the query is complete, clicking the "Export" button will export the query results to a CSV file.

If you check "Show Details", the "Alarm Linkage Snapshot, Recording" (provided that alarm linkage snapshot, recording is configured) will be displayed below the page.

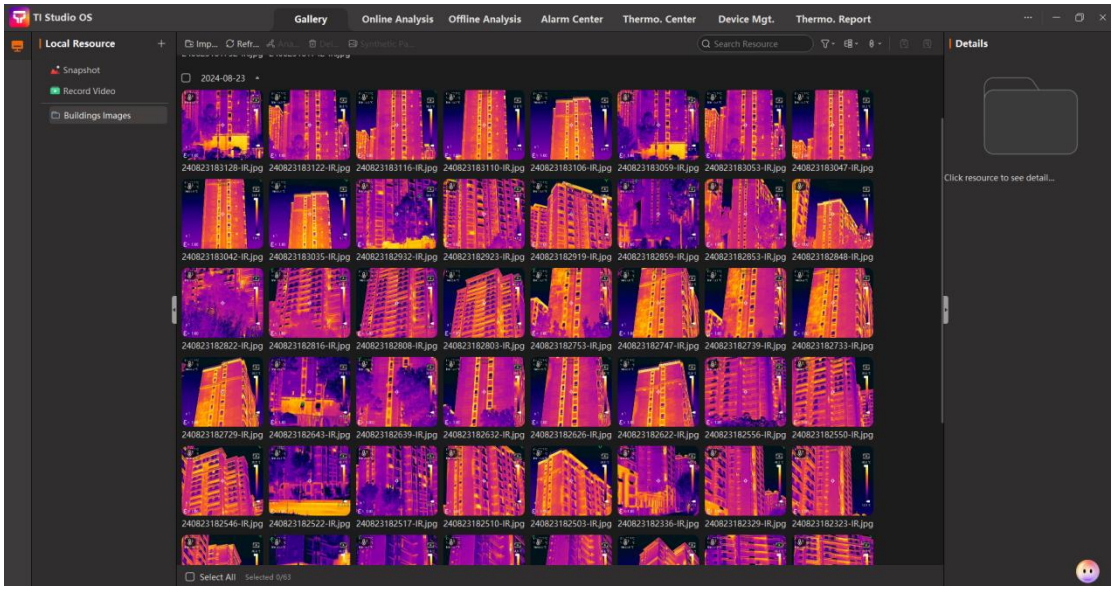


Clicking the icon on the right side of the "Snapshot" or "Recording" title bar will open the local folder where the alarm snapshot/recording is located.

Clicking the icon in the top right corner of the image or the icon on the right side of the video playback control bar will enlarge the snapshot/video in a separate window.

2.3.5 Gallery

The purpose of the "Gallery" is to centrally manage analyzable media materials, making it convenient for subsequent secondary analysis in the "Offline Analysis" .



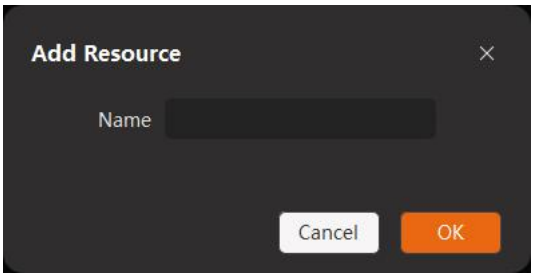
2.3.5.1 Resource Library

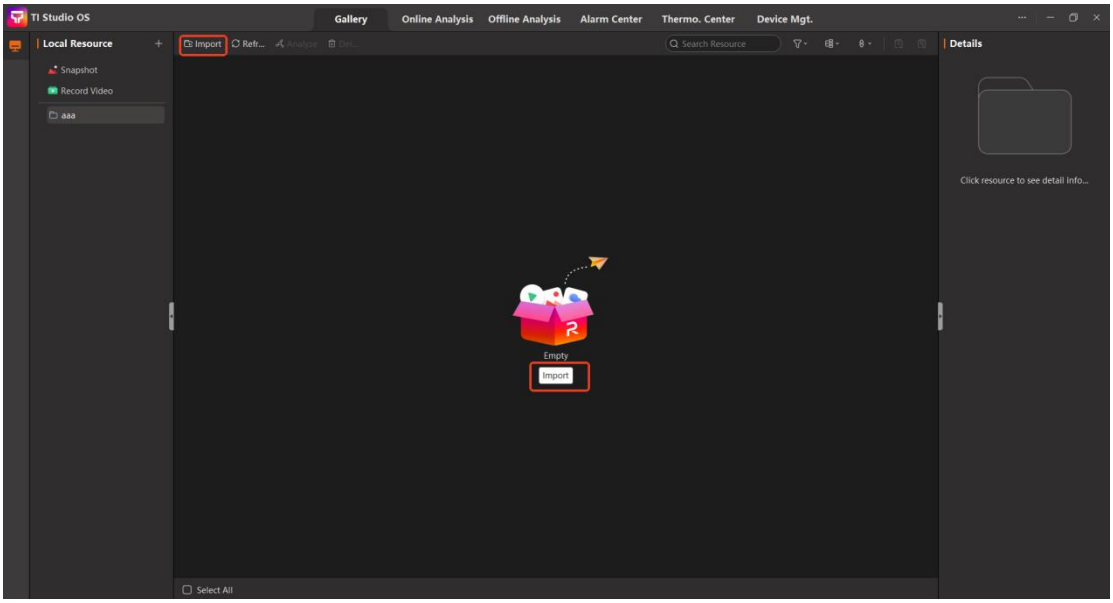
2.3.5.1.1 Local Resource Library

The Local Resource Library centrally manages resources stored on the local computer.

The software comes with two default storage paths: Snapshot and Recording. Images taken by the "Online Analysis" are automatically stored in the "Snapshot" path, and recorded videos are automatically stored in the "Recording" path.

Clicking the button in the image above creates a new material set,which is a folder containing specific materials. You can create multiple material sets to classify and manage materials. You can maintain the name of the material set in the pop-up window.





Select the custom material set on the left, and the area on the right will display the materials contained in the material set.

The "Import" function in the above figure can be used to import material resources from local computers or external devices (such as USB drives, Android devices, etc.) into this material collection for centralized management. Actually, it is copying materials (images, videos) to the specified path.

Right-clicking on the "material set" in the "Local Resource Library" list, as shown in the image below, brings up a context menu where you can perform the following functions:

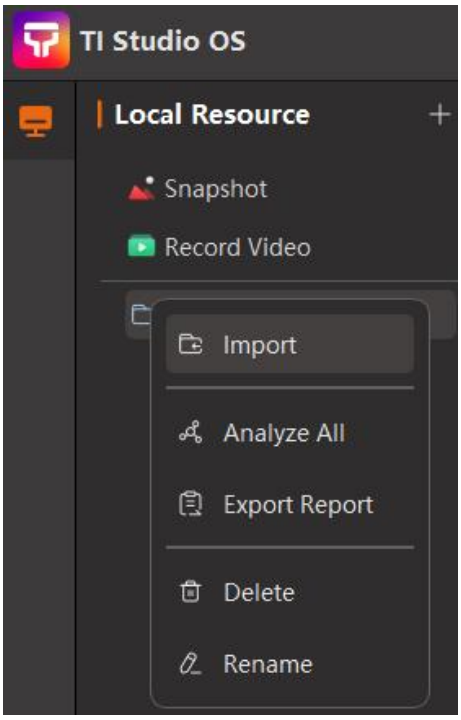
① Import : Imports material resources from local computers or external devices (such as USB drives, Android devices, etc.) into this material set.

② Analyze All : Imports all analyzable resources (images/videos) in that path into the "Offline Analysis" at once for subsequent secondary analysis.

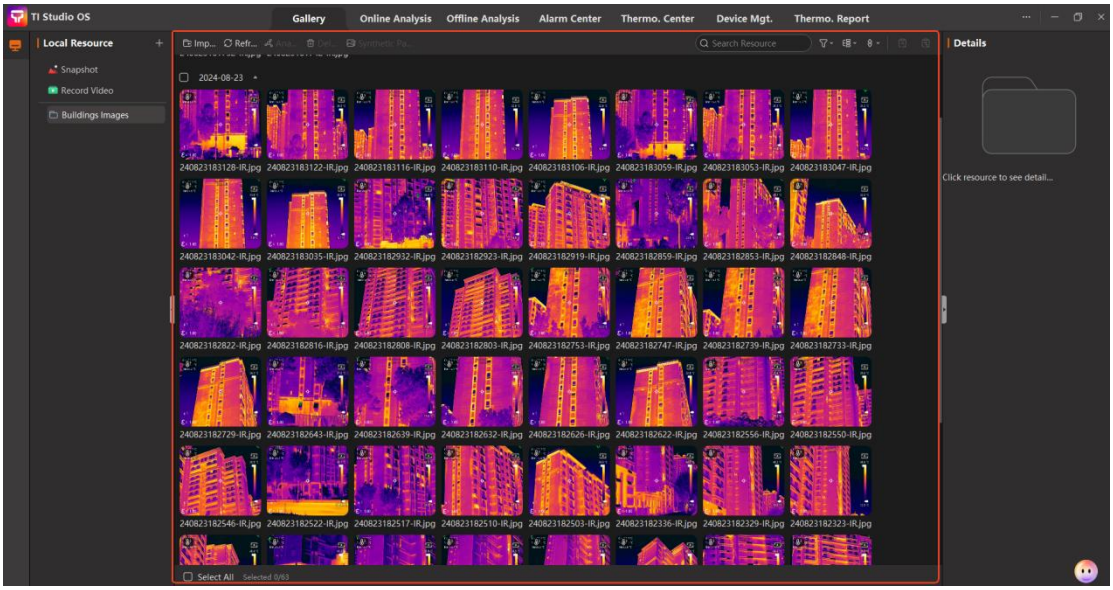
③ Export Report: Quickly batch export temperature analysis reports based on the same report template for all analyzable pictures in that path, see section "*2.3.6.1.4 Generating Temperature Analysis Report*" for details.

④ Delete: Delete the material set, including the files imported into the material set, but do not delete the source files (if the source files are also on the computer).

⑤ Rename: Renames the resource path.



2.3.5.2 Resource Preview

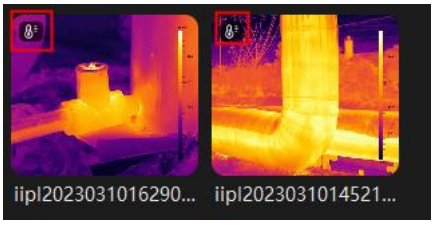


The area outlined in red in the image above is the Resource Preview area. Clicking on a resource path in the "Local Resource " will display the resources contained in that path in this area.

In the preview area, clicking on a resource will select it, and in the "Details" area on the right, you can preview the image or video and view its properties.

Press and Hold the Ctrl key while clicking on resources in the preview area allows you to select multiple resources.

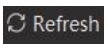
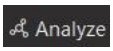
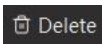
If an image or video contains temperature data (i.e., is analyzable), an analyzable icon will be displayed in the top left corner of the thumbnail in the preview area, as shown in the image below:

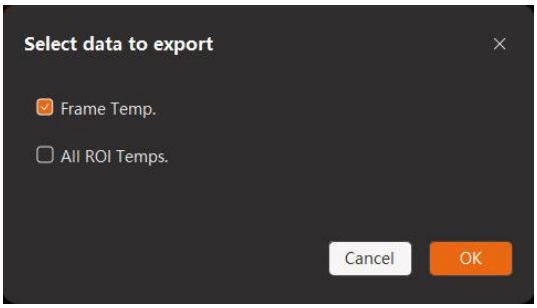


After double-clicking on an analyzable image or video, it will be imported into the "Offline Analysis" for secondary analysis.

For images or videos that cannot be analyzed, double-clicking will open a separate popup window for preview or playback in the gallery.

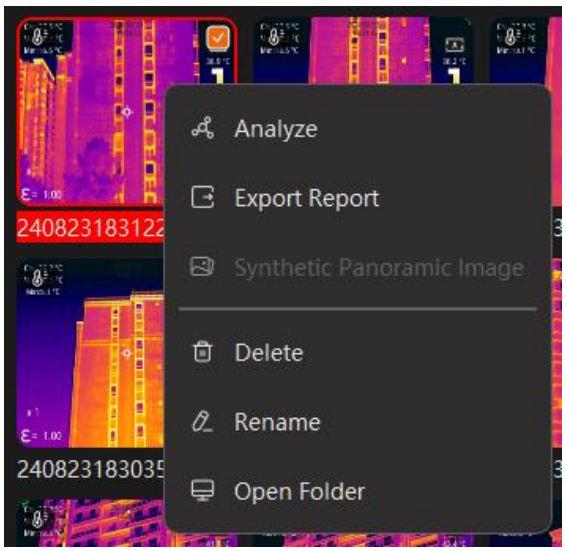
Explanation of buttons in the preview area:

Function	Description
Import	External (computer, USB flash drive, or handheld device) image/video resources can be imported into the current material set
 Refresh	After clicking this icon, resources under the path will be reloaded into the preview area
 Analyze	After selecting one or more resources, clicking the 'Analysis' button allows the selected resources to be quickly imported into the 'Offline Analysis' for subsequent secondary analysis.
 Delete	After selecting one or more resources, clicking the 'Delete' button will remove the selected resources. ⚠ ***Note:*** *The files in the material set will be deleted here, but the source files will not be deleted (if the source files are also on the computer).*
Synthetic panoramic image	By default, it is not available. In the current material set, selecting 2 or more images will make this feature available. After clicking this button, the selected multiple images will be combined into one. If the merge is successful, the merged image will be displayed in a pop-up window later. If the merge fails, an information prompt will be given. The merged image contains temperature data and can be subjected to secondary analysis.
	You can perform a fuzzy search based on the 'File Name'.
Filter	The dropdown menu includes 'All' (default), 'Images', 'Videos'. Upon selection, it filters the resources in the preview area accordingly.
Grouping	Grouping display of resources in the preview area, including three dimensions: by day (default), by month, and by year.
Sorting	Setting sorting options for resources in the preview area, supporting: Group and within group: Ascending by time, Descending by time (default); Within group: Ascending by name, Descending by name.
Export Report	After selecting one or more analyzable images, clicking the

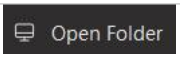
	'Export Report' button allows for the quick export of a temperature analysis report according to the selected fixed report template, as detailed in section '*2.3.6.1.4 Generating Temperature Analysis Reports*'.
Export Temperature Data	After selecting one or more analyzable images, click the "Export Temperature Data" button, and the following window will pop up:  When "Frame Temperature" is checked, the entire frame's temperature data will be exported to a single CSV file. When "All ROI Temperatures" is checked, the temperature data of each closed measurement area (including rectangles, circles, polygons, etc.)—both along its boundary and inside the area—will be exported to a separate CSV file.

Right-click Menu Description for Preview Area:

Right-click on an image or video thumbnail in the preview area to display the following context menu:

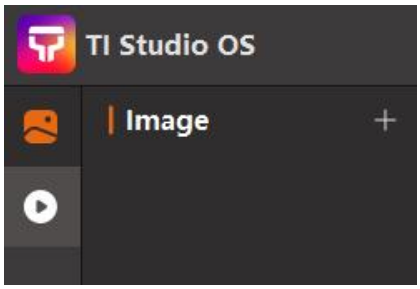


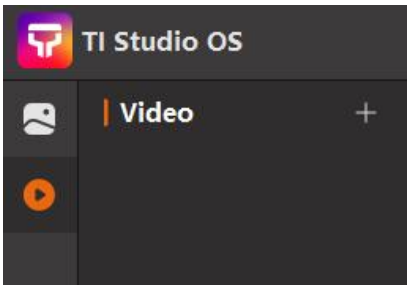
Menu	Function Descriptions
Analyze Analyze	Import one or more selected resources from the current

	preview area into the 'Offline Analysis' for subsequent secondary analysis."
Export Report	Quickly export a temperature analysis report for one or more selected analyzable images from the current preview area using the selected fixed report template. For details, see section '*2.3.6.1.4 Generating Temperature Analysis Reports*'.
Synthetic panoramic image	By default, it is not available. In the current material set, selecting 2 or more images will make this feature available. After clicking this button, the selected multiple images will be combined into one. If the merge is successful, the merged image will be displayed in a pop-up window later. If the merge fails, an information prompt will be given. The merged image contains temperature data and can be subjected to secondary analysis.
Delete	Delete one or more selected resources from the current preview area. ⚠ ***Caution:*** *The files in the material set will be deleted here, but the source files will not be deleted (if the source files are also on the computer)*
Rename	Rename the resource that was right-clicked in the current preview area.
 Open Containing Folder	Open the disk folder containing the resource that was right-clicked.

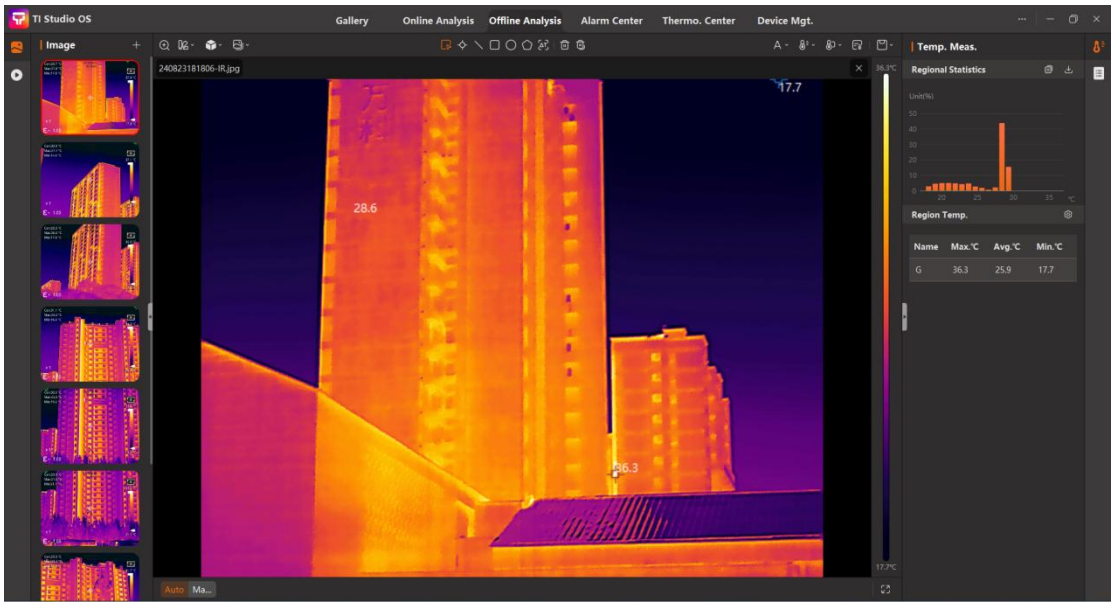
2.3.6 Offline Analysis

The "offline analysis" can perform secondary analysis on images and videos that "contain temperature data." You can switch between "image analysis" and "video analysis" using the tabs on the left side of the page.





2.3.6.1 Image Analysis



2.3.6.1.1 Image Import

Here are the two ways to import images:

1. Internal import (i.e. importing from the material library)

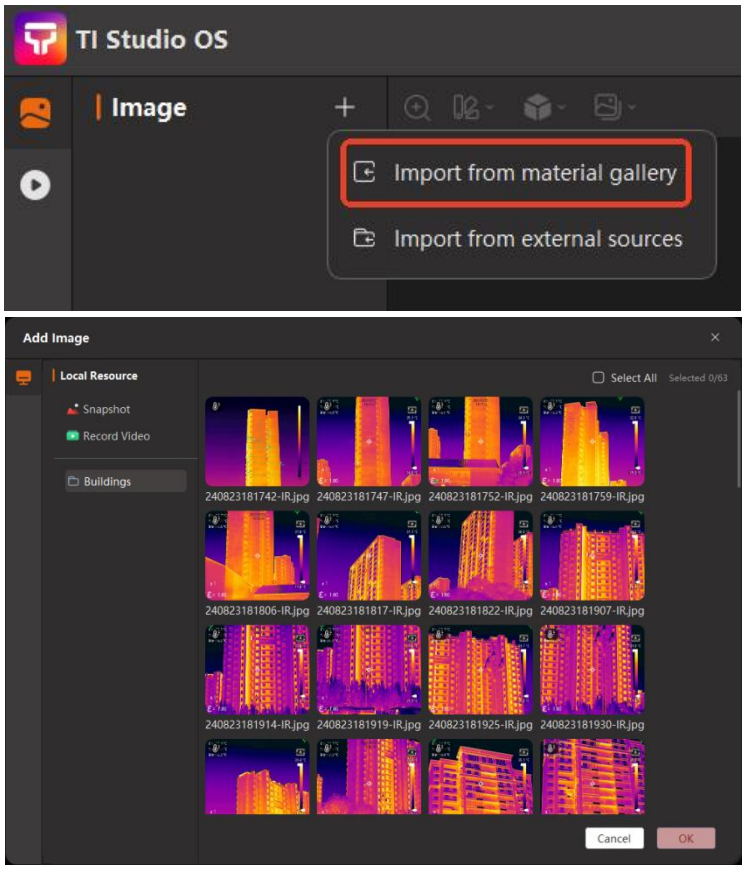
➢ In the "Gallery" , select materials and load them into the "Offline Analysis".

① Double-click on an analyzable image in the "Gallery," and the software will automatically open the "Offline Analysis" and load the image resource.

② Select multiple analyzable images at once, click the "Analyze" button above the preview area, and the software will automatically open the "Offline Analysis" and load all selected image resources.

➢ In the left area of the "Offline Analysis", click the "Import" button and select "Import from Material Library" in the pop-up submenu. Only the image resources managed in the material library module will be displayed in the opened window.

.



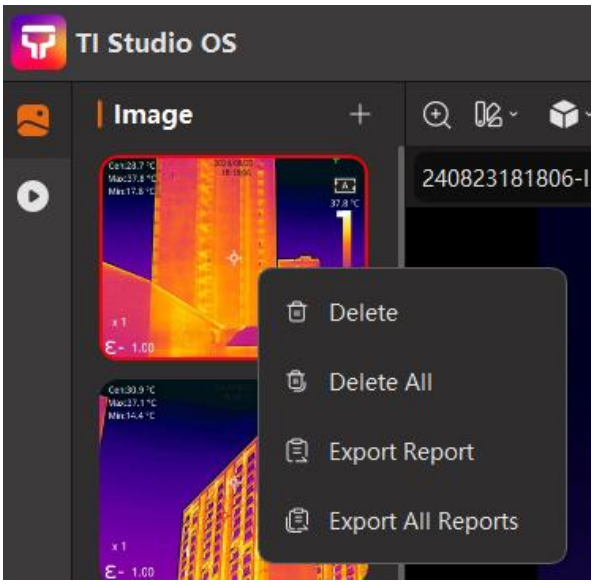
2. External import

- In the left area of the "Offline Analysis" module, click the "Import" button and select "Import from External" from the pop-up submenu. The "System Resource Selection Window" will then open, allowing you to select and import analyzable heat maps from any location on your computer or external mobile devices (such as USB drives, handheld devices, and mobile phones).

Note:

Due to the implementation mechanism issue on the device side, the RT/RS series handheld devices cannot be seen in the system resource manager when importing into the material library module or offline analysis module after enabling "data sharing" (which can be accessed for real-time analysis).

2.3.6.1.2 Image Management



Right-clicking on an image resource in the list provides the following functions in the context menu:

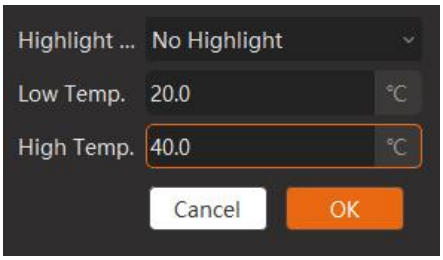
Function	Descriptions
Delete	Delete the currently clicked image
Delete All	Delete all imported resource images from the left-hand list.
Export Report	Export the temperature analysis report for the currently clicked image.
Export All Reports	Batch export temperature analysis reports for all imported images in the left-hand list according to the selected fixed template.

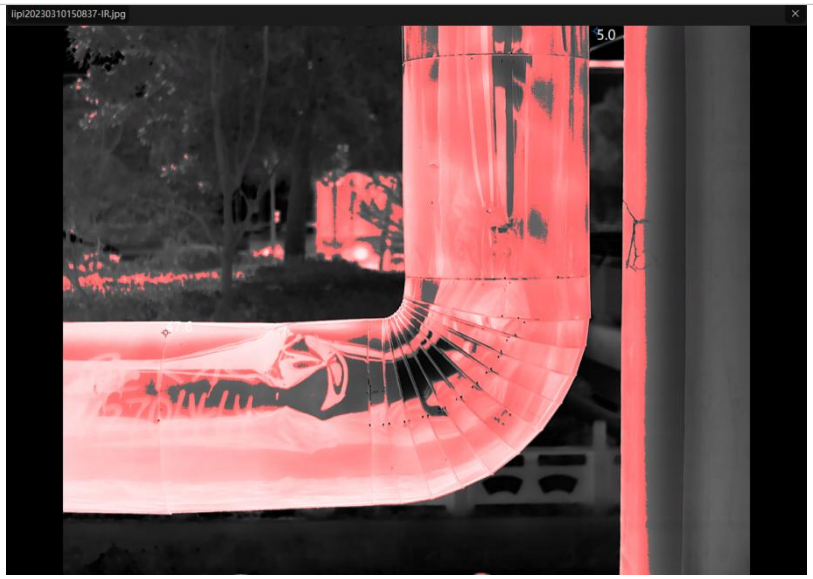
Note:

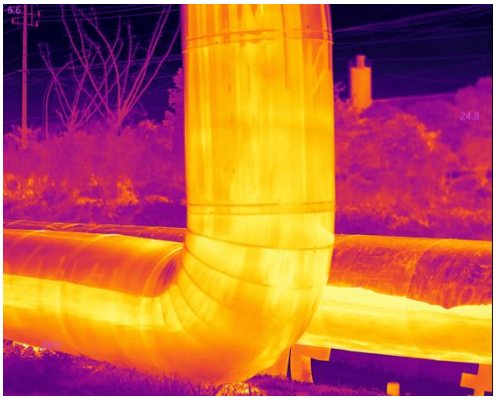
The deletion here only removes the images from the "Offline Analysis" and does not actually delete the files from the disk.

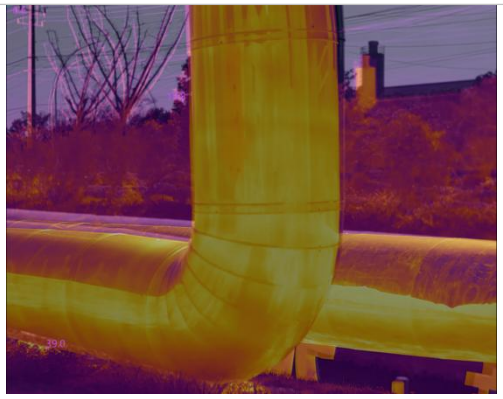
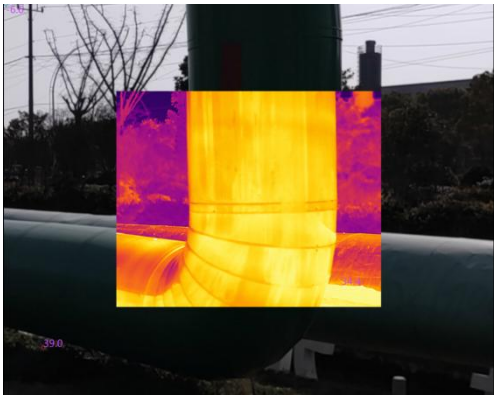
2.3.6.1.3 Analysis Tool

(1) Above the image preview area is the analysis toolbar, with the specific functions of each tool as follows:

Function	Descriptions
Digital zoom	Clicking on , when it becomes selected, indicates that the "digital zoom" function has been enabled. At this point, by scrolling the mouse wheel over the current preview screen, you can zoom in or out of the preview image. Clicking again, when it changes to , disables the "digital zoom" function.
Color palette settings	Clicking on allows you to select the target color palette from the dropdown menu. Once selected, the current preview screen will switch to this color palette.
Color highlight settings	Clicking on opens a window where you can set the type and conditions for highlighting on the screen. This means overlaying special colors on areas of the current preview image that meet certain conditions, allowing for the rapid identification of regions with target temperature distributions.  The highlight types include: No highlight (default), High temperature highlight (overlay color on areas above the high temperature threshold), Low temperature highlight (overlay color on areas below the low temperature threshold), In-range (overlay color on areas between the low and high temperature thresholds), Out-of-range (overlay color on areas above the high temperature threshold or below the low temperature threshold). For example, when "High temperature highlight" is selected, the effect after setting is as shown in the following image:

<table>
<tr><td></td><td> 
</td></tr>
<tr><td> Image mode</td><td>For images captured by dual-spectrum devices, you can set the image display mode, including:

1）Infrared mode, which only displays images captured by the infrared channel. Images captured by single-channel devices are displayed in this mode by default and cannot be adjusted. The display effect is as shown in the following image:
 
2）Fusion mode, which displays a fusion of infrared and visible light images. You can adjust the fusion ratio (from 0 to 1, where 0 is infrared and 1 is visible light). The display effect is as shown in the following image:</td></tr>
</table>

	 3）PIP mode, the display effect is as shown in the following image:  4）Visible light mode, the display effect is as shown in the following image:
Super-Resolution	It is disabled by default. After clicking to enable the Super-Resolution feature, the video feed will undergo 4× Super-Resolution processing.
Temperature measurement rule drawing	Clicking this icon allows you to add a temperature measurement point by single-clicking with the mouse on the real-time preview screen. **Note:** *Currently, the number of temperature measurement points is "array*

*columns * array rows" at most.*

Clicking this icon allows you to add a temperature measurement line by single-clicking and dragging the mouse on the real-time preview screen.

Clicking this icon allows you to add a temperature measurement rectangle by single-clicking and dragging the mouse on the real-time preview screen.

Clicking this icon allows you to add a temperature measurement circular box by single-clicking and dragging the mouse on the real-time preview screen.

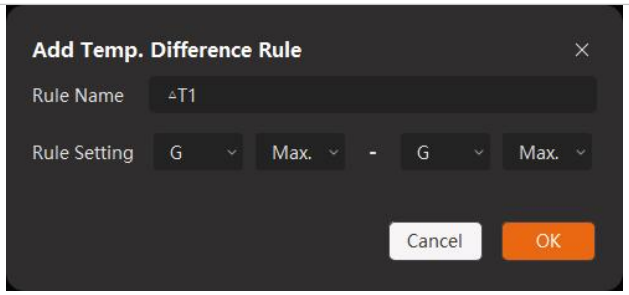
Clicking this icon allows you to add a temperature measurement polygon box by single-clicking and dragging the mouse on the real-time preview screen. This polygon supports up to 10 points.

: S-Smart: After clicking the icon, please draw a rectangle over the target object in the preview area. Based on the image segmentation algorithms, the system automatically selects the edges of the target object within the rectangle. At present, the preview area only supports using this function once to select the target object frame.

Note

Currently, the software supports a maximum of 20 combined temperature measurement tools, including temperature measurement lines, rectangles, circular boxes, and polygons.

Difference temperature measurement rule: Clicking this icon opens a window where you can set the temperature difference between "max, min, avg temperatures of two temperature measurement rules" or "max, min, avg temperature of one temperature measurement rule and a constant”.



Note

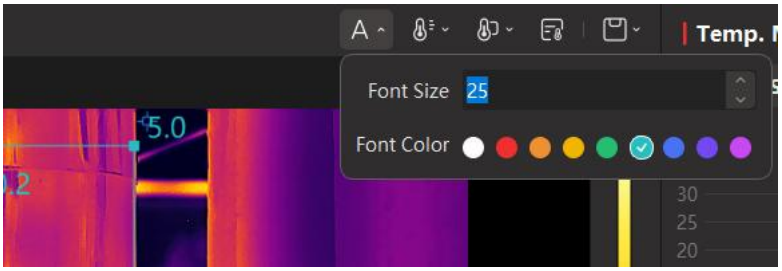
Currently, the software supports defining up to 10 difference temperature measurement rules.

Delete a single temperature measurement rule: Clicking this icon allows you to delete a single temperature measurement rule by clicking on the previously drawn temperature measurement rule on the preview screen.

Delete all temperature measurement rules: Clicking this icon allows you to delete all the temperature measurement rules drawn on the preview screen at once.

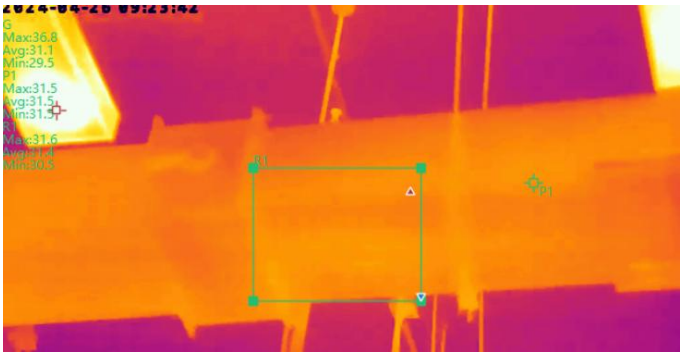
Preview screen font settings

Clicking this icon opens the window shown below, where you can set the **font size and color for the temperature measurement rule names, as well as the font size and color for the highest and lowest temperature values** displayed on the preview screen. Additionally, you can set the **color of the temperature measurement rule borders.**



Settings for displaying max and min temperatures for the full frame

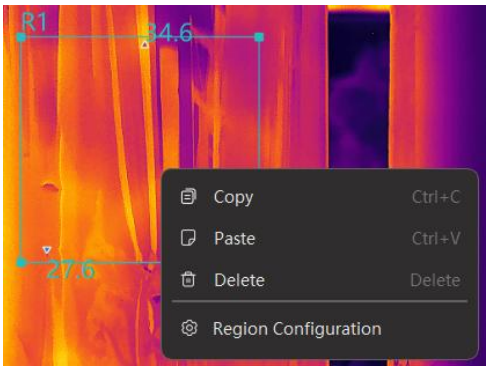
Clicking on it allows you to set whether to display the max and min temperatures for the full frame in the dropdown menu on the **preview screen**. By default, both are displayed.

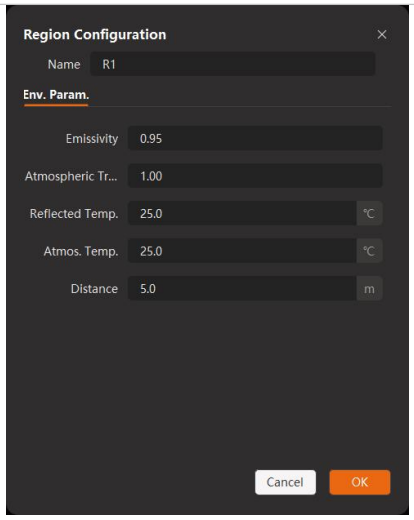
 Settings for displaying max and min temperatures of temperature measurement rules	Clicking on it allows you to set whether to display the maximum and minimum temperatures of each temperature measurement rule in the dropdown menu on the **preview screen.** By default, both are displayed.
 Temperature information display mode settings in real-time preview area	Settings for the display position of the maximum and minimum temperatures of temperature measurement rules. By default, they are displayed within each temperature measurement rule. Clicking this icon toggles the display mode. When it changes to , the high and low temperature information of the temperature measurement rules is concentrated on the left side of the preview screen. Clicking the icon again restores the default state. Default: After toggling: 
 Save/Save As	After clicking this button, the dropdown list contains two options: "Save" and "Save As". Save: Saves the current analysis and settings made to the image, which will modify the original image.

	Save As: Saves the current preview image as a new image. Any modifications made to the image will be saved in this new image, leaving the original image unchanged.

(2) The functions of each submenu in the right-click menu on the preview screen are as follows:

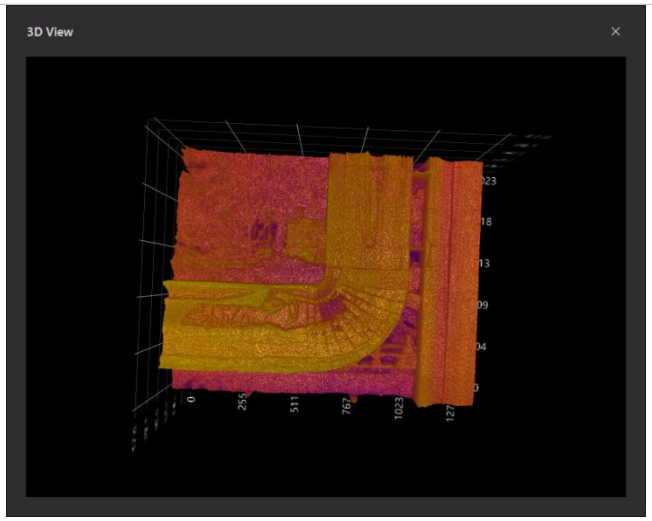
A) Right-clicking on a single temperature measurement rule allows you to access a submenu with the following functions:

Function	Descriptions
Copy Ctrl +C	In the real-time preview area, right-clicking on a temperature measurement rule allows you to quickly "Copy," "Paste," or "Delete" a single temperature measurement rule using these functions. You can also use the keyboard shortcuts "Ctrl + C" for copy, "Ctrl + V" for paste, and "Delete" for delete. 
Paste Ctrl +V	
Delete Delete	
Region Focus	It is the same as the "Region Focus" function in the "Online Analysis" module.
Region settings	In the popup window below, you can modify the name and environmental parameters of the current temperature measurement rule.

	 After the settings are done, click the 'OK' button to confirm.
Export Temperature data	If the current mouse is pointing to a "closed temperature measurement area", such as a rectangle, circle, or polygon, clicking the "Export Temperature Measurement Data" menu item will export the temperature data on the boundary lines and inside the area to a CSV file. If the current mouse is pointing to a "non enclosed temperature measurement area", such as a point or line, clicking the "Export Temperature Measurement Data" menu item will export the entire frame of temperature data to a CSV file.

B) Right-clicking on a non-temperature measurement rule area (i.e., the full frame) allows you to access a submenu with various functions.

Function	Descriptions
Paste Ctrl +V	You can quickly paste a previously copied single temperature measurement rule.
Delete All	You can delete all temperature measurement rules on the preview screen.
Rotate 90° clockwise	Click once to rotate the image in the current preview area image 90° clockwise.
Counter-clockwise 90° rotation	Click once to rotate the image in the current preview area image 90° counterclockwise.
3D View	Clicking this option will display the current preview image in 3D imaging mode, as shown in the following figure:

	 When you right-click and drag on the image, you can adjust the viewing angle of the 3D view.
Super-resolution	Clicking this option will display the super-resolution mode effect of the current preview image (4x resolution).
Region Settings	Same as the “Region Settings” in the "**Right-click on a single temperature measurement rule**" menu, but here it sets the full-frame information.
Export Temperature Data	Export the full-frame temperature data contained in the current preview image to a CSV file.
Export Report	Export a temperature analysis report according to the selected template.

(4) Other Analytical Tools

A) Mouse Follow

In the preview area, to the right of the mouse icon, the temperature value at the mouse pointer location is displayed in real-time.

B) Temperature Scale

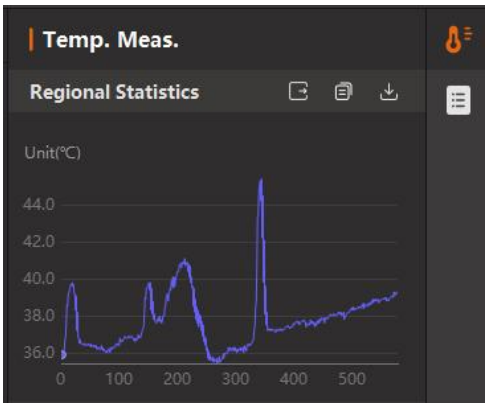
Similar to "Temperature Scale" in "*2.2.2.3.2 Analytical Tools*."

The difference here is that in manual mode, the "Temperature Scale" does not have a "lock function”.

C)Area Temperature Statistics

In the right-hand area of the window, under the "Temperature Measurement" tab, a temperature data distribution chart for the selected (left-clicked) "temperature measurement rule" in the current preview image can be displayed.

For the temperature measurement "line", the distribution chart is as follows:



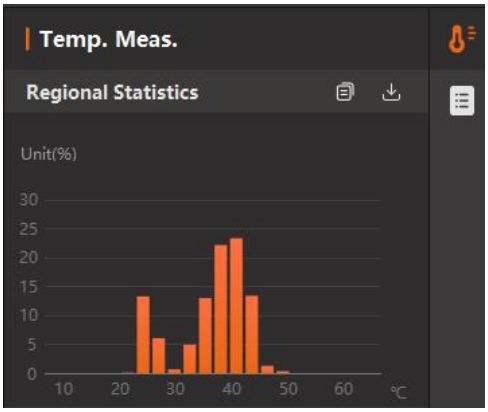
The horizontal axis in the above graph represents the "pixel position on the line," and the vertical axis represents the "temperature corresponding to the pixel".

Click the icon on the right side of the title bar to export the temperature data behind the statistical chart to a CSV file.

Click the icon to copy the current statistical curve, which can be directly pasted into other reports (e.g., Word, PowerPoint).

Click the icon to save the current statistical chart as a JPG file.

For "full frame" or "rectangular, circular, polygonal" temperature measurement rules, the distribution chart is as follows:



The horizontal axis in the above graph represents the "temperature distribution within the statistical area," and the vertical axis represents the "proportion of temperature data."

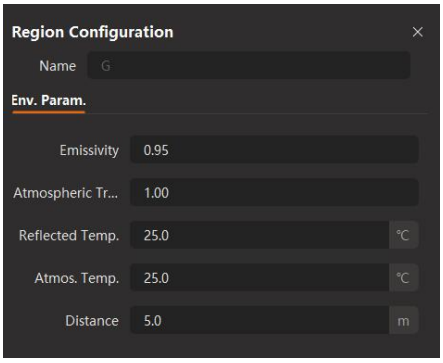
Click the icon on the right side of the title bar to copy the current statistical curve, which can be directly pasted into other reports (e.g., Word, PowerPoint).

Click the icon to save the current statistical chart as a JPG file.

D)Temperature Display for Temperature Measurement Rules

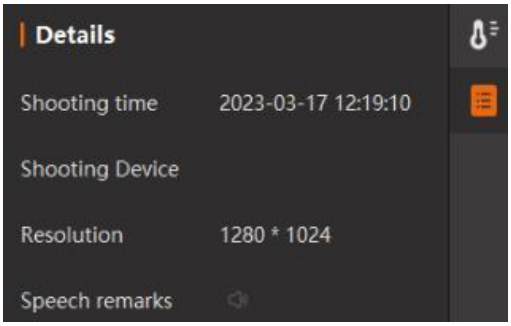
In the right-hand area of the window, under the "Temperature Measurement" tab, the "Area Temperature" section displays the temperature data (highest temperature, lowest temperature, average temperature) for all temperature measurement rules in the current analysis image.

After selecting a specific temperature measurement rule, click the "Settings" icon on the top right of the title bar to open the "Area Settings" window. This window is the same as the one opened from the "Area Settings" option in the right-click menu within the preview window.

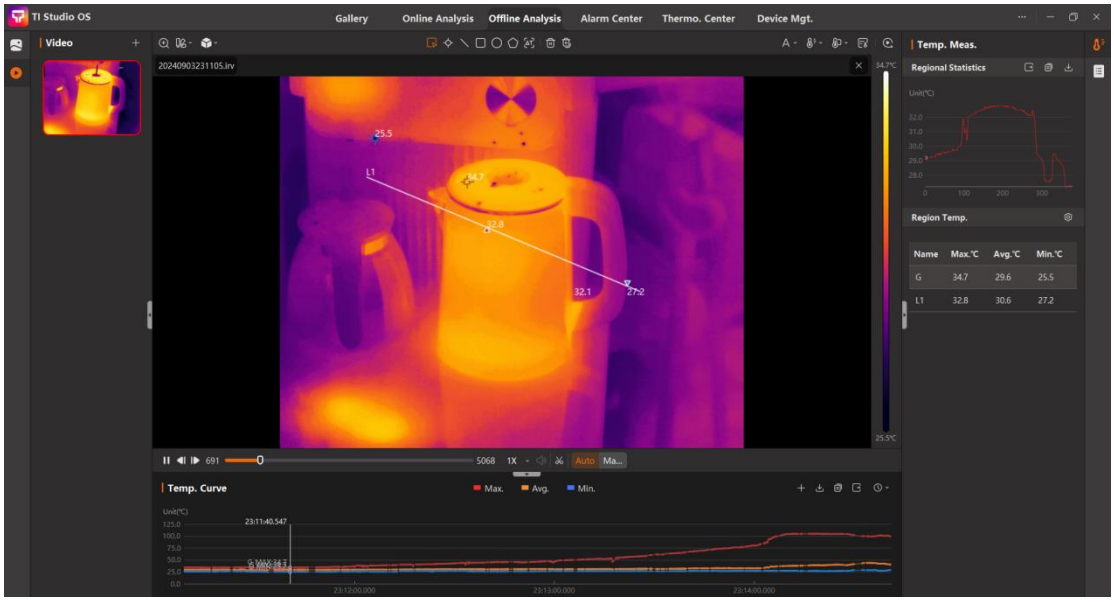


E)Image Details

In the right-hand area of the window, under the "Details" tab, you can view the annotation and attribute information of the image, as shown below:



2.3.6.2 Video Analysis



2.3.6.2.1 Video Import

Consistent with 'Image Import', there are two ways to import videos:

1. Internal import (i.e. importing from the material library)

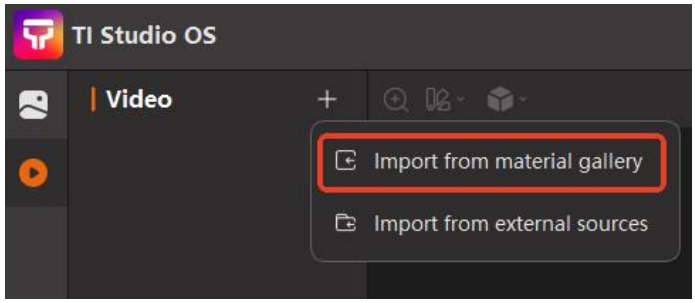
➢ In the "Gallery", select the media and load it into the "Offline Analysis".

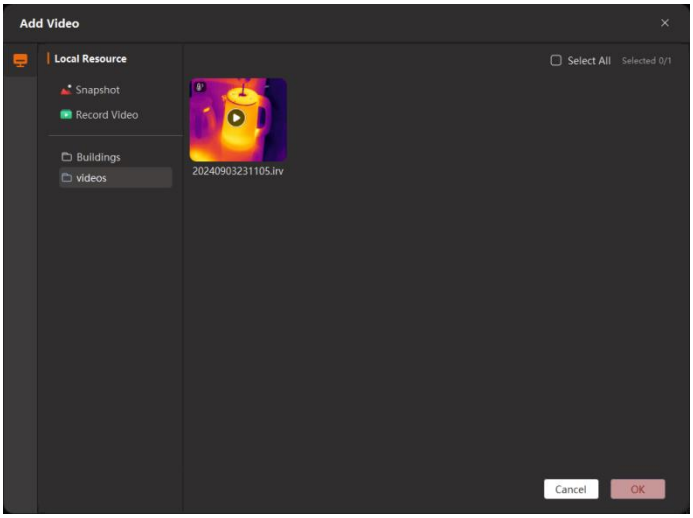
① Double-click a video in the "Gallery" that can be analyzed. The software will automatically open the "Offline Analysis" and load the double-clicked video resource.

② Select multiple videos that can be analyzed, and click the "Analyze" button above the "Preview Area". The software will automatically open the "Offline Analysis" and load all the selected video resources.

➢ In the left area of the "Offline Analysis", click the "Import" button and select "Import from Material Library" in the pop-up submenu. Only the video resources managed in the material library module will be displayed in the opened window.

This import method allows you to conveniently and dynamically import new resources directly in the "Offline Analysis".





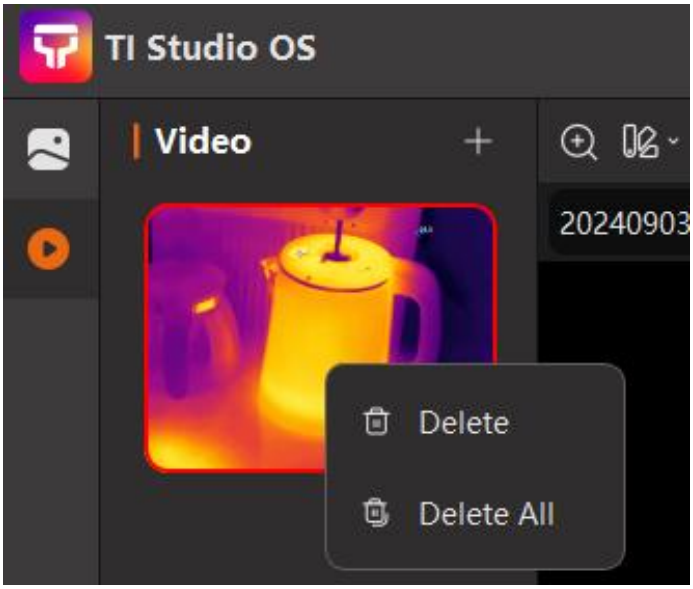
2. External import

In the left area of the "Offline Analysis" module, click the "Import" button and select "Import from External" from the pop-up submenu. The "System Resource Selection Window" will then open, allowing you to select and import analyzable videos from any location on your computer or external mobile devices (such as USB drives, handheld devices, and mobile phones).

Note:

Due to the implementation mechanism issue on the device side, the RT/RS series handheld devices cannot be seen in the system resource manager when importing into the material library module or offline analysis module after enabling "data sharing" (which can be accessed for real-time analysis).

2.3.6.2.2 Video Management



Right-click on a video resource in the list shown above to access the following options in the context menu:

Function	Descriptions
Delete	Delete the currently selected video.
Delete All	Delete all imported videos from the list.

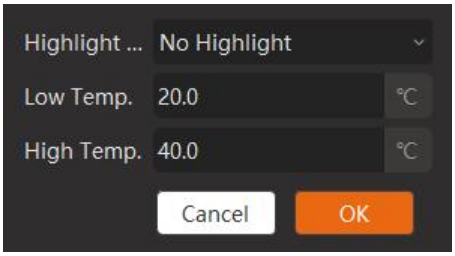
Note:

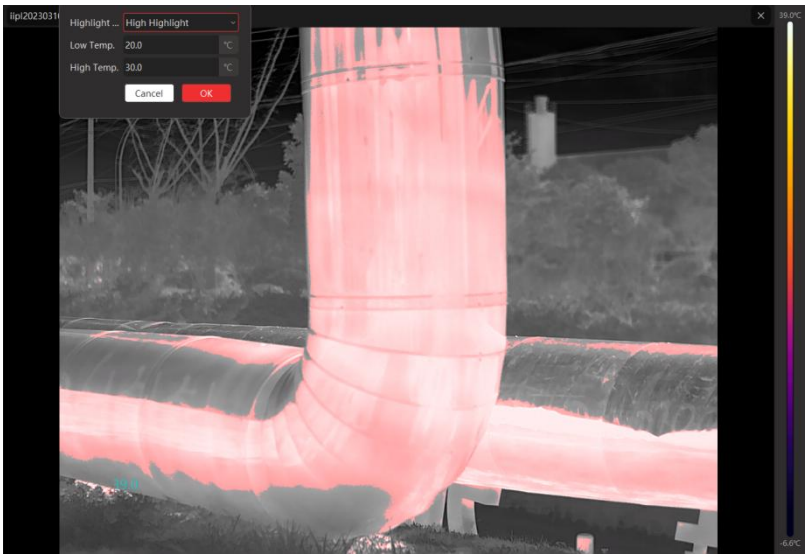
Deleting here only removes the videos from the "Offline Analysis" and does not actually delete the files from the disk.

2.3.6.2.3 Analysis Tools

There are currently two types of videos supported for analysis by software: videos containing temperature data and videos containing gas data.
The analysis functions provided for different types of videos vary.

1. Video containing temperature data
(1) Above the video preview area is the analysis toolbar, with the specific functions of each tool as follows:

Function	Descriptions
Digital Zoom	Click to activate the "Digital Zoom" function. When selected, scrolling the mouse wheel on the current preview screen will zoom in or out. Click again to deactivate the "Digital Zoom" function.
Color Palette Settings	Click to choose a color palette from the dropdown menu. Once selected, the current preview screen will switch to this color palette.
Color Highlight Settings	Clicking opens a window where you can set the type and conditions for color highlighting on the previewed video. This feature overlays special colors on regions of the video that meet specific temperature distribution criteria, making it easier to identify areas with target temperatures.  Highlight types include: No Highlight (default) High-Temperature Highlight (applies color to areas above a high-temperature threshold)

	Low-Temperature Highlight (applies color to areas below a low-temperature threshold) Interval (applies color to areas between a low-temperature and high-temperature threshold) Out of Range (applies color to areas either above the high-temperature threshold or below the low-temperature threshold) For example, if "High-Temperature Highlight" is selected, the effect will be as shown in the following image: 
Super-Resolution	Currently, Super-Resolution is only supported for videos with a resolution of "256*192". It is disabled by default. After clicking to enable the Super-Resolution feature, the video feed will undergo 4× Super-Resolution processing.
Drawing temperature rules	:Clicking this icon allows you to add a temperature measurement point by clicking on the real-time preview screen. ***Note*** *Currently, the number of temperature measurement points that the software supports is "Array Length * Array Width".* : Clicking this icon allows you to add a temperature measurement line by clicking and dragging on the real-time preview screen. : Clicking this icon allows you to add a temperature measurement rectangular box by clicking and dragging on the

real-time preview screen.

: Clicking this icon allows you to add a temperature measurement circular box by clicking and dragging on the real-time preview screen.

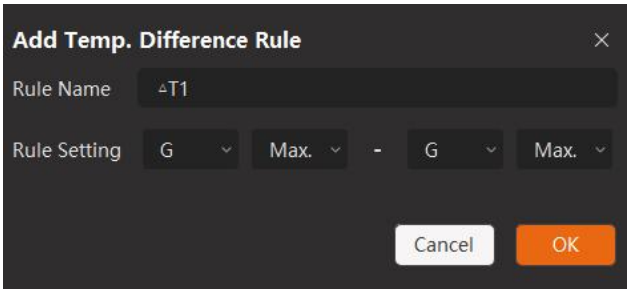
: Clicking this icon allows you to add a temperature measurement polygonal box by clicking and dragging on the real-time preview screen. (**This polygon supports up to 10 points**).

: S-Smart: After clicking the icon, please draw a rectangle over the target object in the preview area. Based on the image segmentation algorithms, the system automatically selects the edges of the target object within the rectangle. At present, the preview area only supports using this function once to select the target object frame.

Note

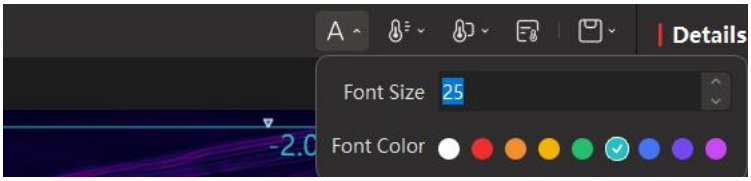
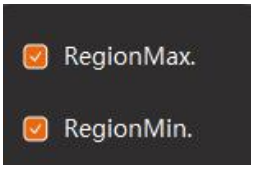
Currently, the software supports drawing up to a total of 20 items, including "Temperature Measurement Line + Temperature Measurement Rectangle + Temperature Measurement Circle + Temperature Measurement Polygon".

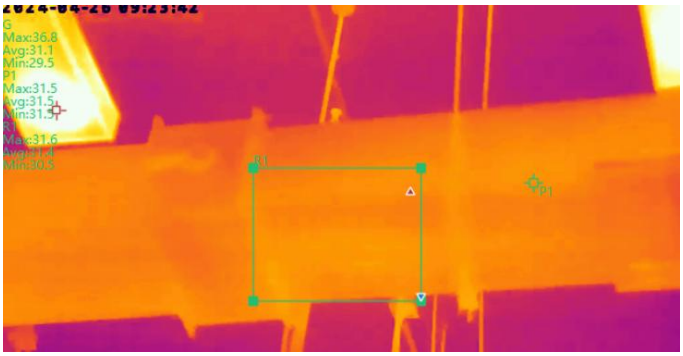
: Temperature difference measurement rule. After clicking this icon, you can set the temperature difference between "max, min, avg temperature of two temperature rules" or "max, min, avg temperature of one temperature rule and a constant value" in the pop-up window.



Note

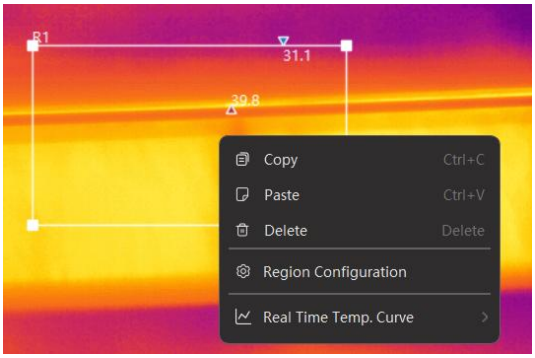
Currently, the software supports defining up to 10 temperature difference measurement rules.

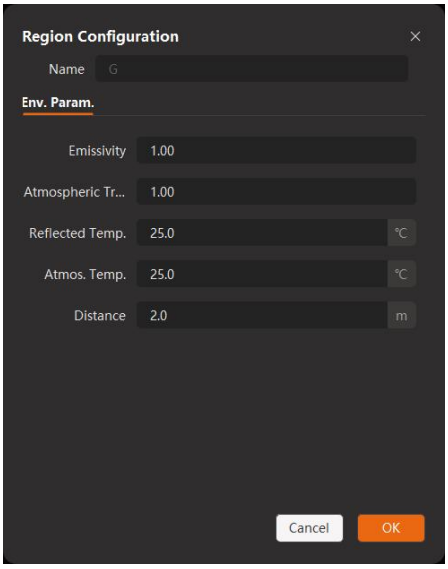
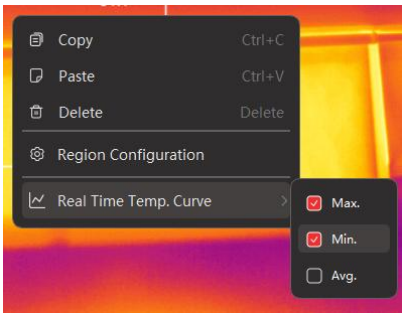
	: Delete a single temperature measurement rule. After clicking this icon, click on the temperature measurement rule previously drawn on the preview screen to delete it. : Delete all temperature measurement rules. After clicking this icon, you can delete all temperature measurement rules drawn on the preview screen at once.
Preview Screen Font Settings	Clicking on this icon opens the window below, where you can adjust the **font size and color of the temperature measurement rule names, as well as the font size and color of the maximum and minimum temperature values** displayed on the preview screen. You can also set **the color of the temperature measurement rule borders.** 
Full Frame Highest/Lowest Temperature Display Settings	Clicking on this option allows you to toggle the display of the highest and lowest temperatures for the full frame on the **preview screen**. Both are displayed by default.
Highest/Lowest Temperature of the Temperature Measurement Rule Display Settings	Clicking here enables you to choose whether to display the highest and lowest temperatures for each temperature measurement rule on the **preview screen**. Both are displayed by default. 
Temperature Information Display Mode Settings in Real-time Preview Area	This option sets the display mode for temperature information in the real-time preview area, specifically the display position of the highest and lowest temperatures for each temperature measurement rule. By default, they are shown within each temperature rule. Clicking on this icon toggles the display mode. When activated, the highest and lowest temperature information for all temperature rules is consolidated and displayed on the left

	side of the preview screen. Clicking it again restores the default state. Default: After switch: 
Export MP4	Clicking this option allows you to generate an MP4 format video of the current analysis video.

(2) Right-click context menu in the preview screen, with the following sub-menu functions:

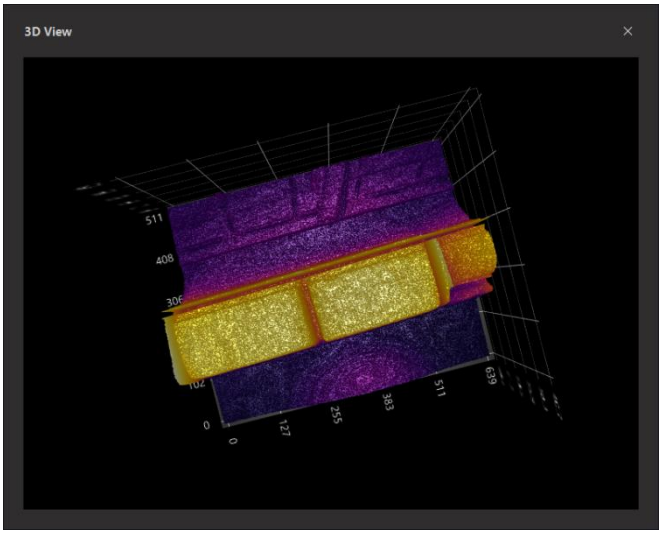
A) Right-click on a single temperature measurement rule.

Function	Description
Copy Ctrl +C	In the real-time preview area, right-click on a temperature measurement rule to quickly "Copy," "Paste," or "Delete" the rule using the context menu options. You can also use the keyboard shortcuts "Ctrl + C," "Ctrl + V," and "Delete" to quickly copy, paste, and delete a single temperature measurement rule.
Paste Ctrl +V	
Delete Delete	

Region Focus	It is the same as the "Region Focus" function in the "Online Analysis" module.
Region Settings	In the pop-up window as shown below, you can modify the name and environmental parameters of the current temperature measurement rule:  After completing the settings, click the "OK" button to apply the changes.
Real-time Temperature Curve	You can select one or more of "Highest Temperature," "Lowest Temperature," and "Average Temperature." The curve display panel will automatically expand, showing the real-time temperature change trends for the selected measurement rule.  Click the button at the top of the "Curve Display Panel" to expand or collapse the panel. Click the button at the top right of the panel to add a new curve in the pop-up window.

	Click the button at the top right of the panel to copy the current curve chart, which can then be pasted into other documents. Click the button at the top right of the panel to save the current statistical chart as a JPG image. Click the button at the top right of the panel to export the temperature data of the current statistical chart to a CSV file. Click the button at the top right of the panel to adjust the temperature curve's time display mode: actual time or relative time.
Export Current Frame Temperature Data	If the mouse cursor is currently pointing to a "closed measurement area" (e.g., rectangle, circle, polygon), clicking the "Export Current Frame Temperature Data" menu item will export the temperature data along the boundary and inside this area to a CSV file. If the mouse cursor is currently pointing to a "non-closed measurement area" (e.g., point, line), clicking the "Export Temperature Data" menu item will export the entire frame's temperature data to a CSV file.

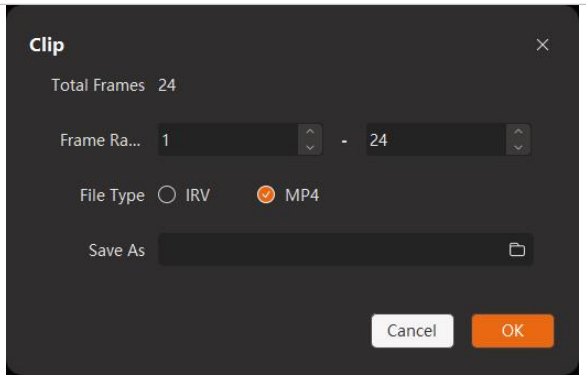
B) Right-click on a non-temperature measurement rule area (i.e., the full frame).

Function	Description
Paste Ctrl +V	You can quickly paste a previously copied single temperature measurement rule.
Delete All	You can delete all temperature measurement rules from the preview screen.
3D View	After clicking, the 3D imaging mode of the current preview image will be displayed, as shown in the figure below:  Right-click and drag on the image above to adjust the viewing angle of the 3D view.

Export All Rules	You can export all the analysis rules set in the current preview screen to a template file, including: 1.Environmental parameters, pseudo color and color highlighting Rules. 2.Information for each temperature measurement rule, including type, coordinates, environmental parameters. 3. Temperature sacle rules, play speed. 4. Temperature curves .
Import All Rules	You can import the "Analysis Rules Template" exported from the software to quickly copy and reuse analysis rules. Note: As long as the resolution of the entire frame in the template is consistent with the resolution of the current video frame, the analysis rules in the template can be imported and applied, even if the shooting devices of the two are different.
Region Settings	Similarly to the "**Right-click on a single temperature measurement rule**" menu, the "Region Settings" here pertain to the full frame information.
Real-time Temperature Curve	Similar to the "Real-time Temperature Curve" option in the "Right-click on a single temperature measurement rule" menu, here it pertains to the full frame information.

(3) Video Play Toolbar Functions:

Function	Description
	Start/Pause Playback.
	Previous Frame, Next Frame. After pausing playback, you can manually control the video frame displayed in the preview screen using these two icons.
	Playback speed adjustment supports 1/8, 1/4, 1/2, 1, 2, 4, 8.
	Audio Playback Control
	Video Clipping: After clicking this icon, you can set the "Clip Range," "Exported Video Format (IRV for analysis, MP4 for non-analysis)," and "Save Path" in the pop-up window shown below. Once the settings are complete, click the "OK" button to have the software automatically perform the clipping.

	
	Export Current Frame Image: The image includes temperature data and can be analyzed. You can use this feature after pausing playback and manually controlling the previous and next frames.
	Export Current Frame Temperature Data to CSV File: You can use this feature after pausing playback and manually controlling the previous and next frames.

(4) Other Analysis Tools

A) Mouse Follow

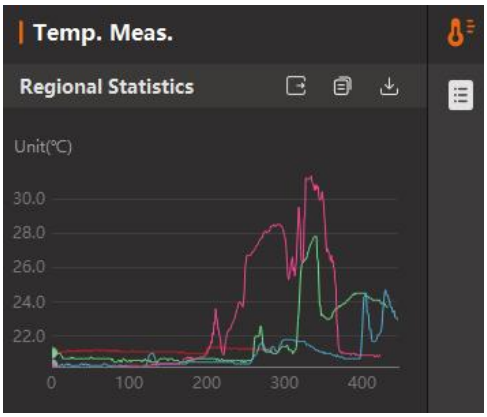
In the preview area, to the right of the mouse icon, the temperature value of the location pointed to by the mouse is displayed in real-time.

B) Temperature Scale

Similar to the "Temperature Scale" in *"2.2.2.3.2 Analysis Tools*". The difference is that in manual mode here, there is no "lock function".

C)Region Temperature Statistics

In the right area of the window, under the "Temperature Measurement" tab, you can display the temperature data distribution chart for all "temperature measurement lines" in the current preview video, as shown below:



In the chart above, the horizontal axis represents the "pixel position on the line," and the vertical axis represents the "temperature corresponding to the pixel."

Click the icon to save the current statistical chart as a JPG file.

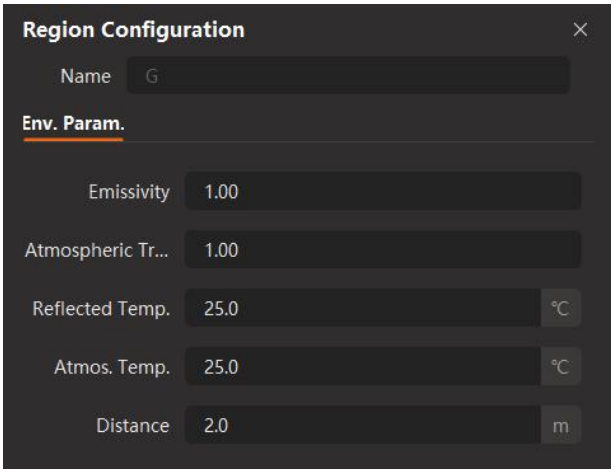
Click the icon on the right side of the title bar to export the temperature data behind the statistical chart to a CSV file.

Click the icon to copy the current statistical curve, which can be pasted directly into other reports (e.g., Word, PowerPoint, etc.).

D) Temperature Display of the Temperature Measurement Rule

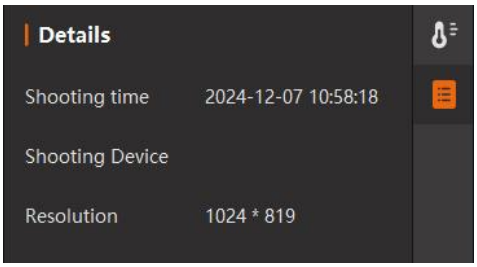
In the right area of the window, under the "Temperature Measurement" tab, the "Region Temperature" section displays the temperature data (highest, lowest, average) for all temperature measurement rules in the current analysis video.

After selecting a temperature measurement rule, click the "Settings" icon on the right side of the title bar to open the "Region Settings" window. This window is identical to the one opened through the "Region Settings" option in the right-click menu in the preview window.



E) Video Details

In the right area of the window, under the "Details" tab, you can view the properties of the video, as shown in the image below:



2. Video containing gas data

(1) Above the video preview area is the analysis toolbar, with the specific functions of each tool as follows:

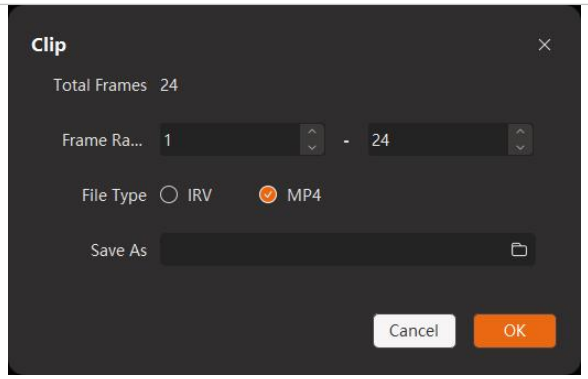
Function	Descriptions
Digital Zoom	Click to activate the "Digital Zoom" function. When selected, scrolling the mouse wheel on the current preview screen will zoom in or out. Click again to deactivate the "Digital Zoom" function.
Export MP4	Clicking this option allows you to generate an MP4 format video of the current analysis video.

(2) Right-click context menu in the preview screen, with the following sub-menu functions:

Function	Description
	Export Current Frame Image: The image includes temperature data and can be analyzed. You can use this feature after pausing playback and manually controlling the previous and next frames.

(3) Video Play Toolbar Functions:

Function	Description
	Start/Pause Playback.
	Video Clipping: After clicking this icon, you can set the "Clip Range," "Exported Video Format (IRV for analysis, MP4 for non-analysis)," and "Save Path" in the pop-up window shown below. Once the settings are complete, click the "OK" button to have the software automatically perform the clipping.



(4) Other Analysis Tools

A) Analyze parameter settings

On the right side of the window, in the "Gas Detection" tab, you can set relevant parameters, which currently include the following parameters:

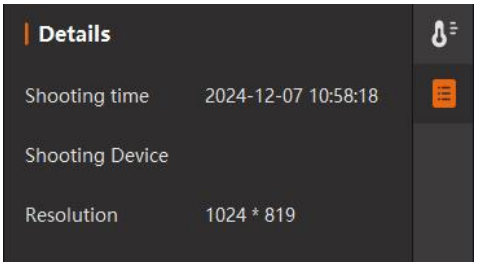
① Sensitivity , refers to the sensitivity of the algorithm to detect gases in the video. The higher the value, the more sensitive the detection, and the lower the requirement for detecting gas concentration.

② Gas types, currently supporting three gases: methane (CH4), sulfur hexafluoride (SF6), and ethylene (C2H4).

After the setting is completed, it will be immediately applied to the left video analysis.

B) Video Details

In the right area of the window, under the "Details" tab, you can view the properties of the video, as shown in the image below:

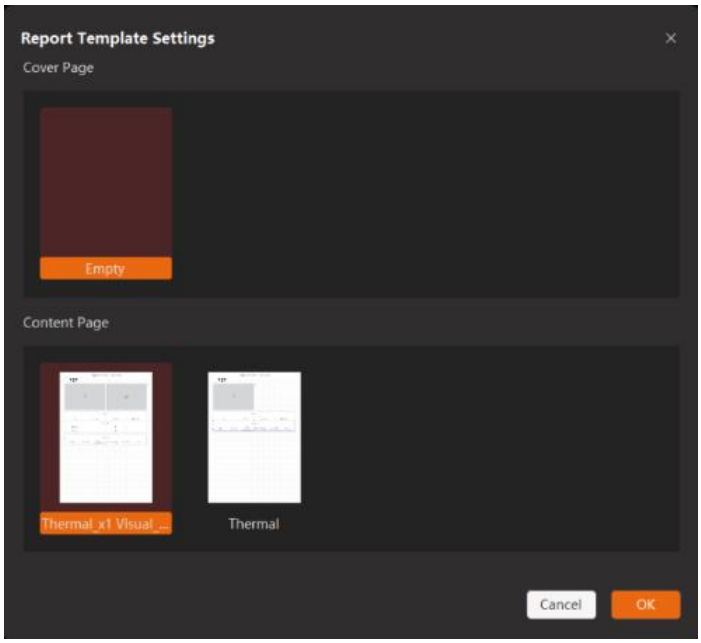


2.3.7 Generate Temperature Measurement Analysis Report

2.3.7.1 Report Template Selection

In "System Configuration - Basic Settings," you can set the "Temperature Measurement Report Template" mode, which includes two options: "Select Every Time" and "Default Settings."

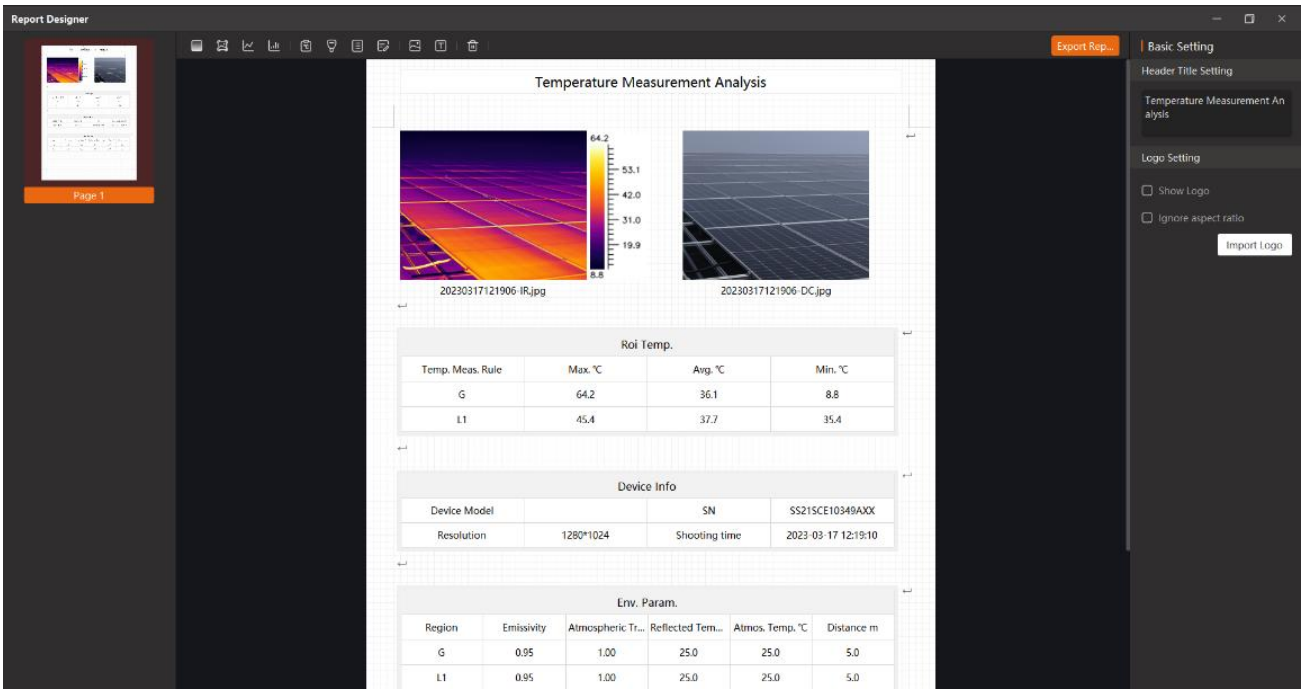
When set to "Select Every Time," a window titled "Report Template Selection" will appear each time you export a report, allowing you to choose the report template to use.
When set to "Default Settings," clicking the "Settings" button will allow you to set a default template in the window below. Subsequently, each time you export a report, the template selection window will not appear, and the default template will be used.



Currently, the software provides two built-in content page templates: "Single Thermal Image with Visible Light" and "Single Thermal Image."

2.3.7.2 Report Preview & Editing

In the "Gallery" or "Offline Analysis", click the "Export Report" function button/icon. After selecting a report template (if the template selection is set to "Select Every Time," you will need to choose a template), you will enter the report preview window, as shown below:



The page includes four areas: ① Component Area, ② Thumbnail Area, ③ Edit Preview Area, and ④ Attribute Area:

① Component Area

Clicking on a component will automatically insert the corresponding component into the current previewed report. The software will automatically calculate the position for inserting the component, but you can drag to adjust it.

Currently, the following components are available:

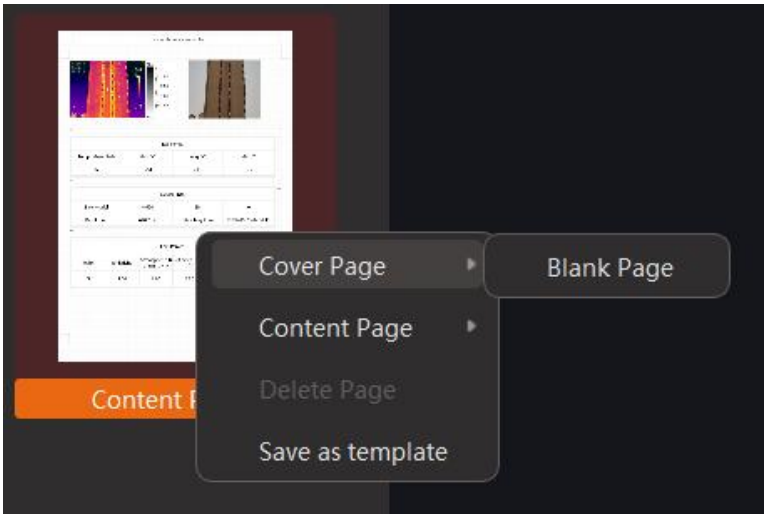
Icon	Name	Function Descriptios
	Thermal Image Component	Inserts an "Thermal Image" component into the report, linking to the infrared image.
	Visible Light Image Component	Inserts a "Visual Image" component into the report, linking it to the "Thermal Image" component and displaying the associated visual image.
	Line Chart Component	Inserts a "Line Chart" component into the report, linking it to the "Thermal Image" component to display the temperature distribution of the "line" ROI in the image.
	Bar Chart Component	Inserts a "Bar Chart" component into the report, linking it to the "Thermal Image" component to display the temperature distribution of the "enclosed area" ROI (e.g., full frame, rectangle, circle, polygon) in the image.
	ROI Temperature	Inserts an "ROI Temperature Information List"

	Information	component into the report, linking it to the "Thermal Image" component to display the maximum, average, and minimum temperature information of the ROI in the image. Support setting 'whether to display whole frame information' Support setting "whether to dynamically calculate and display the maximum temperature difference information between multiple ROIs"
	Device Information	Inserts a "Device Information" component into the report, linking it to the "Thermal Image" component to display relevant information about the device that captured the image.
	Environmental Parameter Information	Inserts an "Environmental Parameter" component into the report, linking it to the "Infrared Image" component to display the environmental parameters of the full frame and each ROI in the image.
	Remark Information	Inserts a "Remark Information" component into the report, linking it to the "Thermal Image" component to display recorded remarks in the image, with an option to edit the remarks. Support setting 'whether to display header'
	Regular Image	Inserts a "Regular Image" component into the report, allowing the inclusion of a normal (non-infrared) image.
	Regular Table	Insert a custom "number of rows and columns" table into the report, the table content only supports text and can be freely edited
	Regular Text	Inserts a "Regular Text" component into the report. Support setting 'whether to display borders'
	Delete Component	After clicking this icon, click on a component in the report to delete it from the report.

② Report Thumbnail Area

Each infrared image corresponds to a report, and each report corresponds to a thumbnail. Clicking a thumbnail displays the corresponding report content in the report preview area.

Right-clicking on a thumbnail in the thumbnail area brings up a context menu that includes options to:Add a Cover Page, Add a Content Page, Delete Page and Save as Template.



Add a new page, including adding a new template page or a new blank page. After adding a blank page, you can fully customize the components included on the page and their arrangement. If you add a template page, you can also modify the components on the page and ther arrangement.

In a report, there can only be one cover page, and there is no limit to the number of content pages.

③ Report Editing and Preview Area

In this area, you can preview the report and make edits and modifications to it.

You can add new components to the report by clicking on the "Component Area."

You can click and drag any component with the left mouse button to adjust its position.

You can right-click any component and select "Delete Component" from the menu that to remove the component from the report.

④ Attribute Editing Area

When you select a component in the report preview area, you can modify its properties in the attribute editing area on the right.

When no component is selected, the basic properties of the entire report are displayed by default.

2.3.7.3 Custom Template

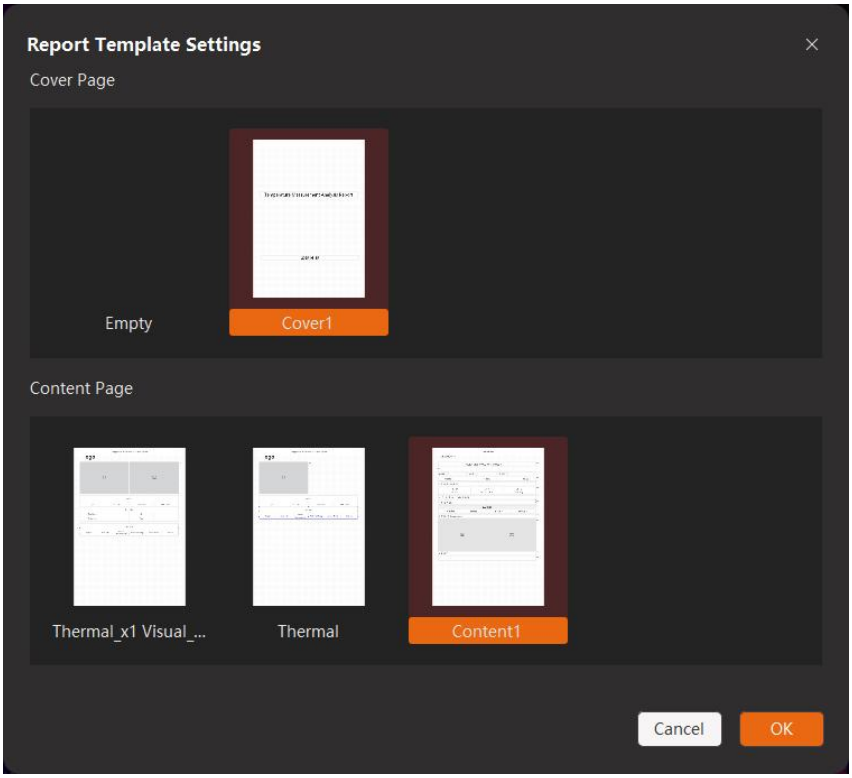
On the "Gallery" or "Offline Analysis" page, click the "Export Report" icon or button. After selecting a specific template or using the default template, you will enter the report preview editing page.

In the report preview editing page, you can make the following adjustments to the report:

- Add new components to the report;
- Delete existing components from the report;
- Modify the properties of components or the report;
- Adjust the position of components;
- Resize certain components.

After completing the adjustments, right-click the thumbnail of the current report, either the cover page or the content page. In the pop-up menu, select "Save as Template." In the window that appears, enter the template name and click the "OK" button to complete the addition of the new template.

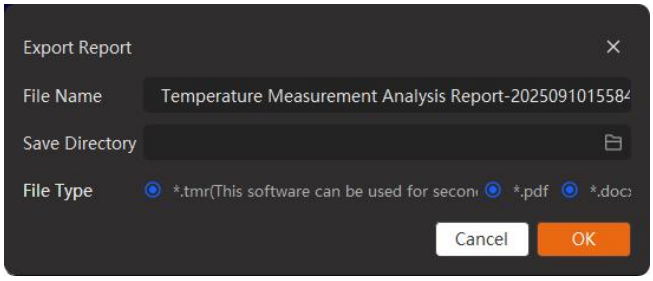
Afterward, when selecting a template for exporting a report or setting the default template in the system settings, you will see the newly added template, as shown in the figure below:



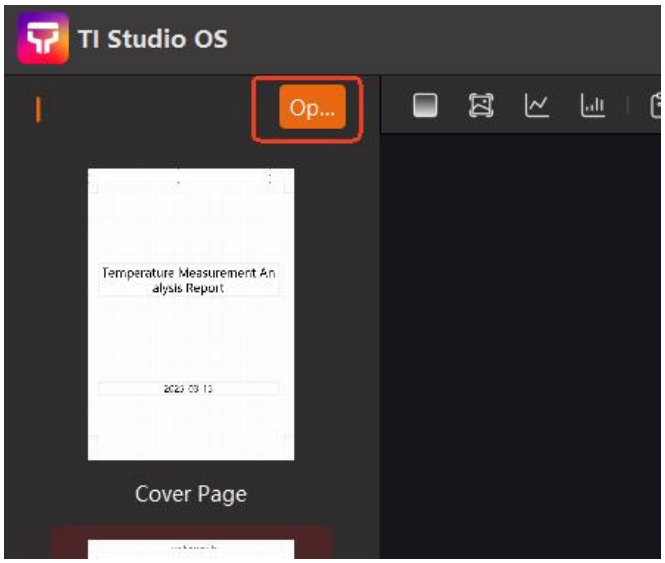
In the above window, for custom templates, right-click to bring up a menu where you can choose the "Rename or Delete" submenu to modify the template name or delete the custom template.

2.3.7.4 Export Report & Edit again

After previewing or editing the report, click the "Export Report" button at the top right corner of the window. In the pop-up window, fill in the "Report File Name" , "Save Path" and “File Type”, then click the "OK" button to export the report.



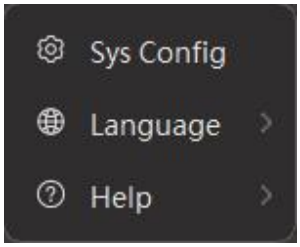
The file types include "*. tmr", "*. pdf" and "*. docx" , and all formats of reports will be exported by default. The "*. tmr" format file can be re imported into the report editor for secondary editing, such as adding, deleting, or modifying components, updating note information, etc., by clicking the "Open" button as shown in the figure below.



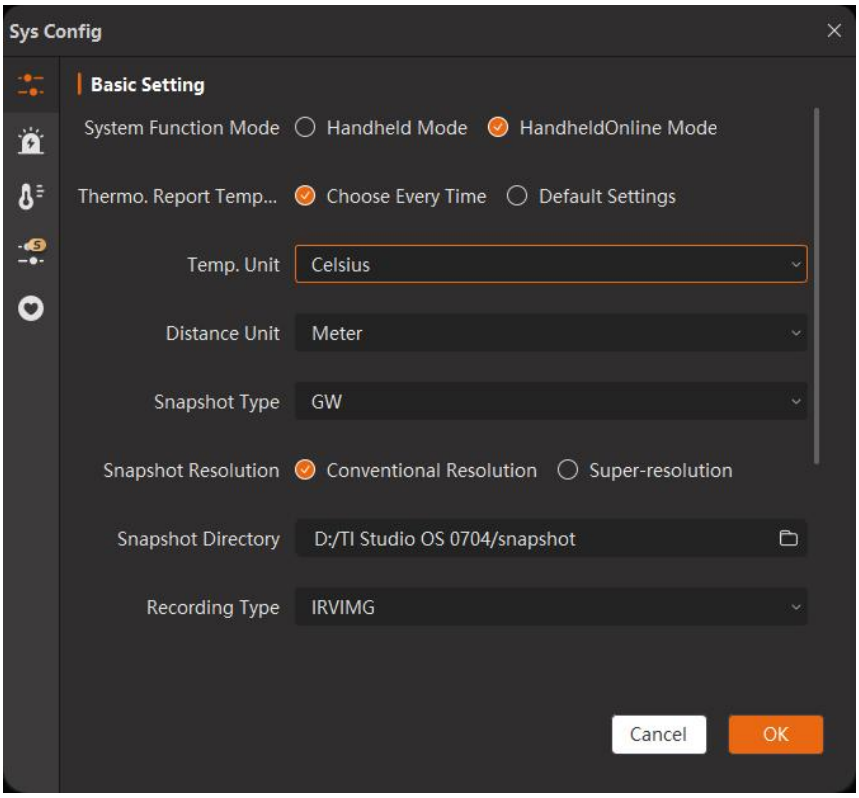
Double click on "Infrared Images" in the report editor, and the system will automatically switch to the "Offline Analysis" page and load the current image. In the offline analysis page, infrared images can be reanalyzed, and after analysis, the temperature measurement analysis report can be exported again.

2.3.8 System Configuration & Help

Click the "More ···" icon in the upper right corner of the software to display the "System Configuration", "Help", and other menus, as shown in the figure below:



2.3.8.1 System Configuration



"System Configuration" function includes five modules: "Basic Settings", "Alarm Settings", "Temperature Measurement Settings", "Advanced Settings" and “Preference settings”. The specific functionalities contained in each module are as follows:

① Basic Settings

Function	Description
System Function Mode	This includes "Handheld Mode" (displaying only the functions associated with handheld devices) and "Handheld + Online Mode" (displaying all functions by default). ➢ When switching the system mode to "Handheld Mode," the program only loads the following modules: Gallery Offline Analysis Some functions in the Online Analysis, including: device list display, real-time preview, analysis tools, ROI temperature list display, real-time temperature curve, scheduled tasks, and

	environmental parameter settings. The System Configuration retains only basic settings and advanced settings. ➢ When switching the system mode to "Handheld + Online Mode," the program loads all functional modules.
Temperature Measurement Report Template	You can set the report template used when exporting reports, including "Select Each Time" (when exporting a report, choose the template to use each time) and "Default Settings" (set a fixed report template, and each time a report is exported, the template selection window will not appear, defaulting to the template set here). When selecting "Default Settings," you can click the "Settings" button on the right side to set the default report template in the pop-up window.
Temperature Unit	Set the temperature unit within the system, supporting Celsius, Fahrenheit, and Kelvin.
Distance Unit	The distance unit in environmental parameters, supporting meters and feet.
Snapshot Type	Set the type of images captured during online analysis. It supports JPG (without temperature data, not analyzable) and GW (national grid format, with temperature data, for secondary analysis).
Snapshot Resolution	You can set the resolution mode for manually or automatically capturing images during online analysis, including regular resolution and super resolution, with the default being regular resolution.
Snapshot Path	Set the storage path for manual image capture during online analysis.
Recording Type	Set the file format for recording videos during online analysis. It supports IRV (analyzable temperature videos) and MP4.
Recording Interval	Set the frame rate for manual video recording during online analysis. The default is "Device Original Frame Rate," which **records as many frames as possible based on the current computer performance from the device output video stream** (frames may be selectively dropped when computer performance is insufficient). You can set a "Custom Frame Rate" to specify the time interval for recording one frame, with the time interval range being 1-3600 seconds.
Recording Path	Set the storage path for recorded video files.

② Alarm Settings

Function	Description
Linked Snapshot Path	Set the storage path for capturing images during linked alarms.
Linked Video Recording Path	Set the storage path for recording videos during linked alarms.
Linked Video Recording Duration	Set the duration of recorded alarm videos during linked alarms. The default is 30 seconds, with a maximum of 90 seconds, starting from the moment of the alarm.
Interval for cleaning alarm data	Set the storage period for alarm data. Data exceeding the set period will be automatically cleared. The default is 30 days, with a maximum of 60 days.
(Alarm) Filtering Time	Set the time interval for filtering "alarms of the same device and type." Within this time interval, alarms of the same device and type will be ignored. Options include 5 seconds, 10 seconds, and 30 seconds, with a default of 5 seconds.
Automatic Alarm Closure	Default is off, meaning that after an alarm occurs, if an IO device is associated with the alarm linkage, the IO device status must be manually "reset" each time an alarm occurs to clear the alarm status of the linked device (such as a sound and light alarm). When this switch is turned on, you can set the "Automatic Alarm Closure Time Threshold." The default is 60 seconds, with a maximum of 60 seconds. This means that if no alarm occurs within the set time interval, the alarm status of the IO device will be automatically reset (restored to the non-alarm state).

③ Temperature Measurement Settings

Function	Description
Temperature Data Cleaning Interval	Set the storage period for temperature data. Data exceeding the set period will be automatically cleared. The default is 4 hours, with a maximum of 24 hours.
Temperature Data Collection Switch	When turned off, temperature data is not collected. When this switch is turned on and the temperature collection interval is set, the software starts collecting temperature. You can query the collected temperature data in the "Temperature Measurement Center".
Collection Interval	Set the time interval for collecting temperature data during real-time analysis. The minimum interval is 1 second.

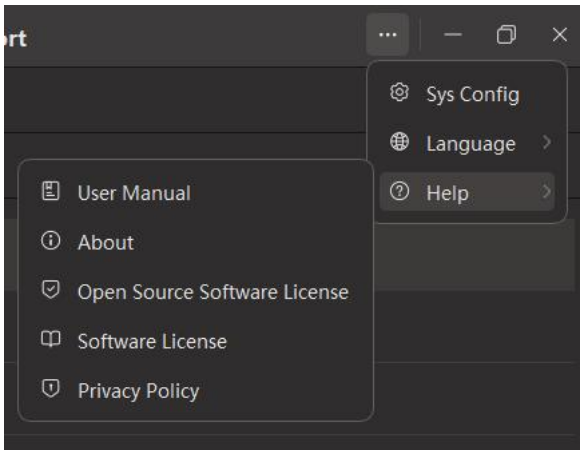
④ Advanced

Function	Description
Frame Skipping	When enabled, in the online analysis, temperature data for temperature measurement rules is calculated every set number of frames. The default is off, meaning calculations are performed for every frame when disabled.
Enable GPU Acceleration	After enabling, it can improve the software's running speed. It is disabled by default. The software automatically detects whether the computer's GPU is available. If available, the user can manually turn on the switch to enhance the software's performance.
Start OpenGLES	When enabled, it resolves anomalies in displaying videos or images in "3D mode" under Windows 7.
(ATU) Automatic Gain Switching	For ATU devices, when automatic gain switching is enabled, if the entire frame's highest temperature exceeds the **upper limit of the current temperature measurement range by a set percentage or if the entire frame's lowest temperature** falls below the **lower limit of the current temperature measurement range by a set percentage** and maintains this state for a duration exceeding the filter time, the device can automatically switch between high and low temperature gains.

⑤ Preference settings

Function	Description
Draw temperature measurement rule mode	In the online and offline analysis modules, there are two modes for drawing temperature measurement rules: "single drawing" (default) and "continuous drawing". Single drawing: After selecting a rule in the toolbar, it can only be drawn once, and it needs to be selected again before the next drawing; Continuous drawing: After selecting a rule in the toolbar, you can draw continuously until the maximum quantity is reached.

2.3.8.2 Help

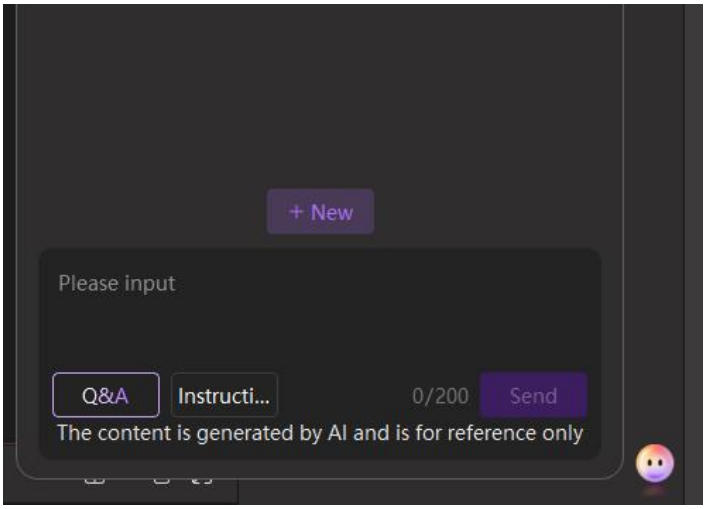


In the "Help" menu shown in the image above, you can access the "User Manual," "About (Software Version Information)," "Open Source Software License," "Software License Agreement," and "Privacy Policy".

2.3.9 AI Assistant -- Raya

Raya, based on the "LLM and proprietary knowledge ", it provides professional knowledge Q&A, software usage guidance and other functions. It also supports "semantic control software", which means that after the intention is input into the software, the software automatically understands the semantics and calls relevant instructions to achieve automatic operation.

In the lower right corner of the software interface, there is the Raya icon. Clicking on the icon will display a chat window, and clicking again will close the chat window.

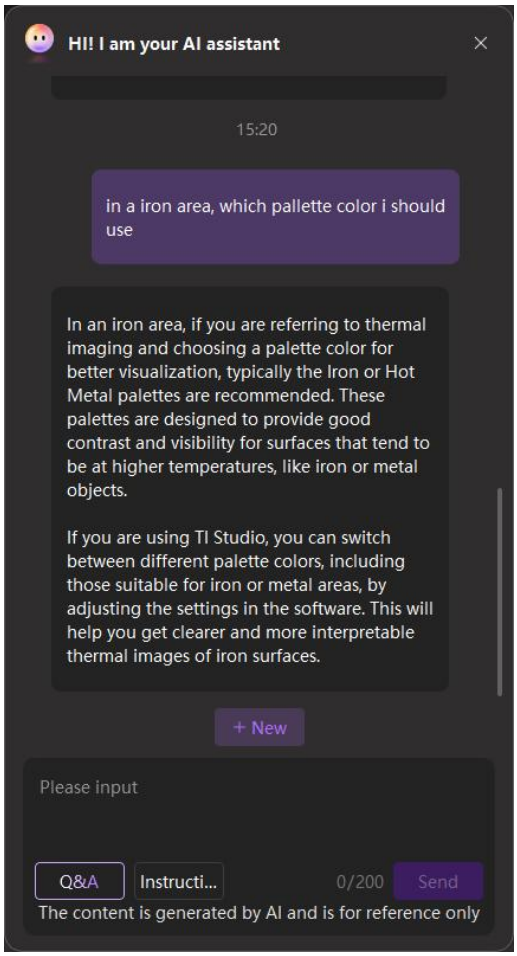


The chat window includes two modes: "Intelligent Q&A" and "Intelligent Command". The intelligent assistant automatically recognizes the current functional page, and the "Intelligent Command" mode is only available when on the "Online Analysis" and "Offline Analysis" pages. The 'Intelligent Q&A' mode is available on all pages. When on the "Online Analysis" and "Offline Analysis" pages, only one of "Intelligent Q&A" and "Intelligent Instruction" can be activated at the same time.

Click the "New" button in the above picture to clear the current chat history and restart the chat.

2.3.9.1 Intelligent Q&A

Through the "intelligent Q&A" function, common software usage issues or other professional problems can be self solved.



2.3.9.2 Intelligent Command

In the "intelligent command" mode, enter the target intention in the input box, and the software automatically recognizes and calls the relevant software instructions to achieve functional automation. For example, if you enter "Set pseudo color to iron red" in the input box, the software will automatically set the current image pseudo color to iron red.

At present, the software supports the following intelligent commands:

Module	Function	Remark
Online analysis	Auto focus	
	Gain mode switching	
	Environmental parameter correction	Including: emissivity, atmospheric transmittance, ambient temperature, reflection temperature, measurement distance
	Alarm rule configuration	
	Alarm linkage rule configuration	
	Timed snapshot	
	Temperature span adjustment	
	Palette switching	
Offline analysis - image	Palette switching	
	Image mode switching	
	Environmental parameter correction	Including: emissivity, atmospheric transmittance, ambient temperature, reflection temperature, measurement distance
	Temperature span adjustment	
Offline analysis - video	Palette switching	
	Environmental parameter correction	Including: emissivity, atmospheric transmittance, ambient temperature, reflection temperature, measurement distance
	Temperature span adjustment	